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EPA Superfund
Record of Decision:

KOPPERS CO., INC. (CHARLESTON PLANT)
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RECORD OF DECISION DECLARATION

SITE NAME AND LOCATION

Koppers Co., Inc. (Charleston Plant) NPL Site
Charleston, Charleston County, South Carolina

STATEMENT AND BASIS OF PURPOSE

This decision document presents the Final selected remedial action for the Koppers Co., Inc. (Charleston Plant) NPL Site in Charleston, South Carolina. EPA's selected remedial action was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substance Contingency Plan (NCP). This decision is based on the Administrative Record for the Site.

The State of South Carolina does not concur with EPA's Final selected remedial action.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health or the environment.

DESCRIPTION OF THE REMEDY

The remedy selected in this ROD is the Final response action selected for the Site. EPA issued an Interim Action ROD in March 1995 to address potential short-term human health risks associated with exposure to surface water and sediments of the Hagood Avenue and Milford Street Drainage Ditches. This ROD selects a site-wide, multi-media response action to address surface/subsurface soil, sediments of drainage ditches, groundwater and NAPL, surface water, contaminant transport pathways, and sediments of the Ashley River, Barge Canal, and North/South/Northwest Tidal Marshes. The major components of EPA's selected remedy include:

- Excavation of an estimated 12,000 tons of the most heavily impacted soil with subsequent off-site disposal in an approved hazardous waste landfill;
- Installation of an estimated 29.7 acre cap over lead impacted soil and relatively less impacted soil to provide additional risk reduction;
- Reconstruction of an estimated 3,600 linear feet of on-site surface water drainage ditches;
- Recovery of groundwater/NAPL via extraction wells at three source areas to remove/treat NAPL to the maximum extent practicable, contain non-restorable source areas, and contain/restore aqueous contaminant plumes;
- Enhanced sedimentation in the Ashley River,
- Placement of a protective cap over sediments of the 3.2 acre Barge Canal;
- Excavation of an estimated 0.25 and 1.50 acres of acutely toxic tidal marsh sediments in the North and South Tidal Marshes, respectively, followed by restoration/revegetation and off-site disposal in an approved hazardous waste landfill; and
- In-situ bioremediation for sediments in the Northwest Tidal Marsh and portions of the South Tidal Marsh which did not demonstrate significant toxicity.

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STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. The remedy for this site utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. The preference for treatment as a principal element is fulfilled through the recovery and treatment of impacted groundwater and NAPL, as well as in-situ bioremediation for the reduction of sediment concentrations in the Northwest and South Tidal Marshes.

Because the selected remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted to ensure the remedy continues to provide adequate protection of human health and the environment within five years after commencement of the remedial action.

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Appendix A: State of South Carolina Non-Concurrence Letter; December 11, 1997

US EPA - Region 4 Response Letter March 18, 1998

Appendix B: Responsiveness Summary
- Attachment 1: Verbatim Transcript of April 15, 1997 Public Meeting
- Attachment 2: Written Comments Received During Formal Comment Period

Appendix C: Superfund Proposed Plan Fact Sheet, Koppers Co., Inc. (Charleston Plant) NPL Site, Charleston, Charleston County, South Carolina, March 1997.

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1.0 SITE NAME, LOCATION, AND DESCRIPTION

The Koppers Co., Inc. (Charleston Plant) Superfund site (hereinafter referred to as "the site") is located in the neck area of northern Charleston, South Carolina on the west side of the peninsula formed by the Ashley and Cooper Rivers. The general location of the site is depicted in Figure 1. The site is approximately 102 acres in size and consists of a number of parcels of property that currently contain a variety of commercial operations. The present use of the area surrounding the site to the north, south, and east consists of a mixture of industrial, commercial and residential properties. The Ashley River borders the site to the west. The total resident, student, and worker population within a 4-mile radius of the site is approximately 150,000.

The specific boundaries of the site are illustrated on Figure 2. The parcel of property bound to the north by Milford Street, to the south by Braswell Street, to the east by Interstate 26, and to the west by the Ashley River represents an approximate 45 acre parcel. This 45 acre parcel was previously owned by the Koppers Company from 1940 to 1978 and was used during their wood-treating operations. In 1988, BNS Acquisitions, Inc. acquired the outstanding common stock of Koppers Co. Inc, In 1989, BNS Acquisitions merged into Koppers Company, Inc., with Koppers Company, Inc. being the surviving corporation. The company underwent a name change to Beazer Materials and Services, Inc. and in 1990, that name was changed to Beazer East, Inc. (Beazer).

The remaining portion of the site, which comprises approximately 57 acres located south and adjacent to the former Koppers property, was never owned by Koppers. These 57 acres were part of a larger tract of land (the entire area south of Braswell Street) owned by the Ashepoo Phosphate/Fertilizer Works. This property was used for phosphate and fertilizer production by a series of owners from the turn of the century until 1978. In November 1984, a barge canal was dredged on this property eastward from the Ashley River. This dredging operation resulted in an observed fish kill in the immediate vicinity of the Ashley River. EPA incorporated these 57 acres into the site boundaries to determine the environmental impact that the dredging operations had on the Ashley River and neighboring tidal marsh.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 Wood-Treating Operations

Wood-treating operations at the site began in the early 1900's, when a wood-treating facility was built in the eastern portion of the site. Koppers acquired the property (north of Braswell Street, south of Milford Street and adjacent to the Ashley River) in 1940 and continued to operate it as a wood-treating facility until 1977 when wood-treating operations ceased. In 1978, the property war sold to Braswell Shipyards, Inc. (now known as Braswell Services Group, Inc.) which subdivided the property into a number of parcels and sold all but two. Braswell Shipyards later re-acquired one of the parcels and, since 1978, has operated'a military ship cleaning, repair, and refurbishing business on two parcels in the northwest corner of the site. In 1994, Beazer acquired the three parcels from Braswell Shipyards, Inc.

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Koppers' wood-treating operations consisted primarily of treating raw lumber and utility poles with creosote. For short periods of time, pentachlorophenol (penta) and copper chromium arsenate (CCA) were also used as preservatives in the wood-treating process. The plant processed poles for utilities such as the power company and the telephone company, foundation pilings for construction of buildings, docks and wharfs, and railroad ties, cross ties, switch ties, bridge timbers, and other railroad materials. The volume of wood treated at the site was approximately 200,000 cubic feet per month.

The majority of wood-treating operations were conducted in the eastern portion of the site, now identified as the former Treatment Area (See Figure 3). In the former Treatment Area, Koppers maintained numerous above-ground storage tanks for the storage of wood-preservatives. The tank farm area in the northeastern corner of the former Treatment Area contained six above-ground storage tanks ranging in size from 50,000 to 650,000 gallons. Koppers also maintained six above-ground working tanks, four of which were on an elevated platform, located east of the treatment building. When penta and CCA were in use, separate working tanks contained these

preservatives. When needed, the creosote was pumped through a pipeline from the storage tanks in the tank farm to the working tanks. The wood-preservatives were then cycled between the working tanks and the treatment cylinders during the treatment process.

Once the virgin lumber was sized, seasoned, or otherwise made ready for treatment, it was pressure treated in one of four pressure treating cylinders. One pressure treating cylinder was dedicated to treating with both penta and CCA, and the remaining three were used exclusively for creosote. All treating cylinders were cylindrical vessels 133 feet long and 8 feet in diameter with a door at one end. Generally, the wood was loaded onto tram cars which were pushed into the cylinders. The cylinder was sealed, a vacuum was applied to remove most of the air from the cylinder and wood cells, and the wood was impregnated with the wood-preservative. At the end of the treatment process, the excess wood-preservative was pumped from the cylinder to the working tanks for re-use. A final vacuum was then placed on the treatment cylinder and any additional wood-preservative drawn out of the wood. The cylinder door was then opened and the trams, loaded with treated wood, were pulled from the cylinder onto the drip tracks.

The Drip Track Area (Figure 3) extended from the Treatment Area in the eastern portion of the site to approximately two thirds of the way to the Ashley River and parallel to the southern Koppers property boundary. The drip tracks were elevated above the rest of the site by 5 to 6 feet. These tracks were constructed at this elevation when the facility was built to facilitate manual movement of treated wood during off loading to a vehicle for transport from the site. Treated wood was either shipped directly to the customer or stored on-site.

During the treatment process, wastewater was generated when steam was used to remove moisture from the wood and from the boiler system. The wastewater from the treatment process contained oils, creosote, and other solids. The wastewater was recovered in a sump pit located adjacent to the treatment cylinders and pumped to a series of six Separation Tanks located near the Treatment Area just south of Braswell Street. Creosote, which has a density greater than water, would settle to the bottom of the sump pit and Separation Tanks. This creosote was recovered, pumped to a dehydrator to remove excess moisture, and then to the working tanks for re-use. Water from the Separation Tanks was discharged to a ditch, now known as the South Braswell Street Drainage Ditch, which flowed eastward to the Ashley River. On occasion, the volume of the Separation Tanks was not sufficient to handle all the material coming from the sump pit and creosote would overflow into the South Braswell Street Drainage Ditch. Historical aerial photographs and sampling conducted during the RI indicate that creosote constituents were transported with wastewater and surface water run-off along the South Braswell Street Drainage Ditch into the Old Impoundment Area (Figure 3). After the mid 1960's, wastewater from the Separation Tanks was discharged to the publicly owned treatment works (POTW).

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Residues that settled to the bottom of the treatment cylinders were removed periodically when accumulations interfered with the treatment processes. Most of the material removed was sand and bark which were coated with creosote. The creosote residue was transported by rail and deposited in the northwestern corner of the site in an area now referred to as the Creosote Treating Cylinder Residue Area (Figure 3). This practice was discontinued in the mid 1960's when residue materials were hauled off-site by a private waste hauler. In addition, a four-acre tract of land in the northwest corner of the former Ashepoo Phosphate Works property (south of Braswell Street) was leased by Koppers from 1953 to 1968 for the stated purpose of depositing sawdust, bark, and other wood waste materials resulting from stripping operations.

2.2 Subsequent Site Operations

Subsequent to Koppers' operations, the Former Treatment Area was used by several industries leasing the properties. The creosote storage tanks in the Tank Farm Area were used by Fed-Serv Industries in the early 1980's to store waste oil. From 1978-1982, Pepper Industries utilized the working tanks to store ship bilge and tank wastes.

As discussed above, Braswell Shipyards has operated a commercial and military ship cleaning, repair, and refurbishing business on the northwest corner of the site since 1978. In operating this shipyard, Braswell has been required to pump bilges and to handle solvents and paint. Braswell operations also include ship paint removal using "Black Beauty" or "Black Diamond" carbon blasting. The parcel of property just south of Braswell Shipyards is used by Parker

Marine, Inc. for prefabrication of marine structures.

The 57 acre parcel south and adjacent to the former Koppers property was used by a series of owners to produce fertilizers and phosphates from around the turn of the century to 1978. In November 1984, after obtaining a permit from the U.S. Army Corps of Engineers, Southern Dredging dredged a barge canal approximately 1000 feet inward from the Ashley River (Figure 3). Slurry material from the canal dredging was pumped approximately 700 feet east of the barge canal and deposited in a bermed spoils area. Water was allowed to flow over a culvert into the South Tidal Marsh while solids settled out and were deposited in the bermed spoils area. As a result of this dredging operation, South Carolina regulatory personnel responded to the presence of exposed creosoted poles, highly turbid water and an oily sheen on the Ashley River adjacent to the canal. Approximately 100 dead fish were observed in the Ashley River within 1/4 mile downstream of the canal. It is believed that this barge canal was dredged in the area formerly leased by Koppers for the disposal of wood waste materials resulting from their stripping operations.

2.3 Previous Removal Actions and Investigations

The first area to tie investigated on-site was the Pepper Industries facility which utilized the former working tanks and wood treatment building. After Pepper Industries abandoned the property in November 1982, Braswell Shipyards notified the South Carolina Department of Health and Environmental Control (SCDHEC) that the tanks were leaking their contents. Sampling and analysis indicated that the tanks contained various oils, contaminated water, and oily sludges. Under an Administrative Order on Consent (AOC) issued by SCDHEC in August 1983, Pepper Industries began a cleanup operation in the working tank area, but later declared bankruptcy and ceased all cleanup activities. Braswell Shipyards performed a cleanup operation of the Pepper Industries property in January 1987, during which they removed all the tanks and containers on the property mid arranged for proper disposal of the wastes. Koppers financed half the expense of this cleanup operation.

Historical investigations conducted from 1983-1985 by SCDHEC and EPA-Region IV revealed numerous releases of waste oil from the storage tanks in the Tank Farm Area leased by Fed Serv Industries. Under an AOC issued by EPA in March 1985, Fed Serv, Koppers and a suite of other entities initiated emergency response actions at the former Tank Farm Area. The activities conducted at this time included proper disposal of material in the tanks, dismantling of the tanks, and excavation and disposal of soils.

As a follow-up to Site Inspections conducted by EPA and SCDHEC regarding activities conducted by Pepper Industries, Fed Serv, and Southern Dredging, EPA initiated a Site Inspection in 1988 on the former Koppers Wood Treating Plant to gather the necessary information required to prepare the Hazard Ranking System (HRS) package. Based upon the results of this investigation, the Koppers Co., Inc. (Charleston Plant) Site received a HRS score of 50 due to the release of wood-treating constituents via the surface water pathway. The site was proposed for inclusion on the National Priorities List (NPL) in February 1992 and became Final in December 1994.

In January 1993, Beazer entered into an AOC with EPA for the performance of a Remedial Investigation/Feasibility Study (RI/FS) at the site. Beazer retained ENSR Consulting & Engineering (ENSR) of Acton, MA to conduct the work required to complete the RI/FS process. EPA and SCDHEC provided oversight of all work conducted during the RI/FS. A complete listing of the documents generated during the comprehensive RI/FS process can be found in the Index to the Administrative Record for this site. This Final ROD is intended to summarize key information from the Administrative Record and provide the rationale for the selected response action specified in Section 9.0. The reader is referred to the site Administrative Record for a more detailed account of the information presented in this document.

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

In late April 1993, EPA conducted community interviews to determine the public's concerns related to the Koppers site. In May 1993, EPA issued a fact sheet to local citizens and public officials announcing the initiation of RI/FS activities at the site. Concurrent with the release of this fact sheet, the Final RI/FS Work Plan documents were submitted for public review to the information repositories located at EPA's office in Atlanta, GA and the Charleston County Main Library in Charleston, SC. On May 25, 1993, EPA held an RI Kick-Off Public Meeting at the Charleston Public Works Building in Charleston, SC to provide a description of the Superfund

process, the work to be performed, and to answer any questions regarding the site.

In January 1995, EPA released a summary publication titled, "Superfund Remedial Investigation Findings and Proposed Interim Remedial Action Fact Sheet" to local citizens and public officials. The stated purpose of this fact sheet was to provide the reader with a description of the site and a brief history, summarize the findings of the RI and the human health Baseline Risk Assessment, and outline EPA's proposed approach for Interim Remedial Action at the site. The Final RI Report, Final Human Health Baseline Risk Assessment (BRA), Technical Memorandum for Interim Remedial Measures and other site related documents were assembled in an Administrative Record (AR) and submitted to the information repositories above for public review and information concurrent with the release of the fact sheet.

A notice to area citizens regarding the availability of the site AR, EPA's proposed approach for interim remedial measures, and initiation of the 30-day public comment period was published in Charleston's daily newspaper, The Post and Courier, on January 19, 1995. A formal public comment period was held from January 20 through February 21, 1995. EPA held a public meeting on January 26, 1995 at the Charleston Public Works Building to present the results of the RI, BRA, and rationale behind the proposed interim remedial action. This meeting was attended by approximately 50 people. A response to comments received during the January 26, 1995 meeting and 30-day public comment period was included in the Responsiveness Summary attached to the Interim Action ROD.

In March 1997, EPA released a summary publication titled, "Superfund Proposed Plan Fact Sheet" to individuals on the site-specific mailing list. This fact sheet is attached to this document as Appendix C. The stated purpose of this fact sheet was to explain the risks posed by the site, describe the cleanup options that were evaluated in the Feasibility Study (FS) Report to mitigate the risks posed, and to describe EPA's preferred cleanup option. The Final FS Report and other supporting documentation were compiled in the AR and submitted to the local information repository for public review concurrent with release of the fact sheet. On March 17, 1997, EPA sponsored a special meeting with residents of the Rosemont subdivision at the Rosemont community center. This meeting was scheduled in an effort to facilitate greater community involvement in the remedy selection process and to hear any concerns the local neighborhoods may have on EPA's proposed cleanup plan.

A notice to area citizens regarding the availability of EPA's Proposed Plan and initiation of the 30-day public comment period was published in The Post and Courier on April 6, 1997.

The 30-day public comment period was held from April 3 to May 2, 1997. EPA sponsored an open house on April 14, 1997 for the public to tour the site and view the progress of the Interim Remedial Action. A public meeting followed on April 15, 1997 at the Charleston Public Works Building to discuss the remedial alternatives evaluated and the specifics of EPA's preferred cleanup alternative. In the May 2, 1997 edition of The Post and Courier, EPA extended the formal comment period an additional 30-days through June 2, 1997.

EPA's response to comments received during the 60-day public comment period is included in the Responsiveness Summary, which is attached as Appendix B. A verbatim transcript of the April 15, 1997 public meeting and a copy of all comments received during the 60-day public comment period are attached in Appendix B. This decision document presents the Final Remedial Action for the Koppers Co., Inc. (Charleston Plant) NPL site, chosen in accordance With CERCLA, amended by SARA, and in accordance with the National Contingency Plan. The decision for this site is based on the materials in the AR and comments received during the public comment period.

4.0 SCOPE AND ROLE OF RESPONSE ACTION

In March 1995, EPA proceeded with an Interim Action to reduce the potential human health risks associated with exposure to the surface water and sediments of the Hagood Avenue and Milford Street drainage ditches, while a Final site-wide cleanup plan was developed. The Performance Standards for this interim response action, as specified in EPA's March 1995 Interim Action ROD are:

- Eliminate off-site migration of non-aqueous phase liquid (NAPL) to the Milford Street drainage ditch;

- Mitigate the drainage system as a conduit for potential NAPL and constituent migration to the Hagood Avenue drainage ditch;

- Eliminate potential exposure to sediments of the Hagood Avenue drainage ditch; and

- Mitigate off-site migration of NAPL in the intermediate water-bearing unit underlying the former Treatment Area.

Implementation of the Interim Action was performed by Beazer under a Unilateral Administrative Order with EPA-Region 4, dated May 22, 1995. Remedial Design documents necessary to implement the Interim Action were approved by EPA and SCDHEC in April 1996.

The following text provides a general chronological summary of the remediation activities that were conducted to achieve the above Performance Standards.

- A groundwater and NAPL recovery pilot system was conducted in the former Treatment Area over a 12-week period from June 4 through August 24, 1996. The results of this small scale operation will be utilized to optimize full scale recovery and treatment in this area.

- In June 1996, a chain link fence was installed around the Hagood Avenue drainage ditch to mitigate potential exposures to sediment and surface water. This activity was considered temporary until the Hagood Avenue drainage ditch is permanently reconstructed.

- Reconstruction of the Milford Street drainage ditch began in August 1996 and was completed in early October 1996. Impacted sediments along an approximate 350 foot stretch of the eastern end of the Milford Street drainage ditch were excavated and disposed of off-site. The open drainage ditch was replaced with a closed system consisting of 22 inch diameter pipe and catch basins to convey storm water.

- Six extraction wells and associated piping were installed along the newly constructed Milford Street drainage ditch. These wells were spaced approximately 40 feet apart with an average depth of 15 feet below ground surface. These wells are designed to collect NAPL and groundwater in the shallow water-bearing unit to eliminate off-site migration in the former Treatment Area. A seventh extraction well was installed to a depth of 35 feet below ground surface near the former location of the pressure treatment vessels.

- In October 1996, the storm drain system between Milford Street and Hagood Avenue was investigated for cracks and joint problems that may facilitate constituent transport. This effort included clean out of all drain lines followed by video inspection.

- In October 1996, approximately 10,000 gallons of water and 100 tons of sludge was removed from the former sump pit that was utilized to collect waste water and residues from the pressure treatment vessels. The water was treated on-site and discharged to the local POTW and the sludge was transported off-site for disposal at a hazardous waste landfill.

- Full scale operation of the six NAPL/groundwater extraction wells installed along Milford Street began in mid-January 1997 and is on-going. Monitoring data has demonstrated steady recovery of NAPL from the shallow water-bearing unit underlying this area. All recovered groundwater has been successfully treated to discharge limits established by the North Charleston POTW. An evaluation of the performance of this system from January 15 to August 31, 1997 is presented in a technical memorandum titled, Evaluation of Shallow Water-Bearing Zone Interim Remedial Action (KEY/ENSR September 24, 1997).

- Rehabilitation of the subsurface storm drain between Milford Street and Hagood Avenue began in late March 1997 and was completed in May 1997. This effort included installation of a cured in place crack/joint sealant, catch basin rehabilitation, and line replacement where necessary, to eliminate potential transport of constituents to the Hagood Avenue drainage ditch.

- Reconstruction of the existing Hagood Avenue drainage ditch began in April 1997 and was completed in August 1997. This effort involved the removal of impacted sediments and replacement with an open, 3-sided trapezoidal concrete fined drain system to convey storm water.

- NAPL recovery and related aquifer testing of the intermediate aquifer underlying the Former Treatment Area was initiated in April 1997 and is on-going. This included refurbishment of the intermediate extraction well to permit conventional and innovative recovery of groundwater/NAPL, baseline NAPL/groundwater recovery to evaluate capture zones, and NAPL recovery with groundwater recirculation. Results of these activities will be utilized to optimize the performance of the site-wide groundwater/NAPL remedy specified in this decision document.

The response action specified in this ROD is the Final action in EPA's overall strategy for remediating the site. This site-wide, multi-media response action will address surface/ subsurface soil, sediments of drainage ditches, groundwater and NAPL, surface water, constituent transport pathways, and sediments of the Ashley River, Barge Canal, and North/South/Northwest Tidal Marshes.

EPA has executed a separate enforcement action to address the former Ashepoo Phosphate/ Fertilizer Works. All future investigations and response actions on the former Ashepoo property will be conducted under the Engineering Evaluation/Cost Analysis (EE/CA) process utilizing Non-Time Critical Removal Action authority. EPA finalized an Administrative Order on Consent and EE/CA Work Plan on September 30, 1997 with successors of this facility to characterize potential impacts associated with historical operations and implement appropriate measures to provide for adequate protection of human health and the environment. The primary focus of this EE/CA will be a surface water drainage ditch leading from the former Acid Chambers to the headwaters of the South Tidal Marsh. Samples collected from this drainage ditch during the Koppers RI field program indicated acidic pH levels and elevated levels of inorganics, particularly lead, in sediments. Performance of an EE/CA on the Ashepoo property is imperative to eliminate the on-going transport of constituents into the headwaters of the South Tidal Marsh, prior to initiating response actions specified in this decision document for the South Tidal Marsh. Field work, as specified in the EE/CA Work Plan, is scheduled for initiation in October 1997.

5.0 SUMMARY OF SITE CHARACTERISTICS

This section provides a brief and concise overview Of the site characteristics as assessed during the site RI. The field component of the RI was conducted in three major phases. Phase I was conducted from June-August 1993. Phase II was performed from February-May 1994. Phase III was conducted during a two-week period in March 1995. In addition, supplemental ecological field investigations were conducted in May 1995 and February 1996 for further ecological characterization. Moreover, a supplemental groundwater investigation of the deep water-bearing unit in the western corner of the site was also conducted in May 1996.

The above field investigations generated a voluminous data base. The results of these field programs and appropriate conclusions have been presented in the following technical reports that are incorporated into the site AR.

- Remedial Investigation Report, Volumes I-IV, ENSR (January 1995)
- Phase III Investigation Report, ENSR (September 1995)
- Technical Memorandum Phase III Ecological Sampling, ENSR (December 1996)
- Feasibility Study Report, Volumes I-III, ENSR (December 1996)

In the interest of brevity, the information presented in the above reports is not re-iterated in this decision document. Rather, the conclusions of the RI are presented in a more qualitative summary format to provide the reader with an overview. Specific human health and ecological risks posed by the site constituents are summarized in Sections 6.1 and 6.2, respectively.

Cleanup goals for all media addressed by this response action are delineated in Section 7.1. The reader is referred to the site AR for a more detailed account of this subject matter.

5.1 Physical Characteristics

This section provides a summary of information regarding the physical characteristics of the site including demography, meteorology, topography, surface water hydrology, geology/hydrogeology and ecology.

5.1.1 Demography

The site is located in an industrial section of Charleston County known as the "Neck area. Current land use on site consists of a mixture of commercial and light industrial operations. Pockets of residential development exist within a 0.5 mile radius of the site the north, south and east. These neighborhoods include Silver Hill south of the site and west of I-26, Four Mile Hibernian directly east of I-26, and Rosemont north of the site and west of I-26. Rosemont is the largest of these neighborhoods, with primary access provided by Doscher Street off Hagood Avenue. The site lies within the 1990 Census tract 44 with three other census tracts (45, 15, and 16) within 0.5 mile of the site. Census tract 44 has a population of 1,141 in 491 households. The population is approximately 90% Black, has a median age of 38 and a median household income of $10,841. The City of Charleston developed future land use plans for the area in a planning blueprint titled Charleston 2000. According to this document, the Neck area along the Ashley River has been recommended for heavy industrial uses. The Rosemont subdivision has been recommended for high density (9+ units/acre) residential use.

5.1.2 Meteorology

The climate in Charleston, SC is temperate and modified considerably by the proximity to the Atlantic Ocean. The marine influence is noticeable during winter when the low temperatures are sometimes 10-155F higher on the peninsula than at the inland airport weather station. Likewise, summer high temperatures are generally a few degrees lower than inland areas. The average daily maximum temperature ranges from 90.25F in July to 57.85F in January. The average daily minimum temperature ranges from 72.75F in July to 37.75F in January. Prevailing winds are northerly in the fall and winter, and southerly in the spring and summer. Summer is warm and humid and is the rainiest season with 41 percent of the annual total. The average precipitation ranges from 7.2 inches in August to 2.5 inches in November. During the fall season from September to mid November, the weather is mostly sunny and temperature extremes are rare. Late summer and early fall is the period of maximum threat to the South Carolina coast from hurricanes. The winter months of December through February are mild with periods of rain. Temperatures of 205F or less on the peninsula and along the coast are very unusual.

5.1.3 Topography

Charleston is a peninsula city bounded by the west and south by the Ashley River, on the east by the Cooper River, and on the southeast by a large harbor. The terrain is generally level, ranging in elevation from sea level to 20 feet on the peninsula. The topographic relief of the site ranges from approximately 15 feet above the National Geodetic Vertical Datum (NGVD) at the eastern site boundary to 0 feet above NGVD at the Ashley River on the western boundary. The site is very flat having a slope of 0.004. The one noted anomaly to this terrain is a rather large debris pile created by the City of Charleston in the central portion of the site which extends a maximum of 20 feet above the surrounding area.

5.1.4 Surface Water Hydrology

Charleston Harbor has been created by the confluence of the Ashley, Cooper, and Wando Rivers. The harbor is tidally influenced and has a mean tidal range of 5.25 feet, a spring tidal range of 6.25 feet, and a maximum tidal range of 6.9 feet. The Ashley River borders the site to the west. The Ashley flows approximately 31 miles from its headwaters in the Cypress Swamp in Berkeley County to Charleston Harbor and drains an estimated 350 square miles of marsh and lowlands. The depth of natural channel ranges from 5.9 to 36 feet. The river is tidally influenced throughout its length and saline waters extend from the harbor to 23 miles upstream. Mapping of the Ashley in the site area indicate the river is 150 feet wide and has a depth ranging to 18 feet in the center channel. Soundings of the river taken during the RI indicate

the river is as deep as 35 feet near the Braswell Shipyards dry dock.

Drainage at this site occurs as either overland flow or through anthropogenic drainage ditches. Drainage occurs as overland flow in the western portion of the site bordering the Ashley River. The eastern portion of the site is drained through a series of anthropogenic drainage ditches. The locations of these surface water ditches are illustrated on Figure 3. Generally, these ditches are referred to as the Milford Street drainage ditch, the Hagood Avenue drainage ditch, the Central drainage ditch, and the Braswell Street drainage ditch. A separate ditch, not illustrated on Figure 3, collects run-off from the former Ashepoo Phosphate/Fertilizer site into the headwaters of the South Tidal Marsh. As discussed in Section 4.0 above, this surface water drainage ditch will be addressed by a separate response action via the EE/CA process.

The western segment of the Milford Street drainage ditch directs run-off to the Northwest Tidal Marsh. The eastern segment of the Milford Street drainage ditch was permanently reconstructed as part of the Interim Action as described in Section 4.0 above. Surface water from this eastern segment flows into a storm drain which then flows north discharging into the Hagood Avenue drainage ditch. The Hagood Avenue drainage ditch discharges into the North Tidal Marsh located north of Hagood Avenue. The Hagood Avenue drainage ditch was also permanently reconstructed as a component of the Interim Action. The Central drainage ditch drains approximately the western third of the site directly into the Ashley River. In areas where this ditch is well-defined, it is lined with a wooden flume. Currently, the Central drainage ditch terminates approximately 940 feet east of the Ashley River. However, historical aerial photography indicates that the Central ditch once drained a much larger portion of the site, extending an estimated 2,200 feet eastward from the Ashley River. Surface water run-off along the South Braswell Street drainage ditch is directed westward and currently discharges into the Barge Canal. Historical aerial photography indicates that the South Braswell Street drainage ditch discharged into the Old Impoundment Area. The western portion of this drainage ditch was lined with a wooden flume similar to that in the Central drainage ditch.

5.1.5 Geology/Hydrogeology

The site is located in the discharge portion of the Atlantic Coastal Plain physiographic province. The Cooper Marl clay formation, a regional confining unit approximately 260 feet thick, is encountered at depths on-site ranging from 50 to 67 feet below land surface (BLS). Therefore, the RI was limited to characterizing the shallow aquifer above the Cooper Marl confining unit. Within a 1 mile radius of the site, groundwater above the Copper Marl is not used for residential or industrial supply. Drinking water to this area is supplied by the City of Charleston.

Three water-bearing units (shallow, intermediate, and deep) and two confining units (shallow and intermediate) were identified in the shallow aquifer above the Cooper Marl. A stratigraphic model of the site is presented graphically in Figures 4, 5, and 6. As seen in the stratigraphic cross-sections, the site is covered with a layer of fill. The fill varies in thickness from 2 feet in the east to 10-15 feet in the west, likely the result of filling of the low lying areas. Beneath the fill layer is a natural geologic unit which together comprise the shallow-water bearing unit. Groundwater on-site is typically encountered between 2 to 6 feet BLS. In the central portion of the site, the shallow water-bearing unit was approximately 25 feet thick.

A shallow clay confining unit is encountered intermittently across the site. In the eastern portion of the site, the shallow clay unit is present at about 15 feet BLS and is 5 feet thick. The shallow clay unit is absent in the central portion of the site. In the western portion of the site, the shallow clay unit is present at about 10 feet BLS. A 10-foot thick intermediate water-bearing unit serves as the transitional zone between the shallow water-bearing unit and the intermediate clay unit. The intermediate clay unit is found across the entire site. In the eastern and central portions of the site, this clay confining unit is consistently present at a depth of 35 feet and is from 5 to 15 feet thick. Adjacent to the Ashley River, the intermediate water-bearing unit is not present. In this area, the shallow clay unit extends uninterrupted to the intermediate clay unit to form a continuous 20 foot thick confining layer. A deep water-bearing unit is encountered between the intermediate clay unit and the Cooper Marl formation. The deep water-bearing unit ranges in thickness from 5 to 20 feet.

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The shallow water-bearing unit extends from the water table to a depth of 25 feet BLS and the intermediate water-bearing unit extends from 25 to 35 BLS. Due to the discontinuity of the shallow clay unit, the shallow and intermediate water-bearing units are considered to act as one hydrologic unit. Figure 7 provides an illustration of groundwater flow direction in shallow/intermediate water-bearing units based upon representative water-table elevation measurements. This figure shows that groundwater in this unit generally flows to the nearest surface water body. Groundwater flow in the eastern portion of the site is to the north toward the North Tidal Marsh. Groundwater flow in remaining portions of the site is west toward the Ashley River and/or towards the adjacent tidal marshes. Water-table contours indicate that the South Braswell Street drainage ditch discharges to groundwater in the eastern portion of the site and receives groundwater in the western portion of the site. Hydraulic conductivities determined by slug tests for wells screened in the shallow water-bearing unit had a geometric mean of 1.8 x 10 -3 cm/sec (0.0035 ft/min). The hydraulic conductivities for wells screened in the intermediate water-bearing unit had a geometric mean of 1.9 x 10 -4 cm/sec (0.0004 ft/min). Utilizing site specific hydraulic conductivities and gradients, groundwater flow rates for this unit were estimated to be 0.22 ft/day (=80 ft/yr) to the north and 0.18 ft/day (=66 ft/yr) to the west.

The deep water-bearing unit extends from 45 feet to a range of 56 to 67 feet BLS. The deep water-bearing unit is considered separate from the shallow/intermediate water-bearing unit because it is consistently separated from the overlying units by the intermediate clay and because it has different groundwater flow direction and chemistry. Comparison of water levels in paired deep and shallow monitoring wells indicate that there is a downward gradient from the shallow to the deep water-bearing unit. Groundwater flow direction in the deep water-bearing unit is west toward the Ashley River (Figure 8). Hydraulic conductivities determined by slug tests for wells screened in the deep water-bearing unit had a geometric mean of 1.2 x 10 -3 cm/sec (0-0024 ft/min). Utilizing site specific hydraulic conductivities and gradients, the groundwater flow rate for the deep water-bearing unit was calculated to be 0.20 ft/day (=73 ft/yr).

5.1.6 Ecology

The upland area of the site is surrounded by three distinct ecological zones: wetland tidal marsh, intertidal zone, and the Ashley River tidal system. The wetland tidal marsh habitat consists of three salt marshes referred to as the North Tidal Marsh, Northwest Tidal Marsh, and South Tidal Marsh (Figure 3). Each marsh system is drained by un-named tidal creeks which flow into the Ashley River. The marshes are dominated by extensive growth of the marsh grass Spartina. Bordering these marshes are narrow areas of riparian habitat which form the boundary between the marsh and upland habitats, typically residential and/or industrial areas. The transition from the marshes to the tidal creeks and Ashley River constitutes the intertidal zone, which is delineated by the five foot tidal range typical of the estuary. The intertidal area may be either vegetated by Spanina or may be bare mud surface. Beyond the low tide mark is the subtidal areas of the marsh creeks and Ashley River.

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5.2 Surface/Subsurface Soils

Impacts to surface soils (defined as 0 to six inches BLS) and subsurface soils (defined as 6 inches BLS to the observed water table) were characterized by the advancement of soil borings into the vadose zone on the upland portions of the site. Generally, this effort included the collection of samples from the nodes of a non-biased grid established across the site for risk assessment purposes and from other areas likely impacted by past operations. These potential source areas of interest included the former Treatment Area, Drip Track Area, Separation Tank Area, Bermed Spoils Area, Old Impoundment Area, and Creosote Treating Cylinder Residue Area. Drainage ditch sediments are also grouped into this section since they are largely present in upland areas. Sediments of the Ashley River, Barge Canal and neighboring tidal marshes are addressed in Section 5.4 below. The investigation strategy for on-site drainage ditches employed

transects aligned perpendicular to the center line. Surface and subsurface soil/sediment samples were collected at established distances along the transects to define the extent of impact off the center line of the respective drainage ditch.

The results of this surface/subsurface soil sampling program were utilized in the Human Health Baseline Risk Assessment (BRA) to quantify potential carcinogenic and non-carcinogenic risks associated with both current and future land uses. Potential receptors evaluated included current/future on-site workers, current/future on-site utility workers, current off-site residents (i.e. trespasser), future on-site residents, and future marina workers. Based upon City of Charleston zoning plans and expected future land-use in the Charleston neck area, EPA has based its surface/subsurface soil cleanup levels on a future industrial exposure scenario for the future on-site worker. Please refer to Section 6.0 of this document for a complete summary of the site risks. Soil cleanup levels are discussed further in Section 7.1.1.

The Human Health BRA concluded that Polynuclear Aromatic Hydrocarbons (PAHs), pentachlorophenol, dioxin, arsenic, and lead are present in on-site surface/subsurface soils at concentrations greater than those deemed adequately protective of the future on-site worker. The areas most impacted by PAHs include the former Treatment Area, Drip Track Area, the Old Impoundment Area, and Northwest Corner (i.e. Creosote Residual Area). The distribution of pentachlorophenol and dioxin in soil is limited to the area which formerly contained the penta storage tank in the Treatment Area. The area most impacted by lead and arsenic is the thin strip of uplands which separates the Barge Canal from the South Tidal Marsh. This area is part of the property formerly owned by Ashepoo Phosphate/Fertilizer Works and is not related to historical wood-treating operations.

The Human Health BRA followed the identical procedure for drainage ditch sediments as described above for surface/subsurface soils. Cleanup goals for drainage ditch sediments have been calculated for the future on-site worker (industrial scenario). The one exception to this is the Hagood Avenue drainage ditch located north of the site. Given the proximity to the Rosemont subdivision, EPA quantified the potential risks posed to a current off-site resident. The Human Health BRA concluded that concentrations of PAHs, arsenic, dioxin, and dieldrin are present in drainage ditch sediments at concentrations greater than those deemed adequately protective of the future on-site worker and current off-site resident. Section 5.3 below discusses the occurrence of NAPL in the Hagood Avenue, Milford Street, Central and Braswell Street drainage ditches. Sediments of the Hagood Avenue and eastern Milford Street drainage ditches were addressed under EPA's Interim Action ROD. The RI concluded that surface/subsurface soil and drainage ditch sediment response actions should be developed and evaluated in the FS process to provide for adequate protection of human health and the environment.

5.3 Groundwater/NAPL

NAPLs comprise a broad class of compounds which are immiscible fluids with densities greater than water (DNAPLs), including creosote, or lighter than water (LNAPLs). Therefore, EPA adhered to the groundwater/NAPL site characterization strategy presented in EPA OSWER Directive 9234.2-25, Guidance for Evaluating the Technical Impacticability of Groundwater Restoration (EPA 1993). This guidance document advocates a strategy which delineates three areas: 1) the NAPL entry location; 2) the NAPL zone or source area; and 3) the aqueous contaminant plume. The entry locations are those areas where NAPL may have entered the environment and, therefore, is likely present in the subsurface. The NAPL zone or source area is defined by that portion of the subsurface containing free-phase or residual NAPL. The aqueous contaminant plume contains dissolved phase constituents down gradient from source areas.

The RI field program focused on likely entry zones by utilizing information gathered on historical operating procedures for the Koppers plant. NAPL source areas and dissolved phase constituent plumes were delineated through the advancement of subsurface borings into the water table and the installation of monitoring wells. A total of 31 conventional monitoring wells were installed in the shallow aquifer above the Cooper Marl. This included 6 in the shallow water-bearing unit, 16 in the intermediate water-bearing unit, and 9 in the deep water-bearing unit. In addition a series of piezometers, drive-point mini wells, and existing monitoring wells installed during previous investigations were sampled to augment the data base.

The locations where NAPL was observed in the subsurface unsaturated and/or saturated zones are depicted on Figure 9. For purposes of this discussion, the occurrence of NAPL is grouped into

four general areas: 1) the former Treatment Area/Milford Street and Hagood Avenue drainage ditches; 2) Northwest Corner, 3) Old Impoundment Area and 4) Braswell Street, Central and North Milford Street drainage ditches. NAPL has been observed in the shallow and intermediate water-bearing units north and south of Milford Street in close proximity to the former Treatment Area. This area is where the bulk of wood-preservation and preservative storage occurred. As discussed in Section 4.0, EPA proceeded with an Interim Action remedy to mitigate the risks posed by the presence and migration of NAPL in the former Treatment Area, and Milford Street/Hagood Avenue drainage ditches. The Northwest Corner of the site is an area where Koppers placed residue from the creosote treating cylinders. This residue consisted of sand, bark and other solid materials including creosote that settled to the bottom of the treating cylinders. NAPL was detected in the shallow water-bearing unit and sediments of the Ashley River in this area. NAPL is present in the shallow, low permeability soils of Old Impoundment Area resulting from run-off from the South Braswell Street drainage ditch. Subsurface soil borings and ditch transects detected the presence of NAPL in the Braswell, Central and North Milford Street drainage ditches. In general, the occurrence of NAPL in these drainage ditches was isolated and at various depths. These drainage ditches are not considered NAPL source areas to groundwater, but constituent transport into respective surface water bodies is a concern.

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Analytical results from monitoring wells were compared to Maximum Contaminant Levels (MCLs) which have been established to be protective of human health based on the use of site groundwater as a drinking water source. This comparison is conservative given that the water-bearing units do not have sufficient capacity and that the groundwater near the Ashley River is either saline or brackish. MCL exceedances were noted in the shallow and intermediate water-bearing units in three general areas of the site. Two of these areas, the former Treatment Area and the Old Impoundment Area, are considered NAPL source areas. The third area is located along the thin strip of uplands which separates the Barge Canal from the South Tidal Marsh (MW-13S). This well exceeded MCLs for arsenic and lead. Pursuant to South Carolina Water Classifications and Standards R 61-68, groundwater containing total dissolved solids (TDS) greater than 10,000 mg/kg may be classified as Class GC after petition and proper administrative procedures. Class GC groundwaters are not considered potential sources of drinking water and of limited beneficial use. The TDS in MW-13S, as measured during the Phase III field program in March 1995, was 17,200 mg/kg. A September 22, 1995 letter from SCDHEC states, "The Department has determined, based on the surrounding marsh conditions, the salinity values in MW-13S, and MW-13S close proximity to the Ashley River, that MW-13S will be considered to be representative of surface water, rather than groundwater. This area should be addressed in the upcoming FS as soil/sediments and surface water pathways." Therefore, the RI concluded that further groundwater remediation at this location will not be required.

MCL exceedances for benzene and thallium were noted in one well screened in the deep water-bearing unit during the RI. This well, MW-01D, is located in the Northwest Corner of the site adjacent to the Ashley River. Additional sampling during the Phase III field program confirmed the MCL exceedance for benzene only. Based upon these results, a supplemental investigation of the deep water-bearing unit was conducted in May 1996 to further evaluate the extent of benzene in this unit. The supplemental investigation consisted of the installation and sampling of two deep monitoring wells at locations approximately 350 feet east and west of MW-01D. This effort confirmed the geology of the area (i.e. clay encountered at approximately 10 feet BLS and continued to approximately 25 BLS where the deep-water bearing unit was encountered) and showed that benzene was not detected in these wells. The RI concluded that this area may meet the criteria of a mixing zone exclusion as outlined in SCDHEC's Groundwater Mixing Zone Guidance Document. The Selected Remedy section of this document (Section 9.2.2) discusses the future requirements for this area.

5.4 Sediments

The nature and extent of impact to sediments of the Ashley River, Barge Canal and neighboring tidal marshes was initially determined by collection of sediment samples. This included the collection of sediment samples from the 0 to 6 inch interval and 6 to 12 inch interval at all established locations. Selected locations in the tidal marshes were also sampled to a depth of 3 feet to evaluate historical trends. Selected locations in the Ashley River and Barge Canal were sampled to depths of 18 feet below the sediment interface with a vibra-corer.

Results of this effort were then compared to relevant ecological screening criteria, NOAA's Effects Range-Low (ERL)/Effects Range-Median (ERM) and EPA's Sediment Quality Criteria, to delineate areas that warranted further investigation or potential remediation. These areas are referred to as Areas of Potential Ecological Concern (APECs). The procedure by which APECs were defined is outlined in Section 7.1.3. The reader is referred to the discussion in Section 7.1.3 and associated figures for a description of the nature/extent of impact in the Ashley River, Barge Canal, and North/South/Northwest Tidal Marshes.

Additional investigations were conducted to evaluate potential impacts on ecological receptors. This comprehensive effort included an 8-week caged oyster bioaccumulation study, sampling and analysis of indigenous mussel populations, acute and chronic whole sediment toxicity tests, benthic macroinvertebrate community structure studies, and Toxicity Identification Evaluation (TIE) on elutriates from sediments. The above ecological assessment activities focused on assessing the potential risks to the benthic invertebrate community and identifying the locations where such a potential risk may exist. A quantitative Ecological Risk Assessment was conducted to evaluate the risks posed to the benthic community and to other biota via the food chain. The results of these efforts are summarized in Section 6.2, Ecological Risk Assessment, below.

5.5 Surface Water

The surface water investigation included a site drainage survey to map overland run-off and the collection of surface water samples from locations in the Ashley River, Barge Canal, tidal marshes, and on-site/off-site drainage ditches. Consistent with the approach described above in Section 5.2, results of this sampling effort were utilized in the Human Health BRA to quantify risks potential risks posed by the surface waters in the Hagood Avenue, Milford Street, Central and Braswell Street drainage ditches. In addition, surface water results were compared to acute and chronic marine Ambient Water Quality Criteria (AWQC). The surface water results were considered during the data evaluation phase of the Ecological Risk Assessment (ERA) discussed in Section 6.2. Due to the low levels of constituents detected in surface water samples from the Ashley River, Barge Canal and neighboring tidal marshes, the ERA did not include exposure to surface water.

Utilizing the applicable exposure scenarios from the Human Health BRA, constituents of concern were developed for the on-site/off-site drainage ditches. PAHs, arsenic, and pentachlorophenol are constituents of concern in the Milford Street, Braswell Street and Central drainage ditches. In the Hagood Avenue drainage ditch, the constituents of concern are PAHs, dioxin and arsenic. EPA's Interim Action ROD addressed the surface water exposure concerns in the eastern end of the Milford Street and Hagood Avenue drainage ditches by source control measures and eliminating exposure to the respective surface waters. While specific cleanup goals have not been developed for surface water, this decision document does specify response actions that will eliminate the sources of identified surface water impacts.

5.6 Fate and Transport

A fate and transport analysis was performed to assess the potential for transport of constituents beyond the boundary of the site. Sampling conducted during the RI has indicated other off-site sources do contribute constituents to the site and surrounding areas. Most notably these include run-off from adjacent industrial areas and drainage into the headwaters of the South Tidal Marsh from the former Ashepoo Phosphate/Fertilizer Works. Conclusions regarding fate and transport have been summarized below for four general areas.

5.6.1 Former Treatment Area/Milford Street Ditch/Hagood Avenue Ditch/North Tidal Marsh Area

The former Treatment Area contains potentially recoverable quantities of NAPL and is considered the source area of site-related constituents detected in sediments and surface waters of the headwaters of the North Tidal Marsh area. NAPL has been observed in the Hagood Avenue Drainage Ditch which feeds the North Tidal Marsh. NAPL is introduced into this system via discharge from the source area into the eastern end of the Milford Street Drainage Ditch. NAPL is then transported via a subsurface culvert which runs approximately parallel to I-26 then empties into the Hagood Avenue Drainage Ditch. The fate and transport evaluation shows that the concentrations of Site-related COCs in surface water and sediment decrease with distance from the source area. This is primarily caused by dilution with tidally-transported water and

sediment. Secondary attenuation mechanisms include biodegradation and photolysis. Secondary transport mechanisms in this area consist of: (1) sediment transport, dominated by NAPL transport, in the upper reaches of the North Tidal Marsh, and (2) partitioning of sediments, dominated by NAPL transport, into surface water.

Sampling conducted during the RI shows that other sources are contributing COC to the North Tidal Marsh. These likely sources include runoff from the heavily industrialized Doscher Street drainage area. In addition, constituents were detected at low levels in the former production well in the deep regional aquifer below the Cooper Marl confining layer. Given the competence and vertical thickness of this confining layer, constituents likely reached this unit by a path associated with the well itself. Dilution within the aquifer prior to reaching other pumping wells is expected to reduce concentrations of constituents to below levels of concern. This well has been properly abandoned, thereby removing it as a potential continuing source of constituents.

5.6.2 Western Area/Central Drainage Ditch/Ashley River/Northwestern Marsh Area

NAPL has been observed in Ashley River sediments north of the Braswell dock. Elevated constituents were detected in the sediments and surface waters of the northwestern marsh area. The concentration of constituents in 0 to 6-inch sediments in the northwest marsh, however, are below Effects Range-Median (ER-Ms). Elevated levels of constituents were also detected in Ashley River sediments immediately surrounding the Central Drainage Ditch. The northwestern area of the Site near MW-01S represents a possible source of NAPL to the Ashley River and elevated concentrations of constituents detected in the northwestern marsh area. Other possible sources include historical discharges via the Central Drainage Ditch and tidal transport from the Barge Canal area. Secondary transport mechanisms in this area consist of dissolved-phase groundwater discharge, sediment transport via the Central Drainage Ditch, and to a lesser extent dissolved surface water flow. During the RI, NAPL was observed in subsurface sediments in the eastern end of this ditch, but NAPL was not observed migrating through the ditch to the Ashley River.

Constituents were detected in MW-01D, screened in the water-bearing unit immediately above the Cooper Marl. NAPL migration through the intermediate clay layer and/or cross-contamination during well installation were considered the most likely sources of these constituents. Two additional deep water-bearing unit monitoring wells were installed during a supplemental field program to evaluate the distribution of constituents in this unit. These constituents were not detected in water samples collected from the two new wells which were installed approximately 350 feet east and west of MW-01D. These analytical results show that the constituents were present in a small area of the Site near MW-01D.

5.6.3 South Braswell Drainage Ditch/Old Impoundment Area/Barge Canal/Ashley River

The Old Impoundment area is a source area with potentially recoverable quantities of NAPL. NAPL has been observed in the South Braswell Street Drainage Ditch, upstream and downstream of the culvert which runs behind the Southern Dredging office and discharges to the Barge Canal. Surface water and sediment data verify that the South Braswell Street Drainage Ditch is an active transport mechanism for NAPL and other related constituents into the Barge Canal and eventually the Ashley River.

Sediment transport in this area is implied by detected constituents at all sediment sampling locations in the South Braswell Street Drainage Ditch and Barge Canal. It should be noted that due to dredging operations in late 1984, the concentrations observed in some of the Barge Canal sediment samples represent fairly recent deposition of sediments from the Ashley River. Tidal flows in the canal may provide a potential pathway for constituent-sorbed sediment transport into the Ashley River.

5.6.4 South Tidal Marsh Area

The South Tidal Marsh area receives surface water run-off from the spoils area, Monrovia Cemetery, a surface water ditch which runs westerly between the former Ashepoo Phosphate/ Fertilizer Works and Monrovia Cemetery, groundwater discharge from the former Asbepoo Phosphate/Fertilizer Works property, and from surface water drainage from east of Highway I-26.

No visual observations of NAPL or staining have been observed in the vicinity of the South Tidal

Marsh. Elevated levels of PAHs were detected in sediment samples collected from the headwaters of the South Tidal Marsh, an area adjacent to the spoils area, and a marsh creek channel extending south from the spoils area. However, the concentrations of inorganic constituents detected in the headwaters of the South Tidal Marsh are of greater ecological concern. These ecological constituents are not a result of past wood-treating activities, but rather a result of fertilizer operations. Sample station SD-81 contained the highest concentrations of lead and arsenic detected during the RI in sediment at concentrations of 41,400 mg/kg and 2,410 mg/kg, respectively. A higher lead concentration was found at sediment sample station SD-93 located in the ditch that drains the former Ashepoo Phosphate/Fertilizer Works property into the South Tidal Marsh.

Sediment and surface water transport are the most dominant transport mechanisms in the South Tidal Marsh. Source areas for elevated levels of PAHs and inorganics are the surface water drainage ditch located between the former Ashepoo Phosphate/Fertilizer Works property and the Monrovia Cemetery, the Bermed Spoils area, and releases associated with the former fertilizer operation located to the south of the former Koppers property. As discussed in Section 4.0 above, EPA will address the former Ashepoo Phosphate/Fertilizer Works via the EE/CA process under its Non Time-Critical Removal authority to mitigate these contaminant transport pathways and source areas.

5.7 Dioxin

Dioxin can be found as a trace constituent in industrial grade pentachlorophenol. Because pentachlorophenol was used as a wood preservative at the site for a limited period of time, a sampling program was developed to determine the nature and extent of impact from this constituent. This included collection and analysis of samples from the surface/subsurface soil, sediments, surface water and groundwater. Additional analysis was conducted on select biota as part of the ecological assessment. Results of this effort are presented graphically on Figure 10. Figure 11 presents the results from the local reference stations. All results on these figures are expressed as parts per trillion (ppt) and presented as concentrations of Dioxin Toxicity Equivalent Quotient(TEQ). Dioxin TEQ is a summary parameter which converts concentrations of dioxin congeners to an equivalent 2,3,7,8-TCDD concentration.

Surface and subsurface soil samples were collected in the former Treatment Area where the penta storage tank was located. Additionally, subsurface soil samples were collected in the Old Impoundment Area and Northwest Corner which received run-off from the Treatment Area and residues from the treatment cylinders, respectively. Results indicate that soils impacted by dioxin are limited to the immediate area surrounding the former locations of the penta storage tank and treating cylinders. Concentrations in surface soil in this area ranged from 738 to 20,123 ppt. Concentrations in subsurface soils in this area ranged from 42 to 26,961 ppt. Groundwater samples from wells installed in the shallow and intermediate water-bearing units in the Treatment Area ranged from non-detect to 1,104 ppt. Source control measures have been implemented under the Interim Action ROD to eliminate off-site migration of impacted groundwater from this area.

Sediment samples collected in the Ashley River adjacent to the site had concentrations similar to those of selected reference stations. Therefore, off-site transport via this pathway was not identified. Concentrations of surface water and sediment samples collected from the Milford Street/Hagood Avenue drainage ditches and the headwaters of the North Tidal Marsh were elevated above reference stations. Interim remedial measures included permanent reconstruction of these drainage ditches and source control measures in the Treatment Area. These efforts will eliminate potential site-related dioxin contribution to this general area. It is important to note that the Hagood Avenue drainage ditch receives run-off from the highly industrialized watershed east of I-26 and the North Tidal Marsh receives run-off from other areas north of Hagood Avenue. Sampling conducted under this activity has indicated these areas may be additional sources of dioxin contribution to the North Tidal Marsh system.

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6.0 SUMMARY OF SITE RISKS

The human health and ecological baseline risk assessment process provides the basis for taking

action and identifies contaminants and the exposure pathways that need to be addressed by the remedial action. It estimates what risks the site poses if no action were taken. This section of the ROD summarizes the results of the baseline risk assessment for this site.

6.1 Human Health Baseline Risk Assessment

The human health risk assessment process consists of the following major components: exposure assessment, toxicity assessment, and risk characterization. The exposure assessment involves the identification of potentially exposed populations and pathways, calculation of media-specific exposure point concentrations from data generated during the RI, and development of assumptions regarding exposure frequency and duration. The toxicity assessment utilizes existing chemical-specific toxicity information to determine the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure and adverse effects. Carcinogenic risks are evaluated by factoring the intake of a chemical with the slope factor for that contaminant. Non-carcinogenic risks are evaluated by comparing the intake of a chemical to the corresponding reference dose of that compound. Risk characterization combines the exposure and toxicity assessments to quantitatively and qualitatively evaluate the potential risks posed. The risk assessment process concludes by the calculation of media-specific cleanup levels that are adequately protective of human health. Cleanup levels are discussed further in Section 7.1 below.

EPA employed a reasonable maximum exposure (RME) approach to estimate the potential exposures and associated risks at the site. The RME is the highest exposure that is reasonably expected to occur at the site and is intended to estimate a conservative exposure case that is still within the range of possible exposures. The exposure pathways evaluated in this assessment included incidental ingestion and dermal contact with surface/subsurface soils, sediments and surface water, and groundwater ingestion and inhalation. Based upon City of Charleston zoning, plans and expected future land-use in the Charleston neck area, EPA has based its cleanup levels on a future industrial exposure scenario for the future on-site worker. However, given the proximity of the Hagood Avenue drainage ditch to the Rosemont subdivision, potential exposure risks to surface soils and sediments/surface water of the Hagood Avenue drainage ditch have been calculated using a current off-site adult and child resident exposure scenario.

Under the future industrial land-use scenario, EPA assumed that an on-site worker would be exposed to surface soil 250 days/year (5 days a week for 50 working weeks) and the sediment/ surface water of on-site drainage ditches 24 days/year (2 days/month). It was assumed the future utility worker was exposed to surface soil 24 days/year (2 days/month) and subsurface soil 12 days/year (1 day/month). The duration of exposure was assumed to be 25 years. Under the current off-site resident scenario, EPA assumed that an off-site resident would be exposed to surface soil and sediments/surface water of the Hagood Avenue drainage ditch 24 days/year. The duration of exposure was assumed to be 6 years for the child and 24 years for the adult.

EPA evaluated the chemicals detected on-site according to their potential to produce either cancer and/or non-cancer health effects. The carcinogenic risk range EPA has set for Superfund cleanups to be protective of human health is 1×10^{-4} to 1×10^{-6}. For example, a cancer risk of 1×10^{-6} indicates that an individual has a 1 in 1,000,000 (or 1 in 10,000 for 1×10^{-4}) incremental chance of developing cancer as a result of site-related exposure to a carcinogen over a 70 year lifetime under the specific exposure conditions at the site. EPA generally uses the cumulative benchmark risk level of 1×10^{-4} for all exposures relating to a particular medium to trigger action for that medium. In other words, a carcinogenic risk greater than 1×10^{-4} for soil would indicate that remedial action for soil is necessary. Non-cancer exposure estimates were developed using EPA reference doses to calculate a Hazard Index (HI). A HI greater that 1 indicates that constituents are present at concentrations that may produce harmful effects.

The resultant carcinogenic and non-carcinogenic risks for the future on-site worker, future utility worker and current off-site resident scenario are provided in Table 1.

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The future industrial and current off-site resident exposure scenarios resulted in unacceptable potential carcinogenic and non-carcinogenic risks. A potential carcinogenic risk of 8×10^{-3} and HI of 20 was calculated for the future on-site worker exposed to surface soils and

sediment/surface water of the on-site drainage ditches. As can be seen by Table 1, risks under this scenario were largely driven by dermal contact with drainage ditch surface waters. A potential carcinogenic risk of 3 x 10 -4 and HI of 5 was calculated for the future on-site utility worker exposed to surface and subsurface soils. Chemicals of concern for the future industrial exposure scenario include PAHs, arsenic, dioxin, and pentachlorophenol. A potential carcinogenic risk of 1 x 10 -1 was calculated for the current off-site resident. Non-cancer HI's for the adult and child off-site resident were 10 and 10,000, respectively. The high risks for the current off-site resident exposure scenario are primarily driven by dermal contact exposure with surface water of the Hagood Avenue drainage ditch. Chemicals of concern in the surface water under this exposure scenario were PAHs, arsenic and dioxin.

6.1.1 Lead Assessment

Historically, land use in the Charleston neck area has been of the commercial and industrial nature. Future zoning plans indicate the site and surrounding area is to remain an industrial district. Therefore, EPA has based its cleanup goals on future industrial land use. EPA has an interim screening level of 400 mg/kg for lead in soil for residential land use. EPA formed a Technical Review Workgroup (TRW) in January 1996 to develop a methodology for assessing risks associated with non-residential adult exposures to lead in soil. The recommendations of this TRW were published in a document titled, "Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposure to Lead in Soil, (December 1996)". This document is expected to promote consistency in assessments of adult lead risks. The methodology described in this document is an interim approach that is recommended for use pending further development and evaluation of integrated exposure biokinetic models for adults.

This document presents a methodology that relates soil lead intake to blood lead concentrations in women of child-bearing age. EPA assumed that a pregnant woman may work at the site under future conditions. In this exposure scenario, the developing fetus would be the sensitive receptor that EPA wishes to protect. An algorithm was developed that relates soil lead exposure to fetal blood lead concentration. A set of default parameter values are provided where site-specific exposure data is not available. In addition, the rationale for each parameter default value is provided in the appendix to the document.

In the absence of site specific exposure data, EPA has employed the default parameter values listed in Table 1, page 6 of the document. Where recommended ranges for the GSD, adult and PbB adult, are provided, EPA has selected reasonable, yet conservative values. A value of 1.9 was selected for GSD i,adult which considers that the exposed population has some degree of heterogeneity. A conservative value of 2.2Ig/dL was selected for the baseline blood lead concentration (PbB adult,o) which is the value provided in the appendix for non-Hispanic black women. EPA has calculated and selected a soil lead cleanup goal of 1,150 mg/kg for the site using these input parameters and algorithms delineated in the above document. The reader is referred to this document, which is included in the site AR, for further discussion regarding this matter.

6.2 Ecological Risk Assessment

As discussed in Section 5.4 above, a comprehensive ecological investigation of the Ashley River, Barge Canal, and North/ Northwest/South Tidal Marshes was conducted during the multi-phased RI. The results of this effort were utilized to define Areas of Potential Ecological Concern (APECs) as sediments requiring potential remediation or further investigation. Sediments within APECs that demonstrated significant acute toxicity to Neanthes arenaceodentata and Mysidopsis bahia have been slated for remediation. Significant toxicity to the selected test species was noted in the Ashley River near the confluence with the Barge Canal, and the headwaters of the North and South Tidal Marshes. The APECs and locations of sediment toxicity are illustrated in Section 7.1.3 below.

Because a majority of the ecological investigations focused on the benthic invertebrate communities, an Ecological Risk Assessment (ERA) was conducted to evaluate potential risks to other biota via the food chain. The methodology and results of this effort are presented in a report titled, "Final Report Ecological Risk Assessment Koppers Woodtreating Charleston, South Carolina, (EPA, October 1996)". Table 2 shows the assessment and measurement endpoints examined by EPA in the ERA.

TABLE 2
ASSESSMENT AND MEASUREMENT ENDPOINTS
ECOLOGICAL RISK ASSESSMENT

Assessment Endpoint	Measurement Endpoint
Protection of benthic invertebrate communities to maintain species diversity, species abundance, and trophic structure.	Neanthes arenaceodentata Ampelisca abdita Mysidepsis bahia
Protection of omnivorous mammals from adverse responses on growth, survival and/or reproductive success.	Raccoon (Procyon lotor)
Protection of piscivorous birds from adverse responses on growth, survival and/or reproductive success.	Great Blue Heron (Ardea herodias)
Protection of insectivorous birds from adverse responses on growth, survival, and/or reproductive success.	Marsh wren (Cistothorus palustris)
Protection of omnivorous birds from adverse response on growth, survival, and/or reproductive success.	Clapper rail (Rallus longirostris)
Protection of fish communities from adverse response on growth, survival, and/or reproductive success.	Killifish (Fundulus heteroclitus) Red drum (Sciaenops ocellatus)

For each measurement endpoint listed in Table 2, appropriate prey species were identified and a contaminant dose was calculated based on the ingestion of contaminated prey and sediment. The arithmetic average and maximum sediment concentrations were calculated for the following four general areas: North Tidal Marsh; Northwest Tidal Marsh; South Tidal Marsh; and Ashley River/Barge Canal. Contaminants of concern (COCs) were identified from the ecological investigations. EPA's ERA evaluated exposure to arsenic, chromium, copper, dioxin, lead, pentachlorophenol and PAHs.

A literature search was conducted to determine levels of exposure to contaminants at which no adverse effect would be expected (i.e. no observed adverse effect level, or NOAEL). If a NOAEL was not available for a constituent or receptor, a converted lowest observed adverse effect level (LOAEL), or LD 50 was used. The hazard quotient method was then utilized to estimate the potential risk posed to selected receptors at the site using the following equation:

Hazard Quotient (HQ) = Exposure Concentration/NOAEL

Exposure concentrations were calculated for each target receptor species based on level of contaminants detected in site sediments, daily food ingestion rates, incidental sediment ingestion rates, and body weight reported in the literature. In this ERA, it was concluded that a potential ecological risk exists if the hazard quotient calculated from the mean area concentration and the NOAEL equals or exceeds 1, or site related toxicity was observed in the toxicity tests conducted. Alternate calculations were made utilizing maximum sediment concentrations and LOAEL toxicity benchmarks to assist in risk management decisions.

Hazard quotients greater than 1 were calculated for all assessment endpoints in all four site areas for exposure to PAHs, arsenic and lead. Hazard quotients greater than 1 were calculated for chromium and copper for all assessment endpoints in all four areas, except for protection of benthic communities. Regarding dioxin exposure, a potential risk was calculated for all assessment endpoints in the North and Northwest Tidal Marshes, except for protection of the benthic invertebrate community. In the South Tidal Marsh, dioxin was determined to pose potential ecological risk to omnivorous mammals. No potential risk was calculated to the assessment endpoints for exposure to pentachlorophenol. Some assessment endpoints were not evaluated due to the lack of toxicity data. Based upon the above discussion, the Ecological Risk Assessment concluded that potential ecological risks exist at the site and that response actions for managing these risks should be evaluated.

Moreover, EPA's ERA recommended the utilization of an alternative risk model to further evaluate potential ecological risks and the effectiveness of remedy options in managing the potential risk. The alternative ecological risk evaluation was conducted in a document titled, "Site-Specific Baseline Ecological Risk Assessment Former Koppers Site Charleston, South Carolina, (ENSR/Ogden 1996)". The alternative scenario employed similar assessment endpoints and constituents than EPA's ERA. However, several deviations from EPA's methodology were applied. Receptors with potentially large feeding areas (i.e. Great Blue Heron, red drum, and raccoon) were assumed to be exposed to the area weighted average of sediment concentrations found in the Ashley River and neighboring tidal marshes. Receptors with relatively small feeding ranges (i.e. marsh wren, clapper rail, and mummichog) were assumed to be potentially exposed to sediment concentrations at individual locations. The alternative scenario found no potential for unacceptable risks to herons or red drum from the constituents evaluated. The alternative scenario found a potential for unacceptable risk to raccoons from arsenic; and to marsh wrens, clapper rails, and mummichogs with one or more constituents in portions of the marshes and river. The alternative scenario was conducted to develop a lower bound of the potential ecological risks posed at the site. When combined with EPA's ERA, the two ecological assessments bound the range of potential ecological risks in which risk management decisions will be made at the site.

Actual of threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

7.0 DESCRIPTION OF ALTERNATIVES

The following section provides a summary of the remedial alternatives for soil/drainage ditch sediments, groundwater/NAPL, and Ashley River/tidal marsh sediments that were evaluated in detail in the Feasibility Study Report. All alternative cost estimates are expressed in 1996 dollars and are based on conceptual engineering, design and construction. Total present worth costs include capital costs and operation/maintenance costs to completely finance the remedy over its planned life.

7.1 Development of Cleanup Levels

A Final Feasibility Study was completed in December 1996 to develop and evaluate cleanup options (referred to as remedial alternatives) that provide adequate protection of human health and the environment. This effort required the derivation of cleanup levels for the media of concern: surface/subsurface soil and drainage ditch sediments; groundwater/NAPL; and sediments of the Ashley River, Barge Canal and North/South/Northwest Tidal Marshes. Cleanup levels were not developed for surface water since this ROD will eliminate the sources of identified surface water impacts. Cleanup levels were necessary to identify areas to be addressed by EPA's Final response action for the site. The Final cleanup levels are discussed below.

7.1.1 Soil and Drainage Ditch Sediments

EPA has selected soil cleanup levels to be protective of the future on-site worker under a future industrial land-use scenario. The Human Health Baseline Risk Assessment developed cleanup levels for soils within EPA's protective risk range of 1×10^{-4} to 1×10^{-6}. Traditionally, EPA has expressed a preference for cleanups to achieve the more protective end of the range (i.e. 1×10^{-6}) pursuant to language in the National Contingency Plan (NCP). However, recent Superfund Administrative Reforms have directed EPA to promote risk management and cost-effectiveness strategies in the remedy selection process. Therefore, a value engineering study was conducted to select an excavation level that optimized risk reduction while minimizing tons of soil removed. This was accomplished by first estimating the tons of soil which exceeded the respective cleanup levels of EPA's protective risk range. Secondly, a resultant residual risk was then calculated assuming that the tons of soil which exceeded the specific cleanup goal were removed and replaced with "clean" soil of an assumed "background" concentration. The residual risk calculations followed the identical approach and assumptions used in the Human Health Baseline Risk Assessment. The results of the value engineering study are summarized in Table 3.

TABLE 3
DETERMINATION OF SOIL EXCAVATION LEVEL

EPA's Protective Risk Range	B(a)P-TE Soil Clean-Up Level(mg/kg) Surface/Subsurface Soil (1)	Estimated Tons of Soil Greater than Clean-Up Level (2)	Estimated Residual Risk Achieved (3)
1 x 10 -4	40/550	5,300	1.6 x 10 -5
5 x 10 -5	20/275	12,000	1.0 x 10 -5
1 X 10 -5	4.0/55	39,000	2.4 x 10 -6
5 x 10 -6	2.0/27.5	86,000	1.1 X 10 -6
1 X 10 -6	0.40/5.5	160,000	8.6 x 10 -8 (4)

Footnotes:

(1) B(a)P-TE, or Benzo(a)Pyrene Toxicity Equivalents, is a summary parameter which converts all carcinogenic PAHs to an equivalent B(a)P concentration. Concentrations are listed for surface soils (0 to 6 inches) and subsurface soils (6 inches to water table).

(2) This column represents total tons of soil which exceeds respective soil clean-up level. B(a)P-TE impacted soil is driving volume estimates.

(3) Estimated residual risk achieved represents the potential risk to future on-site worker AFTER remediation is completed.

(4) Estimated residual risk is lower (i.e. more protective) than EPA's protective risk range of 1 x 10 -4 to 1 x 10 -6.

Figure 12 provides a graphical illustration of residual risk achieved versus tons of soil excavated. Review of this figure demonstrates that the greatest reduction of residual risk achieved per ton of soil removed occurs at the cleanup levels on the higher end of EPA's protective risk range (1 x 10 -4 and 5 x 10 -5). All excavation levels evaluated result in a residual risk within EPA's protective risk range, except the most protective level (1 x. 10 -6) which is outside EPA's protective range. The soil which exceeds the more protective excavation levels of 1 x 10 -5, 5 x 10 -6, and 1 x 10 -6 contains relatively lower concentrations of constituents, therefore the incremental increase in volume of soil excavated is substantial when compared to additional risk reduction achieved. As shown in Table 3 and Figure 12, excavation levels more protective than the 5 x 10 -5 risk level generally double and triple the tons of soil removed while providing a relatively smaller incremental benefit in risk reduction. For these reasons, EPA has selected the 5 x 10 -5 soil excavation level resulting in the removal of an estimated 12,000 tons of soil and ditch sediment. Cost estimates for soil remedies described later in this section are based upon this assumption.

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However, the Feasibility Study did evaluate soil cleanup options that achieve lower levels of residual risk. Soil remedies which combine excavation at the 5 x 10 -5 level described above with capping are presented later in this section. This approach affords the benefit of achieving lower levels of residual risk without incurring the substantial increases in tons of soil and associated costs.

The value engineering study discussed above did not include the constituents of lead or dioxin. Pursuant to discussion in Section 6.1.1, EPA has selected a soil lead cleanup level of 1,150 mg/kg. The majority of lead impacted soil which exceeds the 1,150 mg/kg cleanup level is located on the thin strip of uplands south of the Barge Canal. This area is part of the property formerly owned by the Ashepoo Phosphate/Fertilizer Works and is not related to former wood-treating operations. Representative samples of this lead impacted soil were collected and submitted for analysis to determine its disposal characteristics. Results of leaching potential tests confirm that this lead impacted material is not a characteristic hazardous waste. Therefore, capping and on-site disposal options have been developed to preclude exposure to this material under the future on-site worker scenario.

In regard to the constituent of dioxin, EPA recently issued a policy entitled, "Approach for Addressing Dioxin in Soil at CERCLA and RCRA Sites, OSWER Directive 9200.2-26, April 13, 1998". This policy recommends that a level within the range of 5 Ig/kg to 20 Ig/kg (TEQ) generally be

used as a preliminary remediation goal (PRG) for dioxin in surface soil at remedial sites involving a commercial/industrial exposure scenario. As the policy explains, a level within the range of 5 Ig/kg to 20 Ig/kg for dioxin in commercial/industrial soils is generally protective of human health and the environment. This policy was not issued until after proposal of the selected remedy for the Koppers site which selected cleanup levels of 1.5 Ig/kg (TEQs) in surface soil, and 20 (TEQs) Ig/kg in subsurface soil.

However, if 5 Ig/kg (TEQs) was to be considered as a PRG for surface soils at the Koppers site as recommended by this policy, a final cleanup level of 1.5 Ig/kg (TEQs) for surface soil would still be selected, based on the following reasons.

Soils impacted by dioxin are limited to the Former Treatment Area, in close proximity to former locations of the penta storage tank and treating cylinders. Given this localized distribution, and the co-mingled nature of soil impacted by dioxin and creosote-related constituents (i.e. B(a)P-TE), the value engineering study did not evaluate dioxin. In other words, excavation of B(a)P-TE impacted soil at the performance standard level will also remove soil with dioxin concentrations greater than the cleanup levels derived from the site-specific Human Health Baseline Risk Assessment (1.5 Ig/kg surface soil/20 Ig/kg subsurface soil) and the PRGs recommended by the above policy (within the range of 5 to 20 Ig/kg). Considering the above discussion, EPA has selected 1.5 Ig/kg (TEQs) in surface soil and 20 Ig/kg (TEQs) in subsurface soil as dioxin cleanup levels for this site. Because of the unique nature of the co-mingling of dioxin with the primary COC at this site, the resultant cleanup will attain a more protective dioxin cleanup goal than the recently issued policy range of 5 to 20 Ig/kg (TEQs), without impacting the cost of remediation. Moreover, tbe community and SCDHEC have not objected to EPA's selected dioxin cleanup goal of 1.5 Ig/kg (TEQs) for surface soil.

7.1.2 Groundwater/NAPL

Three source areas of subsurface NAPL and impacted groundwater have been identified at the site. Potential NAPL source areas that will be addressed as groundwater and as ditch sediments are illustrated on Figure 9 in Section 5.3. NAPL observed in the sediments of the Hagood Avenue, Braswell Street, West Milford Street and Central drainage ditches will be addressed through the soil cleanup alternative. EPA has adopted the long-term remediation objectives for sites where NAPL is encountered in groundwater as presented in the EPA OSWER Directive 9234.2-25, "Guidance for Evaluating the Technical Impracticability of Groundwater Restoration (EPA 1993)". EPA's groundwater/NAPL remediation objectives for the Treatment Area, Old Impoundment Area, and Northwest Corner are:

- Removal or treatment of NAPL to the maximum extent practicable;
- Containment of potentially non-restorable source areas; and
- Restoration of aqueous contaminant plumes.

The groundwater/NAPL alternatives developed in the FS Report and summarized in this fact sheet will focus on achieving the above three long-term objectives. Implementation of the Interim Action in the former Treatment Area is underway and is expected to provide valuable operational and performance data on the degree of achievement of these three objectives. All groundwater/ NAPL alternatives developed assume that the Interim Action treatment plant will be used for site-wide remediation. Under the Interim Action, all treated water will be discharged to the North Charleston Publicly Owned Treatment Works (POTW) via permit. Minor upgrades to the treatment system and modifications to the permit may be needed to handle additional capacity.

Based on information obtained during a supplementary May 1996 groundwater investigation in close proximity to MW-01D, a mixing zone for the deep water-bearing unit underlying the Northwest Corner will be applied for during the Remedial Design phase. Moreover, groundwater remediation will not be required at MW-13S given SCDHEC's determination that this well is representative of surface water, rather than groundwater.

7.1.3 Ashley River, Barge Canal, and North/South/Northwest Tidal Marsh Sediments

A weight of evidence approach was developed to derive Areas of Potential Ecological Concern (APECs) for the Ashley River, Barge Canal and three tidal marsh areas neighboring the site. This

protocol utilized the results of sediment samples and whole sediment acute toxicity testing on Neanthes arenaceodentata and Mysidopsis bahia generated during the RI field programs. The protocol is outlined below:

- Within each area (Ashley River, Barge Canal, North/South/Northwest Tidal Marsh), results for sediment samples collected between 0 and 12 inches were compared to available relevant benchmarks for inorganics and PAHs (ER-M or draft EPA Sediment Quality Criteria). Inclusion of data from the 6 to 12 inch interval is considered adequately conservative because the majority of benthic macroinvertebrates are distributed in the upper 6 inches and thus have minimal potential exposure to lower depths;

- Locations where a constituent concentration exceeded the benchmark were assumed to be within the APEC;

- Locations where a constituent concentration was less than the benchmark were assumed to outside the APEC;

- Locations with statistically significant increased mortality of Neanthes and/or Mysidopsis in acute toxicity tests where assumed to be within the APEC;

- Locations where a constituent concentration exceed the benchmark but a co-located toxicity test revealed no statistically significant chronic toxicity relative to reference sites were assumed to be outside the APEC; and

- The edge of the marsh as denoted on the habitat map was used to delineate the extent of an APEC.

The areas requiring remediation in the North and South Tidal Marsh are illustrated in Figures 13 and 14, respectively. The areas requiring remediation in the Ashley River, Barge Canal and Northwest Tidal Marsh are illustrated on Figure 15. Remedial alternatives for sediments may consist of active, intrusive measures (dredging or excavation) or passive, less intrusive containment measures (capping, enhanced sedimentation, bioremediation, natural attenuation). Sediments within those areas illustrated on Figures 13-15 that demonstrated significant acute toxicity to the selected indicator species were evaluated for potential removal (i.e. active remediation). Areas which did not demonstrate sediment toxicity, but did contain sediment concentrations above relevant benchmarks were evaluated for remediation by less intrusive measures.

This approach to remediation in defined APECs affords the benefits of physically removing sediments shown to cause toxicity in site-specific studies, while protectively managing other less impacted sediments in-situ without completely disrupting the function and habitat of these ecosystems. Furthermore, the alternative ecological risk assessment discussed in Section 6.2 compared the areas shown to cause potential ecological risk to the APECs illustrated on Figures 13-15. The findings of this effort suggest that the remediation within APECs to mitigate direct toxicity to benthic macroinvertebrates also eliminates most of the locations with potential food chain risks.

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7.2 Soil and Drainage Ditch Sediments Alternatives

Alternative 1/No Action: As required by CERCLA, a no further action alternative was evaluated to serve as the basis for comparison with other active cleanup alternatives. Under this alternative, no further action would be conducted on soils/drainage ditch sediments which pose an unacceptable risk to the future on-site worker. Deed restrictions would be established to limit future land-use. Total Present Worth = $13,000.

Alternative 2/Containment: Under this alternative, all soil with concentrations greater than the 5 x 10 -5 cleanup level would be covered with a geotextile base and 1 foot of compacted crushed stone cap. One foot of compacted crushed stone cap was used for costing purposes, but the actual

thickness and other parameters such as dust control will be evaluated in Remedial Design. The soil cap would encompass an estimated 6.7 acre area. The Braswell Street, West Milford Street and Central drainage ditches would be reconstructed to achieve the following three objectives: 1) remove all ditch sediment with concentrations greater than the 5 x 10 -5 cleanup level; 2) remove and/or control the transport of NAPL and/or dissolved phase constituents from the drainage ditch; and 3) reconstruct the respective drainage ditch to provide for adequate drainage that is consistent with its future land-use. All impacted ditch sediment will be excavated and disposed of off-site at an approved hazardous waste landfill. The drainage ditches will be reconstructed using a concrete lined channel or enclosed pipe to handle a 10-year, 24-hour storm, which is the design standard for drainage facilities used by the City of Charleston. The estimated total present worth of the drainage ditch reconstruction effort is $1,200,000. Drainage ditch reconstruction is included as a component of all the remaining soil alternatives presented below. Total Present Worth = $1,938,000.

Alternative 3A/Off-Site Disposal: This alternative consists of the excavation of an estimated 12,000 tons of soil which exceeds the 5 x 10 -5 cleanup level, subsequent off-site disposal at an approved hazardous waste landfill, and drainage ditch reconstruction as described under Alternative 2 above. Total Present Worth = $3,313,000.

Alternative 3B/On-Site Disposal: Alternative 3B differs from 3A only in the fact that all excavated soils would be trucked to an on-site landfill rather than a off-site location. Conceptually, a hazardous waste landfill with a multi-layer liner, leachate collection system, and multi-layer cap would be constructed on-site. The proposed location of this landfill is the Spoils Area (See Figure 3, Section 2). Total Present Worth = $3,077,000.

Alternative 4A/On-Site Thermal Desorption and Off-Site Incineration: Alternative 4A includes the excavation of 12,000 tons of soil which exceeds the 5 x 10 -5 cleanup level with subsequent treatment. An estimated 9,000 tons of soil impacted by creosote constituents would be treated on-site by thermal desorption. Thermal desorption units separate organic constituents from soil by heating at temperatures typically between 200-1000 5F. Treated soil would be returned to the on-site excavations. An estimated 3,000 tons of soil impacted by pentachlorophenol with trace amounts of dioxin would be excavated and transported off-site for incineration. Total Present Worth = $8,986,000.

Alternative 4B/On-Site Thermal Desorption and Off-Site Disposal: Under Alternative 4B, 9,000 tons of soil impacted by creosote would be treated on-site via thermal desorption. The 3,000 tons of soil impacted by pentachloropbenol would be disposed of off-site in an approved hazardous waste landfill. Total Present Worth = $6,436,000.

Alternative 4C/Off-Site Incineration: Alternative 4C consists of excavation of the 12,000 tons of soil which exceeds the 5 x 10 -5 cleanup level and transportation off-site for incineration at an approved facility. Total Present Worth = $13,513,000.

Alternatives 5A, 5B, 5C/Capping of Additional Soil to Achieve More Protective Cleanup Levels: Alternatives 5A, 5B and 5C consist of the excavation of an initial amount of soil/ditch sediment containing the highest concentrations of constituents followed by capping of soils containing relatively lower concentrations of constituents. Excavated soil under these alternatives could be treated and/or disposed utilizing any of the options presented in Alternatives 3 and 4 above. Soil alternatives 2 through 4 address the 12,000 tons of soil which exceed the 5 x 10 -5 excavation goal. Alternatives 2 through 4 provide a potential residual risk of 1 x 10 -5 which is within EPA's protective risk range. Alternatives 5A, 5B, and 5C are supplemental alternatives developed by EPA to evaluate options to achieve more protective cleanup goals and an incremental reduction in risk.

Alternative 5A: Alternative 5A consists of the excavation of the 12,000 tons of soil/ditch sediments which exceed the 5 x 10 -5 cleanup leveL Excavated soil could be disposed and/or treated using any of the options described under Alternatives 3 and 4 above. All additional soil which exceeds the 1 x 10 -5 cleanup level would be covered with geotextile base and compacted crushed stone. This cap would cover an estimated 11 acres of the site. The estimated residual risk for implementation of Alternative 5A is 2.4 x 10 -6, which is near the most protective end of EPA's acceptable risk range. The additional Total Present Worth for the 11 acre cap is $1,050,000. Total costs for this alternative will depend on the treatment alternative selected for excavated soil and will range from $4,127,000 to $14,563,000.

Alternative 5B: Alternative 5B consists of the excavation of the 12,000 tons of soil/ditch sediment which exceed the 5 x 10 -5 cleanup level. Excavated soil could be disposed and/or treated using any of the options described under Alternatives 3 and 4 above. All additional soil which exceeds the 1 x 10 -6 cleanup level would be covered with geotextile base and compacted crushed stone. This cap would cover an estimated 31 acres of the site. The estimated potential residual risk for implementation of Alternative 5B is 8.6 x 10 -8 which is outside of EPA's protective risk range (i.e. more protective). The additional Total Present Worth of the 31 acre cap is $2,673,000. Total costs for this alternative will depend on the treatment alternative selected for excavated soil and will range from $5,750,000 to $16,186,000.

Alternative 5C: Alternative 5C consists of the excavation of the 5,300 tons of soil/ditch sediments which exceed the 1 x 10 -4 cleanup level. Excavated soil could be disposed and/or treated using any of the options described under Alternatives 3 and 4 above. All additional soil which exceeds the 1 x 10 -5 cleanup level would be covered with geotextile base and compacted crushed stone. This cap would cover an estimated 11 acres of the site. The estimated residual risk for implementation of Alternative 5C is 2.4 x 10 -6, which is near the most protective end of EPA's acceptable risk range. When combined with the treatment/disposal options of Alternatives 3 and 4, the total present worth of Alternative 5C ranges from $2,937,000 to $7,546,000.

7.3 Groundwater/NAPL Alternatives

Alternative 1/No Action: The no action alternative does not include active measures to address groundwater/NAPL at the three identified source areas except for what is planned under the Interim Action in the former Treatment Area. Restoration of aqueous contaminant plumes would be achieved by natural degradation. A monitoring program would be implemented to evaluate the effectiveness of the Interim Action and rate of natural degradation of aqueous contaminant plumes. Total Present Worth = $102,000.

Alternative 2/Containment by Impermeable Barrier: Alternative 2 consists of the placement of an impermeable barrier down gradient of areas with recoverable NAPL. The objective of the impermeable barrier is to gain containment of the NAPL source area. Groundwater and NAPL recovery wells would be installed and operated up gradient of the barrier to actively recover NAPL and to maintain appropriate groundwater elevations. All recovered groundwater would be piped to the Interim Action treatment system with subsequent discharge to the local POTW. Restoration of aqueous contaminant plumes would be achieved by natural degradation. Total Present Worth = $2,247,000.

Alternative 3/Containment and Recovery with Extraction Wells: Alternative 3 involves the installation of groundwater and NAPL extraction wells to actively achieve the established objectives for this media. The conceptual approach for this alternative includes the installation of 2 groundwater/NAPL recovery wells each in the Northwest Corner (shallow wells) and Old Impoundment Area (intermediate wells). A total of 10 groundwater/NAPL extraction wells are planned for the former Treatment Area which includes 6 wells screened in the shallow water-bearing unit and 4 wells screened in the intermediate water-bearing unit. The extraction wells described above are additional to those installed under the Interim Remedial Action program. Under this alternative, the total groundwater remedy would incorporate 21 extractions wells (14 shallow and 7 intermediate). Additional extraction well(s) may be installed pending review of operation and performance data. All recovered groundwater would be piped to the Interim Action treatment system with subsequent discharge to the local POTW. A monitoring program would be established to monitor the effectiveness of this alternative. Total Present Worth = $3,074,000.

Alternative 4/In-Situ Treatment: Alternative 4 involves the in-situ treatment of organic constituents in groundwater as well as containment and removal of NAPL. Unlike the conventional groundwater extraction wells proposed under Alternative 3, the in-situ process does not require removal of groundwater from the water-bearing units. Instead, the in-situ process establishes a vertical circulation cell by extracting water from a lower screened interval and reinjecting water in an upper screened interval. Over time, dissolved phase constituents in groundwater would be contained in the circulation cell and subject to biodegradation. The in-situ well could also include a NAPL recovery sump to capture NAPL that would be drawn into the well. This technology could also be considered a contingency alternative for the above groundwater/NAPL alternatives should monitoring results indicate that restoration of aqueous contaminant plumes

is not occurring. The cost estimates for this remedy assumed that 2 in-situ wells would be installed in the Old Impoundment Area, 1 in the Northwest Corner, and 4 in the former Treatment Area. Total Present Worth = $2,164,000.

7.4 Ashley River, Barge Canal, and North/South/Northwest Tidal Marsh Sediments Alternatives

Alternative 1/No Action: The no action alternative for river and marsh sediments consists of: 1) mitigation of continuing sources from NAPL in groundwater and ditch sediments; 2) reduction of constituents in river/marsh sediment by natural processes; 3) covering of impacted river/marsh sediments by natural sedimentation; 4) institutional controls to prevent exposure to river/marsh sediments and to mitigate disturbances; and 5) monitoring to determine effectiveness of the passive remediation. Total Present Worth = $275,000.

Alternative 2A/Enhanced Sedimentation: Alternative 2A provides capping of impacted sediments by increasing and accelerating natural sedimentation processes. This alternative is primarily applicable to the Ashley River, since enhanced sedimentation measures in marsh channels are not expected to be effective due to erosive action of storm water run-off from major rainfall events. Enhanced sedimentation of impacted Ashley River bottom sediments can be achieved most effectively by decreasing water velocities in the area of interest, resulting in an increased deposition of the river's suspended sediment load. The conceptual approach to this alternative involves surrounding the area of impacted sediments in the Ashley River with driven piles that extend from the sediment surface. In theory, this pile barrier would capture sediment in a similar manner that a snow fence captures blowing snow. A detailed design study would be necessary to determine the optimal arrangement, spacing of the piles, minimum installation depth and height of piles, and appropriate construction materials. Monitoring and bathymetric surveys would be performed to determine actual rate of deposition. Total Present Worth = $541,000.

Alternative 2B/Subaqueous Capping: Alternative 2B is primarily applicable to the Ashley River and the Barge Canal. In order to preserve the existing elevations and hydrology, use of capping techniques in the North, South and Northwest Tidal Marshes would have to be preceded by dredging. This approach is discussed as part of Alternatives 3A, 3B, 3C, and 3D below.

Capping of Ashley River Sediments: A number of capping systems may be feasible to cover impacted sediments in the area of interest. Key considerations when selecting a cap material include resistance to erosion from relatively high water velocities and consolidation of cap material into the soft base sediments. Sand has been selected as the cap material due to the cost, ease of installation, and ability to re-establish habitat following remediation. Installation of a geotextile base fabric prior to sand application would reduce loss to the underlying soft mud. Geotextile tubes filled with sand would be installed around the cap perimeter to anchor the geotextile base and reduce erosion of the sand cap. Inspection and maintenance of the above described cap would be necessary to ensure its effectiveness. Total Present Worth = $680,000.

Capping of Barge Canal Sediments: Under this alternative, impacted sediments in the 3.2 acre Barge Canal would be capped with a two foot cover. This cover would eliminate exposure to the benthic community and preclude further potential risks to upper trophic level receptors. The cap material would be a prepared mixture with comparable characteristics of organic content, pH and particle size as local tidal marsh sediments. During installation activities, engineering controls would be implemented to abate release of suspended sediments and mitigate adverse impacts to the surrounding environment. A long-term monitoring and maintenance program would be established to mitigate erosional impacts and to ensure the installed cap remains effective at eliminating exposure to underlying sediments. Total Present Worth = $447,000.

As part of the FS process, EPA evaluated the remedial option of combining remediation of the Barge Canal with the lead impacted material from the thin strip of uplands which separates the Barge Canal from the South Tidal Marsh. Site specific leaching data using Ashley River water has confirmed that this material could be used as fill material in the base layer of this remedial option. Conceptually, an estimated 28,000 cubic yards of lead impacted material would be placed in a six foot base layer, followed by the two foot cap discussed in the preceding paragraph. The area would be returned to the appropriate elevations to ensure successful revegetation and repopulation by desired flora and fauna. This conceptual approach to remediation would return the Barge Canal area to its pre-existing condition, prior to the Barge Canal dredging in November 1984. In order to clearly differentiate between remediation and tidal marsh restoration activities, this alternative to Barge Canal remediation must also be selected with the Confined

Disposal option for lead impacted material discussed later in this section. Total Present Worth = $880,000

Alternatives 3A, 3B, 3C, 3D/Dredging, Capping, and Treatment/Disposal: The common components of these alternatives are dredging of impacted sediments, placement of a cap in dredged areas, and revegetation. The distinction between these alternatives is the method of treatment and disposal of dredged sediments. Dredging in the Ashley River was not evaluated due to the similar effectiveness and risk reduction achieved by other comparable alternatives and the prohibitively high cost. Due to the absence of sediment toxicity in the Barge Canal and Northwest Tidal Marsh, active removal of sediment through dredging was not determined appropriate. Therefore, Alternatives 3A/3B/3C/3D apply only to the North and South Tidal Marshes.

Areas of proposed remediation for the North and South Tidal Marsh are illustrated on Figures 13 and 14, respectively. In the North Tidal Marsh, approximately 1,000 feet of tidal creek channel encompassing an estimated 0.25 acres would be excavated. In the South Tidal Marsh, an estimated 1.5 acres would be excavated. The depth of excavation in both tidal marshes is assumed to be the biologically active zone, or the top 1 foot of sediments. Excavation could be accomplished with traditional earth moving equipment using a series of interlocking mats installed over a geotextile layer to provide access. Excavation of sediments saturated with water will require special material handling techniques. Excavated sediments will be loaded directly into water tight trucks and transported to an on-site stockpile area for de-watering and stabilization prior to ultimate disposal. All disturbed areas will be capped with a topsoil mixture consisting of 70% loam/30% organics and returned to former elevations. All disturbed areas will be revegetated and restored with native species.

Alternative 3A/Dredging, Capping and On-Site Thermal Desorption: Excavation would be performed as described above and sediments would be treated via on-site thermal desorption. This alternative would be combined with soil Alternatives 4A or 4B. Total Present Worth = $3,903,000.

Alternative 3B/Dredging, Capping and Off-Site Incineration: Excavated sediments would be treated via off-site incineration. This alternative would be combined with soil Alternative 4C. Total Present Worth = $8,349,000.

Alternative 3C/Dredging, Capping and Off-Site Disposal: Excavated sediments would be disposed off-site at an approved hazardous waste landfill. This alternative could be combined with soil Alternative 3A or be selected as a stand alone cleanup option. Total Present Worth $1,682,000.

Alternative 3D/Dredging, Capping and On-Site Disposal: Excavated sediments would be disposed in the on-site landfill constructed in the Spoils Area as Part of soils Alternative 3B. Total Present Worth = $1,444,000.

Alternative 4/In-Situ Bioremediation: Alternative 4 is potentially applicable to tidal marsh sediments and the Ashley River. The objective of in-situ bioremediation is to increase the rate of natural biodegradation by introducing bacteria and nutrients to improve the conditions for bioremediation to occur. This would be accomplished by the use of biocomposites and micoencapsulation. Microencapsulation involves the packaging of select bacteria and nutrients in degradable capsules. Over time, the capsules release their contents to the impacted sediments. Biocomposites would be injected into the sediments without disturbing the existing plant and animal species. Pilot testing of this approach would be needed to select an appropriate mix of nutrients and bacteria to optimize performance. A sampling program to monitor the effectiveness of this alternative is also included. Total Present Worth = $149,000.

7.5 Lead Impacted Soil

The thin strip of uplands located immediately south of the Barge Canal was formerly utilized by the Ashepoo Phosphate/fertilizer Works to provide access to the Ashley River. An estimated 3.25 acres of soil along this general area contains concentrations of lead, and to a lesser degree arsenic, above EPA's selected cleanup goals. This material is not related to former wood-treating operations. Under the expected future industrial use exposure scenario, cleanup options were developed to eliminate potential risks associated with exposure to this material.

Leaching tests, as specified by the Resource Conservation and Recovery Act (RCRA), conducted on

representative samples of this material confirm that it is not a characteristic hazardous waste. EPA conducted additional leaching tests on this material which consisted of placing a representative soil sample in a jar with water collected from the Ashley River. This mixture was vigorously shaken for 18 hours and the resultant water was analyzed for lead and arsenic. Results clearly indicated that this material does not leach at concentrations that would cause adverse impacts to surface water or ecological receptors. Therefore, this material does not require treatment to render it non-hazardous prior to disposal. The following three alternatives were developed by EPA to eliminate potential human health risks under the future on-site worker scenario.

Alternative 1/No Action: Under this alternative, no further action would be conducted on the soil which exceeds EPA's selected cleanup goals. Deed restrictions would be established to limit future land-use. Total Present Worth = $13,000.

Alternative 2/Containment: Alternative 2 involves capping all soils which exceed cleanup goals for lead and arsenic. For simplicity, the cap system would incorporate the same components (i.e. geotextile base with crushed stone cover) as described under Alternative 2/Soil and Drainage Ditch Sediments. Total Present Worth = $621,000.

Alternative 3/Confined Disposal: Under Alternative 3, soil which comprises this thin strip of uplands would be used as the base layer of fill in the Barge Canal reconstruction alternative (Sediment Alternative 2B). Fill volume estimates of the Barge Canal indicate that most of this upland soil could be placed in the base fill layer. Remaining soil with concentrations above the cleanup levels would be capped, if necessary. The base fill layer in the Barge Canal would be capped with a 2 foot topsoil/organic layer designed for revegetation. This conceptual approach to remediation not only eliminates potential human health risks, but also results in a positive benefit to the Ashley River tidal marsh system by connecting the reconstructed Barge Canal with the expansive South Tidal Marsh system. For the purposes of this document, the total present worth for this alternative is $880,000, which includes the remedial alternative costs for Sediment Alternative 2B- Subaqueous Capping of the Barge Canal. Incremental costs for design/material handling are expected and would have to be estimated if this remedy were selected. In order to clearly differentiate between remediation and tidal marsh restoration activities, this remedial option must be combined with subaqueous capping of Barge Canal sediments (Alternative 2B) presented above.

8.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The objective of this section of the ROD is to evaluate the relative performance of the alternatives with respect to the nine evaluation criteria, so that the advantages and disadvantages of each are clearly understood. The Threshold Criteria must be met for an alternative to be selected. These criteria we presented in Sections 8.1 and 8.2, followed by a discussion presented in the following media-specific subsections: 1) soil/drainage ditch sediments and lead impacted material; 2) groundwater/NAPL; and 3) sediments of the Ashley River, Barge Canal and tidal marshes. Section 8.3 through 8.7 present the Balancing Criteria which are used to weigh the major advantages and disadvantages or each remedial alternative. The discussion in these Sections is organized using the same media-specific subdivisions. Sections 8.8 and 8.9 discuss State Acceptance and Community Acceptance, respectively.

8.1 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

8.1.1 Soil/Drainage Ditch Sediments and Lead Impacted Material

All the soil alternatives evaluated, except the no-action alternative, are protective of human health and the environment by utilizing one or a combination of response actions including capping, excavation, disposal and/or treatment of soil constituents. Since the no-action alternatives for Soil/Drainage Ditch Sediments and Lead Impacted Material do not eliminate, reduce or control any of the exposure pathways, it is therefore not protective of human health and the environment and will not be considered further in this analysis as an option for

impacted soils.

Soil alternatives 5A, B, and C provide the most protection of human health and the environment. These alternatives combine removal of the most heavily impacted soil with the installation of a cover to achieve more protective cleanup levels than afforded by excavation alone. Alternatives 2 through 4 provide relatively the same degree of protectiveness since these alternatives cap, excavate, dispose and/or treat the same quantity of soil. Lead soil alternatives 2 and 3 also provide the same relative degree of protectiveness since both remedial options will eliminate exposure to lead in soil with concentrations greater than 1,150 mg/kg.

8.1.2 Groundwater/NAPL

The primary component of this evaluation criterion is the ability of a remedial alternative to achieve the identified Performance Standards for this media. Generally, these include the removal, treatment and containment of NAPL and the containment and restoration of aqueous contaminant plumes. Since the no-action alternative does not include active measures to address groundwater/NAPL except for what is planned under the Interim Remedial Action, this alternative is not protective and will not be considered further in this analysis.

Alternatives 2 and 3 provide a higher degree of protection than Alternative 4. Alternative 2 achieves containment by the installation of physical barriers and recovery of impacted groundwater and NAPL via extraction wells. Alternative 3 utilizes caution wells to actively achieve the identified Performance Standards in the three noted source areas. Alternative 4 primarily focuses on containment via the use of innovative vertical circulation cell technology.

8.1.3 Ashley River, Barge Canal and Tidal Marsh Sediments

The primary evaluation criteria for sediments of the Ashley River, Barge Canal and tidal marshes is the long-term protection of ecological resources. Given the demonstrated toxicity to selected indicator species and potential ecological risks posed, the no-action alternatives developed for sediments of these areas are not adequately protective and will not be considered further in this analysis.

Regarding the Ashley River, Enhanced Sedimentation (Alternative 2A), and Capping (Alternative 2B) were evaluated as potential remedial alternatives. Both alternatives employ a protective cover of sediment to eliminate exposure of ecological receptors to underlying impacted sediments. The estimated time to achieve protectiveness would be less with the installation of an engineered cap. The shorter time to achieve adequate protection by the capping alternative is somewhat off-set by the short-term disadvantages resulting from dislocation or mortality of existing benthic organisms during cap installation activities in the Ashley River APEC. Capping of the Barge Canal was the only alternative evaluated, given the absence of statistically significant toxicity to selected benthic test species. A two-foot cap over impacted sediments in the Barge Canal with an effective monitoring/maintenance program will adequately protect ecological resources.

Dredging, capping and treatment/disposal of dredged sediments (Alternatives 3A, 3B, 3C, and 3D) and in-situ bioremediation (Alternative 4) were evaluated as potential remedial alternatives in the North, South and Northwest Tidal Marshes. Alternatives 3A-3D provide the highest degree of protection to ecological resources since they involve physically removing sediments shown to cause toxicity to Neanthes and Mysidopsis. Installation of a protective cover and marsh restoration are integral components of with these alternatives to ensure exposure to deeper sediments is eliminated. In-situ bioremediation was retained for application to sediments which did not demonstrate toxicity, but contained concentrations greater than ecological screening criteria. In-situ bioremediation has a demonstrated potential to reduce constituent concentrations without destructing tidal marsh habitat.

8.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Section 121 (d) of CERCLA requires 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). Applicable requirements are those substantive environmental protection requirements, criteria, or limitations promulgated under federal or

state law that specifically address hazardous substances, the remedial action to be implemented at the site, the location of the site, or other circumstances present at the site. Relevant and appropriate requirements are those substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law which, while not applicable to hazardous materials found at the site, the remedial action itself, the site location or other circumstances at the site, nevertheless address problems or situations sufficiently similar to those encountered at the site that their use is well-suited to the site. Compliance with ARARs addresses whether a remedy will meet all of the ARARs of other federal and state environmental statutes or provides a basis for involving a waiver.

8.2.1 Soil/Drainage Ditch Sediments and Lead Impacted Material

All soil alternatives evaluated for this media will attain identified ARARs. However, the recent promulgation of Phase IV Land Disposal Restrictions (LDRs) has added a degree of uncertainty to this analysis. LDR Phase IV states that wood-treating wastes must be treated to Universal Treatment Standards (UTS) prior to land disposal. A two year capacity variance has been granted based on the availability of treatment technologies to achieve UTS. Therefore, wood-treating wastes disposed prior to May 12, 1999 will not be required to meet the promulgated UTS.

Alternatives involving excavation, off-site disposal and supplemental capping activities (Alternatives 3A, 5A-5C) will meet ARARs provided excavation and off-site disposal activities can be completed prior to the May 12, 1999 deadline. This would require fast-tracking the soil component of the selected remedy to meet the resultant time constraints. If this cannot be accomplished due to implementation delays or large volume increases, soil alternatives that either that incorporate thermal desorption or incineration (Alternatives 4A-4C), or in-situ capping alone (Alternative 2A) would be employed to meet ARARs. Alternative 3B, on-site disposal in a hazardous waste landfill, would involve compliance with the most ARARs given a large majority of the site is located within the 100-year flood plain and coastal zone management area. The lead impacted material has been classified as non-hazardous waste according to RCRA. Therefore, all alternatives developed to address this material will meet ARARs.

8.2.2 Groundwater/NAPL

Alternatives 2, 3, and 4 all incorporate technologies to contain and/or potentially recover NAPL and impacted groundwater from the three noted source areas on-site. While achievement of MCL-based cleanup levels may be technically impracticable at sites with NAPL contamination, Alternative 3 incorporates a series of extraction wells that are expected to have a beneficial impact on the restoration of dissolved-phase aqueous plumes downstream of the source area in the former Treatment Area. Therefore, Alternative 3 provides the highest degree of compliance with ARARs. Alternative 2 relies solely on natural degradation or attenuation in areas downstream of NAPL source areas and therefore receives a negative rating for this criterion. Alternative 4 incorporates vertical circulation cell technology that could be used as a contingency alternative with Alternative 3, should monitoring results indicate restoration of aqueous contaminant plumes is not occurring.

8.2.3 Ashley River, Barge Canal and Tidal Marsh Sediments

All remedial alternatives evaluated for this media will meet identified ARARs. Significantly more ARAR compliance issues are presented by the capping and dredging alternatives compared to other alternatives. ARARs for these alternative include Sections 401 and 402 of the Clean Water Act, Section 10 of the Rivers and Harbor Act, and the Federal Coastal Management Act. Alternatives 3A-3D may also be affected by Phase IV LDRs since these alternatives involve components of disposal (on-site/off-site) and treatment (thermal desorption/incineration). These alternatives should be closely coordinated with the selected soil remedy to optimize compliance with ARARs.

8.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once Performance Standards have been met. This criterion includes the consideration or residual risk and the adequacy and reliability of controls.

8.3.1 Soil/Drainage Ditch Sediments and Lead Impacted Material

Soil and drainage ditch Alternatives 2 through 4 address the 12,000 tons of soil which exceed EPA's selected cleanup levels. As discussed in Section 7.1.1, the residual risk was calculated for the future industrial worker after remediation was complete. The residual risk posed to the future on-site worker after completion of Alternatives 2-4 was 1×10^{-5}, which is in the middle of the protective risk range established by EPA. Alternatives 5A and 5C employ an additional 11 acre cap to provide a higher degree of protectiveness in a cost-effective manner. The resultant residual risk for Alternatives 5A and 5C is 2.4×10^{-6} which is toward the more protective end of EPA's acceptable risk range. Alternative 5B includes a 31 acre cap which results in a residual risk of 8.6×10^{-8}. This residual risk is outside, or more protective, than EPA's acceptable risk range.

Alternatives 4A, 4B, and 4C include thermal desorption or incineration prior to disposal. Long-term maintenance would not be required, and therefore these alternatives rank the highest for this criterion. Alternatives 2, 3A and 3B do not involve treatment of soil, therefore these alternatives rank below Alternatives 4A-4C in terms of long-term effectiveness. However, effective maintenance and monitoring programs would provide Alternatives 2, 3A, and 3B reliable long-term permanence and protectiveness.

Regarding the lead impacted soil alternatives, Alternative 2 (capping) and Alternative 3 (confined disposal) provide dependable degrees of long-term effectiveness and permanence. Sediment sampling was conducted in the South Tidal Marsh near the thin strip of uplands which comprises the majority of lead impacted material. Sediment in this immediate area was not included in the APECs delineated using the weight of evidence approach described in Section 7.1.3. Moreover, the subject material is not classified as a characteristic hazardous waste per RCRA regulations. Confined disposal is a proven technology and has been utilized successfully by the U.S. Army Corps of Engineers, other regulatory agencies, and industry for dealing with impacted soils and dredged sediments. Modeling would be conducted to determine the quality of leachate from the base layer. If warranted by the results of the modeling study, engineering controls could be added to the confined disposal ficility to ensure long-term effectiveness and permanence. A long-term inspection and maintenance program is needed to ensure the installed cap remains effective in eliminating human exposure for Alternative 2.

8.1.2 Groundwater/NAPL

All three alternatives are expected to provide an equivalent degree of long-term effectiveness and permanence. Alternative 2 would require routine inspection and maintenance, particularly of the joints of the impermeable barriers. All alternatives would require routine maintenance of extraction wells and the on-site water treatment system

8.3.3 Ashley River, Barge Canal and Tidal Marsh Sediments

In regard to the Ashley River, the capping (Alternative 2B) and enhanced sedimentation (Alternative 2A) alternatives provide the same relative degree of long-term effectiveness and permanence. The engineered cap envisioned in Alternative 2B is expected to more durable. However, the enhanced sedimentation alternative may prove more reliable in the long-term due to natural intertidal revegetation in the accumulated sediment. The long-term success of both Ashley River alternatives and the Barge Canal capping alternative ultimately depend on a maintenance program to repair erosional or other damages to the engineered or enhanced caps. Revegetation and/or restoration would mitigate the adverse impacts of erosional forces on these alternatives.

The long-term effectiveness and permanence of the dredging alternative in the tidal marshes would also be primarily dependant on the durability of the cap. Since these areas to be excavated are focal points for storm water run-off, erosion of the caps can be expected. These impacts can be mitigated by grading the restored areas to proper elevations and actively replanting with native vegetation. In-situ bioremediation is considered to be an innovative and emerging technology for reducing organic and inorganic constituents in sediments. Therefore, the long-term permanence and effectiveness of this alternative cannot be adequately evaluated.

8.4 REDUCTION IN TOXICITY, MOBILITY OR VOLUME

This criterion evaluates the reduction in toxicity, mobility or volume through the treatment technology components of the remedial alternatives.

8.4.1 Soil/Drainage Ditch Sediments and Lead Impacted Material

Alternatives 4A, 4B, and 4C involve thermal desorption or incineration technologies that would provide irreversible destruction of organic constituents through treatment. These alternatives receive the highest ranking under this criterion. Alternatives 3A and 3B do not involve treatment, but would greatly reduce contaminant mobility by confining constituents to an off-site and on-site landfill, respectively. Alternative 2, containment by capping, would also reduce the mobility of constituents by the placement of a cap over impacted soils to eliminate exposure. Drainage ditch reconstruction will also reduce the mobility of constituents by eliminating transport pathways. The remedial alternatives for lead impacted material do not involve treatment components, but capping and confined disposal are expected to provide the same relative degree of reduction in constituent mobility.

8.4.2 Groundwater/NAPL

Alternatives 2, 3 and 4 would all have a positive benefit on the reduction of mobility of NAPL in the three source areas. NAPL recovered under these alternatives would be recovered and subsequently treated or recycled. Impacted groundwater recovered by these systems would also be treated prior to discharge to the selected discharge point. For purposes of this evaluation, all three alternatives were rated equivalent in the reduction of toxicity, mobility or volume of NAPL and impacted groundwater.

8.4.3 Ashley River, Barge Canal and Tidal Marsh Sediments

The Ashley River alternatives of capping and enhanced sediment do provide a reduction in constituent mobility . The engineered cap and accumulation of sediment via enhanced deposition are also expected to reduce the toxicity to benthic organisms and upper trophic levels. Capping of the impacted Barge Canal sediments is also expected to have a positive benefit in the reduction of the mobility of constituents.

The tidal marsh dredging alternatives that involve thermal desorption (3A) and incineration (3B) reduce the toxicity, mobility and volume of organic constitute through treatment and rated the highest in this regard. Dredging alternatives that involve no treatment (3C and 3D) do reduce the mobility of constituents by the excavation of sediment shown to cause toxicity with placement in a controlled and monitored on-site/off-site landfill. Technology performance data on in-situ bioremediation indicates that this technology can be very effective at reducing low molecular weight PAHs (<4 rings). Phytoremediation, which involves the absorption of constituents by plant species, has shown promising results for reducing, concentrations of inorganic constituents.

8.5 SHORT-TERM EFFECTIVENESS

Short-term effectiveness refers to the period of time needed to complete the remedy and any adverse impacts on human health and the environment that may be posed during construction and implementation of the remedy until Performance Standards are achieved. The primary factors influencing ratings for short-term effectiveness are potential adverse impacts to the community and/or remediation workers during site construction activities, potential environmental impacts and duration of remedy implementation activities.

8.5.1 Soil/Drainage Ditch Sediments and Lead Impacted Material

Alternative 2 received the highest ranking since this alternative involves cap installation only with no excavation required. Excavation and off-site disposal options (Alternatives 3A and 4C) would present some potential hazards during excavation due to the number of trucks entering and exiting the site. Noise and dust problems could be mitigated by engineering controls. Alternative 3B, On-Site Disposal, and the remaining on-site treatment alternatives (4A and 4B) provide the least short-tenn effectiveness given the length and intensity of construction and treatment activities necessary to complete the remedial action. Capping of lead impacted material provides a higher degree of short-term protectiveness than the confined disposal alternative.

8.5.2 Groundwater/NAPL

All three groundwater/NAPL alternatives evaluated involve the same relative degree of construction activities necessary to implement the remedial action. Potential impacts during construction would be readily controlled by implementation of an erosion control plan and a health and safety plan for workers. Therefore, all alternatives provide the same degree of short-term effectiveness.

8.5.3 Ashley River, Barge Canal and Tidal Marsh Sediments

The capping alternatives of the Ashley River and Barge Canal, as well as the enhanced sedimentation alternative in the Ashley River, will require engineering controls during construction activities to minimize releases of suspended sediments and associated adverse impacts to surface waters. Silt curtains, sand blankets or other measures identified during the Remedial Design phase could be used to mitigate constituent releases during cap placement and/or pile installation activities. The capping alternatives in the Ashley River and Barge Canal are rated lower since cap placement will result in the displacement of existing benthic organisms.

Short-term impacts from the dredging alternatives are expected to be fairly significant and received the lowest rating with respect to this criterion. The impacts associated with excavation of the North Tidal Marsh are expected to be greatest given the close proximity to the Rosemont subdivision. Alternative dredging techniques, as opposed to the conceptual approach of utilizing traditional earth moving equipment, would greatly reduce disruptions to the environment and neighboring communities. A surface water management plan would be developed to divert run-off during active construction activities. The short-term impacts associated with in-situ bioremediation would be minimal.

8.6 IMPLEMENTABILITY

This criterion addresses the relative ease of remedy implementation and the availability of treatment technologies necessary to meet Performance Standards.

8.6.1 Soil/Drainage Ditch Sediments and Lead Impacted Material

There are no major impediments to implementation of any of the soil alternatives evaluated. The alternatives under consideration utilize well developed and proven technologies, can be readily implemented, can be readily monitored for effectiveness and do not present problems in terms of off-site treatment or disposal capabilities. Alternatives involving excavation and off-site disposal without treatment may impacted if these remedies are not fast tracked to beat the deadline imposed by Phase IV LDRs. Alternatives 3B, On-Site Landfill, rates lower in this criterion given the significant ARARs associated with siting a hazardous waste landfill within the 100 year flood plain and coastal zone.

8.6.2 Groundwater/NAPL

Alternatives 2 and 3 employ field proven technologies that are readily available. These alternatives rated the highest in this criterion. Performance data for Alternative 4, in-situ treatment, has been gathered at numerous locations in the United States and Europe. This technology has been most widely applied to volatile organics. Therefore, in-situ treatment via vertical circulation cells is rated just below Alternatives 2 and 3.

8.6.3 Ashley River, Barge Canal and Tidal Marsh Sediments

Most alternatives developed for this media utilize technologies and equipment which are readily available and proven in the field. Capping and dredging alternatives have been widely applied across the United States with proven success at meeting the Performance Standards established for this site. Confined disposal of lead impacted material and enhanced sedimentation in the Ashley River received slightly lower ratings that the others evaluated. Additional studies during the Remedial Design phase are necessary for these two remedial alternatives to address key implementation issues. Bench scale tests are required for in-situ bioremediation to develop optimal formulations of nutrients necessary to reduce constituent concentrations.

8.7 COST EFFECTIVENESS

This criterion evaluates the Total Present Worth of the developed remedial alternatives. The tables in this section present the Total Present Worth of each alternative while also considering the risk reduction afforded by each. Table 4 presents the Total Present Worth of the soil/drainage ditch sediments and lead impacted material alternatives. Table 5 presents the Total Present Worth of the Groundwater/NAPL alternatives, and Table 6 presents the Total Present Worth of the Ashley River, Barge Canal and Tidal Marsh sediments alternatives.

8.7.1 Soil/Drainage Ditch Sediments and Lead Impacted Material

Table 4 below presents a description of each alternative, Total Present Worth, and residual risk posed to the future on-site worker after completion of the respective soil remedy. Alternatives 2 through 4 address the 12,000 tons of soil which exceed EPA's selected 5×10^{-5} soil cleanup level. Alternatives 5A, 5B, and 5C evaluated the installation of a supplemental cap over soil containing relatively lower concentrations to achieve a more protective residual risk level. The cost estimates for these alternatives depend on the ultimate treatment option selected for excavated soil.

TABLE 4
Total Present Worth of Soil and Lead Impacted Material Alternatives

Alternative/Description	Total Present Worth	Residual Risk/Comments
1 - No Action	$13,000	8 x 10 -3 - Not Adequately Protective
2 - Containment: 6.7 acre cap only.	$1,938,000	1 x 10 -5
3A - Off-Site Disposal: Excavation, off-site disposal in hazardous waste landfill.	$3,313,000	1 x 10 -5
3B - On-Site Disposal: Excavation, on-site disposal in hazardous waste landfill.	$3,077,000	1 x 10 -5
4A - On-Site Thermal Desorption of 9,000 tons and Off-Site Incineration of 3,000 tons.	$8,986,000	1 x 10 -5
4B - On-Site Thermal Desorption of 9,000 tons and Off-Site Disposal of 3,000 tons.	$6,436,000	1 x 10 -5
4C - Off-Site Incineration	$13,513,000	1 x 10 -5
5A - Excavation of 12,000 tons, plus 11 acre cap.	$4,127,000-$14,563,000	2.4 x 10 -6
5B - Excavation of 12,000 tons, plus 31 acre cap.	$5,750,000-$16,186,000	8.6 x 10 -8(1)
5C - Excavation of 5,300 tons, plus 11 acre cap.	$2,937,000-$7,546,000	2.4 x 10 -6
2 Lead Impacted Material - Cap lead soil with concentrations > 1,150 mg/kg	$621,000	Eliminates exposure to future on-site worker
3 Lead Impacted Material - Excavation of lead soil with concentrations > 1,150 mg/kg followed by confined disposal in Barge Canal	$880,000	Combines remediation of lead soil with Barge Canal restoration.

Footnote:
(1) 8.6 x 10 -8 residual risk is outside (i.e. more protective) than EPA's acceptable risk range.

8.7.2 Groundwater/NAPL

TABLE 5
Total Present Worth of Groundwater/NAPL Alternatives

Alternative/Description	Total Present Worth	Residual Risk/Comments
1 - No Action	$102,000	Not Adequately Protective
2 - Containment by Impermable Barrier.	$2,247,000	Utilizes physical barrier and extraction wells to contain/recover NAPL. No active restoration of aqueous contaminant plumes.
3 - Containment and Recovery with Extraction Wells.	$3,074,000	Utilizes extractions wells to actively achieve 3 identified Performance Standards
4 - In-Situ Treatment.	$2,164,000	Utilizes vertical circulation technology to actively achieve 3 identified Performance Standards. Can also be used as contingency remedy in aqueous contaminant plumes.

8.7.3 Ashley River, Barge Canal and Tidal Marsh Sediments

TABLE 6
Total Present Worth of Ashley River, Barge Canal and Tidal Marsh Sediments

Alternative/Description	Total Present Worth	Residual Risk/Comments
1 - No Action	$275,000	Not Adequately Protective
Ashley River/Barge Canal		
2A - Enhanced Sedimentation in Ashley River using piles to decrease water velocities	$541,000	Results in increased accumulation of sediments thus eliminating exposure to benthic community and biota over time.
2B - Capping in Ashley River	$680,000	Installation of engineered cap to eliminate exposure to benthic community and biota once completed.
2B - Capping of Barge Canal	$447,000	Installation of 2 foot cap to eliminate exposure to benthic community and biota. Does not incorporate restoration using lead impacted material as base layer.
North/South/Northwest Tidal Marshes		
3A - Dredging, Capping and Thermal Desorption	$3,903,000	Excavation of toxic sediments. Treatment to be combined with Soil Alternative 4A/4B.
3B - Dredging, Capping and Incineration	$8,349,000	Excavation of toxic sediments. Treatment to be combined with Soil Alternative 4C.
3C - Dredging, Capping and Off-Site Disposal	$1,682,000	Excavation of toxic sediments. Disposal to be combined with Soil Alternative 3A.
3D - Dredging, Capping and On-Site Disposal	$1,444,000	Excavation of toxic sediments. Disposal to be combined with Soil Alternative 3B.
4 - In-Situ Bioremediation	$149,000	To be applied to sediments within APECs which did not demonstrate toxicity.

8.8 STATE ACCEPTANCE

SCDHEC does not concur with EPA's selected remedy described in Section 9.0. The SCDHEC non-concurrence letter is attached to this ROD as Appendix A. While SCDHEC believes that EPA's selected remedy will be of benefit in the reduction of risk at the site, it does not believe that the selected remedy goes far enough in achieving long term protection of human health and the environment. The selected remedy appears to represent a departure from EPA's usual method of selecting remedies at the more protective end of the risk range. SCDHEC's major reasons for not concurring are outlined in the paragraphs that follow.

EPA's Human Health Baseline Risk Assessment utilized exposure point concentrations and other exposure assumptions that SCDHEC does not feel were conservative enough. SCDHEC feels that the human health risks calculated were not based on reasonable exposures, and therefore may underestimate the potential risks posed by the site. Based on these points, SCDHEC did not approve the Human Health Baseline Risk Assessment prepared by the EPA. SCDHEC does not feel that EPA's application of the residual risk methodology at this site gives an appropriate representation of the actual risks that would remain after the selected remedial alternative is implemented. It appears to SCDHEC that this approach represents a departure from the way EPA has traditionally calculated cleanup goals.

SCDHEC does not agree with the proposed cleanup goal of 5 x 10 -5 (20 mg/kg BAP-TE in surface soil and 275 mg/kg BAP-TE in subsurface soil) for Soil/Drainage Ditches. As stated in the NCP, a risk level of 1 x 10 -6 shall be used as the point of departure for determining remediation goals for alternatives when ARARs are not available or are not sufficiently protective because of the presence of multiple contaminants at CERCLA Sites. The NCP also places a preference on the long-term permanence and the reduction of toxicity, mobility, or volume through treatment in selecting remedial goals and alternatives. Considering these points and the uncertainties previously mentioned in the calculation of site risks, SCDHEC feels that protecting to the 1 x 10 -6 cleanup goal is warranted at the Koppers Site. To this end, SCDHEC prefers to excavate an estimated 39,000 tons of soil which exceeds the 1 x 10 -5 cleanup goal (4 mg/kg BAP-TE in surface soil and 55 mg/kg BAP-TE in subsurface soil) for Soi/Drainage Ditches with subsequent off-site disposal. In addition, SCDHEC would prefer to cap all additional areas with soil above the 1 x 10 -6 remedial goal (0.4 mg/kg BAP-TE in surface soil). This cap would cover an estimated 31 acres of the site.

Although SCDHEC approves of the methodology developed by EPA for calculating a cleanup level for lead, SCDHEC does not feel that the exposure assumptions used by EPA to calculate the selected cleanup level of 1150 mg/kg for lead in soil were conservative enough. SCDHEC has calculated a preferred future industrial cleanup level of 895 mg/kg for lead in soil. This cleanup level was calculated using more conservative exposure assumptions.

SCDHEC does not concur with EPA's selected remedy of capping all soils with lead concentrations exceeding the selected cleanup level of 1150 mg/kg. The main area of concern for lead impacted soils is a thin strip of uplands soils in the South Marsh that is surrounded by wetlands. SCDHEC feels that this area may be one of the sources of the ecological impact evident in the South Marsh from lead contamination. Given the ecological and human health concerns, SCDHECs selected remedy is excavation and off-site disposal of all lead impacted soil with concentrations exceeding 895 mg/kg.

While SCDHEC agrees with EPA's three stated remediation objectives for groundwater/NAPL at the three noted source areas on-site, SCDHEC does not concur with the conceptual approach selected by EPA. Based on the preliminary results from the Interim Remedial Action, the number of extraction wells selected may not provide for the complete capture and containment of the entire area of groundwater and NAPL contamination. SCDHEC feels that a more aggressive approach up-front is needed instead of a phased approach that adds additional wells as performance data indicates the need. Based on information in the FS Report SCDHEC is concerned that the proposed groundwater remediation effort may be the basis for an attempt to demonstrate technical impracticability for groundwater restoration. The more aggressive approach proposed by SCDHEC is consistent with OSWER Directive 9234.2-25: Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration.

Based upon the above discussion and SCDHEC's review of the supporting documentation, the following summarizes SCDHEC's selected remedy:

1) Soil/Drainage Ditches: Excavation and off-site disposal of all soils and drainage ditch sediments with concentrations exceeding the 1 x 10 -5 risk level (4 mg/kg BAP-TE in surface soil and 55 mg/kg BAP-TE in subsurface soil) and capping all remaining areas with surface soil above the 1 x 10 -6 risk level (0.4 mg/kg BAP-TE).

2) NAPL/Groundwater: The groundwater/NAPL remedy shall in an aggressive manner achieve the following Performance Standards:
   a) Removal or treatment of NAPL and total fluids to the maximum extent possible;
   b) Containment of potentially non-restorable source areas; and
   c) Containment and restoration of aqueous contaminant plumes to the maximum extent possible.

3) Tidal Marsh and Ashley River Sediments:
   Ashley River: Enhanced Sedimentation with performance standards monitoring that shall indicate a statistically significant accumulation of sediment at the end of one year.
   Barge Canal: Capping and restoration.
   South Marsh: Excavation and offsite disposal followed by restoration of all toxic areas and bioremediation of the remaining area within the APEC.
   North Marsh: Excavation and restoration of the APEC.
   Northwest Marsh: Bioremediation.

4) Lead Impacted Soils: Excavation and off-site disposal of all soils exceeding 895 mg/kg.

8.9 COMMUNITY ACCEPTANCE

A public meeting was held on April 15, 1997 to discuss the remedial alternatives under consideration and EPA's Proposed Plan for cleanup of the Koppers Co., Inc. NPL Site. A 60-day public comment period on EPA's Proposed Plan was held from April 3 to June 2,1997. A copy of all comments received, EPA's response to these comments, and a verbatim transcript of the April 15, 1997 meeting are attached to this ROD as Appendix B, The Responsiveness Summary.

A Technical Assistance Grant (TAG) has been awarded to the Four Mile Hibernian community, Rosemont community and other surrounding neighborhoods. The purpose of this grant is to allow the communities to consult with an advisor so that they may interpret the technical documents generated during the RI/FS process and provide well coordinated input into the remedy selection process. Comments on EPA's Proposed Plan were submitted by the technical advisor, on behalf of the community associations, in a letter dated May 31, 1997. The following is a summary of the community comments contained in this letter:

- Residents are not in favor of cleanup strategies that have not been proven in the field and request specific documentation of results achieved at other sites. This issue pertains specifically to enhanced sedimentation in the Ashley River and in-situ bioremediation of marsh sediments;

- Residents request assurance that no further development, use, or re-use of the site is to take place until cleanup levels in ROD have been achieved. In particular, groundwater and NAPL objectives must be achieved before cleanup can be considered complete;

- Given the uncertainty of assumptions used to calculated cleanup levels for lead, residents prefer SCDHEC's more conservative assumption used to calculate soil cleanup goal for lead;

- Residents object to use of crushed stone as capping material due to dust generation and long-term maintenance/effectiveness; and

- Future industrial activities on-site may be inherently incompatible with adjacent residential use. It is in the best interest of all parties to identify opportunities for re-use that do not adversely impact adjacent neighborhoods.

9.0 THE SELECTED REMEDY

This section of the document provides a description of the components of EPA's Final selected remedy for the Koppers Co., Inc. (Charleston Plant) NPL Site in Charleston, South Carolina. The Performance Standards and other ARARs of EPA's selected remedy are delineated in the sections that follow. The remedy described has been selected under the authority granted in CERCLA and is consistent with the requirements of the NCP. EPA's Final selected remedy is based upon a full consideration of remedial alternatives and all comments received during the 60-day comment period on the Proposed Plan. Cost details of EPA's selected remedy are delineated in Section 9.4. Section 11.0 of this document discusses the significant changes made to the selected remedy from the March 1997 Proposed Plan.

9.1 Soil and Drainage Ditch Sediments

The overall objective of the soil component of EPA's selected remedy is to provide for adequate protection of the future on-site worker under a future industrial land-use exposure scenario. As discussed in Section 6.0 of this document, EPA's Human Health Baseline Risk

Assessment utilized conservative, yet reasonable exposure pathways and assumptions to estimate the potential risks posed to the future on-site worker. Under the future industrial exposure scenario, unacceptable carcinogenic and non-carcinogenic risks were calculated for the future on-site worker exposed to surface soils (0 to six inch interval) and the future on-site utility worker exposed to subsurface soils (six inches to water table). Exposure pathways quantified were incidental ingestion of and dermal contact with on-site soils.

EPA's Human Health Baseline Risk Assessment developed cleanup levels for surface and subsurface soils within EPA's protective risk range of 1×10^{-4} to 1×10^{-6}. As discussed in Section 7.1.1, a value engineering study was conducted to select a soil excavation level within this protective range that optimized risk reduction achieved while minimizing tons of soil removed. This study incorporated risk assessment methodology, traditionally applied only during the characterization phase, into the remedy selection process by re-calculating soil exposure point concentrations and subsequent risk posed under post-remediation conditions (i.e. residual risk). Moreover, EPA evaluated alternatives that involved capping additional soil containing relatively lower concentrations of constituents to achieve more protective cleanup levels. This approach is consistent with recent Superfund Administrative Reforms that direct EPA to promote risk management and cost-effectiveness in the remedy selection process, while also satisfying the NCP preference for cleanups to achieve the more protective end of the risk range (i.e. 1×10^{-6}).

EPA's soil remedy combines the following general components: 1) Excavation of an estimated 12,000 tons of the most heavily impacted soil with subsequent off-site disposal in an approved hazardous waste landfill; 2) Installation of an estimated 29.7 acre protective cap over relatively less impacted soil; and 3) Reconstruction of an estimated 3,600 linear feet of on-site surface water drainage ditches. EPA's selected soil remedy will eliminate exposure to unacceptable concentrations of constituents in soil and permit beneficial future use of the property under the Brownfields paradigm. Property owners are encouraged to consult with nearby communities, and local/state governments to identify opportunities for re-use that maximize compatibility with adjacent neighborboods. The estimated residual risk (i.e. post-remediation risk) achieved by EPA's soil remedy is 1.1×10^{-6}. The specific requirements and Performance Standards of the excavation, capping and drainage ditch reconstruction components are delineated in Sections 9.1.1, 9.1.2, and 9.1.3, respectively.

9.1.1 Excavation and Off-Site Disposal

EPA's Human Health Baseline Risk Assessment determined that five primary constituents contribute unacceptable carcinogenic and noncarcinogenic risks under the future industrial land-use scenario. These constituents are referred to as constituents of concern (COCs) and include: arsenic, B(a)P-TE, dioxin, lead, and pentachlorophenol. EPA has selected a 5×10^{-5} excavation level for the following COCs: arsenic, B(a)P-TE, dioxin, and pentachlorophenol. The applicable excavation levels for these constituents are delineated in Table 7 below. The 5×10^{-5} excavation level is within EPA's protective risk range for the future on-site worker (surface soil) and future utility worker (subsurface soil). EPA has not specified a soil excavation goal for lead, the remaining soil COC. Rather, EPA has decided to specify a cap level for lead impacted soil. The cap level for lead and rationale behind this decision is discussed further in Section 9.1.2 below.

Table 7
SOIL EXCAVATION LEVELS

Constituent	Surface Soil (mg/kg) 1	Subsurface Soil (mg/kg) 2
Arsenic	135	1,550
B(a)P - TE 3	20	275
Dioxin - TEQ 4	0.0015	0.020
Pentachlorophenol	235	4,300

Footnotes:
(1) Surface soil is defined as observed ground surface to six inches below ground surface.
(2) Subsurface soil is defined as six inches below ground surface to the observed water table.
(3) A summary parameter which converts concentrations of carcinogenic PAHs to an equivalent Benzo(a)pyrene concentration. Methodology to calculate B(a)P-TE shall be conducted in accordance with relevant EPA guidance.
(4) Dioxin Toxicity Equivalent Quotient (TEQ) is a summary parameter which converts concentrations of dioxin congeners to an equivalent 2,3,7,8-TCDD. Methodology to calculate Dioxin TEQ shall be conducted in accordance with relevant EPA guidance.

Surface/subsurface soil and drainage ditch sediments with constituent concentrations greater than the excavation levels listed in Table 7 above shall be excavated and disposed in an off-site RCRA-permitted hazardous waste landfill. Figure 16 provides a map delineating the areas of the site where soil will be excavated based upon data obtained during the RI field investigations. An estimated 12,000 tons of soil exceed the excavation levels listed in Table 7. Prior to excavation activities, a statistically based sampling program shall be implemented within the areas slated for removal to further define those soils which exceed the applicable excavation levels. The one exception to this is the spoils pile area in close proximity to sample locations SB-16, SG-51, and SB-74. Surface soil concentrations at samples SB-16 and SB-74 were slightly above the excavation level for B(a)P-TE, while the surface soil concentration at sample SG-51 was above the excavation level for arsenic. Additional sampling shall be conducted in this general area to further define the quantity of soil above the excavation levels in Table 7. EPA and SCDHEC shall have a reasonable opportunity to review and comment on the proposed statistical sampling program prior to implementation. Results of this sampling program shall be reviewed and approved by EPA, with consultation by SCDBEC, prior to the initiation of excavation activities.

All excavation activities shall be conducted in a manner which provides adequate short-term protection of on-site workers, and minimizes disruptions to local businesses and adjacent neighborhoods. Air monitoring during active excavation shall be implemented for the protection of on-site workers and to assess potential off-site impacts. As warranted, dust and odor control measures shall be instituted to mitigate adverse impacts in the active excavation areas, haul roads and adjacent off-site areas. An excavation confirmation sampling progmm, will be developed to verify that all soil has been removed to the specified excavation levels. EPA nd SCDBEC shall

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have reasonable opportunity to review the statistical methods employed by this confirmational sampling program, prior to initiation of excavation activities. The backfill source must be pre-qualified to document its quality. On-site excavations shall be backfilled and restored to a condition consistent with the intended future use of the property.

Excavated soil may be stockpiled on-site, or directly loaded onto transportation vehicles prior to off-site transportation. All excavated soil shall be transported off-site for disposal in an approved hazardous waste landfill. All transportation and off-site disposal activities shall be conducted in full accordance with all ARARs, including but not limited to, RCRA and DOT regulations. The excavated material will be considered listed hazardous wastes and the following wood-treating waste codes apply: F032 (penta with trace dioxin), F034 (B(a)P-TE) and F035 (arsenic and chromium). On May 12, 1997 the Phase IV Land Disposal Restrictions (LDRs) were promulgated in 62 Federal Register (FR) pages 25998-26040 for the above listed wood-treating

wastes (CFR Section 268.30(b)). Per the requirements of Phase IV LDRs, the above listed wood-treating wastes must be treated to Universal Treatment Standards (UTS) prior to land disposal. A two year national capacity variance has been granted based on the availability of treatment technologies to achieve UTS. Therefore, the effective date of the national capacity variance for soil/debris contaminated with F032, F034, and F035 is May 12, 1999.

Listed wood-treating wastes disposed in an off-site, approved hazardous waste landfill prior to May 12, 1999 will not be required to meet the promulgated UTS. Considering this time critical task, excavation and off-site disposal of all material above the excavation levels specified in Table 7 shall be the immediate priority in remedy implementation. Remedial activities described in Section 9.1 (Soil and Drainage Ditch Sediments) and Section 9.3.3.1 (Dredging, Capping, and Off-Site Disposal in North/South Tidal Marshes) shall be closely coordinated to maximize the removal and off-site disposal of soil/debris regulated by Phase IV LDRs prior to May 12, 1999.

9.1.2 Containment by Capping

The objective of EPA's capping component of the soil remedy is to eliminate exposure to unacceptable concentrations of COCs in surficial soils. When combined with the excavation and off-site disposal activities described in Section 9.1.1 above, EPA's additional soil cap remedy will achieve more protective clearitip levels in a cost-effective manner.

EPA has specified a soil cap level for two COCs under the future industrial land-use scenario. It is important to note that EPA has extended the cap area under what was envisioned for soil remedy Alternative 5A. EPA has selected a 2 mg/kg cap level for B(a)P-TE, which is equivalent to the 5 x 10 -6 risk level. The resultant residual risk, or post-remediation risk posed to the future on-site industrial worker is 1.1 x 10 -6. EPA made this risk management decision to satisfy the NCP preference to protect to the more protective end of EPA's acceptable risk range. The value engineering study conducted during the Feasibility Study indicated that B(a)P-TE Was the primary constituent driving soil remediation, particularly at the more protective cleanup levels. In other words, capping all soil with concentrations greater than 2 mg/kg B(a)P-TE will also cover soil with unacceptable concentrations of the other COCs. For this reason, EPA has specified a cap level for B(a)P-TE only and not the remaining soil COCs listed in Table 7 of Section 9.1.1 above.

As discussed in Section 6.1.1, EPA has selected a soil lead cleanup level of 1,150 mg/kg to be adequately protective of the developing fetus of a future on-site pregnant woman worker. In the March 1997 Proposed Plan, EPA's preferred alternative for lead impacted soil was excavation and confined disposal in the adjacent Barge Canal. However, most commenters expressed opposition to this conceptual plan stating reasons of uncertainty over: 1) the long-term permanence; and 2) the adequate protection of aquatic biota and the surrounding environment. Therefore, EPA has reconsidered its initial preference and selected containment by capping for lead impacted soil to achieve the stated objectives of this remedy component. The reader is referred to Section 11.0, Documentation of Significant Changes, for a more detailed discussion regarding this issue.

After completion of excavation and off-site disposal activities discussed in Section 9.1.1 above, all surface soil with constituent concentrations greater than the capping levels specified in Table 8 below shall be covered. Figure 16 provides an illustration of the soil that will be covered based upon the data obtained during the RI field investigations. An estimated 20.7 acres of soil will be capped under this component of EPA's soil remedy. This includes an estimated 24.5 acres of soil which exceeds the 2 mg/kg B(a)P-TE cap level, and an estimated 5.2 acres of soil which exceeds the 1,150 mg/kg lead cap level. The total cap area may be less than 29.7 acres given the potential for co-located B(a)P-TE and lead above the respective soil cap levels. Prior to capping activities, a statistically based sampling program shall be implemented within the areas slated to be covered to further define those soils which exceed the applicable capping levels. The one exception to this is the spoils pile area where surface soil concentrations are greater than the capping levels in Table 8. Additional sampling shall be conducted in the spoils pile area to further define the areal extent of soil above the capping levels in Table 8. EPA and SCDHEC shall have a reasonable opportunity to review and comment on the proposed statistical sampling program prior to cap installation. Results of this sampling program shall be reviewed and approved by EPA, with consultation by SCDHEC, prior to the initiation of cap installation activities.

TABLE 8
SOIL CAPPING LEVELS

Constituent	Surface Soil (mg/kg) 1
B(a)P - TE 2	2.0
Lead	1,150

Footnotes:
(1) Surface soil is defined as observed ground surface to six inches below ground surface.
(2) A summary parameter which converts concentrations of carcinogenic PAHs to an equivalent Benzo(a)pyrene concentration. Methodology to calculate B(a)P-TE shall be conducted in accordance with relevant EPA guidance.

The conceptual design for the cap material consists of a geotextile base and 1 foot of compacted crushed stone. Cost estimates detailed in Section 9.4 are based upon this assumption. However, some commenters on EPA's Proposed Plan objected to the use of crushed stone as a capping material due to concerns over dust generation and the long-term permanence. In response, EPA has developed a list of Performance Standards for the final cover installed under this component of the soil remedy. A detailed design study shall be conducted to develop and install a final cap that meets the following Performance Standards:

1) Eliminate exposure for the future on-site worker to surface soil with concentrations greater than those listed in Table 8 above;

2) Provide a visible demarcation between cap material and underlying soil;

3) Mitigate adverse impacts related to quantity and quality of resultant storm water runoff;

4) Mitigate on-site dust generation during installation and useful life; and

5) Ensure long term permanence and effectiveness of installed cap to meet above four Performance Standards.

9.1.3 Drainage Ditch Reconstruction

Drainage ditch reconstruction of on-site surface water conveyances is the third and final component of EPA's selected soil remedy. EPA's March 1995 Interim Action ROD included the permanent reconstruction of the Milford Street and Hagood Avenue drainage ditches located north of the former Treatment Area. Work conducted under this component of EPA's Final soil remedy will be similar in nature to that performed under the Interim Action ROD. Based upon data obtained during the RI field investigations, it is estimated that 2,250 linear feet of the South Braswell Street ditch, 480 linear feet of the West Milford Street ditch, and 850 linear feet of the Central ditch will be reconstructed. Figure 17 shows the locations where drainage ditch reconstruction will be performed.

The South Braswell, West Milford, and Central drainage ditches shall be permanently reconstructed to meet the following Performance Standards:

1) Remove all soil and drainage ditch sediments with concentrations of COCS greater than the excavation levels listed in Table 7 of Section 9.1.1 above;

2) Remove and/or control the transport of NAPL and/or dissolved phase constituents from the respective drainage ditch; and

3) Reconstruct the respective drainage ditch to: 1) eliminate exposure to sediments of the respective drainage ditch; and 2) provide for adequate drainage that is consistent with its future land-use. Reconstruction activities shall be in fall accordance with the regulations delineated in the document titled, South Carolina Stormwater Management and Sediment Control Handbook for Land Disturbance Activities (February 1997).

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All excavation, material handling, transportation and off-site disposal activities conducted under this section shall be in full accordance with the requirements delineated in Section 9.1.1 Vertical excavation limits during drainage ditch reconstruction activities shall be the observed water table. Limits to horizontal excavation shall be instituted when visually impacted material in the vadose zone has been removed, or upon encroachment to subsurface utilities and/or road side. In the event of encroachment to subsurface utilities and/or road side, best professional efforts shall be made to remove all visually impacted material in close proximity to open excavations.

Investigations conducted during the RI revealed that the existing South Braswell Street drainage ditch and the former Koppers ditch generally coincide in the eastern portion of the property, but the former Koppers ditch is located approximately 10 feet south of the existing ditch in the western portion of the property. The existing Central drainage ditch terminates approximately 940 feet east of the Ashley River. However, historical aerial photography indicates that the Central ditch extended past its current eastern extent to a distance approximately 2,200 feet east of the Ashley River. A sampling program shall be conducted to investigate and verify the now abandoned portions of the South Braswell and Central drainage ditches. The specific objective of this program is to define the potential presence of NAPL and soils/sediments which may exceed the applicable excavation levels. The investigation findings and recommendations for future action shall be presented in a report for EPA and SCDHEC review. EPA approval with consultation by SCDHEC, shall be granted prior to the initiation of drainage ditch reconstruction activities.

9.2 Groundwater/NAPL

EPA's groundwater/NAPL remediation strategy presented in this section applies to the shallow and intermediate water-bearing units described in Section 5.1.5, except for the activities included under Section 9.2.2 below. Implementation of the groundwater/NAPL remedy at this site shall be consistent with OSWER Directive 9234.2-25, Guidance for Evaluating the Technical Impracticability of Groundwater Restoration (EPA 1993). This guidance promotes an iterative, phased approach which includes early actions to remove contaminant sources, control plume migration, and mitigate risks posed by impacted groundwater. EPA issued an Interim Action ROD in March 1995 to achieve these short-term remediation objectives in the former Treatment Area. Information gathered during implementation of the Interim Action shall be utilized to achieve the site-wide, long-term groundwater NAPL remediation Performance Standards listed below.

9.2.1 NAPL Source Areas

Three source areas of subsurface NAPL have been defined on-site, as presented in Sections 5.3 and 7.1.2. These areas are referred to as the former Treatment Area, Old Impoundment Area, and Northwest Corner. The goal of EPA's groundwater/NAPL remedy is the restoration of impacted groundwater at these three source areas to the ARAR-based cleanup levels, Maximum Contaminant Levels specified by the Safe Drinking Water Act. However, EPA recognizes that restoration to these levels may be technically impracticable given the characteristics of NAPL, limitations in remediation technology and/or complex hydrogeology. Therefore, the groundwater/NAPL remedy in the three NAPL source areas shall at a achieve the following Performance Standards:

1) Removal or treatment of NAPL to the maximum extent practicable;

2) Containment of potentially non-restorable source areas; and

3) Containment and restoration of aqueous contaminant plumes.

The above Performance Standards shall be achieved by the recovery of NAPL and impacted groundwater by extraction wells installed in the shallow and intermediate water-bearing units underlying the three source areas. Figure 18 provides an illustration of the three source areas and locations of extractions wells. Conceptually, the groundwater/NAPL remedy envisions the installation of 2 shallow recovery wells in the Northwest Corner, 2 intermediate recovery wells in the Old Impoundment Area, and 6 shallow and 4 intermediate recovery wells in the former Treatment Area. These extraction wells are additional to those installed under the Interim Remedial Action program. Therefore, EPA's total site-wide groundwater/NAPL remedy incorporates a

total of 21 extraction wells, 14 wells screened in the shallow water-bearing unit and 7 wells screened in the intermediate water-bearing unit.

All groundwater recovered via this remedy component shall be treated to the meet the ARARs of the selected discharge option. It is envisioned that all recovered groundwater will be conveyed to the on-site water treatment system installed as part of the Interim Action. The water treatment system shall be properly operated and maintained to meet the discharge requirements imposed by the North Charleston POTW. The existing permit with the North Charleston POTW shall be modified as necessary to allow for continued discharge of treated effluent as required by this remedy component. The capacity of the existing Interim Action water treatment system will be upgraded to handle the quantity of recovered groundwater necessary to meet the above Performance Standards, if necessary. EPA has reserved flexibility regarding the selected discharge option in the event that discharge to the POTW becomes infeasible in the future due to insufficient capacity, cost effectiveness or other engineering evaluation criteria, as identified. EPA, with consultation by SCDBEC, shall approve all discharge options selected to fulfill the requirements of this section.

The full-scale groundwater NAPL remedy shall be monitored, modified and/or enhanced where appropriate to demonstrate that best professional efforts have been made to achieve ARAR-based cleanup levels and the applicable Performance Standards of this remedy component. A comprehensive monitoring network will be established to delineate the NAPL zone and aqueous contaminant plume(s). The data generated by this monitoring program will be utilized to track the effectiveness of the remedy in achieving the established objectives. The conceptual remedy described herein may be modified and enhanced as warranted based on review and analysis of monitoring data generated. Recovery and treatment enhancements may include the installation of additional extraction well(s) and/or in-situ treatment which incorporates vertical circulation cell technology. EPA considers the full-scale groundwater/NAPL remedy to be an iterative process which must be conducted for a sufficient period of time before its ability to meet applicable cleanup levels and long-term Performance Standards can be fully evaluated. All decisions regarding the technical impracticability of achieving ARAR-based cleanup levels and the long-term Performance Standards at the three NAPL source areas shall be made by EPA, with consultation by SCDBEC.

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9.2.2 Northwest Corner Deep Water-Bearing Unit

The presence of benzene above the MCL has been confirmed in MW-01D, as discussed in Sections 5.3 and 7.1.2. MW-01D is screened in the deep water-bearing unit underlying the Northwest Corner of the site. Supplemental investigations have concluded the following: 1) The areal extent of benzene above the MCL is localized near MW-01D; 2) There is not an up-gradient source of benzene on-site; 3) Groundwater in the deep water-bearing unit is flowing towards the Ashley River; 4) groundwater in this area is brackish and therefore is unsuitable for use as a drinking water source; and 5) The area of MCL exceedance is small and is contained within the site or bounded by the Ashley River and the Northwestern marsh. Based upon these conclusions and findings, this area may meet the requirements for a mixing zone exclusion as outlined in SCDHEC's Ground-Water Mixing Zone Guidance Document. Therefore, a mixing zone permit for this general area shall be submitted to SCDHEC. Approval of this mixing zone permit by this section.

9.3 Ashley River, Barge Canal and Tidal Marsh Sediments

This section of the document presents EPA's selected remedy for the sediments of the Ashley River, Barge Canal, and North/South/Northwest Tidal Marshes. Areas of Potential Ecological Concern (APECs) in these areas were defined utilizing data collected during the RI field program and the weight-of-evidence approach, as discussed in Section 5.4 and 7.1-3. EPA's Final Ecological Risk Assessment (October 1996) for this site concluded that potential ecological risks exist and that remedial options should be evaluated to mitigate potential risks posed. The sediment remedies described in the sections that follow have been developed to provide for adequate protection of ecological receptors.

9.3.1 Ashley River

EPA has selected enhanced sedimentation as the sediment remedy in the Ashley River. Sediments

within the Ashley River APEC were found to be acutely toxic to the selected benthic invertebrate test species of Neanthes arenaceodentata and Mysidopsis bahia. The food chain analyses conducted as part of the Ecological Risk Assessment process concluded potential risks exist for other ecological receptors that frequent the Ashley River APEC. Therefore, the objective of EPA's enhanced sedimentation alternative in the Ashley River is to sufficiently cover the impacted river bottom sediments with clean sediments, thus mitigating the potential risks posed to the benthic community and upper trophic levels.

EPA's enhanced sedimentation remedy in the Ashley River involves capping of impacted sediments by increasing and accelerating natural sedimentation processes. Enhanced sedimentation of impacted Ashley River bottom sediments can be achieved most effectively by decreasing water velocities in the area of interest, resulting in an increased deposition of the river's suspended sediment load. The conceptual approach to this remedy includes surrounding the area of impacted sediments in the Ashley River with driven piles that extend upwards from the sediment surface. In theory, this pile barrier will increase interparticle collisions and thereby enhance sedimentation within the enclosed area. Practically speaking, this approach will work similarly to the way that snow fences are utilized to capture blowing snow or in sand dune refurbishment projects along erosional coast lines.

Figure 19 provides a conceptual illustration of EPA's enhanced sedimentation remedy for the Ashley River. The pilings shall be installed to adequately cover the defined APEC for the Ashley River. This includes an approximate 1,500 foot strip adjacent to the site which stretches from sample point SD-70 north of the site to sample point SD-64 south of the site. The western edge of the area of enhanced sedimentation shall extend as close to the Ashley River navigation channel as reasonably possible. The Ashley River navigation project remains active for the Charleston District Corps of Engineers (COE). The Charleston District COE takes yearly soundings and surveys which indicate that, at the present time, the channel depth is being maintained without dredging. The channel continues to support commercial and pleasure traffic. Therefore, close coordination with the COE District Engineer and Navigation Section shall be established during design and implementation activities to mitigate adverse impacts on the navigable waters, commercial/recreation traffic, and future maintenance dredging should it be required.

The conceptual approach described above involves the installation of 50 foot, 12 inch diameter timber pilings spaced on 2 foot centers. The cost estimate for this remedy detailed in Section 9.4 is based upon this assumption. However, an evaluation will be conducted during the Remedial Design phase to determine the minimum installation depth and length of piles, and appropriate construction materials. Modeling studies shall also be conducted at this time to determine the arrangement/spacing of piles to optimize sediment deposition, predicted sediment deposition within the pile barrier, and predicted responses upstream and downstream of the installed pile barrier. Enhanced sedimentation in the Ashley River shall be designed and implemented to meet the following Performance Standards:

1) Ensure short-term protectiveness to surrounding environment during construction and installation activities;

2) Provide sufficient cover to mitigate exposure to benthic organisms and subsequent adverse impacts to the food chain; and

3) Ensure long-term effectiveness and permanence by mitigating erosional effects.

Engineering controls shall be implemented during pile installation to eliminate potential contaminant releases that may result in adverse impacts to surface water and sediments. Several construction projects in this general area have recently installed piles in subtidal and intertidal areas. These projects have utilized fairly elaborate and costly containment systems consisting of sand blankets, silt curtains and timber lagging walls to eliminate potential impacts resulting from pile driving activities. While monitoring data has indicated these systems were effective in providing short-term protectiveness, other more cost-effective containment systems which provide adequate protection may be available. Flexibility has been reserved regarding the type of engineering controls utilized, provided they ensure short-term protectiveness during construction activities. The engineering controls to be implemented shall be reviewed and approved by EPA, with consultation by SCDHEC, prior to the initiation of pile installation activities.

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EPA has established a five year evaluation period to monitor the effectiveness of the enhanced sedimentation remedy in achieving the established Performance Standards. This evaluation period was selected to coincide with EPA's required 5-year review for remedies selected under CERCLA. Prior to construction activities, the baseline conditions in the Ashley River APEC shall be established. This will include a bathymetric survey, or approved alternative method, to document baseline elevations of the sediment interface. In addition, sediment grab samples will be collected from within the Ashley River APEC to document initial constituent concentrations in surficial sediments. A minimum of seven transects, spaced on 250 foot centers, shall be established perpendicular to the shoreline along the length of the APEC. From each transect, a minimum of 3 sediment grab samples shall be collected with a ponar dredge and composited for analyses. This sampling protocol will minimize spatial variability associated with discrete grabs and allow EPA to evaluate average trends in sediment concentrations. All sample and transect locations stall be established with sufficient accuracy to enable collection of future samples from same locations. Additional physical parameters, such as current velocities and total suspended sediment concentrations, may also be collected to verify the modeling conducted to support the design of the enhanced sedimentation alternative.

Following the completion of construction activities, the bathymetric surveys and sediment sampling protocol delineated above shall be conducted on a yearly basis for 5 years. At the completion of the 5-year monitoring period, EPA will evaluate all available data to determine thedegree to which the established Performance Standards have been achieved. Evaluation criteria employed will: 1) Determine if statistically significant accumulations of sediment have been deposited within the Ashley River APEC to mitigate exposure to the benthic community and upper trophic levels; 2) Determine constituent concentration trends of the sediments within the area of enhanced sedimentation; and 3) Determine degree of long-term permanence and effectiveness of enhanced sedimentation alternative. EPA shall institute contingency remedies if the established Performance Standards are not achieved by the 5-year evaluation period. These may include, but are not limited to the installation of a supplemental cap and/or measures to reduce erosional forces and augment long-term cover stability. EPA will evaluate all feasible alternatives and issue its final recommendation as part of its five-year review process.

9.3.2 Barge Canal

EPA has selected sub-aqueous capping as the sediment remedy for the Barge Canal. Sediments within the Barge Canal did not demonstrate significant toxicity to the selected indicator species. However, EPA's Ecological Risk Assessment did conclude that potential risks exist for other ecological receptors in this area. Therefore, the objective of EPA's selected remedy for the Barge Canal is to eliminate potential exposure to ecological receptors by placing a cap over impacted bottom sediments of the Barge Canal.

A two-foot cap shall be placed over the bottom sediments of the approximate 3.2 acre Barge Canal to achieve the established objectives of this remedy component. This area is illustrated in Figure 20. The two-foot thickness shall be measured after placement, to property account for expected consolidation. The installed cap shall extend westward past the mouth of the Barge Canal and into the Ashley River to cover sample station SD-66 where significant acute sediment toxicity was observed for both indicator test species. The cap material shall be a prepared mixture with comparable characteristics of organic content, pH and particle size as local tidal marsh sediments.

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Capping of the Barge Canal will likely proceed from the east to west. During cap installation activities, engineering controls such as silt screens or temporary dams shall be utilized to abate the release of suspended sediments and mitigate adverse impacts to the surrounding environment. Following the completion of cap installation, a monitoring program shall be implemented to ensure the cap remains effective, in the long-term, at eliminating exposure to the underlying sediments. The cap should be designed and installed to resist deterioration by reasonable erosional forces. Contingency plans shall be developed to maintain the installed cap to the required two-foot thickness, in the event that erosional forces adversely impact the integrity of the cap. Complete restoration of this area to a low, intertidal spartina marsh habitat is not required by this decision document. However, marsh restoration when combined the

EPA's selected remedy would not only provide a high degree of long-term permanence and protection, but would also create productive habitat by restoring the Barge Canal area to its pre-existing condition.

9.3.3 North, South and Northwest Tidal Marshes

EPA has selected a combination of physical removal with off-site disposal and in-situ bioremediation for the sediments of the tidal marshes neighboring the site. Sampling conducted during the RI field program indicated that sediments in the headwaters of the North and South Tidal Marshes demonstrated significant acute toxicity to Neanthes arenaceodentata and Mysidopsis bahia. Sediments of the Northwest Tidal Marsh and remaining areas of the South Tidal Marsh did not demonstrate toxicity to the above test species, but constituents were detected in sediments of these areas at concentrations that may cause potential risks to ecological receptors. Given these findings, EPA's objective for this remedy component is two fold 1) Physically remove those sediments from the tidal marshes which demonstrated significant acute toxicity to the selected indicator species; and 2) Manage the remaining sediments which may be a potential risk to ecological receptors in place via bioremediation. The requirements to achieve the objectives of this remedy component are delineated in the sections that follow.

9.3.3.1 Dredging, Capping and Off-Site Disposal

EPA has selected dredging, capping and off-site disposal for those sediments in the North and South Tidal Marshes which demonstrate significant acute toxicity to the aforementioned test species. Implementation of this remedy component shall be closely coordinated with excavation and off-site disposal of soils and drainage ditch sediments (Section 9.1.1) to minimize the impacts that Phase IV LDRs may have on the logistics and cost for off-site disposal of regulated material.

The estimated area of sediment excavation in the South Tidal Marsh is illustrated in Figure 21. Based upon sediment toxicity data collected during the RI an estimated 1.5 acres of sediment will be excavated from the South Tidal Marsh. However, the co-mingled nature of PAHs and inorganic constituents in the sediments of this area has made it difficult to accurately correlate what constituents and concentration levels are actually causing the observed toxicity. Moreover, it has been noted that several sampling stations within the South Tidal Marsh APEC with similar constituent concentrations shown to cause toxicity are not slated for excavation. Therefore, a sampling program shall be implemented prior to excavation activities to better define those sediments within the South Tidal Marsh APEC which demonstrate significant toxicity.

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This sampling program shall supplement the data gathered during the RI field efforts by employing whole sediment acute toxicity tests with Neanthes arenaceodentata and Mysidopsis bahia. EPA and SCDHEC shall have a reasonable opportunity to review and comment on the proposed sediment toxicity sampling program prior to implementation. Results of this sampling program shall be reviewed and approved by EPA, with consultation by SCDHEC, prior to the initiation of excavation activities. All sediments with danonstrated significant acute toxicity of the selected benthic invertebrates shall be excavated.

The estimated area of sediment excavation in the North Tidal Marsh is illustrated in Figure 22. Sediments to be excavated from the North Tidal Marsh are relatively confined to the tidal creek. Approximately 1,000 feet of the tidal creek channel encompassing an estimated 0.25 acres will be excavated. The downstream extent of excavation shall extend to sample point SD-109, unless otherwise justified by additional sediment toxicity sampling similar to that presented above for the South Tidal Marsh.

Vertical excavation limits during tidal marsh restoration activities shall be the biologically active zone. At a minimum, this shall be interpreted to be the upper 1 foot of the sediment interface. Conceptually, excavation will be accomplished with traditional earth moving equipment with access provided by interlocking wood mats installed over a geotextile separation layer. Practically speaking, the depth to excavation may be deeper than 1 foot given the technical limitations associated with the operation of excavation equipment in these areas. In all cases, best professional efforts shall be made to remove all visually impacted material mii close proximity to open excavations. Engineering controls shall be employed during active excavation

activities to provide short-term protectiveness and to mitigate the potential release of constituents via suspended sediments, tidal fluctuations and stormwater discharges.

Given the expected lower solids content, special attention shall be dedicated to the material handling issues of all excavated material. Efforts shall be made to eliminate spins and to reduce water content prior to transportation to the stabilization area. This issue could be addressed by the adoption of a newer dredging technique referred to as "dry dredging". This technology has been tested locally, most recently at the Ripley Light Marina, with reported success of producing dredged material with favorable solids content. All dredged material shall be transported to an on-site stockpile area for dewatering and stabilization prior to off-site disposal in an approved hazardous waste landfill. All transportation and off-site disposal activities shall be conducted in full accordance with all ARARs, including but not limited to, RCRA and DOT regulations.

Once portions of the proposed excavations have been dredged to the required depth, a prepared cap shall be placed over the disturbed areas. The cap material shall be similar in composition to the sediments of the undisturbed portions of the respective marshes. All disturbed areas shall be returned to pre-excavation elevations, so as not to disrupt the dynamics of the local, tidal marsh ecosystem. All disturbed areas will be revegetated and restored with native species typical to tidal marshes of the vicinity. A monitoring and contingency plan shall also be adopted to ensure the restored areas, return to functioning and productive habitat.

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9.3.3.2 In-Situ Bioremediation

EPA has selected in-situ bioremediation for portions of the Northwest and South Tidal Marshes. In-situ bioremediation shall be applied to sediments within the defined APECs which did not demonstrate significant toxicity to selected indicator test species. The areas for in-situ bioremediation in the Northwest and South Tidal Marshes are defined in Figure 20 and Figure 21, respectively. It is important to note that the area illustrated in the South Tidal Marsh may change, pending the results of the additional whole sediment toxicity tests discussed above in Section 9.3.3.1.

EPA considers in-situ bioremediation to be an innovative and emerging technology that warrants further refinement and development at sites with impacted sediments. Technology performance data indicates that in-situ bioremediation can be very effective at reducing concentrations of low molecular weight PAHs (< four rings). Moreover, phytoremediation, the biouptake or absorption of contaminants by plant species, has shown promising results for reducing the concentrations of inorganic constituents. Due to the evolving nature of this technology, the extent of constituent concentration reduction at this site is difficult to predict. Therefore, the Performance Standard for this remedy component is simply the reduction of sediment constituent concentrations from observed baseline conditions. EPA feels this general Performance Standard is appropriate considering that in-situ bioremediation will be implemented in portions of the South and Northwest Tidal Marshes where sediment toxicity to benthic organisms was not observed.

EPA's objective for in-situ bioremediation is the reduction of organic and inorganic constituent concentrations in the sediments of the Northwest and South Tidal Marshes. Organic constituent reduction will be accomplished by increasing the rate of natural biodegradation. Inorganic constituent reduction will be accomplished by constituent absorption into either naturally occurring or introduced plant species. Plants will then be routinely harvested to remove inorganics from the study areas. Conceptually, this remedy component will be implemented in three phases. Phase I will involve laboratory bench tests to determine optimal formulations to achieve the established objectives. Phase I will also incorporate a sampling program to document baseline constituent concentrations in the study areas and to gather bioremediation profile data for subject sediments. Phase II will involve field implementation utilizing test plots and control plots. During Phase II, key bioremediation indicators shall be monitored in both test and control plots for one year. Results obtained from Phase I and II will be utilized for full-scale application in Phase III.

A comprehensive monitoring program during all phases of this remedy component is integral to documenting the results achieved. EPA and SCDHEC shall have reasonable opportunity to review and comment on the in-situ bioremediation monitoring program prior to implementation of Phase I.

9.4 Cost Summary

This section of the document provides a cost summary for the key elements of EPA's selected remedy at the Koppers Co., Inc. (Charleston Plant) NPL Site. The estimated capital costs for each major remedy component, estimated operation and maintenance (O&M) costs, and total net present worth over a 30-year period are provided below. All cost estimates are expressed in 1996 dollars and are based upon conceptual engineering, design and construction. The reader is referred to Appendix D of the Final FS Report for a more detailed breakout of the cost information summarized below.

Soil and Drainage Ditch Sediments	Cost ($)
Excavation of 12,000 tons x $50/ton	600,000
Transportation and off-site disposal of 12,000 tons x $150/ton	1,800,000
24.5 acre cap for B(a)P-TE impacted soil	2,116,000
5.2 acre cap for lead impacted soil	621,000
Drainage ditch reconstruction	945,000
Sub-Total Soil Component	6,082,000
Groundwater/NAPL	
Capital costs for recovery wells, line installation and hook up	1,680,000
O&M for recovery wells	566,000
O&M for water treatment plant	828,000
Sub-Total Groundwater/NAPL Component	3,074,000
Ashley River and Tidal Marsh Sediments	
Enhanced sedimentation for Ashley River	
Capital costs for pile installation and baseline surveys	495,000
Monitoring and maintenance for cap integrity	46,090
Sub-Total Ashley River	541,000
Subaqueous capping for Barge Canal	
Two feet of cap material; 10,000 yards x $22/yard	220,000
Design, mobilization and engineering controls during construction	152,000
Monitoring and maintenance for cap integrity	75,000
Sub-Total Barge Canal	447,000
Dredging, capping and off-site disposal in North/South Tidal Marshes	
Site prep., excavation, stockpiling and restoration	814,000
Material handling, transportation and off-site disposal of 4,935 tons x $176/ton	868,000
Sub-Total Tidal Marsh Excavation and Restoration	1,682,000
In-Situ Bioremediation in South/Northwest Tidal Marshes	
Bench test to full scale operation (Phase I - III)	85,000
Long-term monitoring costs	64,000
Sub-Total In-Situ Bioremediation	149,000
Total Estimated Cost of EPA's Selected Remedy	11,975,000

10.0 STATUTORY DETERMINATIONS

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

10.1 Protection of Human Health and the Environment

EPA's selected remedy protects human health and the environment through media-specific components designed to eliminate or mitigate potential risks posed by the site. EPA's remedy

consists of. Excavation and off-site disposal of 12,000 tons of the most heavily impacted soil and drainage ditch sediment; installation of an estimated 29.7 acre cap over lead impacted soil and relatively less impacted soil; surface water drainage ditch reconstruction; containment and recovery of NAPL and groundwater at three source areas; enhanced sedimentation in the Ashley River, capping of Barge Canal sediments; excavation and off-site disposal of an estimated 1.75 acres of sediments in the North and South Tidal Marshes; and in-situ bioremediation in the Northwest and South Tidal Marshes.

Excavation of 12,000 tons of the most heavily impacted soil will eliminate potential risks posed to the future on-site worker and utility worker by exposure to surface/subsurface soils. All excavated soil will be disposed off-site in a controlled and permitted hazardous waste landfill. Installation of an estimated 29.7 acre cap over lead impacted soil and relatively less impacted soil will provide further protection for the future on-site worker. The combination of excavation/off-site disposal and capping provides a residual risk (post-remediation risk) of 1.1 x 10 -6 which is near the more protective end of EPA's acceptable risk range. This approach satisfies the NCP preference for cleanups, to use the risk level of 1 x 10 -6 as a point of departure when determining cleanup levels when ARARs are not available or are not sufficiently protective because of the presence of multiple contaminants. Permanent drainage ditch reconstruction will eliminate exposure to unacceptable concentrations, of sediment/surface water and remove constituent transport pathways to receiving surface water bodies.

The Performance Standards developed for groundwater and NAPL at the three subsurface source areas will remove and treat NAPL to the maximum extent possible, contain potentially non-restorable source areas, and contain/restore aqueous contaminant plumes. All recovered groundwater will be treated to protective levels prior to discharge. Groundwater in the shallow aquifer is not used for residential or industrial-purposes however, EPA's selected remedy will eliminate risks posed by off-site transport to surface water bodies and drainage ditches.

EPA's selected remedy for sediments in the Ashley River, Barge Canal and neighboring tidal marshes places a priority on the removal of sediments shown to cause statistically significant acute toxicity to Neanthes arenaceodentata and Mysidopsis bahia. An estimated 1.5 acres and 0.25 acres will be excavated in the South and North Tidal Marshes, respectively. All excavated sediments will be disposed off-site with material excavated under the soil component of EPA's selected remedy. Impacted sediments of the Ashley River and Barge Canal will be capped, thus eliminating exposure to ecological receptors. Sediments in the Northwest Tidal Marsh and portions of the South Tidal Marsh not slated for excavation will be treated in-situ via bioremediation to reduce observed concentrations. The removal of toxic sediments combined with less intrusive cleanup measures for non-toxic sediments fully considers the advantages and disadvantages of disturbing saltmarsh habitat.

10.2 Compliance with Applicable or Relevant and Appropriate Requirements

EPA's selected response action will meet all ARARs discussed in Section 9.0 of this document. These include, but are not limited to:

- RCRA Requirements for Identification, Management and Transportation of Hazardous Waste (40 CFR 261, 262 and 263)
- RCRA Land Disposal Restrictions (40 CFR 268)
- DOT Hazardous Materials Regulations (49 CFR 107 and 171-179)
- Safe Drinking Water Act (40 CFR 141)
- Clean Water Act (40 CFR 403 and 404)
- Coastal Zone Management Act (15 CFR 930)
- OSHA Health and Safety Requirements (29 CFR 1910 and 1926)

10.3 Cost Effectiveness

EPA's selected response action will provide adequate protection of human health and the environment at an estimated cost of $11,975,000. Recent Superfund Administrative Reforms advocate the adoption of cost-effectiveness techniques in the remedy selection process. As discussed in Section 7.1.1 of this ROD, EPA conducted a value engineering study to select a soil excavation level that optimized the residual risk achieved while minimizing the tons of soil removed. EPA has selected an excavation level which removes the most heavily impacted material, while capping soil with relatively lower concentrations. The soil component of EPA's selected

remedy involves the excavation and off-site disposal of 12,000 tons of the most heavily impacted soil, installation of an estimated 29.7 acre cap over lead impacted soil and relatively less impacted soil and surface water drainage ditch reconstruction. EPA's selected soil remedy provides an estimated residual risk, or post-remediation risk of 1.1 x 10 -4 at an estimated cost of $6,082,000 (See Section 9.4).

Excavation goals more protective than EPA's selected levels generally double and triple the volumes of soil removed and the associated response costs, while providing a relatively smaller incremental benefit in risk reduction. For example, the soil remedy preferred by SCDHEC results in the excavation and off-site disposal of 39,000 tons of soil, The installation of a 31 acre cap, and the excavation and off-site disposal of lead impacted soil. To further illustrate this point, the estimated cost of SCDHEC's preferred soil remedy has been developed using the information in Section 8.8 (State Acceptance), and identical assumptions and pricing information from the Feasibility Study Report and Proposed Plan. The total estimated cost of SCDHEC's preferred soil remedy is $17,268,000, and the major components are summarized below:

Excavation/Off-Site Disposal of 39,000 tons soil x $200/ton.....$7,800,000
Drainage Ditch Reconstruction $945,000
Installation of 31 acre cap $2,673,000
Excavation/Off-Site Disposal of lead impacted material 39,000 tons x $150/ton.....$5,850,000
Total Estimated Cost of SCDHEC's Preferred Soil Remedy.....$17,268,000

The Feasibility Study assumed that 39,000 tons of soil exceeded EPA's selected cleanup level for lead. It is important to note that SCDHEC has selected a soil lead cleanup goal that is more conservative. Therefore, the cost estimate indicated above for off-site disposal of lead impacted material is likely on the low side. Moreover, it is also important to note that implementation of SCDHEC's preferred soil remedy results in a residual risk of 8.6 x 10 -8, which is more protective than EPA's acceptable risk range.

Based upon the above discussion, EPA has determined that the selected remedy provides protectiveness that is proportionate to its costs and represents a reasonable value for the money that will be spent.

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

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner for the final response action at the Koppers Co., Inc. (Charleston Plant) NPL Site. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that this selected remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and considering state/community acceptance.

The groundwater/NAPL remedy component involves technologies that recover NAPL to the maximum extent practicable at the three source areas on-site. All recovered groundwater will be treated to permanently reduce contaminant concentrations to appropriate standards. This component also selects innovative vertical circulation cell technology as a contingency remedy for restoration and hydraulic control of the dissolved-phase aqueous contaminant plumes downgradient of NAPL source areas. The Braswell Street, Milford Street and Central drainage ditches will also be permanently reconstructed to eliminate exposure to sediment/surface water and to permanently eliminate constituent transport pathways off-site.

10.5 Preference for Treatment as a Principal Element

EPA's selected remedy will fulfill the preference for treatment as a principal element through the recovery and treatment of impacted groundwater and NAPL. Furthermore, this response action selects in-situ bioremediation as an innovative treatment for the reduction of sediment concentrations in the Northwest and South Tidal Marshes.

11.0 DOCUMENTATION OF SIGNIFICANT CHANGES

Pursuant to the requirements of Section 117(b) of CERCLA, this section of the ROD documents and

discusses the significant changes made to the selected remedy from the Proposed Plan. For reference, the Proposed Plan is attached to this ROD as Appendix C. Specific written and/or oral comments received during the formal 60-day comment period held from April 3 to May 2, 1997 are included in the Responsiveness Summary (Appendix B). EPA's selected remedy changes two remedy components from the cleanup plan proposed in March 1997. These include the selected response actions for lead impacted material and the sediments of the Barge Canal. These are discussed further in the sections that follow.

11.1 Lead Impacted Material

EPA's March 1997 Proposed Plan selected Confined Disposal as the response action to address soil with lead concentrations greater than 1,150 mg/kg. The large majority of soil on-site with concentrations exceeding this cleanup level is located on the thin strip of uplands which separates the Barge Canal from the South Tidal Marsh. Under the proposed strategy of Confined Disposal, all soil with lead concentrations greater than 1,150 mg/kg would be placed in the bottom of the adjacent Barge Canal. This base layer of lead-impacted fill would then be capped with a two-foot topsoil/organic layer, returned to appropriate elevations, and restored to a functioning saltmarsh habitat. EPA's rationale behind this proposed approach are outlined below:

- Confined Disposal of lead impacted material represents an innovative, cost-effective and adequately protective solution to a rather complex problem Confined Disposal resolves three issues with one response action: 1) Impacted sediments in the Barge Canal would be capped; 2) Potential human health risks posed to the future on-site worker by exposure to unacceptable soil lead concentrations would be eliminated; and 3) Additional acreage of functional, intertidal tidal marsh would be created. Furthermore, confined disposal in near shore facilities is a well documented and proven management technique for dealing with dredged spoil material.

- Lead impacted material is classified as a non-bazardous waste per RCRA regulations. Representative samples of this subject material were collected and submitted for TCLP analysis. Statistical evaluation of the analytical results, as specified by RCRA regulations, concluded this material is non-hazardous. Moreover, EPA conducted additional leaching tests on this material which consisted of placing a representative soil sample in a jar with water collected from the Ashley River. This mixture was shaken vigorously for 18 hours and the resultant water was analyzed. Results clearly indicated that this material does not leach at concentrations that would cause adverse impacts to surface water or ecological receptors.

- The thin strip of uplands is not adversely impacting the adjacent South Tidal Marsh, Ashley River, or Barge Canal. Extensive sediment sampling was conducted in the Barge Canal, Ashley Riverand South Tidal Marsh during delineation of APECs as described in Section 7.1.3 of this ROD. All sediment samples collected from these areas did not exhibit concentrations greater than the ecological screening criteria (ER-M) for lead. Moreover, sediment toxicity testing at Station SD-47 in the South Tidal Marsh, located immediately south of the subject upland area, did not demonstrate significant toxicity for the test species evaluated. This data provides convincing evidence that the lead impacted material from the upland area is not causing ecological impact to the surrounding area.

Notwithstanding the above discussion, opposition to EPA's proposal of Confined Disposal was expressed during the 60-day public comment period. The most emphatic opposition was voiced by several Natural Resource Trustee agencies which generally cited concerns over long-term leaching and unreasonable risks of injury to trust resources. Moreover, a discussed in Section 8.8 and 10.3 of this ROD, SCDHEC prefers excavation and off-site disposal in a non-hazardous waste landfill for all soil with lead concentrations greater than 895 mg/kg.

After fully considering the written comments included in Appendix B, EPA has decided to cap all soil with lead concentrations greater than 1,150 mg/kg. The cap shall be installed to meet the Performance Standards specified in Section 9.1.2. The cap over lead impacted material will cover approximately 5.2 acres at an estimated cost of $621,000. As discussed in Section 10.3, SCDHEC's preferred alternative of excavation and off-site disposal of lead impacted material is estimated to cost in excess of $5.5 Million. Considering the above discussion and site-specific data, EPA does not believe the exorbitant costs associated with SCDHEC's preferred alternative are

warranted. EPA's selected remedy of capping will provide adequate protection of human health and the environment in a far more cost-effective manner.

11.2 Barge Canal

EPA's selected response action for the Barge Canal in the March 1997 Proposed Plan was closely linked with confined disposal of lead impacted material discussed above in Section 11.1. EPA's proposed cleanup plan for impacted sediments involved subaqueous capping to eliminate exposure to benthic organisms and potential risks to upper trophic level ecological receptors. The approach proposed in March 1997 involved the confined disposal of lead impacted material in a six-foot thick bottom layer of the Barge Canal, followed by placement of a two-foot cap of an organic supplement mixture. The area would be returned to appropriate elevations and revegetated to return the area to a functional saltmarsh habitat.

Pursuant to the discussion in Section 11.1, EPA has dropped its proposal for confined disposal of lead impacted material in the Barge Canal. This decision has also necessitated a change in the selected remedy for impacted sediments of the Barge Canal. Considering the above, EPA's selected remedy involves capping the impacted sediments with a two-foot cover only, to eliminate exposure to ecological receptors. A long-term monitoring and maintenance program will be established to miligate erosional impacts and to ensure the installed cap remains protective over the long-term. Engineering controls will be implemented to abate the release of suspended sediment and to mitigate adverse impacts to the surrounding environment during cap installation activities. In order to clearly differentiate between remediation and restoration activities, EPA's selected remedy does not require that the Barge Canal be restored to a functional low, intertidal Spartina marsh. However, marsh restoration in this area may be considered to provide a high degree of long-term permanence and protection, and/or to address issues related to past damages of natural resources.

<IMG SRC 98102WB>

December 11,1997

2600 Bull Street
Columbia, SC 29201-1708

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Mr. John H. Hankinson, Jr.
Regional Administrator
U.S. EPA, Region IV
61 Forsythe Street
Atlantic, GA 30303

RE: Koppers NPL Site - Charleston County
Record of Decision

Dear W. Hankinson:

The South Carolina Department of Health and Environmental Control (the Department) has reviewed EPA's Draft Record of Decision (ROD) for the Koppers NPL Site in Charleston and does not concur with EPA's selected remedy because the Department has determined that this remedy is not adequately protective of public health and the environment. Therefore, the Department reserves any right or authority it may have to require the responsible parties to conduct additional corrective action in accordance with the Pollution Control Act and the South Carolina Hazardous waste Management Act. These rights include, but are no limited to, the right to insure that all necessary permits are obtained,

clean-up goals and criteria are met, and to take separate action in the event clean-up goals and criteria are not met. The Department's reasons for not concurring are outlined below.

The Department does not believe that EPA's selected remedy is sufficient in achieving long term protection of human health and the environment. This remedy represents a departure from EPA's usual method of selecting remedies at the more protective end of the risk range. In addition, EPA's Human Health Baseline Risk Assessment utilized exposure point concentrations and other exposure assumptions that the Department does not feel were conservative enough. The Department believes that the calculated human health risks were not based on reasonable maximum exposures, and therefore may underestimate the potential risks posed by the site. Based On these points, the Department did not approve the Human Health Baseline Risk Assessment prepared by the EPA. Furthermore, the Department does not feel that EPA's application of the residual risk methodology at this site gives an appropriate representation, of the actual risks that would remain after the selected remedial alternative is implemented.

The Department does not concur with the proposed cleanup goal of 5 x 10 -5 (20 mg/kg BAP-TE in surface soil and 275 mg/kg BAP-TE in subsurface soil) for Soil/Drainage Ditches. As stated in the NCP, a risk level of 1 x 10 -6 shall be used as the point of departure for determining remediation goals for alternatives when ARARs are not available or we not sufficiently protective because of the presence of multiple contaminants at CERCLA Sites. At the Koppers Site, it does not appear that EPA used l x 10 -6 as the point of departure for evaluating alternatives. The NCP also places a preference on the long-term permanence and the reduction, of toxicity, mobility, or volume through treatment in selecting remedial goals and alternatives. The selected remedy does meet this preference. Considering these points and the uncertainties previously mentioned in the calculation of site risks, the Department feels that protecting to the 1 x 10 -6 cleanup goal is warranted at the Koppers Site. To this end, the Department prefers to excavate an estimated 39,000 tons of soil which exceeds the 1 x 10 -1 cleanup goal (4 mg/kg BAP-TE in surface soil and 55 mg/kg BAP-TE in subsurface soil) for Soil/Drainage Ditches with subsequent off-site disposal. In addition, the Department would prefer to cap all additional areas with soil above the 1 x 10 -6 remedial goal (0.4 mg/kg BAP-TE in surface soil). This cap would cover an estimated 31 acres of the site.

Although the Department approves of the methodology developed by EPA for calculating a cleanup level for lead in soil, the Department does not feel that the exposure assumptions used by EPA to calculate the selected cleanup level of 1150 mg/kg were conservative enough. Therefore, the Department does not concur with EPA's selected remedy of capping all soils with lead concentrations exceeding the selected cleanup level of 1150 mg/kg. The Department has calculated a preferred industrial use cleanup level of 895 mg/kg for lead in soil. This cleanup level was calculated using EPA's methodology with more conservative site-specific exposure assumptions that more accurately reflect the demographics of the surrounding community. Due to both the ecological and human health concerns, the Department's preferred remedy is excavation and off-site disposal of all lead impacted soil with concentrations exceeding 895 mg/kg.

While the Department agrees with EPA's three stated remediation objectives for groundwater/NAPL at the three noted source areas on-site, the Department does not concur with EPA's conceptual approach for achieving these objectives. Based on performance data already obtained during the operation of the interim action pump and treat system, the Department believes that a more aggressive initial approach is justified instead of a phased approach that adds additional wells as future performance data indicates the need. Based on language approved by EPA in the Feasibility Study Report, the Department is concerned that the purpose of the proposed groundwater remodiation effort is to demonstrate technical impracticability for groundwater restoration rather than actual remediation of impacted groundwater The more proactive approach proposed by the Department is consistent with OSWER Directive 9234.2-25: "Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration."

Thank you for the opportunity to comment on EPA's Draft Record of Decision. Based an the above mentioned concerns, the Department respectfully requests that EPA reconsider the selected remedy and selecta remedy which better addresses the concerns of the Department Thank you for your consideration of this matter . If you have any questions, please feel free to contact me at (803) 734-5360.

<IMG SRC 98102WC>

cc: Hartsill Truesdale
Keith Lindler
Gary Stewart
Wayne Fanning, Trident EQC
Richard Haynes

<IMG SRC 98102WD>

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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MAR 18 1998

4WD
Mr. R. Lewis Shaw, P.E.
Deputy Commissioner
Environmental Quality Control
South Carolina Department of Health and Environmental Control
2600 Bull Street
Columbia, SC 29201

SUBJ: Record of Decision for the Koppers Co., Inc. (Charleston Plant) NPL Site; Charleston County, South Carolina.

Dear Mr. Shaw:

Thank you for your letter of December 11, 1997 regarding the South Carolina Department of Health and Environmental Control's (SCDHEC) position of non-concurrence on EPA-Region 4's Record of Decision, (ROD) for the Koppers NPL Site in Charleston, South Carolina.

We have worked closely with SCDHEC in developing this ROD and appreciate all of the support you have given us in the process. The fact that we disagree on certain technical aspects of the ROD should not lessen the joint commitment we share to ensuring that this site is properly cleaned up, that public health and the environment is protected, and that the desire of the community for a productive and reusable site is achieved.

In your letter, you noted that SCDHEC does not concur with EPA's selected remedy for the subject site. As you know, Section 121 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) directs EPA to select remedies that are adequately protective of human health and the environment, comply with applicable or relevant and appropriate requirements, are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

We believe that EPA's selected remedy for the Koppers NPL Site meets the statutory requirements of Section 121 of CERCLA given the site-specific conditions. In particular, this remedy is consistent with reforms which are being implemented by EPA to enhance Superfund's effectiveness in protecting human health and the environment. These reforms are intended to address the recurrent criticisms of the Superfund Program: exorbitantly high cleanup costs; inequitable enforcement processes; excessive transaction costs; and inadequate involvement of stakeholders. Specifically, we believe our selected remedy for the Koppers NPL Site addresses the following Administrative Reforms:

- Ensure all risk assessments are grounded in reality;
- Make smarter cleanup choices that protect the public health at less cost; and
- Control remedy costs and promote cost-effectiveness.

Your letter expressed concern that EPA's selected remedy represented a departure from EPA's past practices of selecting remedies. Given the implementation of the above Administrative Reforms, we agree that some of the cost effectiveness and risk management techniques applied during the Remedial Investigation/Feasibility Study (RI/FS) process at this site are a departure from traditional methodologies of the past. However, we believe that the selected remedy affords a high degree of long-term protection within EPA's acceptable risk range, and therefore is protective of human health and the environment.

My staff has prepared a thorough technical response to SCDHEC's stated reasons for not concurring on EPA's ROD. The technical response is enclosed and will become part of the Administrative Record for this Site. We believe a dialogue on this issue has helped to address SCDHEC's concerns by modifying certain components of the selected remedy for the Koppers NPL Site which have brought us closer to agreement, although differences do remain. In our judgement, this ROD balances the concerns of all stakeholders and ensures consistency with the Superfund Administrative Reforms in developing a comprehensive, site-wide remedy that is protective of human health and the environment.

We want to continue to work closely with SCDHEC during implementation of the selected remedy to identify means by which EPA's selected remedy may further address the concerns of SCDHEC. Moreover, EPA is committed ta working closely with SCDHEC, adjacent communities, local governments and the responsible party in identifying opportunities for site re-development which optimize compatibility with local neighborhoods.

I appreciate your concern and interest in this matter. If you should have any questions, please feel free to contact me at (404) 562-8357, or Craig Zeller of my staff at (404) 562-8827.

<IMG SRC 98102WE>

Enclosure

EPA REGION IV'S TECHNICAL RESPONSE
to
SCDHEC's Position of Non-Concurrence on EPA's Record of Decision
Koppers Co., Inc. NPL Site; Charleston, South Carolina

This technical response was developed by EPA Region IV to provide specific responses to the South Carolina Department of Health and Environmental Control's (SCDHEC) reasons for not concurring on EPA's Record of Decision (ROD) for the Koppers Co., Inc. (Charleston Plant) NPL Site in Charleston, South Carolina. SCDHEC's reasons for not concurring on EPA's ROD were outlined in a letter dated December 11, 1997 from Mr. R. Lewis Shaw, Deputy Commissioner for SCDHEC Environmental Quality Control, to Mr. John H. Hankinson, Jr., Regional Administrator for EPA Region IV. EPA's technical responses to SCDHEC's reasons for non-concurrence are presented below in the order they appear in the December 11, 1997 letter.

Human Health Baseline Risk Assessment

SCDHEC has stated, "[E]PA's Human Health Baseline Risk Assessment utilized exposure point concentrations and other exposure assumptions that ....[m]ay underestimte the potential risks posed by this site". EPA believes that the Human Health Baseline Risk Assessment utilized reasonable maximum exposures to estimate conservative exposure scenarios that are still within the range of possible exposures. Soil data was generated during the RI field program from an unbiased statistical grid established across the site for risk assessment purposes, and from biased locations in areas suspected to be impacted by past operations. In order to calculate an unbiased representation of the soil exposure point concentrations at the site, EPA averaged Soil concentrations from biased sample locations in the most heavily impacted areas of the site with soil concentrations from the nearest unbiased grid sample locations. This strategy eliminated the bias that would result if one were to assume the future on-site worker was repeatedly exposed only to the most heavily impacted soil on-site.

Residual-Risk Analysis and Soil Cleanup Levels

Unlike traditional applications of the Baseline Risk Assessment (BRA), EPA employed a residual risk analysis at this site to estimate potential risks posed by on-site soils to future on-site workers after remediation is complete. The residual risk analysis incorporates accepted BRA techniques into the remedy selection process by re-calcalating soil exposure point concentrations, and subsequent risk posed, under post-remediation exposure scenarios. A value engineering study was conducted to select a soil excavation level that optimized residual risk achieved while minimizing tons of soil removed. This procedure entailed:

1) Estimate tons of soil which exceed the clean-up levels of EPA's acceptable risk range (i.e. 1×10^{-4} to 1×10^{-6});
2) Replace the excavated soil with clean soil of an assumed background concentration; and
3) Calculate residual risk achieved by utilizing the identical exposure parameters of the Human Health BRA and EPA-approved methodology.

The results of this procedure are summarized in Table 1 which is attached to this document for reference. A graphical illustration of residual risk achieved versus tons of soil excavated is also attached as Figure 1. This information shows that EPA did evaluate the 1×10^{-6} risk level as the point of departure for determining soil cleanup levels, as stated in the National Contingency Plan (NCP). However, the 1×10^{-6} cleanup goal results in an estimated residual risk to the future on-site worker of 8.6×10^{-8}. This estimated risk is lower (i.e. more protective) than EPA's protective risk range of 1×10^{-4} to 1×10^{-6}. In actuality, soil excavated during the remedial action will be replaced with prequalified backfill. Therefore, EPA believes that the residual risk methodology is grounded in reality, and provides an accurate representation of the potential risks posed to the future on-site worker after the remedial action is completed.

Table 1 and Figure 1 also shows that the greatest reduction of residual risk achieved per ton of soil removed occurs at the cleanup levels on the higher end of EPA's protective risk range (1×10^{-4} and 5×10^{-5}). A larger volume of relatively less contaminated soil exceeds the excavation levels of 1×10^{-5}, 5×10^{-6}, and 1×10^{-6}. Therefore, to achieve any significant incremental reduction in risk, a very large increase would occur in the volume of soil excavated. Excavation levels below the 5×10^{-5} risk level generally double and triple the tons

of soil removed while providing a relatively smaller incremental benefit in risk reduction.

For example, excavation of 12,000 tons of soil (i.e. the 5 x 10 -5 cleanup level) provides a risk reduction of approximately three orders of magnitude when compared to the no-action alternative. However, SCDHEC's preferred soil excavation goal of 1 x 10 -5 more than triples the volume of soil excavated (39,000 tons of soil), while achieving less than an order of magnitude in additional risk reduction. Moreover, SCDHEC's preferred soil excavation goal of 1 x 10 -5 adds an estimated $5.4 Million to the remedy cost when compared to the 5 x 10 -5 cleanup level (additional 27,000 tons @ $200/ton for off-site disposal). For these reasons, EPA has selected the 5 x 10 -5 soil excavation level resulting in the removal of an estimated 12,000 tons of soils and ditch sediment.

In addition, the soil component of EPA's selected remedy includes placement of a protective cap over surface soil containing relatively lower concentrations of constituents. This approach affords the benefit of achieving lower levels of residual risk without incurring the substantial increases in tons of soil excavated and associated costs. EPA has selected a 2 mg/kg cap level for Benzo(a)Pyrene Toxicity Equivalents (BAP-TE), which is the main constituent driving soil remediation at this site. The 2 mg/kg cap level represents EPA's risk management-based decision to potentially resolve the differences between EPA and SCDHEC, and to satisfy the NCP preference to protect to the more conservative end of EPA's acceptable risk range. The 2 mg/kg BAP-TE cap level corresponds to a resultant residual risk of 1.1 x 10 -6 posed to the future on-site worker EPA has developed performance standards for the final cap which will ensure its long-term permanence and effectiveness. SCDBEC has stated a preference to cover all surface soil above the 1 x 10 -6 cleanup goal, or 0.4 mg/kg BAP-TE. While EPA maintain that the cap level of 2 mg/kg is adequately protective, the constituent area identification and methodologies to be utilized in cap design and placement will most likely exceed the goal of 2 mg/kg thus making the respective differences in the cleanup goals of 2 mg/kg and 0.4 mg/kg negligible.

Lead Impacted Soil

In regard to the constituent of lead, SCDHEC concurs with EPA's methodology for calculating a future industrial cleanup level for lead in soil. However, SCDBEC has calculated a preferred industrial use cleanup level for lead in soil of 895 mg/kg versus EPA's selected cleanup level of 1,150 mg/kg. SCDHEC has stated, "This cleanup level was calculated using EPA's methodology with more conservative site-specific exposure assumptions that more accurately reflect the demographics of the surrounding community". EPA does not agree with this statement. SCDHEC has selected more conservative exposure parameters which assume the exposed population is entirely "Non-Hispanic Black". EPA his selected exposure parameters which assume the exposed population has a greater degree of heterogeneity. EPA believes its assumptions are more indicative of the current workforce population and any likely future industrial populations and land-use practices at the site.

In addition, EPA has a different view from SCDHEC concerning the appropriate remedy for lead impacted soil. EPA's selected remedy for lead impacted material involves placement of a protective cap to eliminate human exposure. This decision is based on comprehensive site-specific data which supports the following conclusions:

- Lead impacted material is classified as "non-hazardous" per RCRA regulations;
- Leaching tests conducted with this material and Ashley River water indicate that the lead impacted material does not leach at concentrations that would cause adverse impacts to surface water or ecological receptors;
- Extensive sediment sampling in areas adjacent to the lead-impacted upland soils did not exhibit concentrations greater than ecological screening criteria, and did not demonstrate toxicity for the test species evaluated.

EPA's cap over lead impacted material will cover approximately 5.2 acres at an estimated cost of $621,000. SCDHEC's preferred alternative of excavation and off-site disposal of lead impacted material is estimated, to cost in excess of $5.5 Million. In light of the above discussion, EPA does not believe the significant additional costs associated with SCDHEC's preferred alternative are warranted when compared to the degree of risk protection afforded. EPA's selected

alternative for lead impacted soil will provide adequate protection of human health and the environment while providing a high degree of cost-effectiveness.

Groundwater/NAPL Remediation Approach

Agreement has been reached between EPA and SCDBEC regarding the remediation objectives for groundwater and non-aqueous phase liquid (NAPL) at the three noted source areas on-site. The established performance, standards include: 1) Removal or treatment of NAPL to the maximum extent practicable; 2)Containment of potentially non-restorable source areas; and 3) Containment and restoration of aqueous contaminant plumes. SCDHEC has argued that EPA's proposed approach is not sufficiently aggressive and that the purpose of the proposed groundwater remediation effort is to demonstrate technical impracticability for groundwater restoration rather than actual remediation of impacted groundwater EPA does not agree.

The goal of EPA's groundwater/NAPL remedy is the restoration of impacted groundwater to MCL's specified by the Safe Drinking Water Act. However, in recent policy and guidance, EPA has recognized that restoration to these levels may be technically impracticable given the characteristics of NAPL, limitations in remediation technology, and/or complex hydrogeology. EPA's OSWER Directive 9234.2-25, Guidance for Evaluating the Technical Impracticability of Groundwater Restoration (EPA 1993), advocates an iterative approach to remediation at NAPL sites. This includes early actions to remove contaminant sources, control plume migration, and mitigate risks posed by impacted groundwater. EPA issued an Interim Action ROD in March 1995 to achieve these short-term objectives in the former Treatment Area. Physical construction has been completed and active groundwater/NAPL recovery in this area continues.

Information gathered during implementation of the Interim Action will be utilized to optimize the approach by which the long-term remediation objectives will be achieved. In an effort to address SCDHEC concerns regarding the initial effort of groundwater/NAPL, remediation, EPA added additional extraction wells to the selected remedy from what was originally specified in the Feasibility Study. EPA does not support a prescribed groundwater remediation system which gives little consideration to: 1) whether it could ever achieve the stated goal of MCL's and; 2) the associated capital expenditures and operation/maintenance costs of such as system. Rather, EPA remains committed to achievement of the above three performance standards through a step-wise, performance-based groundwater/NAPL, remediation approach.

TABLE 1
DETERMINATION OF SOIL EXCAVATION LEVEL

EPA's Protective Risk Range	B(a)P-TE Soil Clean-Up Level (mg/kg) Surface/Subsurface Soil (1)	Estimated Tons of Soil Greater than Clean-Up Level (2)	Estimated Residual Risk Achieved(3)
1 x 10 -4	40/550	5,300	1.6 x 10 -5
5 x 10 -5	20/275	12,000	1.0 x 10 -5
1 x 10 -5	4.0/55	39,000	2.4 x 10 -6
5 x 10 -6	2.0/27.5	86,000	1.1 x 10 -6
1 x 10 -6	0.40/5.5	160,000	8.6 x 10 -8 (4)

Footnotes

(1) B(a)P-TE, or Benzo(a)Pyrene Toxicity Equivalents, is a summary parameter which converts all carcinogenic PAHs to an equivalent B(a)P concentration. Concentrations are listed for surface soils (0 to 6 inches) and subsurface soils (6 inches to water table)

(2) This column represents total tons of soil which exceeds respective soil clean-up level. B(a)P-TE impacted soil is driving volume estimates.

(3) Estimated residual risk achieved represents the potential risk to future on-site worker AFTER remediation is completed

(4) Estimted residual risk is lower (i.e. more protective) than EPA's protective risk range of 1 x 10 -4 to 1 x 10 -6.

<IMG SRC 98102WF>

APPENDIX B
RESPONSIVENESS SUMMARY
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Attachment 1 - Verbatim Transcript of April 15, 1997 Public Meeting

Attachment 2 - Written Comments Received During Formal Comment Period

1.0 INTRODUCTION

The Final Record of Decision (ROD) for the Koppers Co., Inc. (Charleston Plant) NPL site consists of three components: Declaration, Decision Summary, and Responsiveness Summary. The Declaration can be found at the front of the ROD and functions as an abstract for the key information in the Decision Summary. The Decision Summary is embodied in Sections 1 through 11 of the ROD. This section of the ROD presents the Responsiveness Summary which is the final step in selection of the site-wide remedy for this site. The Responsiveness Summary provides a concise written summary of significant comments, criticisms, and new relevant information that was submitted to EPA during the formal comment period required by CERCLA Section 117. The Responsiveness Summary allows EPA to reassess its initial determination that the Final ROD provides the best balance of trade-offs by factoring in any new information or points of view expressed by the community, local/state officials and potentially responsible parties (PRPs) during the public comment period. These comments may prompt EPA to modify aspects of the preferred alternative or decide that another alternative provides a more appropriate balance.

The highlights of community participation during the RI/FS process at this site were presented in Section 3.0 of the ROD. EPA held a 60-day public comment period on its proposed cleanup plan (i.e. Proposed Plan) for this site from April 3 to June 2, 1997. A formal public meeting on the Proposed Plan was held on April 15, 1997 at the Charleston Public Works Building in Charleston, South Carolina. The verbatim transcript of the public meeting is included as Attachment 1 to the Responsiveness Summary. Section 2.0 of the Responsiveness Summary presents a synopsis of comments received during the public meeting as well as EPA's response. A significant volume of written comments were submitted on EPA's Proposed Plan during the above noted 60-day comment period. A copy of all comments received is included as Attachment 2 to the Responsiveness Summary. Section 3.0 of this document provides a synopsis of written comments received, followed by EPA's response.

2.0 SUMMARY OF COMMENTS RECEIVED DURING APRIL 15,1997 PUBLIC MEETING

While not explicitly stated, the attendees at the meeting seemed generally supportive of EPA's site-wide proposed cleanup plan for this site. No major opposition to EPA's proposal was implied or otherwise stated. This section of the Responsiveness Summary provides a synopsis of the questions and comments received during the Question and Answer (Q&A) session of the April 15, 1997 public meeting. The Q&A session begins on page 58 of the verbatim transcript included as Attachment 1. Each question or comment is summarized below and followed by EPA's paraphrased response.

1) Comment/Question: Please comment on the points of dispute between EPA and the State of South Carolina regarding the Proposed Plan.

EPA Response: There are three major points of dispute between EPA and SCDHEC on EPA's Proposed Plan for the site. These are summarized below. Further discussion regarding this issue is also addressed in Section 3.0 which presents EPA's response to written comments received.

1) Groundwater/NAPL Remediation Approach - EPA and SCDHEC, generally agree on the established performance objectives for groundwater/NAPL at the three noted source areas. SCDHEC has stated that EPA's proposed groundwater/NAPL approach is not aggressive enough and that additional extract wells are needed to achieve the performance objectives. EPA maintains that further aquifer response and groundwater/NAPL recovery data, particularly in the intermediate water-bearing zone, is necessary to accurately specify the exact number of wells required to meet the performance data. EPA advocates an iterative process to achieve the established performance standards, rather than a rigid prescriptive approach. Regardless of the number of wells employed, the groundwater/NAPL recovery system will be operated property to achieve the established performance standards at the three source areas.

2) Soil Cleanup Levels - EPA has selected a soil cleanup level which results in the excavation of 12,000 tons and the installation of a 24.5 acre cap. SCDHEC favors a more stringent soil cleanup goal which results in the excavation of 39,000 tons and the installation of a 31 acre cap. EPA maintains that SCDHEC's more protective excavation levels triple the volume of soil removed while having a minimal incremental benefit in risk reduction achieved. Moreover, SCDHEC's preferred soil cleanup levels results in a residual risk (i.e. risk posed to future on-site worker after cleanup is complete) which is outside

(i.e. more protective) than EPA's acceptable risk range specified in the applicable environmental statute.

3) Lead Impacted Soil - EPA and SCDHEC disagree over the soil lead cleanup level. Based upon the recommendations of EPA's workgroup on adult exposures to lead in non-residential exposure settings, EPA has selected 1,150 mg/kg as a cleanup level for lead in soil. SCDHEC disagrees with certain model parameters and has selected more conservative values resulting in a preferred cleanup level for lead in soil of 630 mg/kg.

2) Question/Comment: Where would SCDHEC put more extraction wells?

SCDHEC Response: SCDHEC would increase the number of wells up front in all three source areas.

3) Question/Comment: Is there Pentachlorophenol or Arsenic contamination in the groundwater?

EPA Response: Groundwater cleanup is being driven by the presence of NAPL (creosote) in groundwater.

4) Question/Comment: Does pentachlorophenol come from creosote?

EPA Response: Pentachlorophenol was a separate wood preservative which was stored in separate vessels.

5) Question/Comment: The community was not notified that cleanup work was going on.

EPA Response: Through an EPA grant, a technical advisor has been retained by local communities to help them get more involved in the remedy selection process. EPA, with the assistance of the advisor, has attempted to keep local communities updated through mailings and frequent meetings as needed. Attendance by the local residents at most meetings has been minimal. What would you suggest or recommend EPA do to notify residents of future activities?

Response: I think mailing would be the best thing. Please give the community advance notice when specific things are going to be done on the site.

EPA Response: We will target Rosemont, Four Mile and Silver Hill neighborhoods via mail of upcoming activities.

6) Question/Comment: The community is concerned about the impacted tidal creek and tidal marsh closest to Rosemont. Could contaminants be transported to nearby gardens?

EPA Response: EPA will evaluate this general area for potential contaminant transport. Initial efforts will focus on the collection and analysis of soil samples from areas of interest.

7) Question/Comment: Can you elaborate on the bioremediation for lead in the South Tidal Marsh?

EPA Response: An EPA laboratory in Gulf Breeze, Florida has developed a bioremediation process that reduces concentrations of PAHs, as well as inorganic contaminants such as lead. For lead, plants are utilized to uptake inorganics from the sediment. The plants are then harvested to reduce observed concentrations in local sediments. EPA considers this technology to be innovative and one that warrants further field evaluation.

8) Question/Comment: Would you please explain enhanced sedimentation in the Ashley River?

EPA Response: Enhanced sedimentation in the Ashley River will capture sediment in a similar way that snow fences are utilized to reduce beach erosion. For instance, if you were to collect a glass of water from the Ashley River it would be muddy. If you let that glass of water sit for a few hours, the water velocity would be zero (i.e. decrease water velocity). After a few hours, that glass of water would have a layer of sediment that settled to the bottom. Enhanced sedimentation will work in this fashion. Driven piles will be utilized to decrease water velocities in the area of interest. Thus a clean layer of suspended sediment will be deposited over impacted sediments of the Ashley River.

9) Question/Comment: Enhanced sedimentation is new and you're not sure that it will work. Why

are you going to try something new instead of something that has worked somewhere else?

EPA Response: To EPA's knowledge, enhanced sedimentation has not been used to cover contaminated sediments. However, the proposed engineering controls have demonstrated success in facilitating sediment deposition in high energy, erosional environments. The Corps of Engineers (COE) have considerable experience in this field. Experts familiar with these applications from the COE in Vicksburg, Mississippi have been consulted on this proposal and will be involved during design and implementation. This approach provides EPA an opportunity to develop a promising technology for use by others in the future. If the proposed approach proves unsuccessful, EPA will implement contingency remedies. This may include installation of a supplemental cap. In this case, the installed piles will be used as a containment measure to hold the cap in place.

10) Question/Comment: What will you monitor to decide if enhanced sedimentation is working?

EPA Response: EPA will primarily rely on bathymetric surveys to monitor sediment accumulation. Bathymetric surveys measure the vertical distance from an established datum (i.e. the water level) to the sediment interface. The baseline conditions will be established prior to pile installation, and monitored yearly after that, at a minimum. If this vertical distance decreases over time, sediment is accumulating. If this vertical distance increases over time, erosion is occurring.

11) Question/Comment: Do you plan to test deposited sediment for contaminants?

EPA Response: Yes. EPA will establish a program to monitor contaminant trends over time. EPA expects contaminant concentrations to decrease.

12) Question/Comment: Is there a possibility of implementing enhanced sedimentation on a pilot scale, prior to driving 800 piles?

EPA Response: Pilot scale projects typically last less than 1 year. Realistically, EPA does not expect significant or measurable accumulations in time frames that are typical of pilot scale studies. Therefore, EPA has established a 5-year time frame to evaluate the effectiveness of enhanced sedimentation. If after 5 years enhanced sedimentation has not met the established objectives, the piles could be utilized as a containment measure to hold an engineered cap in place.

13) Question/Comment: What is the depth of water where the piles will be driven?

EPA Response: The actual depth escapes me. However, the Ashley River navigation channel is approximately 30 feet in depth. The piles will not be installed in the maintained navigation channel. Therefore, the depth to water is well under 30 feet.

14) Question/Comment: Does the environmental reuse of this site involve dock access?

EPA Response: Yes. EPA considers dock access a key issue for current, as well as future, land owners adjacent to the Ashley River. The enhanced sedimentation alternative will allow for current/future dock access, while other alternatives evaluated did not.

15) Question/Comment: On page 15 of your fact sheet, it says that SCDHEC does not feel that EPA's residual risk methodology gives an appropriate representation of the actual risks that would remain? What is the remaining risk(s)?

SCDHEC Response: SCDHEC's concerns are that the residual risk looks at 100 acres as a whole. If the site were broken into smaller parcels, there would be soil with concentrations which SCDHEC considers significant.

EPA Response: EPA would respond that when the capping component is completed, all soil with concentrations greater than 2 ppm of benzo(a)pyrene (creosote) would be covered. EPA feels this goal is adequately protective.

16) Question/Comment: How is capping going to affect land use? Is any of the land going to be useable, or is that going to be a site than can't be used?

EPA Response: EPA's full intention is to return this property to future industrial use. The site is currently zoned industrial and has been recommended for future industrial use by the City of Charleston. This is why EPA has based its cleanup goals on a future industrial use exposure scenario. Specific operations are somewhat for the land owners to decide.

17) Question/Comment: Under the groundwater alternative, how will containment be achieved?

EPA Response: Containment will be achieved by extraction wells.

18) Question/Comment: Could the acidic pH levels coming from the former acid chamber area mobilize any of the lead that EPA proposes to dispose in the barge canal?

EPA Response: Based upon current data, EPA believes the low pH condition is isolated in close proximity to this surface water drainage ditch (indicating on map). However, EPA is planning another investigation to further characterize the low pH groundwater condition in this general area. Leaching studies to simulate long-term permanence of EPA's proposed confined disposal alternative will be conducted to ensure the remedy remains protective. Leaching studies will consider the data generated by this upcoming investigation.

3.0 SUMMARY OF WRITTEN COMMENTS RECEIVED DURING FORMAL COMMENT PERIOD

A significant volume of written comments were submitted to EPA-Region 4 during the 60-day public comment period held from April 3 to June 2, 1997. Written comments on EPA's Proposed Plan were received from the following entities:

- South Carolina Department of Health and Environmental Control - State Acceptance Section of EPA's Proposed Plan (March 1997), and Section 8.8 (State Acceptance) of Final ROD;
- South Carolina Bureau of Ocean and Coastal Resource Management - April 10, 1997;
- Beazer East, Inc. - May 30, 1997;
- U.S. Fish and Wildlife Service - May 30, 1997;
- Four Mile Hibernian Community Association - May 31, 1997;
- Conoco Inc. - June 2, 1997;
- General Engineering Laboratories, Inc. - June 2, 1997;
- South Carolina Department of Natural Resources - June 2, 1997;
- National Oceanic and Atmospheric Administration - June 2, 1997;

Copies of the above written comments are included as part of this Responsiveness Summary as Attachment 2. This section of the Responsiveness Summary provides a synopsis of the written comments received from each entity above, followed by EPA's response. Additional written comments on a variety of issues related to this site were also submitted to EPA after the formal comment period had ended. The majority of comments received after June 2, 1997 often reiterated comments or positions that were communicated to EPA during the 60-day comment period. In this case, this section of the Responsiveness Summary should clearly explain EPA's rationale and justification for selecting the final remedy described in the ROD. In the interest of thoroughness, comments received after June 2, 1997 are included in the Administrative Record (AR) for the site. Where necessary, EPA has provided separate responses to these comments in the Administrative Record.

3.1 Comments from South Carolina Department of Health and Environmental Control (SCDHEC)

As the support agency, SCDHEC has been actively involved in the review and comment on all technical documents generated during the RI/FS process at this site. This correspondence can be found in the AR. SCDHEC did not concur with several components of EPA's Proposed Plan. SCDHEC's major reasons for not concurring on the Proposed Plan were outlined in the State Acceptance section of the EPA's March 1997 Proposed Plan. Several of SCDHEC's positions changed from the time EPA's Proposed Plan was issued in March 1997 to finalization of the ROD.

There continues to be several points of dispute between EPA and SCDHEC regarding EPA's Final selected remedy for the site. SCDHECs reasons for not concurring on EPA's selected remedy are summarized in Section 8.8 (State Acceptance) of the ROD, and in the December 11, 1997 SCDHEC non-concurrence letter from Mr. R. Lewis Shaw, Deputy Commissioner for SCDHEC Environmental Quality Control, to Mr. John H. Hankison, Jr., Regional Administrator for EPA-Region IV.

SCDHEC's non-concurrence letter is attached to the ROD as Appendix A. EPA formally responded to SCDHEC's non-concurrence letter via a March 18, 1998 letter from Mr. Hankinson to Mr. Shaw. EPA's response letter is also included as part of Appendix A of the ROD.

The technical rationale behind EPA's selected remedy is presented in detail throughout the text of the ROD, and in the March 18, 1998 technical response to SCDHEC's non-concurrence letter (Appendix A). In the interest of brevity, these positions are not re-iterated here. Rather, the reader is referred to Appendix A for EPA's formal response to SCDHEC's reasons for non-concurrence on the selected remedy for this site.

3.2 Comments from SCDHEC Bureau of Ocean and Coastal Resource Management

In an April 10, 1997 letter, SCDHEC Bureau of Ocean and Coastal Resource Management (OCRM) notified EPA that the Koppers Co., Inc. NPL Site, "[a]ppears to be a Federal Activity in the Coastal Zone of South Carolina. Because of the Federally approved Coastal Zone Management Plan for this area, you will need to comply with the Federal Consistency provisions of the Coastal Zone Management Act, as found in 15 CFR 930. Your Statement of Consistency should include a detailed description of the activity, its associated facilities, and their coastal zone effects, and comprehensive data and information sufficient to support the Federal agency's consistency statement."

EPA officials from Region 4 have discussed this overall issue with representatives from OCRM on several occasions via the telephone and during a face-to-face meeting in Charleston, SC on June 17, 1997. It is important to note that EPA and Beazer East coordinated with OCRM during implementation of the Interim Action ROD. Construction design plans for rehabilitation of the Milford Street and Hagood Avenue drainage ditches were forwarded to OCRM for review and approval prior to the initiation of remedial activities. EPA desires to continue this working relationship with OCRM on applicable components of the site-wide remedy specified in the ROD.

In follow-up correspondence dated July 23, 1997 and September 8, 1997, OCRM expressed an interest in the following items:

- A statement of consistency with the South Carolina Coastal Management Program as required by the Federal Coastal Management Act;
- Navigation hazards of the enhanced sedimentation area in the Ashley River;
- Permanence of the soil cap; and
- A master stormwater plan and associated permits to address stormwater leaving the property prior to discharge to the Ashley River.

Following signature and approval of the ROD, EPA will issue a letter to OCRM to address the substantive technical requirements related to the Federal Consistency Determination. Details requested by OCRM in regard to the enhanced sedimentation alternative in the Ashley River, the permanence of the soil cap and master stormwater plan for the site under post-remediation scenarios are not available at this phase of the project. However, EPA did develop several Performance Standards for applicable remedy components in an attempt to address OCRM concerns at this phase.

For example, Section 9.3.1 of the ROD delineates the requirements of the enhanced sedimentation alternative in the Ashley River. Language in this section states that the enhanced sedimentation alternative shall be designed and implemented to "[m]itigate adverse impacts on the navigable waters, commercial/recreation traffic, and future maintenance dredging should it be required." Section 9.1.2 of the ROD delineates the requirements for containment by capping (i.e. soil cap). This section specifies that a detailed design study shall be conducted to develop and install a final cap that meets a set of five Performance Standards which address, among other objectives, long-term permanence/effectiveness and resultant quantity/quality of stormwater runoff. Moreover, Section 9.1.3 (Drainage Ditch Reconstruction) states that "Reconstruction activities shall be in full accordance with the regulations delineated in the document titled South Carolina Stormwater Management and Sediment Control Handbook for Land Disturbance Activities (February 1997)."

EPA has adopted provisions in the ROD for the Koppers site which address OCRM concerns to the maximum extent possible at this stage in the process. As the Remedial Design (RD) progresses, construction drawings will become available which should address the details requested by OCRM. EPA will ensure that OCRM remains involved throughout the RD process and has ample opportunity to review and comment on appropriate construction drawings.

3.3 Comments from Beazer East, Inc.

Beazer East, Inc. (Beazer) is the successor in interest to the former Koppers NPL Site in Charleston, SC. In 1988, BNS Acquisitions, Inc. acquired the outstanding common stock of Koppers Co., Inc. In 1989, BNS Acquisitions merged into Koppers Company, Inc., with Koppers Company, Inc. being the surviving corporation. The company underwent a name change to Beazer Materials and Services, Inc. and in 1990, that name was changed to Beazer East, Inc. (Beazer). In January 1993, Beazer entered into an Administration Order by Consent (AOC) with EPA for the performance of a Remedial Investigation/Feasibility Study (RI/FS) at the site. Beazer retained ENSR Consulting & Engineering (ENSR) of Acton, MA to conduct the work required to complete the RI/FS process. EPA and SCDHEC provided oversight of all work conducted during the RI/FS. Beazer's obligations under the January 1993 AOC are fulfilled concurrent with the approval of the ROD for this site. Separate agreements will be negotiated with Beazer for implementation of the response actions specified in the Final ROD.

Beazer's comments on EPA's Proposed Plan were presented in a May 30, 1997 letter from Ms. Billie Flaherty, Esquire for Beazer. In general, Beazer expressed support for EPA's Proposed Plan and believes the remedy meets the primary goals of CERCLA. Beazer organized its comments around thirteen major topics related to the RI/FS process and components of the proposed remedy. In the discussion below, each of Beazer's comments are summarized in the order they appear in the May 30, 1997 letter, and then followed by EPA's response. The reader is referred to Appendix 2 of the Responsiveness Summary for a more detailed account of Beazer's comments on EPA's Proposed Plan.

Beazer Comment: EPA's use of innovative approaches and remedial methodologies is consistent with the goals of CERCLA. Beazer supports the selection of enhanced sedimentation in the Ashley River, and in-situ bioremediation in the Northwest and South Tidal Marshes. Beazer supports the value engineering approach EPA employed to calculate soil cleanup levels for the site. In addition, Beazer supports EPA's proposal of combining soil capping with soil excavation to achieve lower levels of residual risk in a cost-effective manner. Beazer believes the ROD should provide sufficient flexibility to allow the use of in-situ wells for the groundwater/NAPL component of the selected remedy. Lastly, Beazer prefers to use the term "Performance Goal" rather than the term "Performance Standard", as it relates to measuring the performance of the selected remedy.

EPA Response: EPA acknowledges Beazer's support on the noted items. EPA believes the issue of whether to use the term "performance goal" or "Performance standard" for the ROD is really a matter of semantics. The term Performance Standard is defined and utilized by EPA in most legal agreements for the performance of Remedial Design/Remedial Action activities at NPL sites. Therefore, EPA prefers to use the term Performance Standard when referring to cleanup levels or other substantive requirements of the selected remedy.

Beazer Comment: Beazer supports EPA's use of residual risk in calculating volumes of soil for excavation and recommends that EPA utilize residual risk methodology in the ROD.

EPA Response: EPA believes the remedy selected at this site is consistent with Superfund Administrative Reforms, which are being implemented by EPA to enhance the Program's effectiveness in protecting human health and the environment. The residual risk methodology was one of several innovative techniques utilized by EPA during the RI/FS process to address the intent of the reforms that are applicable to this site. EPA has utilized the residual risk methodology in the ROD.

Beazer Comment: EPA's Human Health Risk Assessment uses unduly conservative assumptions that result in an overestimation of potential risks posed by the site. Beazer recommends that EPA re-evaluate a number of the assumptions used in the Baseline Risk Assessment.

EPA Response: EPA developed the Human Health Baseline Risk Assessment (BRA) to balance the

concerns of all involved stakeholders. In fact, SCDHEC has stated that they believe EPA's BRA may actually underestimate the potential human health risks posed by the site. EPA maintains that the Human Health BRA utilized reasonable maximum exposure assumptions to estimate an upper bound, conservative estimate of site risks that are still within the realm of potential current/future exposure scenarios. Beazer has presented detailed discussion on several issues related to the Human Health BRA in the attached May 30, 1997 letter. On several occasions, Beazer also submitted extensive comments on the Human Health BRA while the document progressed through the development process. The AR contains a detailed account of Beazer's positions as well as EPA's responses to these comments. Therefore, it is not necessary to rehash these issues in the Responsiveness Summary. EPA considers the Human Health Baseline Risk Assessment documents to be Final.

Beazer Comment: Beazer believes that the EPA Ecological Risk Assessment (October 1996) must be considered to be a screening level risk assessment, rather than a baseline risk assessment, because it does not include site-specific information and it utilizes constituent maximum values. Beazer commends EPA's use of Beazer's Baseline Ecological Risk Assessment and the available site-specific information to make its risk management decisions in the Proposed Plan.

EPA Response: EPA's Ecological Risk Assessment (ERA) was prepared in accordance with applicable guidance issued by the Agency. EPA's ERA concluded that potential ecological risks exist at the site and that response actions for managing these risks should be evaluated. In an effort to address Beazer's above comment, EPA's ERA also recommended the utilization of an alternative risk model to further evaluate potential ecological risks and the effectiveness of remedy options in managing the potential risk. The alternative ecological risk evaluation was conducted by Beazer in a document titled, "Site-Specific Baseline Ecological Risk Assessment Former Koppers Site Charleston, South Carolina, (ENSR/Ogden 1996)". The alternative scenario was conducted to develop a lower bound of the potential ecological risks posed at the site. When combined with EPA's ERA, the two ecological assessments bound the range of potential ecological risks in which risk management decisions were made at the site.

Beazer Comment: The drainage ditch reconstruction component of the remedy should not require design to City of Charleston future flow rates. Beazer requests that EPA, at a minimum, either reconsider the need to meet City of Charleston design flows or include flexibility in the ROD for alternate design criteria.

EPA Comment: Pursuant to Section 121(d) of CERCLA, EPA must select remedies that 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). EPA has identified South Carolina regulations that are applicable to the drainage ditch reconstruction activities required by the ROD. These regulations are delineated in a document titled, South Carolina Stormwater Management and Sediment Control Handbook for Land Disturbance Activities (February 1997). This document lists design criteria and minimum standards for construction projects requiring stormwater management and sediment control. Section 9.1.3 of the ROD specifies three Performance Standards for drainage ditch reconstruction activities, which includes compliance with the applicable requirements of the aforementioned handbook.

Beazer Comment: The soil component of the selected remedy should include the option for either on-site or off-site disposal.

EPA Response: EPA's Proposed Plan specified that all excavated soil would be transported off-site for disposal in an approved facility. As such, public comments were solicited on this proposed strategy. No opposition was noted during the 60-day public comment period. Therefore, EPA selected the off-site disposal option for all soil/sediment that is excavated during remedy implementation. EPA considers the on-site disposal option to be a fundamental difference from off-site disposal. The implementability of on-site disposal is somewhat questionable given the siting requirements and proximity of the site to the 100-year flood plain. Public acceptance of on-site disposal is also a factor that warrants further consideration. EPA realizes that the deadlines imposed by LDRs do represent a significant challenge. In the event that all soil/sediment above specified excavation goals cannot be removed by May 11, 1999, EPA will consult with SCDHEC and Beazer to evaluate contingency alternatives. On-site disposal will likely require a ROD Amendment, which requires a public comment period.

Beazer Comment: The groundwater remedy presented in the FS is protective. Beazer recommends that the groundwater remedy be implemented in a phased manner and that the ROD reflect the 14 wells discussed in the FS as the initial phase of the groundwater remedy.

EPA Comment: EPA's groundwater/NAPL remediation strategy was developed to be consistent with OSWER Directive 9234.2-25, Guidance for Evaluating the Technical Impracticability of Groundwater Restoration (EPA 1993). This guidance promotes an iterative, phased approach which includes early actions to remove contaminant sources, control plume migration, and mitigate risks posed by impacted groundwater. Therefore, EPA agrees with Beazer that the groundwater remedy should be implemented in a phased manner.

In January 1997, Beazer submitted a proposal to EPA which included the addition of several shallow and intermediate extraction wells from what was proposed in the FS Report. This proposal was submitted by Beazer in the spirit of cooperation and compromise to potentially resolve SCDHEC's concerns that the groundwater remedy was not sufficiently aggressive up front. EPA's groundwater NAPL remedy specified in the ROD is performance based. In other words, EPA has issued a set of three Performance Standards that the groundwater/NAPL remedy shall attain, rather than developing a rigid, prescribed approach. Agreement has been reached between EPA, SCDBEC and Beazer regarding the Performance Standards for the groundwater/NAPL remedy. Therefore, the exact number of wells ultimately installed is somewhat irrelevant, provided the Performance Standards are achieved. Based on the above discussion, EPA's groundwater/NAPL remedy described in the ROD reflects the number of extraction wells and cost estimates detailed in Beazer's January 1997 proposal.

Beazer Comment: In regard to EPA's selected remedy for the Barge Canal, EPA must clearly differentiate between "response" work encompassed by Sections 107(4)(A) and (4)(B) of CERCLA and "restoration", which is a form of compensation for natural resource damages which may be sought by Natural Resource Trustees pursuant to Section 107(4)(c). As specified in the FS, the habitat enhancements which were included as a component of Barge Canal remediation were evaluated to partially satisfy CERCLA requirements related to compensation under Section 122(j)(2) of CERCLA.

EPA Response: EPA agrees with Beazer's position regarding the scope of Barge Canal remediation. During the months of February/March 1996, EPA mediated a technical agreement in principle between Beazer and the Natural Resource Trustees for the creation of 5 acres of low, intertidal Spartina marsh to compensate for injury and loss of services to the environment. This technical agreement in principle was never finalized by legal counsel for Beazer and/or the Natural Resource Trustees.

EPA expended significant efforts to develop a Proposed Plan that combined remediation of the Barge Canal and the former rail road bed, with habitat creation. EPA's Proposed Plan involved capping impacted Barge Canal sediments with a six foot base layer of soil from the adjacent thin strip of uplands(i.e. former rail road bed) which contained concentrations of lead and arsenic above human health cleanup goals. This six foot base layer was to be covered with a two foot cap, resulting in what the Agency referred to as a Confined Disposal facility (CDF). Additional leach testing and future monitoring of the CDF was also an integral component of EPA's proposal. Since EPA's proposed remedial measures in this area would disturb an estimated 5 acres, EPA's CDF concept also included restoring the area to proper elevations and re-vegetating the area with Spartina to ensure a high degree of long-term permanence and protectiveness.

As discussed in Section 11 of the ROD, EPA's CDF proposal was adamantly opposed by several of the Natural Resource Trustees which generally cited concerns over long-term leaching and unreasonable risks of injury to trust resources. Given these concerns, EPA's selected remedy for the former rail-bed includes placement of a protective cap to preclude exposure to the future on-site worker. This change has also necessitated a change in the Barge Canal remedy. EPA's selected remedy for the Barge Canal involves capping the impacted sediments with a two-foot cover only, to eliminate exposure to ecological receptors. Therefore, in order to clearly differentiate between remediation and restoration activities, EPA's selected remedy does not require that the Barge Canal be restored to a functional low, intertidal Spartina marsh. Marsh restoration may be considered in the 3.2 acre Barge Canal to provide a high degree of long-term permanence and protection, and/or to address issues related to past damages of natural resources.

Beazer Comment: The placement of lead-impacted soils in the Barge Canal may not be the most

appropriate remedy. Beazer is not responsible for lead impacted soil, and opposes placement of lead-impacted soil in the Barge Canal absent receipt of a covenant not to sue from EPA and the Natural Resource Trustees related to potential damages associated with the confined disposal remedy. Moreover, Beazer believes capping these soils in place provides a similar level of risk reduction as confined disposal.

EPA Response: The rationale behind the development of EPA's Confined Disposal remedy was presented in a previous response and is also discussed in Section 11.1 of the ROD. EPA believes Confined Disposal could be readily implemented, and adequately designed, constructed and monitored to ensure an appropriate degree of long-term protectiveness. However, given the opposition to EPA's proposal of Confined Disposal expressed during the 60-day public comment period, EPA has decided to cap this material in place.

Beazer Comment: The promulgation of Universal Treatment Standards (UTS) for the wood-treating wastes will increase the costs of the remedy. Beazer recommends that EPA work with Beazer to resolve the State of South Carolina non-concurrence issues on the ROD and to facilitate the implementation of the remedy within the time frames imposed by Phase IV Land Disposal Restrictions (LDRs). As a contingent measure, EPA should designate the Site as an AOC and include an on-site disposal option in the ROD.

EPA is fully aware of the time constraints imposed by the Phase IV LDRs. In the event that soil/sediment which exceeds ROD excavation levels cannot be excavated and transported for appropriate off-site disposal by the capacity variance deadline (May 11, 1999), potentially significant increases in remedy costs are likely. EPA is fully committed to working with Beazer, and SCDHEC to facilitate removal of soil/sediment which exceeds excavation levels specified in the ROD within the capacity variance. As discussed previously, on-site disposal cannot be listed as a contingency alternative in the ROD, because it was not included in the Proposed Plan for public comment. However, the ROD can be amended to select other appropriate soil disposal options, if necessary.

Beazer Comment: The State of South Carolina non-concurrence with the remedy poses significant implementation issues.

EPA Response: EPA, SCDHEC, Beazer and other stakeholders worked very closely throughout the RI/FS process to develop a remedy for the site which addressed the interests of all involved. EPA acknowledges Beazer's willingness, on several occasions, to compromise its own interests in an effort to address the concerns of other entities. Ultimately, EPA had to select a comprehensive site-wide remedy which: 1) satisfied the statutory requirements of CERCLA; 2) provided the best balance with regard to the concerns of all stakeholders; and 3) ensured consistency with the Superfund Administrative Reforms. EPA believes the ROD meets these three objectives. EPA and SCDHEC have engaged in substantive discussions involving top-level management from both agencies in an effort to resolve our differences. EPA believes this dialogue has met the intent of the dispute resolution process in the Memorandum of Understanding between EPA and SCDHEC and Subpart F of the NCP. While this dialogue has resolved some outstanding issues, differences do remain which has resulted in SCDHEC's position of non-concurrence on EPA's ROD.

EPA agrees that SCDHEC's position of non-concurrence does create additional remedy implementation issues and uncertainties. The degree to which SCDHEC's non-concurrence position will impact remedy implementation cannot be accurately determined at this time. EPA's responses to SCDHEC's stated reasons for not concurring are included Appendix A of the ROD. EPA maintains that the selected remedy provides a high degree of long-permanence that is near the most protective end of EPA's acceptable risk range. EPA is committed to working with Beazer during implementation of the selected remedy to identify means by which the selected remedy may further address the concerns of SCDHEC.

Beazer Comment: The National Superfund Remedy Review Board (the "Board") was established in 1995 as a method for controlling remedy costs. Accordingly, all proposed remedies that are over $30 million, or that are over $10 million and 50% greater than the cost of the least-costly, protective, ARAR-compliant will be subject to the Board's review. The Agency has selected a remedy which is protective and ARAR-compliant. However, Beazer believes that Soil Alternative 5C in the FS (excavation of 5,300 tons and a cap of 11 acres) is the least costly ARAR-compliant remedy and the remedy that Beazer prefers. Therefore, any remedy selected which increases the

cost of Alternative 5C by 50% or more will require Board review.

EPA Comment: Beazer is correct on the criteria which require review by the National Remedy Review Board. However, these criteria apply to the entire remedy selected in the ROD, not just media specific components of the overall ROD. Moreover, EPA believes the least costly, ARAR compliant soil remedy is Alternative 2 (6.7 acre cap only), not Alternative 5C. EPA has evaluated the remedy costs for all remedial alternatives evaluated in detail in the Final FS Report. An evaluation has been conducted which compared the remedy costs of: 1) a site-wide remedy consisting of the least costly, ARAR-compliant alternatives for all appropriate media components; and 2) EPA's selected remedy in the ROD. Based on this evaluation, EPA has concluded that this remedy does not require review by the Board.

Beazer Comment: EPA's enforcement action against Conoco/Agrico may impact Beazer's implementation of the ROD. To avoid inconsistency, adverse impacts on implementation of the ROD, and the potential that Beazer will not concur with a remedial or removal action that EPA directs Conoco/Agrico to undertake, Beazer recommends that all proposed work to be undertaken at the site by Conoco/Agrico or other responsible entities be reviewed and approved by Beazer.

EPA Response: Pursuant to discussion in Section 4.0 of the ROD, EPA has recognized that on-going transport pathways from the former Ashepoo Phosphate/Fertilizer Works to the headwaters of the South Tidal Marsh must be eliminated prior to initiating response actions specified in the ROD for the sediments of the South Tidal Marsh. Regarding the former Ashepoo facility, future investigations and response actions will be conducted under the Engineering Evaluation/Cost Analysis (EE/CA) process utilizing EPA's Non-Time Critical Removal Action authority. The timeliness of this process should eliminate potential adverse impacts to remedy implementation in the South Tidal Marsh. EPA will coordinate all future work undertaken by the successors to Ashepoo, or other responsible parties that may impact implementation of the selected remedy for the Koppers site. As a courtesy, EPA will forward relevant work plans, EE/CA investigation reports and other appropriate documents to Beazer for review and comment. However, pursuant to the NCP and CERCLA, EPA shall retain all decision authority regarding the sufficiency of remedial or removal actions conducted at the site.

3.4 Comments from Four Mile Hibernian Community Association

A Technical Assistance Grant (TAG) has been awarded to residents in the neighborhoods adjacent to the Koppers site. The purpose of this grant is to allow the communities to consult with an advisor so that they may interpret the technical documents generated during the RI/FS process and provide well coordinated input into the remedy selection process. In a letter dated May 31, 1997, a set of five comments on the Koppers Proposed Plan were submitted by the TAG Technical Advisor, Mr. Melvin H. Goodwin, Ph.D., on behalf of the Four Mile Hibernian Community Association. Each community comment is presented below, followed by EPA's response.

Community Comment: " 1. Residents are not infavor of cleanup strategies that have not been previously shown to be effective in similar applications. Residents request site-specific documentation of results achieved at other contaminated sites where these techniques have been used. This issue is of particular concern with regard to the proposed procedure for remediating contaminated sediments in the Ashley River and adjacent marsh."

EPA Response: The challenges posed by reducing the risks posed by hazardous waste sites across the United States has necessitated a constant evolution in the Superfund Program. This includes the adoption of innovative solutions to site remediation mile also complying with the statutory remedy evaluation criteria such as overall protection of human health and the environment and cost-effectiveness. The innovative remedies for the Ashley River and the Northwest Tidal Marsh provide significant advantages over other alternatives evaluated in detail in the Feasibility Study.

Dredging of Ashley River sediments immediately adjacent to the site was evaluated given the observed toxicity to selected indicator species. However, this alternative was not selected by EPA due to the similar effectiveness and risk reduction achieved by other comparable alternatives and the prohibitively high cost. The remaining alternatives EPA evaluated in detail for Ashley River sediments, enhanced sedimentation and subaqueous capping, rated approximately equal with regard to the threshold and balancing remedy evaluation criteria. The primary reasons EPA selected enhanced sedimentation over subaqueous capping involve issues of short-term

effectiveness and long-term operation and maintenance. Subaqueous capping would result in the displacement of existing benthic organisms, and disrupt access to existing and potential future dock facilities on the Ashley River. Both alternatives require a long-term monitoring program to ensure the alternatives remain protective. From a maintenance perspective, EPA's analysis determined that enhanced sedimentation would prove more reliable and less troublesome in the long-term due to the expected natural intertidal revegetation in the accumulated sediment.

Notwithstanding the above discussion, EPA has developed a contingency remedy for the Ashley River should Enhanced Sedimentation not achieve the established Performance Standards. EPA will monitor sediment accumulation and constituent concentration trends within the area of Enhanced Sedimentation for a period of five years. Data generated during the five year monitoring period will be evaluated by EPA to determine if contingency remedies are necessary.

These may include, but are not limited to the installation of a supplemental cap and/or measures to reduce erosional forces and augment long-term cover stability.

In regard to the Northwest Tidal Marsh, physical removal of sediments was not evaluated due to the absence of statistically significant toxicity to selected test species. Rather, EPA has selected in-situ bioremediation to reduce sediment constituent concentrations from observed baseline conditions. Technology performance data from an EPA laboratory indicates that in-situ bioremediation can be very effiective at reducing concentrations of low molecular weight PAHs (< four rings). In-situ bioremediation will be implemented in phases consisting of a combination of laboratory bench tests and field implementation to optimize technology perfonmance results.

In consideration of the available data, EPA believes enhanced sedimentation and in-situ bioremediation warrant further development and implementation at sites with impacted sediments. The science and data generated by these innovative remedies will be utilized by EPA, other regulatory agencies and the environmental industry to better fulfill our respective missions.

Community Comment: "2. Residents request assurance that no further development, use, or re-use of the site is to take place until cleanup levels specified in the Final Record of Decision have been achieved, and all mitigation measures are completed. In particular, remediation objectives for groundwater/NAPL at source areas on-site must be achieved before cleanup can be complete."

EPA Response: This request contradicts EPA's Brownfields Initiative which endeavors to return historical industrial facilities to beneficial uses. EPA has based its cleanup on a future industrial exposure scenario to protect the future industrial worker. When completed, EPA's remedy will provide a high degree of protection for the future on-site worker near the most conservative end of EPA's risk range. It will take many years to achieve the established Performance Standards for groundwater/NAPL. In addition, ultimate restoration of groundwater to drinking water standards may be technically impracticable give the presence of NAPL in the shallow and intermediate water-bearing units underlying the three noted source areas on-site. However, EPA has adopted some, provisions in the ROD to identify opportunities for site re-use that maximize compatibility with adjacent neighborhoods. Any re-use of the site would restrict use of groundwater until cleanup standards have been achieved. Please see EPA's response to community comment number five below.

Community Comment: "3. Given the uncertainty of assumptions used to calculate cleanup levels for lead, residents would prefer that the more conservative assumptions used by SCDHEC be used to calculate the final cleanup level."

EPA Response: The reader is referred to Section 6.1.1 of the ROD for a detailed description of the methodology EPA employed to calculate a lead soil cleanup level for a future industrial exposure scenario. Based upon the discussion in Section 6.1.1, EPA has selected a lead soil cleanup level of 1,150 mg/kg. At the time of the Proposed Plan, SCDHEC had calculated a lead soil cleanup level of 630 mg/kg utilizing EPA methodology. However, SCDHEC was utilizing model input parameters, most importantly the absorption fraction, which were not within the range of values recommended by EPA.

Since that time, SCDHEC has re-evaluated its initial position and calculated a lead soil cleanup level of 895 mg/kg. The major difference between the EPA (1,150 mg/kg) and SCDHEC (895 mg/kg) values is a model parameter which considers the exposed population. SCDHEC has selected a more

conservative exposure parameter which assumes the exposed population is entirely "Non-Hispanic Black". EPA has selected an exposure parameter which assumes the exposed population has a greater degree of heterogeneity. It is important to note that the other input parameters selected by both EPA and SCDHEC were conservative in nature. EPA believes the input parameters selected by SCDHEC unnecessarily layers conservative assumptions producing an unrealistic exposure scenario. EPA maintains its assumptions are more indicative of the current workforce population and any likely future industrial populations and land-use practices at the site.

Community Comment: "4. Insufficient details are provided to adequately evaluate the ramifications of cleanup Alternative 5A (additional capping) for contaminated soils. Based on the information presented in the Proposed Plan, residents object to the use of crushed stone as a capping material because: a) Large amounts of dust are likely to be generated which would negatively impact the adjacent neighborhoods; and b) There is no mention of means to contain the capping material in its intended location. Without some sort of retention crushed stone is likely to be scattered and thinned, particularly if there is heavy vehicle traffic on the site - reducing the effectiveness of the cap."

EPA Response: A compacted, crushed stone cap was utilized in the Feasibility Study to generate plausible cost estimates for the remedial alternatives. EPA understands that adjacent neighborhoods have experienced problems, notably fugitive dust emissions, with crushed stone caps at other nearby industrial/commercial facilities. To address the concerns voiced by the community, EPA has developed a set of Performance Standards for the final cover installed under EPA's selected remedy. These include:

1) Eliminate exposure for the future on-site worker to surface soils with concentrations greater than EPA's selected cleanup levels;

2) Provide a visible demarcation between cap material and underlying soil;

3) Mitigate adverse impacts related to quantity and quality of resultant storm water runoff;

4) Mitigate on-site dust generation during installation and useful life; and

5) Ensure long term permanence and effectiveness of installed cap to meet above four Performance Standards.

A detailed design study shall be conducted to develop and install a final cap that meets the above Performance Standards.

Community Comment: "5. Residents request details of plans for eventual re-use of the site, because cleanup objectives are predicated on anticipated use, and many types of industrial activity are inherently incompatible with adjacent residential uses. It is in the best interest of all parties to identify opportunities for re-use that do not adversely impact adjacent neighborhoods and to evaluate ways in which developing these opportunities might contribute to remediation of the site. For example, a well-designed light manufacturing campus could include a hard cap for contaminated soils, as well as landscaping to transform the site into a visual amenity. Marsh restoration included in the Proposed Plan could contribute to this sort of use by making a more attractive environment for workers on site as well as for residents of the area. This sort of re-use strategy would add value to the site, and provide greater opportunity to recover at least a portion of the cleanup costs if the site were used for more typical purposes (such as container storage and/or servicing)."

EPA Response: Specific land-use at the site is determined by private land-owners provided it is consistent with zoning ordinances established by local governments. The Koppers site is currently used for industrial/commercial operations and City of Charleston zoning plans indicate the site will continue to be utilized in this fashion in the future. For these reasons, EPA's soil cleanup goals were developed to be adequately protective of the future on-site worker under an industrial exposure scenario. EPA does agree that it is in the best interest of all stakeholders (i.e. property owners, adjacent neighborhoods, local governments) to identify re-use opportunities for the site that do not adversely impact the surrounding communities. Therefore, EPA's selected remedy does include provisions to address this issue. For example, Section 9.1 of the ROD states, "Property owners are encouraged to consult with nearby communities, and local/state governments to identify opportunities for re-use that maximize

compatibility with adjacent neighborhoods."

3.5 Comments from Conoco Inc.

Conoco is a successor in interest to the Ashepoo Phosphate/Fertilizer Plant located immediately south of the Koppers NPL site. The Ashepoo facility manufactured phosphate-based fertilizers by treating phosphate ores with sulfuric acid. The Ashepoo facility operated from the 1880's until the mid-1970's on an approximate 77 acre parcel south of Braswell Street. The formal boundaries of the Koppers NPL Site include an estimated 57 acres of property formerly utilized by Ashepoo. The 57 acre parcel is generally comprised of the South Tidal Marsh, Barge Canal, and uplands including the access road to former docking facilities on the Ashley River. EPA incorporated these 57 acres into the Koppers NPL site boundary to determine the environmental impact on the Ashley River and adjacent tidal marsh resulting from the November 1984 Barge Canal dredging event.

In the initial phases of the RI/FS for the Koppers site, sediment samples were collected from the headwaters of the South Tidal Marsh with the intent of determining the impact that woodtreating operations had on the sediment quality and function of the marsh system. While PAH contamination attributed to Koppers' operations was discovered in sediments of this area, elevated concentrations of lead and arsenic were also detected at 41,400 mg/kg and 2,410 mg/kg, respectively. Given the nature of Koppers' operations and a thorough understanding of constituent transport pathways impacting the South Tidal Marsh, the presence of these inorganic constituents were not attributed to woodtreating activities.

In September 1995, a supplementary investigation was conducted to further characterize the neighboring uplands and determine the source of lead and arsenic detected in the sediments of the South Tidal Marsh. The investigation focused on a drainage ditch which leads from the former location of the Acid Chambers on the Ashepoo property to the tidal marsh headwaters. Sediment samples collected from this drainage ditch confirmed a completed transport pathway with a maximum lead concentration of 50,700 mg/kg in the 0-6 inch interval. Shallow groundwater samples collected from the periphery of the former Acid Chambers, near probable discharge points into the drainage ditch, exhibited pH levels in the range of 1.7 to 5 Standard Units. Moreover, soil samples collected from the upland area near the former Acid Chambers were shown to have elevated levels of lead with a maximum detected concentration of 45,000 mg/kg.

In September 1997, EPA entered into an Administrative Order on Consent with Conoco and Freeport McMoRan, Inc. (the "Respondents") for the performance of an Engineering Evaluation/Cost Analysis (EE/CA) on those parcels of property of the former Ashepoo facility which are not formally incorporated into the Koppers NPL site. Field sampling was conducted during the November/ December 1997 time period and the EE/CA report is expected to be submitted to EPA in Spring 1998. EPA will review the results of the EE/CA report and select an appropriate response action (i.e. Non-Time Critical Removal Action) that will be documented in an Action Memorandum. Performance of the Non-Time Critical Removal Action will likely be conducted via a separate order with the Respondents. The EE/CA and Non-Time Critical Removal Action at the Ashepoo facility is an integral component of EPA's strategy for cleaning up the Koppers NPL site. Source control and elimination of constituent transport pathways leading from the Ashepoo, facility are imperative prior to implementing EPA's selected response actions for the South Tidal Marsh.

Conoco submitted a comprehensive set of comments on EPA's March 1997 Proposed Plan and supporting information contained in the site AR. Conoco's comments, dated June 2, 1997, were embodied in four volumes containing Appendices A through P. Volume 1 contains the Executive Summary and presentation of specific comments. Volumes 2 through 4 contain the various appendices and supporting documentation. In the Executive Summary of Volume 1, Conoco identifies its major issues regarding the Proposed Plan and AR. These specific issues are listed below, and followed by EPA's response. The reader is referred to the site AR for a more detailed account of Conoco's comments.

Conoco Comment: "The Ashepoo Phosphate Fertilizer Works operated a closed loop system that historically was the only industry on the Ashley River with effective waste control procedures in operation. The RI provides no basis for EPA to conclude that the plant contributed to the contamination that requires remediation at the Koppers Superfund Site."

EPA Response: Conoco's claim that the Ashepoo facility operated a closed loop system apparently

comes from a report prepared by the U.S. Department of Health, Education and Welfare titled, Ashley River Pollution Study Charleston, SC., June-July 1965 (August 1, 1965). A copy of this report is provided in Appendix O of Conoco's comments. The subject study was conducted from June 15 - July 28, 1965 to investigate reported fish kills in the Ashley River. In regard to the Ashepoo facility, then known as the American Agricultural Chemical Co., the report concludes, "Only one industry, American Agricultural Chemical Co., has effective waste control procedures in operation. All other industries and municipalities contribute untreated wastes to the Ashley River.", and further states, "[the Agrico plant] has a reclaiming process for removing the flourides and sufflides from their waste. Cooling water from the sulfuric acid plant could contain metals. No sample cf this was obtained."

EPA has extensive aerial photography for the Ashepoo facility generally spanning the years of 1944 through 1989. These photographs do indicate the presence of an engineered holding pond which may be the flouride/sulfide reclaiming process referred to in the subject report. Outfalls are visible which indicate effluent from Ashepoo did discharge to an impoundment area on Ashepoo property. This impoundment is the same one which received effluent from the Koppers' operations and is currently referred to by EPA as the Old Impoundment. Response measures to address impacted soil and subsurface NAPL in the Old Impoundment area are included in EPA's selected remedy for the Koppers site.

EPA is more concerned over environmental impacts associated with the production of sulfuric acid on the Ashepoo facility. The subject report speculates that metals could be present in acid plant cooling water. It is an uncontested fact that acid was manufactured at the Ashepoo facility in a series of large lead-lined reaction chambers. Lead is rendered more soluble when subjected to low pH conditions typical of the acid concentrations produced by Ashepoo. Typical sulfuric acid manufacturing practices of this time period involved the periodic cleaning of lead-lined acid chambers with water. It is believed that wash water was allowed to soak into the highly permeable soils of the area, therefore creating a potential for impact by lead and acidic pH levels in adjacent soils, surface waters, groundwaters; and tidal marshes. In addition, prior to the 1920's, phosphate plants used pyrite ores (FeS 2) as a sulfur source in the production of sulfuric acid. Pyrite cinders from the sulfur burners were spread over the site. These ores and cinders are commonly contaminated with lead and arsenic, and may have contributed to contamination at the Ashepoo facility.

Over the course of active operations at the Ashepoo facility, several channelized drainage ditches leading from the acid chambers to what is now referred to as the South Tidal Marsh are visible on the aerial photography. During the course of the Koppers RI, environmental samples were collected from the uplands area of the former acid chambers, a drainage ditch which leads from the former acid chambers to the headwaters of the South Tidal Marsh, and the South Tidal Marsh itself. Soil samples collected from the upland areas near the former acid chambers exhibited elevated levels of lead with a maximum detected concentration of 45,000 mg/kg. Sediment samples collected from the drainage ditch leading from the acid chambers to the South Tidal Marsh were shown to have elevated levels of lead with a maximum lead concentration of 50,700 mg/kg in the 0-6 inch interval. Shallow groundwater samples collected from the periphery of the acid chambers, near probable discharge points into the drainage ditch, exhibited pH levels in the range of 1.7 to 5 Standard Units. Moreover, lead and arsenic were detected in sediments of the South Tidal Marsh at 41,400 mg/kg and 2,410 mg/kg, respectively.

Based upon the above body of evidence, EPA refutes Conoco's claim that "[t]he RI provides no basis for EPA to conclude that the plant contributed contamination that requires remediation". EPA maintains that is it fair to conclude from the available data that a completed contaminant transport pathway has been confirmed and that former operations of the Ashepoo Phosphate/Fertilizer Works have adversely impacted the environment.

Conoco Comment: "Phase III analytical data for wood-treating constituents previously detected in the South Tidal Marsh (e.g., copper and chromium) are currently not included in the Administrative Record and may never have been gathered. Only a partial summary sheet is provided for some of the sample points; the raw data are unavailable. "

EPA Response: The Phase III field investigation in the South Tidal Marsh was generally conducted to further characterize the source of lead and arsenic contamination entering the marsh. Phases I and II of the RI provided sufficient data regarding the extent of contamination related to wood-treating operations. Therefore, this data has been collected. Phase III field

work conducted in the South Tidal Marsh included the collection of sediment samples for rapid analysis by EPA's Athens, GA laboratory. These analytical results were considered screening level and were utilized to conduct more comprehensive and costly toxicity testing and detailed chemical analyses. Summary sheets for all data collected in the South Tidal Marsh during the Phase III field investigation are presented in the report titled, Technical Memorandum, Phase III Ecological Sampling (ENSR, December 1996). The raw data sheets from EPA's Athens, GA laboratory were inadvertently omitted from the AR when it was last updated in April 1997. The raw data sheets will be included with the next AR update.

Conoco Comment: "EPA's proposed plan to excavate a portion of the South Tidal Marsh is based upon flawed characterization of laboratory test results and site conditions, which do not accurately reflect current conditions in the healthy, thriving South Tidal Marsh."

EPA Response: EPA cannot agree with this statement. As an initial matter, the characterization strategy employed for the tidal marshes adjacent to the Koppers Site was developed by a project team which included representation and active participation by EPA-Region 4, SCDHEC, Beazer East, NOAA, SCDNR and USFWS. Consensus was reached by this group of stakeholders regarding a "weight of evidence' approach to define Areas of Potential Ecological Concern (APECs) for sediments of the Ashley River, Barge Canal, and adjacent tidal marshes. This protocol utilized the results of sediment sample analyses and site-specific, whole sediment acute toxicity tests on Neanthes arenaceodentata and Mysidopsis bahia. This protocol is defined in detail in the AR and summarized in Section 7.1.3 of the ROD.

Secondly, consensus was reached by the above project team regarding how the results of the weight-of-evidence approach would be utilized to develop and evaluate appropriate response actions in the FS process. It was agreed that sediments within the delineated APECs which demonstrated significant acute toxicity to the selected indicator species would be evaluated for potential removal (i.e. active remediation). It was further agreed that areas which did not demonstrate sediment toxicity, but did contain sediment concentrations above relevant benchmarks would be evaluated for remediation by less intrusive measures (i.e. capping, enhanced sedimentation, bioremediation, natural attenuation). This approach to remediation in defined APECs affords the benefits of physically removing sediments shown to cause toxicity in site-specific studies, while protectively managing other less impacted sediments in-situ without completely disrupting the function and habitat of these ecosystems.

In regard to the South Tidal Marsh APEC, sample locations SD-75, SD-80 and SD-81 demonstrated significant toxicity to selected indicator species when compared to the reference stations. The area of tidal marsh which incorporates these sample stations is estimated to encompass 1.5 acres. For the test organism neanthes, percent survival when compared to selected reference stations was 59% for SD-75, 80% for SD-80, and 12% for SD-81. For the test species mysidopsis, percent survival when compared to selected reference stations was 0% for SD-75, 70% for SD-80, and 0% for SD-81. Elevated levels of PAHs attributed to wood-treating operations were detected in these sediment samples. However, EPA believes the concentrations of inorganic constituents detected in the headwaters of the South Tidal Marsh are of greater ecological concern.

For example, sample station SD-81 contained the highest concentrations of lead and arsenic detected in sediment during the RI. Lead concentrations in sediment from SD-81 ranged from 4,360 mg/kg in the 0.5 - 1.0 foot interval up to 41,400 mg/kg in the 2.0 - 3.0 interval. Arsenic concentrations in sediment from SD-81 ranged from 79 mg/kg in the 0.5 - 1.0 foot interval up to 2,410 mg/kg in the 2.0 - 3.0 foot interval. For comparison, NOAA's Effects Range-Median (ER-M) for lead and arsenic are 218 mg/kg and 70 mg/kg, respectively. ER-Ms were derived by NOAA from examination of the statistical distribution of constituent concentrations in sediment and their associated effects. The ER-M is defined as the sediment concentration of a particular constituent at which adverse impacts were observed in 50 percent of the studies examined. In the case of lead and arsenic, sediment concentrations detected in the area of the South Tidal Marsh stated for excavation exceeded the ER-Ms by two orders of magnitude.

Moreover, lead and arsenic concentrations in SD-81 increased with depth, which indicates these elevated concentrations are a result of historical deposition. Several channelized drainage ditches leading from the acid chambers on the Ashepoo facility to the South Tidal Marsh are visible on historical aerial photography. As established in a response to an earlier Conoco comment, a completed contaminant transport pathway has been confirmed leading from the source

area on the uplands near the former acid chambers to the headwaters of the South Tidal Marsh, via historical and existing surface water drainage ditches.

EPA is not making the conclusion that observed adverse impacts in the headwaters of the South Tidal Marsh are solely attributable to past operations of the Ashepoo facility. Rather, EPA maintains these observed adverse impacts to the South Tidal Marsh ecosystem are more likely a result of synergistic effects caused by past wood treating operations, phosphate/fertilizer operations and other factors. In light of the above discussion, EPA believes Conoco's description of the South Tidal Marsh as "health" and "thriving" is without merit and technically deficient.

Conoco Comment: "Excavation of the marsh sediments and/or subsurface soils would have a greater negative impact on the South Tidal Marsh than no action. No excavation should be proposed in the South Tidal Marsh."

EPA Response: EPA does not agree with this statement. Please refer to EPA's response to previous comment. EPA's remediation strategy employed for tidal marsh sediments fully considers and weighs the advantages of removing sediments shown to cause direct toxicity to benthic macroinvertebrate in site-specific studies, and the disadvantages of disturbing functional saltmarsh habitat.

Conoco Comment: "The only remediation related to the South Tidal Marsh should be to address the Spoils Pile and Spoils Pile berm which are clearly the responsibility of the current property
owner, Beazer East, Inc., who has also assumed the past environmental liabilities of Braswell Shipyards and Southern Dredging."

EPA Response: The need for response actions on CERCLA sites are driven by the results of human health and ecological risk assessments. EPA has acknowledged in Section 9.1.1 of the ROD that three surface soil samples in the spoils pile area exceed excavation goals selected by EPA. Surface soil concentrations at samples SB-16 and SB-74 were slightly above the selected excavation level for B(a)P-TE, while the surface soil concentration at sample SG-51 was above the excavation level for arsenic. Additional sampling will be conducted in this general area to further define the quantity of soil above the excavation levels selected by EPA.

Conoco Comment: " The major contamination of the South Tidal Marsh appears to be creosote-related constituents (such as BaP) coupled with high copper levels (or occasionally arsenic). Creosote is used in wood treating because of the synergistic biocidal properties of its constituents. Both copper and arsenic are used under other conditions as algaecides and aquatic herbicides and are well kwown for their aquatic toxicity. Copper is often used in ship bottom paint for this reason. All of these pollutants are associated with woodtreating or ship maintenance wastes which migrated from the former Koppers property into the Barge Canal area. Subsequent surface water runoff and sediment transport from the dredged Barge Canal, Spoils Pile and Spoils Pile Berm have resulted in the deposition of creosote constituents, copper, lead, and arsenic in the South Tidal Marsh. The area indicated for cleanup corresponds to the BaP-contaminated areas in the Technical Memorandum Phase III Ecological Sampling Report. Other potential sources of contamination include seepage and erosion of filled materials from the Monrovia Cemetery ditch, wastes from tank cleaning activities, and runoff from the Charleston Oil Company and other industrial and urban properties east of the site. "

EPA Response: Creosote (BaP), CCA (copper chromium arsenate) and pentachlorophenol were utilized by Koppers as wood preservatives during active operations. In regard to creosote, B(a)P impacted soils and potentially recoverable quantities of NAPL have been identified in the Old Impoundment Area. Historical aerial photographs and sampling conducted during the RI indicate that creosote constituents were transported from the former Koppers treatment area to the Old Impoundment Area, via the South Braswell Street Drainage Ditch. Identified sources of creosote constituents in what is now the Barge Canal include historic and current transport from the Old Impoundment Area and the direct placement of waste materials resulting from Koppers' stripping operations. EPA believes the 1984 Barge Canal dredging activity resulted in the placement of wood-treating constituents in the spoils area with subsequent transport to the headwaters of the South Tidal Marsh. EPA has acknowledged the presence of elevated levels of B(a)P in sediments of South Tidal Marsh.

In regard to copper, the Human Health Baseline Risk Assessment did not identify copper as a constituent of concern in surface/subsurface soils across the site. In other words, the concentration and distribution patterns of copper as delineated during the RI field effort do not pose unacceptable risks to human health under the future on-site worker exposure scenario. In addition, the majority of sediment samples collected during the RI did not exhibit copper concentrations greater than the ER-M value of 270 mg/kg. Most sediment samples collected from the 0 to 1 foot interval showed concentrations of copper between the ER-L value of 34 mg/kg and the ER-M. In contrast, sediment samples in the headwaters of the South Tidal Marsh consistently exhibited lead concentrations several times greater, and in some instances several orders of magnitude greater, than the ER-M.

Conoco has stated that surface water and sediment transport from the spoils pile and spoils pile berm are the source of lead in the South Tidal Marsh. Data does indicate several sample locations in this general area with elevated concentrations of lead in soil. However, it is important to note that prior to construction of the spoils pile berm in 1984, runoff from the Ashepoo facility was directed to what is now the spoils pile. This fact is clearly established in the EPA's aerial photographic analysis. Conoco also lists several other potential sources of contamination in the South Tidal Marsh including fill material from Monrovia Cemetery, and runoff from the adjacent industrial and urban properties. However, Conoco has not provided site-specific data to substantiate these claims. EPA maintains that data generated during the RI/FS process fully supports EPA's conclusion that a completed contaminant pathway has been identified between the Ashepoo facility and documented environmental impacts in the South Tidal Marsh.

Conoco Comment: "Beazer's Remedial Investigation (RI) and Feasibility Study (FS) include numerous self-serving statements that copper, arsenic, and lead are not related to Koppers' former wood-treating operations which are inconsistent with Koppers' own documents. For example, the use of copper chromium and arsenic salts (CCA) did not cease in 1967 as stated in the RI, but continued to be a significant part of Kopper's operations until the facility was closed in 1978. CCA salt cylinder sludge as well as creosote sludge was continually placed on Koppers' property north of the Barge Canal from prior to 1967 through 1978. In addition, lead and low pH waste water have been documented in Koppers tank wastes and waste water discharges to the Ashley River. The source of the toxicity is important to EPA's selection of an appropriate remedial approach. For example, assuming any remediation is required, the selection of excavation or bioremediation should depend on the constituents involved and where they are located."

EPA Response: Based upon EPA's understanding of historical and current contaminant transport pathways, Koppers' wood-treating operations, and the distribution of lead impacted soils across the site, EPA has concluded that lead is not related to wood-treating operations. Rather, EPA believes the available data substantiates its conclusion that the former operations of the Ashepoo facility are a source lead, arsenic and pH contamination delineated in on-site surface/subsurface soil, sediments, surface water, and groundwater. Environmental impacts believed to be associated with former Ashepoo operations were discussed in a previous response. EPA's remedial alternatives for this site were based on a thorough analysis of the contaminants involved and distribution across the site.

Conoco Comment: "The Fact Sheet conclusion that marsh sediments exhibit toxicity to lead is inconsistent with the laboratory elutriate testing discussion in the RI/FS which concluded that toxicity present in the South Tidal Marsh sediment is related to anionic compounds and not metallic cations, such as lead."

EPA Response: EPA's Proposed Plan Fact Sheet does not explicitly state that observed toxicity in the South Tidal Marsh sediments are due to elevated levels of lead. EPA believes that the laboratory elutriate testing and Toxicity Identification Evaluation conducted by Beazer during the RI/FS was inconclusive in determining the source of observed toxicity in the South Tidal Marsh. As discussed previously, EPA believes that the adverse environmental impacts documented in the South Tidal Marsh are likely a result of synergistic effects caused by past wood treating operations, phosphate/fertilizer operations and other factors.

Conoco Comment: "The Ashley River Railroad bed (currently referenced as the "road to the radio tower") that is adjacent to the Barge Canal and which crosses the former Ashepoo Phosphate/ Fertilizer Works plant area was constructed in 1877 by the Ashley River Railroad Company on vacant land prior to acquisition of the property by Ashepoo Phosphate Fertilizer Works and has

had no significant impact on the environment. "

EPA Response: Information concerning the Ashley River railroad was presented in Appendix C of Conoco's response. Conoco has submitted this information to apparently build a defense that Conoco was not the owner of the Asbepoo Phosphate/Fertilizer Works at the time the railroad bed was constructed. The subject railroad bed generally crosses the middle of the Ashepoo property and formerly provided rail access to the Ashley River. EPA has reviewed this information and believes it to be inconclusive with regard to the veracity of Conoco's claims.

Phosphate and fertilizer manufacturing was conducted on this parcel of property from 1882 to 1978, or approximately 96 years. EPA believes the railroad bed received fill material, or was otherwise modified, during the 96 years of operation. In April 1996, EPA conducted a subsurface soil investigation of the former railroad bed which leads to the Ashley River. The former railroad bed consists of a thin strip of uplands which separates the Barge Canal from the South Tidal Marsh. Four trenches, or test pits, were excavated along the length of the former railroad bed. Each trench was approximately three feet wide, fifteen feet long and extended approximately 5 feet below land surface. Reddish colored slag material was encountered in all four test pits.

EPA has gathered information which indicates that the reddish colored slag material is a by-product of phosphate/fertilizer manufacturing. EPA believes this material is incombustible iron pyrite cinders (i.e. clinker) from the pyrite burners. Before purer grades of sulfur were available, iron pyrite (FeS_2) was burned in the presence of oxygen to obtain a sulfur trioxide gas. Sulfur trioxide was interacted with water mist to make sulfuric acid (H_2SO_4). Historically, Charleston was a leading producer of phosphate-based fertilizers. Available literature indicates that as many as twelve former phosphate/fertilizer plants were located on the Charleston peninsula along the Ashley and Cooper Rivers. EPA has positively identified nine such plants and in February 1998 initiated field investigations to determine potential environmental impacts associated with this industry. EPA has encountered the reddish slag material at several other former phosphate/fertilizer facilities located along the Ashley River. In addition, interviews with former employees of these facilities have confirmed the reddish slag material to be a waste product of phosphate-based fertilizer production.

Composite soil samples were collected from the four test pits excavated during the April 1996 investigation. Lead concentrations in these samples ranged from 5,900 mg/kg to 13,000 mg/kg. Arsenic concentrations in these samples ranged from 1,200 mg/kg to 1,800 mg/kg. These levels are greater than EPA's soil cleanup goals specified in the Koppers ROD. EPA's selected soil cleanup level for lead is 1,150 mg/kg. For the constituent of arsenic, EPA has selected a surface soil cleanup level of 135 mg/kg, and 1,550 mg/kg for subsurface soil. TCLP and other leaching procedures were conducted on this material to determine its leaching potential. Of the six samples TCLP samples available from the RI and the April 1996 investigation, two samples marginally failed the TCLP regulatory limit of 5 mg/L for lead. However, pursuant to RCRA statistical guidance, this material is not classified as "characteristic" hazardous waste.

Leaching tests conducted on this material using Ashley River water, and sediment sampling in areas adjacent to the former railroad bed, indicate that this material has not adversely impacted the surrounding ecology. While this material is not classified as characteristic hazardous waste, it does pose potential unacceptable human health risks to the future on-site worker. Therefore, to preclude exposure to the future on-site worker, EPA's selected remedy includes placing a protective cap over lead and arsenic soil with concentrations greater than the selected cleanup goals discussed above. This cap is estimated to cover approximately 5.2 acres at an estimated cost of $621,000.

Conoco Comment: "The Railroad bed currently acts as a barrier to migration of creosote constituents, copper, arsenic and other wood-treating-related constituents from the former Koppers' operations to the South Tidal Marsh. Such a barrier is of particular importance in light of the inadequate investigation of large source areas on the Koppers property.

EPA Response: EPA does not view the railroad bed as a barrier which mitigates constituent migration to the South Tidal Marsh. Rather, EPA views the railroad bed as a thin strip of uplands containing reddish slag material with unacceptable concentrations of arsenic and lead. EPA maintains its investigation has adequately determined the nature and extent of potential source areas on the former Koppers property, and has provided sufficient information to select feasible remedial alternatives to address unacceptable potential risks posed to human health and

the environment.

Conoco Comment: "Excavation and placement of the Railroad bed into the Barge Canal would create a suspended fine silt condition in the South Tidal Marsh and Ashley River which will be detrimental to aquatic biota."

EPA Response: This comment pertains to EPA's proposed remedial approach for addressing the unacceptable lead/arsenic concentrations in soil of the railroad bed. EPA's March 1997 Proposed Plan selected Confined Disposal as the response action to address soil with unacceptable concentrations of lead and arsenic. Under the proposed strategy of Confined Disposal, all soil with lead and arsenic concentrations above the selected cleanup goals would be placed in the bottom of the adjacent Barge Canal. This base layer of impacted fill would then be capped with a two-foot topsoil/organic layer, returned to appropriate elevations, and restored to a functioning saltmarsh habitat. Pursuant to comments received during the 60-day public comment period, EPA has decided to place a protective cap over impacted soil of the former railroad bed, instead of the Confined Disposal alternative. The rationale behind this change is explained in Section 11 of the ROD.

If Confined Disposal was implemented at this site, EPA does agree that resuspension of sediments in the Barge Canal would be an issue. Engineering controls would likely be needed to ensure short-term effectiveness to the aquatic biota and surrounding ecosystem during implementation of Confined Disposal in the Barge Canal.

Conoco Comment: "Low pH has been reported in the ditch adjacent to the Monrovia Cemetery However, RI data indicate the surface water and ground water at the entrance to the South Marsh have returned to an essentially neutral pH. The evidence indicates that lead (such as at SD-81) is associated with the Spoils Pile berm; berm materials and soil have simply been eroded and transported as sediment into the adjacent marsh. Conoco has proposed to perform limited remedial activities in this ditch to neutralize pH."

EPA Response: EPA believes Conoco's interpretation of the available data is technically flawed. Shallow groundwater samples collected from the periphery of the former Ashepoo facility acid chambers, near probable discharge points into the drainage ditch, exhibited acidic pH levels. This dam provides credible documentation of a release to the environment from Ashepoo's acid chambers. Soil samples collected from the upland area near the former acid chambers were shown to have elevated levels of lead with a maximum detected concentration of 45,000 mg/kg. As established in an earlier response, sediment samples in the drainage ditch leading from the acid chambers to the South Tidal Marsh confirmed a completed transport pathway with a maximum lead concentration of 50,700 mg/kg. EPA believes this data discredits Conoco's claim that the lead in sediments of the South Tidal Marsh simply migrated from the spoils area.

Conoco Comment: "This low pH may be related to historic discharges of spent acid from a metal alloy manufacturing company east of the site or to use of metal containing slag as fill material."

EPA Response: Conoco has not provided any site-specific data to substantiate this hypothetical theory. Given the simple fact that acidic pH in shallow groundwater has been documented in close proximity to the former acid chambers, EPA believes that the low pH condition was caused by former Ashepoo operations, rather than from migration from a far more distant source alleged by Conoco.

Conoco Comment: "The selected remedy for the site should include 1) maintaining the Railroad bed in place, 2) containing the Spoils Pile and Spoils Pile berm, and 3) allowing natural attenuation/sedimentation to remediate the South Tidal Marsh. Conoco will continue to work toward implementation of a remedial plan to address EPA's concern with potential low pH conditions in the ditch that drains the north and west sides of the Monrovia Cemetery."

EPA Response: In regard to items 1 and 2, EPA's selected remedy does includes a placement of a protective cap over the railroad bed, without disrupting the underlying soils. Additional sampling will be conducted in the spoils pile area to further define the quantity of soil above the excavation levels specified in the ROD. All soil greater than the excavation levels will be transported off-site for proper disposal. Regarding item 3, natural attenuation is not an effective remediation strategy for inorganic constituents, such as lead, under these site

specific circumstances. Lead has been well established as a constituent of concern in the sediments of the South Tidal Marsh. The effectiveness of sedimentation in the North and South Tidal Marshes was evaluated during the Feasibility Study. Due to the erosive action of storm water runoff in channelized drainage ditches and tidal creeks, EPA determined that sedimentation in the tidal marshes would not be adequately protective of the ecosystems. Therefore, sedimentation was eliminated from further consideration and evaluation.

Conoco Comment: "The characterization and remedial plan for the north portion of the Superfund Site are inconsistent with the National Contingency Plan (NCP) because of the failure to define adequately the nature and extent of contamination present at the Site. Consequently, EPA lacks a basis for selecting a remedy that will be effective in controlling migration into the Ashley River and to the South Tidal Marsh and will satisfy the NCP."

EPA Response: EPA disagrees with these statements. EPA maintains the RI/FS has accurately defined the nature and extent of contamination present at the site, and the response action selected by EPA in the ROD adequately addresses the risks posed to human health and the environment. The RI/FS has delineated source areas, dominant contaminant transport pathways, and potential risks posed in a manner that is sufficient to fully support the selection of an adequately protective remedy. Additional sampling will be conducted as necessary during remedy implementation to confirm the assumptions EPA has utilized to develop its working model of the site. Where necessary, EPA will institute refinements to the selected remedy to ensure the implemented response action remains adequately protective to human health and the environment.

The RI/FS process included a comprehensive fate and transport analysis to assess the potential for transport of constituents beyond the boundary of the site. Sampling conducted during the RI has indicated other off-site sources do contribute constituents to the site and surrounding areas. Most notably these include run-off from adjacent industrial areas and drainage into the headwaters of the South Tidal Marsh from the former Ashepoo Phosphate/Fertilizer Works. EPA's selected remedy does include source control measures to eliminate off-site migration to off-site areas including the adjacent tidal marshes and the Ashley River. This will be accomplished primarily by drainage ditch reconstruction activities and groundwater/NAPL recovery at the three noted subsurface source areas on-site (i.e. Treatment Area, Old Impoundment Area, and NW Corner).

As discussed in Section 4.0 of the ROD, performance of the EE/CA by Conoco on the former Ashepoo property is an integral component of EPA's overall strategy for remediating the Koppers NPL site. On-going constituent transport pathways from the former Ashepoo Phosphate/Fertilizer Works must be eliminated prior to initiating response actions specified in the ROD for the South Tidal Marsh.

Conoco Comment: "The portion of the FS addressing the South Tidal Marsh is inconsistent with the NCP because it is based on Beazer unsubstantiated conclusion that marsh sediments exhibit lead toxicity which disagrees with the laboratory test results. The failure to recognize that excavating the marsh is unnecessary based on the field studies and would cause irreparable damage to the marsh has resulted in mischaracterization of the Site risks and the significance of the minor amounts of marsh sediment toxicity (less than 1.7% of the Marsh)."

EPA Response: EPA has not concluded that observed toxicity to South Tidal Marsh sediments was due solely to the presence of lead. As stated in an earlier response, EPA believes observed toxicity in the South Tidal Marsh sediments are likely the result of synergistic effects associated with past wood treating operations, phosphate/fertilizer operations and other factors. Therefore, the South Tidal Marsh section of the FS is not inconsistent with the NCP.

The investigation and remediation strategy employed by EPA for tidal marsh sediments was discussed in a previous response. Because a majority of the ecological investigations focused on the benthic invertebrate communities, an Ecological Risk Assessment (ERA) was conducted to evaluate potential risks to other biota via the food chain. The methodology and results of this effort are presented in a report titled, "Final Report Ecological Risk Assessment Koppers Woodtreating Charleston, South Carolina, (EPA, October 1996)". An alternative risk model was also utilized during the FS process to further evaluate potential ecological risks and the effectiveness of remedy options in managing the potential risk. The two ecological assessments bound the range of potential ecological risks in which remedy selection and risk management decisions were made at the site. With regard to the South Tidal Marsh, EPA's ERA concluded that

a potential unacceptable ecological risk exists for all six assessment endpoints for exposure to PAHs, arsenic, and lead. EPA's selected remedy for the tidal marshes bordering the site is based upon the potential ecological risks posed to ecological receptors. EPA maintains that active remediation within APECs to eliminate direct toxicity to benthic macroinvertebrates also mitigates a majority of potential food chain risks.

Conoco Comment: "The FS is inconsistent with the NCP because it relied on an incomplete RI for the North site and a flawed interpretation of toxicity data and human risk assessment. This has resulted in the development, evaluation, and selection of inappropriate response actions which are excessive in some cases and non-protective in others. Nonetheless, EPA can develop and select a remedy that is consistent with the NCP by taking into account the facts presented in these comments, leaving the Railroad bed in place, eliminating South Tidal Marsh remediation and providing for an adequate perimeter based remedy to control migration to the Ashley River from the former Koppers Site."

EPA Response: EPA has previously addressed Conoco's comments related to the adequacy of the RI/FS process at this site, and the scope of the selected remedy. Conoco does not offer additional
arguments here which warrant further EPA response.

Conoco Comment: "There is no evidence that the lead measured in samples from the southern portion of the site, including the South Tidal Marsh, is from the Ashepoo Fertilizer operations. Rather, it is more likely to be from adjacent property owners and fill placed on the site subsequent to 1978. Potential pollutant sources include: the fill used to create the Spoils Pile berm, fill used north and west of the Monrovia Cemetery including sand-blasted, lead- and copper-based paint from Braswell Shipyards and off-site fill containing slag and scrap, runoff from the Charleston Oil Refinery, lead shot from the Charleston Gun Club, and other urban and industrial sources east and south of the site. The statement that lead is not associated with the former Koppers property is incorrect. Lead salts may have been used during the wood-treating process to break down oil/water emulsions. Lead releases from the former Koppers' storage and working tanks include 1,000 ppm level concentrations in soils and an oily sample from a depth of 30 feet. Documented post-1978 releases in the area are likely to have run off to the west into the Barge Canal prior to its dredging and to the south, ultimately into the Cemetery ditch. High lead concentrations, found in soil and sediment at numerous locations on the north part of the Site by previous investigations have not been presented in the RI/FS or other Beazer East, Inc. (ENSR) site reports."

EPA Response: EPA believes the evidence in the AR clearly demonstrates that releases from the former Ashepoo Phosphate/Fertilizer Works have adversely impacted the environment. Nonetheless, Conoco continues to allege that environmental impacts documented by EPA are more likely from adjacent property owners and fill placed on the former Ashepoo property by others entities. Conoco's conceptual theories of how the activities of other parties may have adversely impacted the Ashepoo property are largely not corroborated or confirmed by site-specific data. EPA believes a majority of the fill placed on-site after 1978 is demolition debris associated with closing down the former Ashepoo facility.

For example, the drainage ditch which currently separates the former Acid Chamber area from the Monrovia Cemetery trends in a westerly flow direction before transitioning to a southerly orientation as it runs between the Spoils Pile and the Monrovia Cemetery, ultimately discharging to the headwaters of the South Tidal Marsh. At this transition zone, an estimated 5-6 vertical feet of the northern bank (Ashepoo side) of the drainage ditch is exposed, providing a representative cross-section of fill material in this general area. Visual inspection of this cut section reveals the presence of the reddish slag material (iron pyrite clinker), glover tower packing media, crystallized sulfur, and old bricks. All these materials are known to be a part of phosphate/fertilizer production. EPA believes the practice of using demolition debris as on-site fill material was common, having witnessed the occurrence of similar materials at several other abandoned phosphate/fertilizer facilities in the Neck area of Charleston, SC.

Conoco has also taken issue with EPA's statement that lead is not associated with wood-treating operations. Conoco states that lead concentrations of up to 1,000 mg/kg in soil have been documented in Koppers' former Treatment Area. Moreover, Conoco states that releases in the former Treatment Area are likely to have been transported south, via a drainage ditch, into the Cemetery ditch. Figure 2 in Appendix A of Conoco's response provides an illustration of this

drainage ditch. As illustrated, the "south site drainage ditch" flows approximately 300 feet east under I-26, where it turns south for approximately 1,500 feet along the east side of I-26, ultimately turning back west (under I-26 again) for approximately 400 additional feet before connecting with the Cemetery ditch.

In summary, EPA believes the lead transportation theory offered by Conoco violates the fundamental principles of environmental science as well as logical perception. EPA's conclusion regarding lead and its association with wood-treating operations came only after a thorough analysis of historical/current contaminant transport pathways, Koppers' wood-treating operations, and the distribution of lead impacted soils across the site. EPA does not contest the presence of soil in the former Treatment Area with lead concentrations greater than the selected cleanup level of 1,150 mg/kg. EPA believes this is a result waste oil operations conducted by Peppers, Fed-Serv and others in the former Treatment Area, subsequent to Koppers' wood-treating operations. However, the concentration of lead in several soil and sediment samples on and adjacent to the former Ashepoo property have been detected in the 40,000 - 50,000 mg/kg range. The "south site drainage ditch" illustrated on Figure 2 of Appendix A is inferred to be continuous, when in fact several significant discontinuities have been noted by EPA in the field.

EPA will not acknowledge a lead transportation theory which involves migration down an approximate 0.50 mile stretch of fragmented drainage ditch, resulting in downstream deposition of soil/sediment concentrations 40 to 50 times more than the initial alleged source material.

EPA reasserts its position that the AR contains clear and credible evidence that former operations conducted at the Ashepoo Phosphate/Fertilizer Works have resulted in a release of hazardous substances to the environment.

Conoco Comment: "Ignoring the Spoils Pile, excavating the South Tidal Marsh, and disposing of the Railroad bed in the Barge Canal would be inconsistent with the NCP. The Spoils Pile is a source area. Marsh and Railroad bed excavation would be detrimental to the environment, and the proposed remedial plans for the north portion of the site do not adequately address large source areas, which were not investigated on the former Koppers property."

EPA Response: EPA has addressed the general intent of the above comment in previous responses. The reader is referred to the discussion contained in the above section of the Responsiveness Summary. EPA has determined that the response actions specified in the Koppers ROD are necessary to protect public health, welfare, or the environment, and are not inconsistent with the NCP or CERCLA.

3.6 Comments from General Engineering Laboratories, Inc.

General Engineering Laboratories (GEL) is a consulting firm located in the Charleston area which provides environmental consulting services to local clients. In a letter dated June 2, 1997, Mr. P. Trapier G. Puckette of GEL expressed concerns regarding the distribution of dioxin concentrations in sediments of the Ashley River and Charleston Harbor estuary. The following discussion presents a summary of GEL's major concerns expressed in the June 2, 1997 letter, followed by EPA's response.

GEL Comment: "Based on our review of the data, we have concerns that the Koppers site may be a significant source of dioxin/furans (dioxins) detected at several locations in the Charleston Harbor estuary and that issues regarding the potential impact of the dioxins have not been adequately addressed in the proposed remediation."

EPA Response: Regarding the adequacy of EPA's proposed remediation, an extensive Remedial Investigation (RI) was conducted over a four year period which consisted of three major phases of field work, and several supplemental field investigations. The purpose of the RI was to gather the necessary data to adequately characterize the site for the purpose of developing and evaluating effective remedial alternatives to address the potential human health and ecological risks posed. Dioxin can be found as a trace constituent in industrial grade pentachlorophenol (penta). Because penta was used as a wood preservative at the site for a limited period of time, EPA developed a sampling program to determine the nature and extent of impact from dioxin. This included collection and analysis of samples from the surface/subsurface soil, sediments, surface water and groundwater. Specifically, ten Ashley River sediment samples and twenty-three sediment

samples from the marshes and tidal creeks in and around the site were analyzed from dioxin. Additional analysis was conducted on selected aquatic biota as part of the ecological assessment.

EPA conducted human health and ecological risk assessments utilizing the data generated by this extensive field program. The human health and ecological risk assessment process provides the basis for taking remedial action and identifies contaminants and exposure pathways that need to be addressed by the remedial action. EPA's Proposed Plan and the selected remedy delineated in the Final Record of Decision (ROD) were developed to properly address the unacceptable risks posed to human health and the environment by potential exposure to dioxin and the other constituents of concern. Generally, EPA's selected remedy requires remediation of impacted soils, groundwater, and sediments of the Ashley River, Barge Canal, and adjacent tidal marshes and creeks to levels deemed adequately protective by EPA's risk assessment process. Moreover, EPA's selected remedy includes components to eliminate off-site constituent transport pathways via reconstruction of on-site surface water drainage ditches and NAPL/groundwater recovery.

In a follow-up letter dated July 1, 1997, GEL provided dioxin data for sediment samples collected from various sites in the Charleston Harbor estuary. The data was collected by the following entities: Charleston District Corps of Engineers (September 1992); Lockwood Marina (May 1995); Ripley Light Marina (July 1995); Columbus Street Terminal (November 1995); Charleston Harbor anchorage site (June 1996); Carolina Yacht Club (December 1996); and Patriots Point Tour Boat Facility (January 1997). The complete set of this data and associated sample location map can be found in the AR. The dioxin data generated during the Koppers RI and data made available by the above entities was compiled in table form by Ogden Environmental, on behalf of Beazer East, in correspondence dated September 22, 1997. This table lists the sample location number, approximate distance from the site and calculated dioxin toxicity equivalent quotient (TEQ). This information can also be found in the AR.

It is important to note that data made available by the above entities was not subjected to the rigorous quality control/quality assurance (QA/QC) procedures that are typical of data generated during Superfund investigations. In most instances, data from other sources was available in summary sheets only (i.e. laboratory data sheets were not provided), or marked "Preliminary Results - Final QC Not Yet Performed". Not withstanding the limitations in data quality, EPA has conducted a comparison of dioxin sediment results obtained from various locations in the Charleston Harbor estuary. The table below presents the findings.

SUMMARY OF DIOXIN TEQ CONCENTRATIONS
CHARLESTON HARBOR AREA SEDIMENTS

Location of Samples	Approximate Range and/or Distance from Site	Number of Samples Available for Calculation of Arithmetic Average	Range of Dioxin TEQ Concentration (parts per trillion)	Arithmetic Average of Dioxin TEQ Sediment Concentration (parts per trillion)
Ashley River, Upstream of Site	2.3 to 4.7 miles up stream of site	6	4.8 to 32.4	12.1
Ashley River, Adjacent to Koppers Site	0	2	12.2 to 55	33.6
Ashley River, Downstream of Site	0.3 to 6.0 miles downstream of site	9	0.7 to 54.5	19.0
Charleston Harbor	7.6 to 10.5 miles	13	0.8 to 22.6	9.9
Cooper River	11.3 to 20.0 miles	11	3.6 to 11.8	8.5
Wando River	13.1 miles	1	5.5	5.5

While the highest individual concentrations of dioxin in sediments were detected immediately adjacent to the Koppers site, EPA maintains that reported range of concentrations are statistically and spatially similar throughout Charleston Harbor area. For example, assuming the Koppers site was the sole source, or even a significant source of dioxin in the harbor system as GEL asserts, one would expect decreasing concentrations with increasing distance from the site. Yet many of the reported concentrations for the harbor, Cooper River and Wando River are higher, or at the very least similar, to concentrations in the Ashley River system. Moreover, the spatial analysis of this data must recognize the influences of both tidal and seaward flows in the Charleston Harbor estuary. Given the sizeable flow rates of the Cooper and Wando Rivers, and the fact that samples were collected up to 20 miles from the Koppers site, EPA believes it is unreasonable to assume the Koppers site is a sole source, or even a significant source, of dioxin impact in the Charleston Harbor system.

EPA does not contest the obvious fact that the Koppers site contributed wood-treating related constituents to the Ashley River. EPA's selected remedy of enhanced sedimentation will effectively cover sediments of the Ashley River immediately adjacent to the Koppers site and eliminate any future constituent transport pathways from the site to the Ashley River. EPA believes the data strongly suggests that many diverse sources of dioxin exist in the Charleston Harbor system. This issue is addressed in the following EPA response.

GEL Comment: "A review of the present and former industries in and around the Ashley River and Charleston Harbor indicates that a likely source of the dioxins is the wood treating activities a the former Koppers site located on the Ashley River. [W]e know of no other site in the Charleston Harbor that is a specific source of dioxins."

EPA Response: The presence of dioxin in industrial harbors such as Charleston is well documented in the environmental literature. Dioxin-like compounds are released to the environment in a variety of ways and in varying quantities depending on the source. In a document titled, Estimating Exposure to Dioxin-Like Compounds, Volume II: Properties, Sources, Occurrence and Background Exposures. EPA/600/6-88/005Cb. (EPA 1994), EPA identified four major sources of dioxin release into the environment. These are:

- Industrial/Municipal Processes: Dioxin-like compounds can be found in paper products and liquid/solid wastes from the manufacture of bleached pulp and paper; and municipal wastewater treatment facilities and sewage sludge which receive influent from industrial facilities and stormwater;

- Chemical Manufacturing/Processing Sources: Dioxin-like compounds can be formed as by-products from the manufacture of chlorine and chlorinated compounds.

- Combustion/Incineration Sources: Dioxin-like compounds can be generated and released to the environment from various combustion processes when a chlorine donor is present. These sources can include incineration of municipal solid waste, sewage sludge, hospital, and hazardous wastes; metallurgical processes such as high temperature steel production, smelting operations, and scrap metal recovery furnaces; and the burning of coal, wood, petroleum products, and used tires for power/energy generation; and

- Reservoir Sources: The persistent and hydrophobic nature of dioxin-like compounds causes them to accumulate in soils, sediments, and organic matter. Dioxin-like compounds in these "reservoirs" can be re-distributed by various processes such as dust and sediment resuspension.

The scope of the RI/FS at the Koppers NPL site did not include a positive identification of all potential sources of dioxin-like compounds in the industrialized neck area of Charleston. Rather, EPA's specific objective was to develop a cleanup alternative to address unacceptable human health and environmental risks posed by the Koppers site. EPA's selected remedy in the Final ROD fully meets this objective. Given the above information and knowledge of historical and current industrial operations in the Charleston Harbor estuary, EPA believes one could reasonably conclude that there are numerous point and non-point sources of dioxin-like compounds in the study area.

GEL Comment: "Several facilities in the Charleston area have recently requested permits from the Charleston District, Corps of Engineers (COE) to conduct dredging at their facilities located along the Ashley River and in Charleston Harbor. As part of this permitting process, the COE has requested sampling and analyses of the proposed dredged material, including analyses for dioxins. The results of the sediment testing for each of these facilities has indicated toxicity equivalent concentrations (TEQs) of dioxins above the 2.5 parts per trillion (ppt) TEQ level of concern established by the COE and other regulatory agencies in South Carolina. The COE and the other regulatory agencies have determined that dioxins at levels greater than 2.5 ppt TEQ pose a potential threat to the environment. Based on the results of sediment testing, the COE is requiring extensive and costly management procedures for the dredged material as a stipulation to the dredge permit. In several instances, the excessive additional cost resulting from the presence of dioxins in the dredged material has made dredging prohibitively expensive. [I]t is suggested a more extensive investigation be conducted".... "[t]o determine if the Koppers site is a significant source of the dioxins in the Ashley River and Charleston Harbor. It may be useful to obtain input from the COE, as well as other stakeholders, in developing an investigation plan."

EPA Response: Based upon EPA's responses regarding the spatial distribution of dioxin in sediments and the numerous potential sources of dioxin-like compounds in sediments of the Charleston Harbor estuary, EPA does not believe additional investigations are warranted at the Koppers site to enable the Agency to select an adequately protective remedial alternative. However, EPA fully appreciates the adverse economic impacts on local marinas and businesses resulting from the lack of feasible, cost-effective and adequately protective disposal options for dredged sediments containing dioxin concentrations above other regulatory agencies threshold criteria.

EPA, linked with SCDHEC, the Medical University of South Carolina, and local agencies and community organizations is focusing resources on human health and environmental issues in the Charleston/North Charleston area under a Community Based Environmental Protection (CBEP) initiative. The CBEP initiative, announced in March 1997, endeavors to bring together the existing authorities of all appropriate levels of government, across all media programs to develop a more comprehensive workplan to address the community's environmental problems. Specifically, the community-based effort will characterize the area's environmental problems,

establish environmental goals and indicators, and develop solutions to problems by bringing members of the community together with the federal, state and local regulatory and resource agencies.

Based on the currently available information, EPA is unable to determine if the shortage of approved and cost-effective disposal options for dredged sediment with dioxin concentrations above other state and federal regulatory agencies "level of concern" is an issue of concern to the local community. If this issue proves to be a significant concern to local businesses and the Charleston neck area, EPA would commit to leading substantive discussions with all relevant and appropriate stakeholders to address this particular issue under the auspices of the Charleston CBEP initiative. In the interim, EPA will initiate discussions with appropriate program leads in the Charleston District COE and other stakeholders to evaluate if this issue warrants a more comprehensive problem solving approach under the CBEP initiative.

3.7 Comments from the Natural Resource Trustees (NRTs)

Natural Resource Trustees (NRTs) are federal and/or state officials who act on behalf of the public as trustees for natural resources. Given the proximity of the Koppers site to both federal and state natural resources, EPA expended significant efforts to involve the NRTs during the planning, scoping, and implementation of field investigations and ecological risk assessments during the RI/FS process. Comments on EPA's Proposed Plan were received in correspondence from the following federal and state NTRTs: U.S. Fish and Wildlife Service (USFWS), May 30, 1997; South Carolina Department of Natural Resources (SCDNR) - June 2, 1997; and National Oceanic and Atmospheric Administration (NOAA) - June 2, 1997.

The above entities generally organized and presented their comments on the major components of EPA's Proposed Plan (i.e. Ashley River, Barge Canal, Tidal Marsh Sediments, Groundwater/NAPL). In the interest of consistency, EPA has summarized the NRTs concerns regarding the major components of EPA's proposed remedy which is followed by EPA's respective response. The reader is referred to Attachment 2 of the Responsiveness Summary for the specific concerns of each individual agency listed above.

Summary of NRT Comments on EPA's Proposed Remedy for the Ashley River: The NRTs do not support EPA's selected remedy of Enhanced Sedimentation in the Ashley River. Rather, the NRTs have expressed support for the placement of an engineered cap over impacted sediments within the Ashley River Area of Potential Ecological Concern (APEC). Stated reasons for favoring capping Ashley River sediments over Enhanced Sedimentation include: 1) Enhanced Sedimentation is an unproven technology for isolating impacted sediments; 2) Contaminants may be released to the Ashley River during the installation of piles which are necessary to implement Enhanced Sedimentation. Therefore, containment measures similar to those applied during construction of the SC Aquarium and the National Park Service tour boat facility will be required; and 3) Enhanced Sedimentation would result in continued exposure to ecological receptors prior to adequate sediment deposition. Placement of an engineered cap is a proven remediation method that would immediately isolate contaminated sediments of the Ashley River.

ERA Response to NRT Comments Regarding the Ashley River: The conceptual approach to enhanced sedimentation in the Ashley River was developed in collaboration with the U.S. Army Corps of Engineers (USACE) Waterways Experiment Station (WES) in Vicksburg, Mississippi. The USACE is tasked with the operation and maintenance of the nation's waterways for navigation. As such, they have developed a tremendous knowledge and experience base related to characterization, and development/evaluation of management techniques for contaminated sediments. WES is the premier research facility of the USACE and employs respected scientists in the disciplines of numerical modeling (hydraulic/contaminant transport/sediment deposition), dredging, capping and other disposal/treatment options. While proven remedial technologies and solutions are preferred in some cases, EPA has ventured with other stakeholders in industry and academia to develop innovative solutions to site remediation which meet the challenges posed by reducing risks at hazardous waste sites in the United States.

EPA selected enhanced sedimentation in the Ashley River after considering the convincing body of evidence generated from discussions with USACE-WES personnel, similar applications in Charleston Harbor, and the detailed analysis of alternatives in the Feasibility Study. For example, local marinas in Charleston Harbor have break-waters, floating docks, and other structures which decrease water velocities similar to the way that driven piles will be utilized in the enhanced

sedimentation remedy. While local marinas apply these barriers and techniques for different reasons, the resultant effect is increased sediment deposition. Information has been gathered from local marinas in Charleston Harbor regarding the frequency of dredging sediments that is necessary to maintain access and normal operations. This data indicates that local marinas must dredge accumulated sediment on an average of every five years to permit reasonable boat access. Moreover, EPA believes that enhanced sedimentation provides significant advantages when considering the remedy evaluation criteria, particularly in long-term effectiveness and permanence, when compared to installation of an engineered cap.

EPA has established the following Performance Standards for enhanced sedimentation in the Ashley River:

- Ensure short-term protectiveness to surrounding environment during construction and installation activities;
- Provide sufficient cover to mitigate exposure to benthic organisms and subsequent adverse impacts to the food chain; and
- Ensure long-term effectiveness and permanence by mitigating erosional effects.

Based upon the above discussion, EPA believes that the remedy of enhanced sedimentation can be designed, constructed, and monitored effectively to meet the established Performance Standards. Nonetheless, EPA will monitor sediment accumulation and constituent concentration trends within the area of enhanced sedimentation for a period of five years. Data generated during the five year monitoring period will be evaluated by EPA to determine if contingency remedies are necessary to meet the established Performance Standards. Contingency remedies may include, butare not limited to, the installation of a supplemental cap and/or other measures to reduce erosional forces and augment long-term cover stability.

EPA's selected remedy also addresses the NRTs concerns of short-term effectiveness during pile installation activities. However, EPA does not concur with the NRTs prescriptive solution of sand blankets, silt curtains and timber lagging walls to eliminate potential impacts resulting from pile driving activities. While monitoring data from similar construction projects in the area suggests these systems were effective in providing short-term protectiveness, EPA believes these systems are fairly elaborate and that other more cost-effective containment systems which provide adequate protection may be available. Therefore, EPA has reserved flexibility regarding the type of short-term engineering controls utilized, provided they ensure short-term protectiveness during construction activities.

The NRTs have also expressed concerns that enhanced sedimentation will result in continued exposure to Trust Resources until such time that sufficient sediment deposition occurs. For this reason, the NRTs support the placement of an engineered cap given the faster relative time to achieve adequate protection. EPA believes it is reasonable to assume that subaqueous capping may provide adequate protection to ecological receptors in a shorter time frame when compared to the time needed for enhanced sedimentation to meet the established Performance Standards. However, EPA believes this advantage is a trade-off when one considers that subaqueous capping would displace existing benthic organisms and disrupt access to existing and potential future docking facilities on the Ashley River.

Summary of NRT Comments on EPA's Proposed Remedy for the Barge Canal: The NRTs generally supported EPA's proposed remedy of capping the impacted sediments in the Barge Canal and restoring the area to intertidal salt marsh. However, the USFWS and SCDNR expressed emphatic opposition to EPA's proposal to use the Barge Canal as a confined disposal facility for lead impacted material from the adjacent uplands area. NOAA's opposition was less assertive, stating that they would like to review criteria and engineering specifications for containment of lead impacted soils within the Barge Canal, prior to providing further comment on the use of these soils for base fill in the Barge Canal. The NRTs generally cited concerns of long-term leaching of lead impacted material to the surrounding ecosystem and unreasonable potential risks of injury to Trust Resources.

EPA Response to NRT Comments Regarding the Barge Canal: EPA's proposed response action for the Barge Canal was closely linked with the proposed response action to address lead impacted soil. EPA's proposed strategy for the Barge Canal included capping impacted sediments with a confined

disposal facility (CDF). The concept of the proposed strategy involved placing all soil with lead concentrations greater than 1,150 mg/kg in the bottom of the Barge Canal. This base layer of lead-impacted fill would then be capped with a two-foot topsoil/organic layer, returned to appropriate elevations, and restored to a functioning saltmarsh habitat.

Confined disposal in near shore facilities is a well documented and proven management technique for dealing with dredged spoil material. When combined, EPA's proposed response actions for lead-impacted material and the Barge Canal would provide for adequate protection of human and ecological receptors with a high degree of cost-effectiveness. Extensive water leach testing conducted on representative soil with concentrations greater than 1,150 mg/kg of lead indicated: 1) the lead impacted material is classified as non-hazardous per RCRA regulations; and 2) this material does not leach at concentrations that would cause adverse impacts to surface water or ecological receptors. Extensive sediment sampling was conducted during the RI in the Ashley River, Barge Canal and South Tidal Marsh, immediately surrounding the upland area containing elevated levels of lead in soil. All sediment samples collected in this area did not exhibit concentrations greater than the ER-M for lead, and did not demonstrate significant toxicity for the test species evaluated. Considering the upland soil with elevated lead concentrations has been in place for decades, EPA believes it is fair to assume that the subject upland soils have not adversely impacted the surrounding marsh and river habitat. In light of the site-specific data, EPA felt confident in its ability to design, construct and monitor a CDF to fulfill the response action objectives.

An additional advantage of EPA's combined response actions for the Barge Canal and lead impacted material included the creation of additional acreage of functional, intertidal marsh habitat. For example, the Barge Canal covers an estimated 3.2 acres adjacent to the Ashley River. Implementation of the remedy as proposed in March 1997 would have disrupted an estimated 5 acres of land in the critical coastal zone area along the Ashley River. Following the placement of lead impacted material in the near shore CDF, the area disturbed by the CERCLA remedy would have been restored to a intertidal Spartina marsh to ensure the long-term permanance and effectiveness of the respective response actions.

After fully considering the NRTs comments, EPA has decided to cap impacted sediments in the Barge Canal to eliminate exposure to potential ecological receptors. The cap material will consist of a "clean", two-foot layer of material with comparable characteristics as local tidal marsh sediments. The decision not to utilize the Barge Canal as a CDF for adjacent lead impacted material required the Agency to evaluate other feasible alternatives for upland soil with concentrations of lead greater than 1,150 mg/kg. SCDHEC's preferred alternative of excavation and off-site disposal of soil with concentrations greater than 895 mg/kg is estimated to cost in excess of $5.5 Million. Considering the site-specific data and recent Superfund Administrative Reforms, EPA does not believe the significant costs associated with SCDHECs preferred alternative are warranted. Rather, EPA's selected remedy specifies that all soil with concentrations greater than 1,150 mg/kg lead shall be capped sufficiently to meet a set of five Performance Standards. The cap over lead impacted material will cover approximately 5.2 acres at an estimated cost of $621,000. EPA believes the selected remedy of capping will provide adequate protection of human health and the environment in a far more cost-effective manner.

It is important to note that EPA's selected remedy will not result in the disruption of five acres of land, as the March 1997 proposal did. Therefore, in order to clearly differentiate between remediation activities required by CERCLA, and restoration/mitigation activities potentially required by other applicable Sections of CERCLA and/or environmental statutes, EPA's selected remedy does not require that the Barge Canal be restored to a functional tidal marsh habitat Marsh restoration in this area may be considered to provide a high degree of long-term permanence and protection, and/or to address issues related to past damages of natural resources.

Summary of NRT Comments on EPA's Proposed Remedy for the North, South and Northwest Tidal Marshes: The NRTs generally support EPA's proposed, and subsequently selected, remedy of dredging, capping and off-site disposal in defined APECs of the North and South Tidal Marshes. However, there remains some misunderstanding and disagreement over how the "weight-of-evidence" approach was applied to delineate APECs. There is some concern that sediments falling outside of the areas to be excavated will continue to pose unacceptable risks to ecological receptors which utilize the habitat. The NRTs have recommended additional sampling in the South Tidal Marsh APEC to further refine the boundaries of sediment to be removed. The USFWS has referred to the

Agency's in-situ bioremediation proposal for Northwest Tidal Marsh sediments as "[e]xperimental and has no documentation of proven effectiveness". The NRTs have suggested that a monitoring plan is necessary to track the effectiveness of in-situ bioremediation in reducing concentrations of constituents.

EPA Response to NRT Comments Regarding the North, South and Northwest Tidal Marshes: EPA's stated remediation goal for the North and South Tidal Marshes is to physically remove sediments which demonstrated significant acute toxicity to selected indicator species. EPA adopted the weight-of-evidence approach to delineate those sediments which warranted physical removal, versus those sediments which warranted remediation by less intrusive measures. This strategy affords the benefits of physically removing sediments shown to cause toxicity in site-specific studies, while protectively managing other less impacted sediments in-situ without completely disrupting the function and habitat of these ecosystems.

The concept of the weight-of-evidence approach was first suggested by a NOAA Coastal Resource Coordinator. EPA expended significant efforts and a notable amount of time during the RI phase of this project to ensure consensus was reached, among all stakeholders, regarding the procedures and indicator species employed. EPA believes the Administrative Record is clear on this issue. It was mutually agreed that whole sediment acute toxicity tests would be conducted on Neanthes arenaceodentata and Mysidopsis bahia utilizing sediment collected from the subject tidal marshes. It was further agreed that sediments which demonstrated significant acute toxicity to one (i.e. single toxicity) or both (i.e. double toxicity) of these selected indicator species would be evaluated for excavation.

SCDNR has suggested that "[a]ctive remediation should also be considered for sediments which exhibited toxicity to only one test species". In fact, the weight of evidence approach does consider this issue. For example, sediments of the North Tidal Marsh APEC, that are slated for excavation, include a sample station (SD-58) which did not demonstrate acute toxicity to neanthes, but did demonstrate toxicity to mysidopsis. In correspondence submitted to EPA after the comment period, the NRTs have requested that Amphipod toxicity tests using Ampelisca abdita should be used to further define sediments to be excavated in the North and South Tidal Marshes. This issue was discussed at great length during the RI phase of the project and consensus on using this test species could not be reached between all stakeholders. Therefore, EPA has decided not to use amphipod toxicity tests, selecting instead the mutually agreed upon test species of neanthes and mysidopsis.

The weight of evidence approach and ecological investigations placed an emphasis on the benthic invertebrate communities. Therefore, EPA conducted an Ecological Risk Assessment (ERA) to evaluate potential risks to other biota via the food chain. The NRTs were consulted on the procedures and assessment/measurement endpoints employed in ERA. An alternative risk model was also utilized to further evaluate potential ecological risks and the effectiveness of remedy options in managing the potential risk. The two ecological assessments bound the range of potential ecological risks in which remedy selection and risk management decisions were made at the site. EPA's selected remedy for the tidal marshes bordering the site is based upon the potential ecological risks posed to ecological receptors. EPA maintains that active remediation within APECs to eliminate direct toxicity to benthic macroinvertebrates mitigates a majority of potential food chain risks, while also considering the disadvantages of disturbing functional saltmarsh habitat.

EPA has recognized that additional sampling is necessary in the South Tidal Marsh to ensure that the stated goal of removal of toxic sediments is achieved. The co-mingled nature of PAHs and inorganic constituents in the sediments of the headwaters of the South Tidal Marsh has made it difficult to accurately correlate what constituents and concentration levels are actually causing the observed toxicity. EPA has attempted to address NRT concerns regarding this issue by incorporating the following text into Section 9.3.3.1 (Dredging, Capping and Off-Site Disposal) of the ROD, "[i]t has been noted that several sampling stations within the South Tidal Marsh APEC with similar constituent concentrations shown to cause toxicity are not slated for excavation. Therefore, a sampling program shall be implemented prior to excavation activities to better define those sediments within the South Tidal Marsh APEC which demonstrate significant toxicity."

Regarding in-situ bioremediation of tidal marsh sediments, EPA does not agree with the statement by USFWS that it has "[n]o documentation of proven effectiveness". EPA does consider in-situ

bioremediation to be an innovative and emerging technology that warrants further refinement and development at sites with impacted sediments. Available technology performance data indicates that in-situ bioremediation can be very effective at reducing concentrations of low molecular weight PAHs (< four rings). Moreover, phytoremediation, the biouptake or absorption of contaminants by plant species, has shown promising results for reducing the concentrations of inorganic constituents. Conceptually, in-situ bioremediation will be conducted in several phases consisting of laboratory bench scale tests, field demonstration, and full-scale application. EPA recognizes that a comprehensive monitoring program during all phases of in-situ bioremediation is integral to documenting the results achieved. The NRTs shall have reasonable opportunity to review and comment on the in-situ bioremediation monitoring program prior to implementation.

Summary of NRT Comments on EPA's Proposed Remedy for Groundwater/NAPL: The NRTs concerns regarding EPA's proposed remedy for groundwater/NAPL focus on adequate containment and cleanup to ensure protection of adjoining aquatic/wetland habitats and trust resources utilizing such habitats. The NRTs generally support EPA's selection of containment and recovery with extraction wells, but favor the remediation strategy advocated by SCDHEC.

EPA Response to NRT Comments Regarding Groundwater/NAPL: EPA has established the following Performance Standards for remediation of groundwater/NAPL at the three noted source areas on site: 1) Removal or treatment of NAPL to the maximum extent practicable; 2) Containment of potentially non-restorable source areas; and 3) Containment and restoration of aqueous phase liquid. These Performance Standards were developed in accordance with EPA guidance regarding groundwater restoration at NAPL sites and directly address the NRTs concerns of contaminant transport to the Ashley River and adjacent tidal marshes. EPA has previously responded to the groundwater/NAPL remediation strategy advocated by SCDHEC. The reader is referred to EPA's response to SCDHEC's non-concurrence letter in Appendix A of the ROD for a more detailed response to this comment.

ATTACHMENT 1

VERBATIM TRANSCRIPT OF
APRIL 15, 1997 PUBLIC MEETING

1 UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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4 IN RE: KOPPERS CO., INC.
(CHARLESTON PLANT) NPL SITE

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7 COPY

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10 PUBLIC MEETING

11 DATE: April 15, 1997

12 TIME: 7:05 PM

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LOCATION: Charleston Public Works
14 103 St. Philip Street
Charleston, SC

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16 REPORTED BY: LORA L. McDANIEL,
REGISTERED PROFESSIONAL REPORTER

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CONCERNED CITIZENS
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(INDEX AT REAR OF TRANSCRIPT)
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MR. ZELLER: Let's go ahead and try to get started. We have a real good case of Murphy's law entering here. Anything that can go wrong, will. We don't have an overhead projector at the present time. It's awful hard to find good contractors these days, but they have not shown up.

But we are going to run a few ideas past you-all if we can proceed. Actually, I am a little bit better at giving informal presentations than the full dog and pony shows. This might work out even better.

I have a contingency plan. I made copies of all the overheads I was going to use anyhow. That's this nice thick quarter-inch, I guess eight-and-a-half-by-11 sheets of paper. If everybody would make sure they have one of those.

We do have an overhead machine coming from MUSC, and it's going to be here probably in 15, 20 minutes. If it's all right, we can kind of start on the old classroom approach of page by page here, and once the overhead comes, at that point in time we can kind of reshuffle and start, I guess, reorganize and get the presentation going on from there. Is that reasonable to everybody?

I apologize. I'm sick to my stomach

about it, but this is the best we can do at this point in time.

My name is Craig Zeller. I am the remedial project manager of Region IV out of Atlanta's EPA. I have been investigating with Beazer East and the State of South Carolina for a period of about four years. This work has now reached the point where we're in the public comment period.

We have a proposed cleanup plan out for the Koppers NPL site here, and this meeting fulfills one of the requirements in the statute, actually, in the environmental law that we work under, which is Superfund or SARA. We are in the middle of a comment period right now.

I want to get out to you-all and talk about the site background, which is on the second page, and talk to you a little bit about what the investigation has found and provide a summary of the risks posed to the human element from the site.

I'll talk about the interim remedial action underway and currently being implemented. I'll talk to you about our proposed site widening multi-media plan which addresses soil, groundwater and sediments and aquatic environments near the site. I'll talk about public input, how that is addressed

and taken into account during EPAs remedy selection on the project.

Then Shannon Craig from Beazer East Company, who is responsible for most of the contamination, wanted a few minutes to address and give the company's perspective on things.

At that point in time, I'll open it up to questions and answers. We will stay here as long as you-all have questions for us.

Proceeding on, let's talk a little bit about page 3 of that handout. Let's talk a little bit about Koppers site. The site is really 102 acres. It's bounded to the east by Interstate 26, to the west by the Ashley River, to the north by Milford Street, to the south by Braswell and neighboring tidal marsh.

It was used for the greater, part of the 19th century in the Beazer or Koppers name from 1940 to 1978 for the process of treating wood. This is an overhead or aerial photograph of the Koppers site that was taken, I guess, in May of '54. This is the King Street Extension here on the east beside Interstate 26, which came in later, I guess; in the late '60s here.

I want to talk just a little bit about

how wood flowed through this site and how we, I guess, have taken it upon ourselves to investigate this. The majority of the operation took place here in really the eastern portion of the site. This is what we call now the former treatment area.

I think the fourth page of that handout shows the overall site plan and a lot of these interested features I will continually refer to in this presentation.

In the eastern portion of the site was where most of the product was stored. What Koppers essentially did was they brought virgin lumber onsite, and it was treated by using three preservatives.

A majority of the preservatives used was Creosote, which is a black, kind of smokey substance usually found on utility poles and railroad ties. Most of y'all know what Creosote is. Two other preservatives were CCA or Copper, Chromium Arsenate. That's currently what most wood in the United States is treated with. If you go and buy wood for landscaping, it's kind of that greenish osmosis process. That also is CCA.

A third preservative was Pentachlorophenol fungicide and insecticide. All

that stuff was stored in this eastern portion of the site. We had six pretty large treatment tanks that reportedly held over two million gallons. That was mostly all Creosote.

We also had another series of areas where they were working all in and around the treatment building. Basically, what they did was rail in virgin lumber into pressure vessels, 133 feet in length and about eight feet wide. They were cylindrical. The wood would be railed into that, the doors shut, pressurized to suck the moisture out of the wood and then the wood would be impregnanted with the preservative of choice.

Following that, after the wood was treated, it was pulled out into a series of drip tracks. The wood would stay there, for what we are guessing, sometimes five minutes maybe as long as five days; probably depending on how busy the plant was.

The wood would be allowed to drip for a while and stored. Finish wood was stored onsite. The black areas of the site was where the Creosote wood was treated. You can see generally, where the central portion of the site is, you can see the white area, the virgin lumber could have been treated

there. That could also have been treated with CCA.

Some interesting features to note here, most of the surface water drainage, a lot of it was directed into a series of drainage ditches located onsite. One particular one here, the Braswell Street ditch, that just ran south of what is currently Braswell Street. It ran the length of the site for a couple thousand feet and emptied into an old impoundment area here. You can also see that this area has been primarily industrial for the most part of the 1900s.

To the north we have the Old Planters Phosphate/Fertilizer Plant; some know it as Columbian Nitrogen; to the south, Koppers or what we call now the Ashepoo Phosphate/Fertilizer Plant. We have run into some environmental contaminants at Ashepoo. I will talk to you in a little bit about that separate enforcement action with the responsible parties for that. We are getting around to investigating it.

We have done some preliminary investigation with Columbian Nitrogen and found some interesting things and will probably move forward with additional investigation.

Back to Koppers. The central drainage ditch started at the western one-third of the site

and drained into the Ashley River. This is their dock area over on the Ashley where a lot of shipping and receiving, et cetera was conducted.

When the EPA really got involved, when everything kind of came to the attention of most regulatory agencies and the EPA and DHEC in November 1984, George Dent owned Southern Dredging, which is no longer located there, and received permits from the agencies to actually construct and dredge a barge canal. This barge canal was constructed right through here.

During that time, no one knew at that time or it probably wouldn't have been permitted if we knew about it, it ended up that Creosote and some other things were dredged and resulted in observed fish kill in the Ashley River.

All the spoiled material from that dredging operation was pumped 700 feet east into an area called the spoils area. It was a very primitive burned area. It was culvert constructed. As the water level timbers were added, the water was allowed to skim off into the tidal marsh and the finds from the dredging operation went into the spoils area That is kind of a general overview of it.

Some other things back on that figure 1

page 4 of your handout, you can see the drip track area, former treatment area, some of the marsh area that we are set to do the investigation here.

So getting onto the remedial investigation, which was initiated in January of '93 with the signing of the administrative order, EPA negotiated with Beazer to conduct a field investigation essentially. The objective of this field investigation was to fully characterize and find the nature of contamination onsite as a result of past operations.

In addition to remedial investigation, which is essentially the collection of samples and analysis of soil samples, collection of surface water, all those major medias, in addition to that, risk assessment.

Risk assessment was also conducted. That evaluated the risk posed to human health and also the environment from human health pathways, human health concerns. Risk assessments were conducted on that.

Two major ones were finalized by EPA January of '95 and January of '96. The pathways evaluated were: Ingestions and derma contact with soils onsite, surface water onsite and sediments

onsite.

We also looked at the hypothetical possibility of groundwater ingestion or inhalation via the shower. It's important to know the groundwater we are talking about is above the Cooper Formation and is not used for industry or drinking water. Drinking water is supplied by the Commission of Public Works and the City of Charleston.

The pathways we evaluated: We did look at the actual toxicity observed to the ecological receptors. What that really entailed was taking generally three test species, neanthes, mysidopsis and ampelisca; neanthes is sediment worm; mysidopsis is grass shrimp; ampelisca is basically a water flea; ones that would dwell in sediment.

What we are doing there is subjecting these test species to sediments from the site to see if it killed them. There are all kinds of protocols for this to determine if there is significant toxicity.

We also did food chain accumulation to look at the potential effect of actually taking sediment and surface water results and creating a hypothetical food chain accumulation; like a food web. The species or the endpoints to be looked at

were raccoon, great blue heron, marsh wren and some fish as well.

And what we did was construct a food web such as -- I can't remember actually all the details -- such as the red drum is exposed to sediment inside the northwest tidal marsh, and then the red drum is eaten by the great blue heron. What could the great blue heron be subjected to? We looked at vegetation also.

Getting into the human health risk assessment, it's fairly often controversial and even very confusing for us to understand. I will take a crack at the potential risks. We looked at two general categories; one is carcinogenic and the other is non-carcinogenic risk.

According to our statute, what the EPA looked at was the carcinogenic risk rate which estimates the potential. You need to realize this is the incremental chance of developing cancer over a lifetime given the exposure at a particular site; in this case, Koppers.

The baseline risk in developing cancer by living on God's green earth is one in three people may develop cancer over a lifetime. The risks that we are talking about are on a much smaller fraction.

If you can see on the left-hand of that time line I have constructed on this page -- you can see the greater risk. Your risk is one in three you will develop cancer. I put .30. That's baseline risk.

When we were developing cleanup goals for sites that are on the Superfund list, we get into acceptable risk range. The Superfund list range is in the middle. What that means, the EPA, and the state shoot for an acceptable risk range that is between one in 10,000 and one in 1 million.

What we do, we create a potential exposure scenario. And if that potential exposure scenario calculates that your incremental of developing cancer as a result of exposure to contaminants is between one in 10,000 and one in 1 million, that is an acceptable risk per the environmental statute. If it is greater than that, if it's one in 1,000 times ten minus three, action is warranted, and the EPA and the state must look at corrective action or remediation to address this.

Non-carcinogens are really estimated in a completely different way. These are estimates; what we call hazard index. By the way, we do this with simple division. Actually, you estimate the potential intake that one may be exposed to, divide

that by a reference dose that is derived from epidemiological studies. If that ratio is greater than one, the conclusion is there may be potential risks posed by the same.

What does all this mean? Well, the big conclusion here is that there are unacceptable risks posed to human health from site conditions. The EPA and the state are proposing a future industrial land use scenario here.

Cleanup goals are going to be based on the expected future land use in this area which is future industrial. So the land use scenario that we worked out, the potential exposure was, for future onsite workers potentially exposed to surface and subsurface soils. There were unacceptable risks in the minus three to eight times ten minus three range.

I think we have the overhead here. Give me a chance to set this up. I apologize.

(A recess transpired.)

MR. ZELLER: We are back in business. Just to step back, this is that time line I was talking about. This is the protective range we shoot for. We are looking for incrementals that shall be no greater than one in 10,000 and one in 1 million. If it falls within this range, some cleanup action is

1 warranted to provide for human health environment.

2 The human health risk assessment did

3 conclude, based on this industrial scenario, that

4 there was unacceptable risk posed. The risk posed

5 falls about in this range, in the minus three range;

6 eight times ten minus three for the future industrial

7 worker exposed to surface soils onsite.

8 It's important to know the assumptions

9 that went into this model for there to be a potential

10 unacceptable risk. A future onsite worker must be

11 exposed to surface soils 250 days a year and exposure

12 of 25 years. The unacceptable risk for subsurface

13 soils was 12 days a year. That's much less frequency

14 as opposed to surface soils.

15 We also looked at the off-site residents

16 scenario. We were worried about sediments we found

17 in the Hagood drainage ditch north of the site that

18 tends to migrate off-site and had gotten up there.

19 The exposure we did up there was for off-site

20 residents, possibly Rosemont residents or someone

21 else that would be exposed to sediments and surface

22 water and Hagood Avenue drainage.

23 We also calculated some unacceptable

24 risks based on that potential. The chemicals of

25 concern, the chemicals that are driving the actual

unacceptable risks here are Polynuclear Aromatic Hydrocarbons, which are a family of compounds that make up motor oils and sometimes in this case part of Creosote. They are all over sometimes just as a result of man's activities.

We also have some pentachlorophenol, which is a wood treatment preservative onsite as a result of their use. Dioxin is present in trace amount. We also had dioxin on the site, arsenic and also lead is causing some unacceptable risk. We have contaminated soil onsite that needs to be addressed.

Regarding groundwater contaminants, let's kind of go over a quick summary of what we found in the RI report. Regarding groundwater, we focused on the water-bearing units of the aquifers of the Cooper Formation.

What the Cooper Formation is, the Cooper Formation is a 260-foot thick clay layer, widely considered a very good confining unit. It's kind of gray in color, gray-green color, and it's encountered about an average of 60-foot below the site. So we focused all our groundwater testing on the water-bearing units above that. Contamination is not expected to be below that Cooper Formation.

We had three water-bearing units in the

eastern portion of the site separated by clay layers and in the western portion of the site. The shallow clay layer disappears, and we are really down to two water-bearing units. I mentioned earlier the groundwater above the Cooper Formation is not used for residential or industrial supply.

We did notice and identified three NAPL source areas onsite that may have potential recoverable quantities of Creosote. When I mentioned NAPL, it's non-aqueous phase liquid. What is that? Well, oil and water don't mix.

In this case, Creosote is slightly denser than water. So Creosote, in this case, is going to sink until it hits something that it can't sink through. In this case, most of our NAPL is sitting on top of clay layers with fairly significant permeabilities that are not allowing it to seep through deeper into the aquifer.

We also found three or four general areas of contaminant transport concerns, contaminants getting potentially transferred off-site. Here is a graph that I want to show you. I mentioned we have three general areas of NAPL or Creosote product in the ground. We are going to try to recover those three areas where the former

treatment tanks were held.

We also have a potential to recover quantities of NAPL which is runoff from the Braswell Street ditch. We also have a recoverable quantity of NAPL in the northwest corner, which was possibly some waste that was buried over the years at the disposal area.

In addition, we have four general areas of off-site contamination in our transport pathways that we are concerned with. The first was the subject of the interim action and that was the mobilization of the transport of Creosote-related compounds off the site in the former treatment area. That is up in this general area.

The second area of concern was also the Braswell Street drainage ditch. We have got some Creosote and some NAPL in this general area getting into the old impoundment, and we are concerned with a little bit of potential transport off-site.

The third area is in the northwest corner, the central drainage ditch. We got some Creosote also in the ditch, and we are concerned about potential transfer maybe into the Ashley River.

The fourth is what we call the southern

end or Ashley Phosphate Tidal Marsh; in this general area. I mentioned in this overhead or this picture here, Ashepoo Phosphate made fertilizers for agricultural distribution. In the process, they manufactured sulfuric acid, and they applied this in these acid chambers to locally mined phosphate to make superphosphate. That's not necessarily a friendly player in the environment.

What we have found over the years, the pH in this shallow groundwater is less than two standard units, which is highly acidic. What that has done, we believe, is mobilize some lead in the area, and this lead now is present in the south tidal marsh at concentrations of about 50,000 ppm.

We are proposing with DHEC to move forward with a separate investigation with the responsible parties for this facility, and we are moving forward with what we are calling non-time critical removal, which is certainly a RI/SF process. We'll try to do the same thing with the contamination in and around this Ashepob Phosphate works and develop some cleanup. That pretty much sums up groundwater in a nutshell.

Let's talk a little bit about the ecological assessment. We found potential risk to

the ecological receptors. I mentioned earlier about the direct sediment toxicity. Direct sediment toxicity was noted to the test species in three general areas; one was the north tidal marsh by Hagood Avenue; one was in the south tidal marsh near the Ashepoo Phosphate that I mentioned a second ago.

We also had demonstrated toxicity in the Ashley River adjacent to the site. We did not have toxicity in the barge canal, but we had predicted unacceptable, risks to the receptors in that area.

What we have there, the general conclusion at that point, we do have unacceptable risk posed to the human health environment that the EPA must look at and address.

So while we are doing that, we proceeded with the interim remedial action. The interim remedial action, it's been called a Band-aid approach. It is really a source control remedy to getting in and minimize and eliminate short-term risk posed by the site while a final comprehensive site-wide cleanup plan was developed. The specific objectives of it were really four-fold. We wanted to eliminate off-site migration.

Let me talk to you a little bit about what we got going here. As I mentioned, we have

Creosote in the subsurface soil underlying the former treatment plants. Over time, what we believe is happening is that this Creosote in the shallow water-bearing unit got into the Nova Street/Milford Street drainage ditch.

When this got into the subsurface drainage line, it was transported under this underground conduit, basically, stormwater drainage and carried out to the Hagood Avenue drainage ditch.

Based on that potential transport and the potential unacceptable risk in the Hagood Avenue drainage ditch due to exposure of the sediments and the surface, we proceeded with interim-action that is currently implemented, and we're almost done with it.

What that did, that entailed -- the first thing was reconstruction of the Milford Street drainage ditch. We took a 350-foot stretch at one time. If you looked at it, it was in a condition that you could see contaminants real good. You could see Creosote. You could smell it. It was also filled with a lot of trash.

We excavated that ditch, dug up that soil, containerized that soil, took that soil off-site for proper disposal, once we did that, we put in 22-inch high-density polyurethene and enclosed

that section. What was once an open drainage is now closed.

We put in or inserted four manholes to collect surface water and then the transport of elevated levels go to the Hagood Avenue drainage ditch. That eliminated the potential to the Milford Street ditch.

Once that was reconstructed, the second step was to install extraction wells into the shallow clay. It's going to be hard to see, but I will explain it to you a little bit. This is that shallow clay that sits right through here. We have six now, shallow extraction wells, that are pumping water and NAPL and stopping the transport and off-site movement of free product off the site. We are trying to eliminate that northern expansion of any plume or any Creosote moving off-site. That plan has been operating since it's been installed.

We put a pilot system in place in the middle of '96. We fired that system up about mid-January of '97. We have been experiencing the normal clogged lines and normal clogged pumps that are going to be pretty normal for any kind of system of this nature. We are finally working out a lot of those bugs.

In the month of March, we had our very first month of really pretty good success. The last number we recovered, 63 gallons of product in the month of March from that site. We recovered a lot of groundwater that's being treated in an onsite treatment plant right here. All that water is being treated to standards imposed by the North Charleston's sewer district, and then that water is discharged for additional treatment by the city.

The third step was then eliminating any other potential migration into the existing storm drainage. Some of these storm drains have cracks in them. The actual pipes may be cracked themselves. We didn't want any other additional contaminants moving into that pipe.

What was done just in the last couple of weeks, we lined those existing storm drains with what is called in-situ. It's a form of about a quarter-inch thick resin. What this does is basically lines the storm drains with this material on the inside and eliminates or basically seals all the joints and cracks so that no contaminant can get into that system. That was completed again a couple weeks ago.

The fourth and final step which is

underway at this present time is the reconstruction of the Hagood Avenue drainage ditch. That system is going to be an open ditch, three-sided, with a flat concrete bottom and sloping concrete sides. We got about half of that drainage ditch excavated.

Now we had revisited a few design issues on the line itself. Excavations of that ditch will probably commence -- excavation will commence probably next week, and we will be done with that I expect in the month of May. Once that is done, the physical construction of the interim system will be completed. We will continue to operate the interim action recovery system to recover free product and impacted groundwater back in this general area.

While that was going on, concurrently, we also developed feasibility studies to look at the bigger issues at hand. A feasibility study was completed this year or actually -- excuse me -- December of '96. And the objective was to identify alternatives to address and mitigate the risk posed by the site.

Per the statute that we work under in the environmental law, it mandates that the EPA and the state look at a wide range of alternatives from doing absolutely nothing to short of digging up the

entire site and carrying it off as an example.

What you try to do is develop a range of alternatives that combine some containment alternatives with no treatment but also try and incorporate some treatment alternative that will reduce the toxicity, the mobility or the volume.

All these alternatives and cleanup plans are addressed and then are ran through a series of remedy criteria. The first seven range from overall protection of human health and environment and costs are evaluated with respect to each other.

At the end of the feasibility study, the state can accept and the community can accept, which is what we are here to do and talk about tonight.

The state, we have worked very closely with them in this process. While we have a lot of agreements, the state agrees this EPA proposed remedy does achieve some benefit. We do have disagreement over some general arguments such as cleanup levels and how clean is clean argument.

I am not going to go too much into it at least at this present time. I'm happy to address some questions from the public on it. We do have some representatives from the state agency. If there are any questions about that, we will address those.

And lastly and probably more importantly than all the other previous issues is community acceptance. We want to hear from the community, hear their concerns about the remedy, do they like it, are there portions that concerns them. We want to make sure all their concerns are addressed.

This is again what I mentioned is part of this process of why we are here tonight. That is the whole objective of the public comment period; get those comments, get them in writing, and the EPA will formally respond as part of its selection.

I need to stress, the plan that is on the table tonight is a proposal. It's not final. We have not made up our mind. We can change our mind and often do based on the comments we've received from the public. We would encourage you, if you are interested, to become involved in that.

Let's talk a little bit about -- I have the EPA proposed remedy split into four major parts. I will start first with soil or drainage ditch sediments and then work into groundwater, work into the sediments in the neighboring-tidal marsh and also talk a little bit about lead.

First, soil and drainage ditches. What are our objectives?

As I mentioned, we have some potential and acceptable risk by contact with the soil onsite. First thing we want to do by this cleanup is eliminate that potential exposure. In addition, we want to eliminate exposure to sediments that are in drainage ditches. Two objectives of that; one is to remove any potential transports in these drainage ditches, to provide enough adequate drainage so the site doesn't flood in a storm. We are using, as a guideline at this point, some of the recommendations which is to provide adequate drainage on what they call ten-year 24-hour storm drains.

Before we get into soil, we have to talk a little bit about soil cleanup goals and what area of the site are you going to potentially dig up, what area are you going to potential cap, that type of thing. You need to start focusing on areas.

Traditionally, EPA has favored or expressed preference for cleanup that goes to the far and near; the one in 1 million risk range. Recent Superfund reform, some of you may or may not remember, the Congress of 1995 really came after EPA pretty hard and, as a result of that, we have adopted some reforms that advocate the adoption of risk management and cost effective strategies to reduce

the risk proposed by these sites and not necessarily dig up and treat every last item of contamination of these sites.

Please keep in mind these remedies still must be adequately protective of human health and environment. That is EPAs mission. That's what we are intending to do with all these remedies. To meet that challenge, what we did was actually, conduct value engineering studies that the objective of this was to minimize the tons of soil excavated or removed from sites while optimizing the risk reduction achieved by this remedy. It really incorporated some residual risk methodology. It actually looked at digging up soil, taking the soil off-site and looking at what the proposed remedial risk would be on the site.

What we did, real quickly, is a fairly involved study. It took a lot of time and is summarized in a nice three-ring binder about six inches thick. What we did here on the left-hand columns over here, this is the EPA protective risk range, ranging from the minus six range, which is going to be the most protective cleanup goals, to the still acceptable cleanup goals of one in 10,000. Soil that was above those respective cleanup goals

was then identified on a map. Okay.

And we went through an exercise whereby we assumed, for instance -- let's say that the one time risk range is a one in 10,000 risk for developing cancer. We developed a cleanup level for the concentration of soil. Then we identified how much soil onsite was actually greater than that concentration.

In this case, using that top line, 5,300 tons of soil actually exceeded that cleanup goal. Then we assume that you take that soil out of the equation; take it off-site for this paperwork exercise. We took it out of the equation, and we replaced that dirty soil with clean fill of assumed background concentration for this area.

We re-ran the exposure scenario to evaluate the potential to a future onsite worker potentially exposed to soils in the future. That's what we are calling residual risk. We plotted those results to kind of demonstrate what the overall result was and found -- and you can probably guess what we did find.

This is a graph. Here on the Y axis, we have tons of soil. And on the X axis we have the actual risk achieved by this excavation. You can see

with no action, the soil, as I mentioned, is minus three risk. Okay.

The minus four area to the minus six area is EPA protected risk range. Whatever soil remedy we choose at Koppers must fall within this risk range. Okay.

You can see this kind of isotonic development trend here. If you excavate 5,300 tons, come back in with clean soil, you are left with minus four, minus five range. You get a very big reduction in risk for 5,300 tons of excavation.

If you excavate 12,000 tons, you go from eight times ten minus three risk to one times ten minus five risk. That's right in the middle range.

The general trend we want to illustrate in this graph is to show, as the tonnage increases, your actual residual risk achieved is miniscule; is small. You can see that in this case.

Let's say you go from 12,000 tons to 39,000 tons. The volume actually tripled, greater than tripled, but your residual risk -- the additional risk you achieved there was very small in comparison.

What this tells us is that you have a certain amount of soil onsite that's pretty heavily

contaminated there or hot spots. A lot of other soil onsite you could call mildly contaminated, and then we have somewhat widespread mild or low level contamination onsite.

What we are looking at here -- we've worked a little bit with DHEC. We are proposing to excavate the hot spots and then come back in and cap this other mildly contaminated soil. What we are proposing to do is actually dig up this 12,000 tons and then cap to a level that gives us really the digging up of 86,000 tons down here on this minus six risk range. I will get into that a little bit more in a second. If there is anything confusing, we are going to have a question and answer period.

These are the overall remedies that we evaluated for soil. Okay. The range, as I mentioned, is from no action all the way to incorporating some treatment alternatives. We looked at possibly just capping soil, okay, possibly just capping 6.7 acres with actually no excavation and no treatment.

And we also looked at the potential of just digging up this soil; digging up 12,000 tons of soil and taking that off-site for disposal. We looked at digging up the soil and potentially

1 constructing a hazardous waste landfill onsite to
2 contain this material.
3 And we also incorporated some treatment
4 alternatives where we looked at various combinations
5 of digging up the soil, thoroughly incinerating some
6 soil. And then you can see the five series of this
7 alternative where we actually looked at the combined
8 excavations of 12,000 tons with some additional
9 capping to achieve a greater level of protection.
10 And that's where we are at as far as
11 proposed soil alternative combination of things. We
12 are looking at the excavation of 12,000 tons of soil,
13 the hot spot stuff, and also the sediments and take
14 that off-site for disposal. The location that has
15 been appointed for disposal is the Laidlaw facility
16 for hazardous waste in Pineville, South Carolina. Is
17 that Laidlaw?
18 In addition to that, we are going to go
19 with additional capping. We are talking about 24.5
20 acres capped over soil with greater than two parts
21 per million. BenzoPyrene equivalent will
22 provide residual risk of 1.10 minus six. The
23 present worth of that alternative estimated for the
24 soil is roughly $5.43 million.
25 I want to show you a few figures on the

soil remedy. This is a picture of the site. It shows areas that we are going to excavate or are proposed for excavation and shows proposed areas for capping.

The cap we've developed is conceptual, for cost purposes. It is a geotextile mat first placed on the soil that we are not going to dig up. That mat or that layer is really for demarcation only. It's not intended for any infiltration barrier or anything. It's intended to say soil below this is mildly contaminated.

In addition to that, we are going to put a layer of compacted crushed stone. We estimate 12 inches will be sufficient at this point in time. We were going with that at this point in time. It's very consistent with some of the other capping alternatives that have been utilized for container storage.

And once this stuff gets wet, and it's compacted, it can be as hard as concrete. We like this conceptual approach probably a little bit better than asphalt or concrete given the drainage considerations.

If we end up capping 24.5 acres with asphalt, we are going to have one heck of a quantity

of rain to deal with if it rains a half inch. It could end up flooding that area. That gives you a little bit of the basis behind that crushed limestone.

The area with double cross hatch are the areas for excavation. Most excavations are around the former treatment area, some of the drip track area. This middle portion site is where the storage of the wood was. We're proposing to cap some of that. Some of the excavation is in the old impoundment area. Some of the other suspected sites and some areas of lead on the road and the barge canal we are also dealing with as well.

I want to show you real quickly what EPAs proposed remedy does in the range of risk reduction. Here is the time line. There is EPAs protected risk range. EPA can accept any remedy within this protected risk range.

You can see, with no action, we are outside; in the red zone; the remedy not protected; must take some action. By the excavations of only 12,000 tons, by the replacements with clean fill back in those areas, we fall right about in the middle of EPAs protected risk range; right about one in 100,000.

By that additional cap of 24.5 acres, another level on the order of or the magnitude of an additional risk reduction, that takes us right to the end of the actual risk range of 1.1 times ten minus six.

I guess our point that I would like to make with this graph is the combination of 12,000 tons with off-site excavation disposal and 24 acres capped takes us right up to the threshold that we are allowed to under the statute.

A quick minute about drainage reconstruction. The three major ditches we are going to dig up soil and reconstruct are the Braswell Street ditch. I believe 2,250 linear feet of that ditch is going to -- actually, sediments are going to be pulled out of that thing and reconstructed. In all likelihood, at this point in time, we are talking about reconstructing those ditches to very similar, if not identical, to the Hagood Street ditch.

In the interim action, it will be constructed with tapered sides or three-sided; linear concrete on the bottom and two sloping concrete sides, roughly 800 feet vertical drainage proposed for reconstruction and also about 500 feet of the Milford Street ditch that's proposed.

And keep in mind that also includes the ditches that have been reconstructed or will be reconstructed under the interim action system. That's pretty much soil in a nutshell.

Groundwater; we have three objectives for the groundwater program in the three sources that I mentioned. These objectives plotted those three source areas; one, we are going to go in. We want these groundwater remedies to remove NAPL, remove Creosote to the maximum standard that you practically can.

All of you need to realize that this is a very similar analogy to an oil field type thing. You are exploring for oil. You are trying to recover oil for deposits. There is only so much oil you can get out with the existing technology. Sooner or later you come to a point you turn off the pump. At this-point in time, we cannot extract. Cost effective technology does not exist to get one more drop.

The same analogy applies to Creosote or non-aqueous phase liquids. We are going to remove the maximum that we can with the technology present. The area that we can no longer remove the Creosote, we want to contain that so we don't have any

additional migration off the site. That's the second objective, containment of these potentially non-restorable resource areas.

Lastly but not least important is the restoration of aqueous contaminant plumes. We are going to go after those as well.

We looked at four general alternatives to achieve; one was no action; two, just the containment using placement of intermittent barriers to stop any additional migration and limited pumping. The third alternative was containment and recovery of NAPL. We would achieve these objectives by using conventional extraction wells.

And the last one we looked at is innovative in-situ treatment, which actually establishes vertical circulation cells. You actually have two well screens that you extract water from the bottom oil screen and then reinject at the top. You actually get vertical circulation in the aquifer.

The advantage with this system, you don't actually have to extract groundwater, but you set up this wall of defenses in the groundwater that you have now insured that no water in moving past this point, and you gain containment that way.

We are kind of combining -- what we are

proposing to do at this stage is kind of combine a little bit of both technologies. We are proposing to go with alternative three, which is containment and recovery with extraction wells in these three areas. And in the former treatment area, six shallow feeding wells with interim remedial water barriers. Those are in addition to the wells installed under the interim action system.

In the northwest corner near Ashley River, we're proposing to install two shallow wells. In the old impoundment area, we're talking about an additional two intermediate wells.

These are conceptual. What our plan is, as we proceed with this plan, if it looks like these wells are not adequate, if we don't have the spacing, don't have the pumping power to achieve these objectives, we can go ahead and put some more wells in.

Another potential contingency we are also considering and also proposing, the adopting of in-situ wells to potentially achieve these objectives. The present worth is $3.074 million. I want to talk conceptually about it and show you what this consists of.

Here is your three NAPL source areas we

are going after. it shows the proposed location of the extraction wells in the former treatment area. It shows two extraction wells in the impoundment area and also shows two extraction wells in the northwest corner. That's it for groundwater.

We have areas of sediment contamination that need to be addressed. These areas are five; Ashley River, the barge canal, and three tidal marsh areas known as north tidal, south tidal and northwest tidal marsh. Our objective for this sediment alternative, we are to remove demonstrated toxicity. In those areas where we had demonstrated toxicity, we want to remove that toxicity and restore those marshes to a functioning system.

In the areas where we did not have demonstrated toxicity to the organisms, we want to contain those sediments in those areas to make sure we don't have any additional migration. We're not necessarily proposing to excavate, not proposing to remove soil but to look at some less intrusive measures such as capping, et cetera to take care of that. That's really what we did in developing these sediment alternatives where we had to evaluate the feasibility of physical removal of that sediment.

And then in the areas which did not have

toxicity, let's look at some less intrusive methods such as sedimentation to remove that toxicity or remove that potential problem.

Here are some other alternatives we looked at for the sediments in those areas; one was no action. No action really looked at just source control and just counting on natural degradation of contaminants. We recognize no action in, this case is not adequate protection so we really can't select it as an option.

We looked at enhanced sedimentation in the Ashley River. The part of the Ashley River we are talking about is surrounding the area of interest with some piles; actually driven piles. The analogy I have used, these driven piles are going to be driven in the Ashley River to surround the area of interest and that these piles are actually going to decrease water velocity to enhance sedimentation, to entice the Ashley River to drop out its sediment load.

The people in the midwest use snow fences, and it may be more appropriate in the coastal area to talk about the sand dunes. In very similar ways that we install snow fences along sand dunes to capture rolling sand and make sure the dune

environment stays, that's the general idea of enhanced sedimentation. We looked at enhanced sedimentation and placing an engineered cap on those sediments.

We looked at subaqueous capping in the barge canal and in the tidal marshes. We actually did not look at capping alone in the tidal marshes. The idea being is that we need to excavate some soils from these tidal marshes first. If we were to place a cap on top, we would start messing with the existing tidal marsh.

We have looked at changes in tidal marshes. They are really these three series, which was first, excavation in the toxic area followed by restoration and capping.

The fourth thing we looked at was also in-situ bioremediation. That's basically introducing oxygen and other nutrients to facilitate and speed up the natural degradation of these contaminants.

The alternative we are proposing to go with -- I have figures for all of these -- in the Ashley River, proposing to go with enhanced sedimentation. We want to surround this potential ecological concern with driven piles.

We are going to have to design these

1 piles to determine optimal arrangement to get the
2 maximum range of deposition; how far should these
3 piles be placed, what's the overall height, how far
4 do these piles need to be installed to make sure they
5 don't bend over in a storm.
6 This is the general area here that we
7 are talking, about. It's a roughly 1,500-foot segment
8 of the Ashley River immediately adjacent to the site.
9 It's going to go out -- the width of the actual
10 enhanced sedimentation alternative is going to go out
11 to the channel of the Ashley River that is maintained
12 by the Corps of Engineers.
13 The beauty of this alternative is that
14 it works with the existing land use. There are some
15 current docks here, Braswell shipyard and also Tommy
16 Parker of Parker Marine has a dock there as well. By
17 installing these piles and enticing the natural
18 sedimentation, it allows these businesses to
19 continually operate; does not put them out of
20 business. We do not mess up the use of their
23 existing docks.
22 Here is the general idea. This is just
23 a conceptual cross section. These piles will be
24 driven into the sand or driven into the sediment, and
25 we suspect that these piles may still stick above the

water level at, say, low tide. We don't have these answers right now. We need to get some hydraulic modeling to find out the optimal spacing and what height to entice and give us the best rate of deposition.

Over time, we expect accumulation of clean sediment in that impacted area. We talked with the Charleston Corps of Engineers. This remedy has been used locally at a place called Wigley Point; not to recover contaminated sediment. It's used to actually shore up the eroding shoreline, okay, actually keep up that area and enhance that sedimentation.

We believe that based on the data we have now, it is going to -- it can be very effective. We do expect a fair amount of sedimentation over time. I will tell you that there is a contingency built in this plan. If I am wrong, if we have made a mistake, if we do not engineer this thing appropriately, if we don't get the accumulation of sediment that we expect,the beauty of this remedy is that we can then say, in a five-year period, if we don't see the accumulation we like, we can come back in and use those installed piles to actually place and contain an engineer cap; that might be a sand

1 blanket or a foot layer of sand or geotexture fabric
2 and just enhance it if it's not working. But what
3 this gives us is an opportunity to try this, see if
4 it works.
5 We believe, based on our discussions
6 with some of the experts that are developing this,
7 that it will work. If it does, great. If not, we
8 can go back in, like I mentioned, and augment with an
9 engineered cap at a later time.
10 The barge canal remedy is the middle
11 here. Barge canal is talking about subaqueous
12 capping. Let me give you that picture. This is the
13 barge canal, this general area. It's 3.2 acres in
14 size.
15 This barge canal was dredged one time
16 into the tidal marsh. Right now it's a barge canal
17 that's filled up. It has impacted sediments at the
18 bottom. These sediments do not demonstrate toxicity.
19 We really didn't evaluate it as far as removal. We
20 do want to cap this.
21 What we are proposing to do is fill this
22 and cap this area. What we want to do is return the
23 barge canal to what its existing or what its former
24 land use or use was, which was a support tidal marsh,
25 which is the grassy marsh that fiddler crabs and

other nice bugs and bunnies live in. To do so, we need roughly 28,000 cubic yards of fill material.

We are looking at the capping of this barge canal in really two different layers. The bottom layer is what we call the base fill layer; roughly six feet thick. We need some sort of fill materials to fill that. On the top two feet is your actual marsh mud organic matrix that will be used to plant new growth, support tidal feedlings and to hold that cap for a lifetime.

At the present time, what we are proposing to do is use onsite fill source for that bottom six-foot layer. As I mentioned, as a result of Ashepoo's Phosphate operation in this area, this thin strip of upland is impacted with lead above our cleanup goal, okay. It has some relatively high levels of lead. We did some leaching testing on this lead to find out is it hazardous waste or is it non-hazardous waste. The leaching testing is specified in the regulations.

We also went a little bit beyond this, and we actually took some Ashley River water, all right, and collected a representative sample of that material on this thin strip of upland right here and shook that for 18 hours and then analyzed the

resultant water to see if this material would leach at concentrations that would potentially impact the surrounding environment; the ecology in this instance.

What we found, no, it does not. And it was important to know the test we conducted was for actual open water disposal. The test we conducted, hypothetically, we dig up this material. We take it out of Charleston, if you were allowed to do it and dispose of that pile of lead contaminants in the sediments, really soil in this case, and is it going to reach a concentration that is going to impact ecological receptors.

We are actually going one step further. We are not talking about open water disposal. We are talking about confined disposal of lead. We are going to dispose of it in there, cap it with two feet of clean marsh mud and then monitor it over a thirty-year period to make sure it does not impact this stuff. We believe that confined disposal is very prudent technology that is utilized in all coastal areas.

The Corps of Engineers uses this for dredge disposal of soil material for impact sediments classified as waste. It's very proven technology.

We believe it will work here. That's our proposed remedy for the barge canal.

I kind of jumped ahead and got into lead impacted. We are really killing two birds with one stone in this aspect; not only recovering potential impacted sediments, we're also removing potential exposure to lead soils and also dealing with those soils in a manner that buy us some cost effectiveness.

The alternative is to take this lead or deal with this lead, take it off-site for $200 a ton, for upwards of $8 million and manage it in a way that does not impact the environment. Again, we really kill two birds with one stone.

In the tidal marshes, we are talking about excavation in two tidal marshes followed by capping. In the north tidal marsh up on Hagood Avenue, north of Hagood Avenue, this area of Rosemont subdivision, we have about 1,000 linear feet of that tidal creek that's impacted and has demonstrated toxicity. Roughly, putting it all together, about a quarter of an acre of sediments, 1,000 feet. Dig it up, take it off-site and revegetate, reestablish it as a functional tidal marsh.

In the south tidal marsh, very similar;

little bigger on the excavation. This is the south tidal marsh. The contaminants are really comingled. We have some pH that we feel are attributable to Koppers operation. More importantly, we have lead up to 50,000 ppm. That's pretty high.

What we are proposing to do is excavate an acre and a half; 1.5 acres. This is this general area here. This is the area of demonstrated toxicity. Again, meeting our objective to remove that toxic sediment from the area it's on, after we excavate that material, we are then going to come back in with a foot layer of cap and reestablish it as a functional tidal marsh again.

The other general area of this site, some of this other area of the marsh that demonstrated a potential for unacceptable risk posed to the ecological receptors, since we didn't have demonstrated toxicity, we don't necessarily want to remove that material and maybe create a situation where the cure is worse than the disease.

We do want to try to enhance that degradation of those, contaminates by in-situ or bioremediation. That is going out there with capsules of nutrients, implant them in the tidal marsh. Over time, these capsules release nutrients,

enhance degradation of pH and also for lead as well and take care of those contaminants in that way.

I failed to mention while I had this slide up, in-situ bioremediation in the northwest tidal marsh of this section has also been highlighted as an area of potential concern. Again, no potential toxicity. We want to enhance the natural degradation by in-situ bloremediation. This area here shows you generally the Ashley River and proposed enhanced sedimentation alternatives.

Let me conclude that by the sediment alternatives, we are talking about on the order of $3.25 million. Again, that includes enhanced sedimentation in the Ashley, capping in the barge canal and then dredging and off-site disposal, in-situ bioremediation in the north, south and northwest tidal marshes.

I still got ahead of myself and talked to you about the lead impacted soil. I will back up just a quick second. I mentioned that we have some lead onsite. As a result, we believe not as a result of past Koppers operation but as operations by the Ashepoo Phosphate/Fertilizer Works, we have developed a cleanup goal for that lead of 1,150 parts per million.

It's an interesting dilemma. The EPA has established interim screening levels for residential soil levels of 400 ppm. Right now the EPA does not have an official policy on lead cleanup for expected industry land use. We have tabled that problem at the present time.

We've developed an equation that would protect the developing fetus of a pregnant woman onsite. Say what we assume at this point in time a pregnant woman may be working onsite. In the future, we want to protect the developing fetus which would be a sensitive receptor in this instance.

The model that we have calculated, blood lead levels in the developing fetus is not to exceed ten micrograms per decimeter. It looks at potential absorption and what have you. We are proposing any lead contained in soil that is above 1,150 parts per million, we are going to take that material, use that as an onsite fill use in the barge canal reconstruction project. That not only eliminates potential to the future onsite worker, we also get a very clean and effective onsite fill source for use in the barge site construction.

As I mentioned, the test allows us to sample the soil, and it's not classified as hazardous

waste. The tests we have done suggests it will not leach at levels that impact the environment. That's really the nuts and bolts of that lead soil alternative.

Two things here on that lead soil alternative we are proposing for disposal. We're looking at three alternatives. We looked at capping soil concentrates greater than 1,150 and,also confined disposal.

There are two key concerns we need to be keyed into. There is a short-term issue and long-term. Short-term issue, while we construct this barge canal and cap these sediments, we need to make sure that we don't impact the Ashley River or any neighboring tidal marshes during that construction project. We feel that can be handled by engineering control and maybe even sheet pile to help us out in that aspect.

And there is also the long-term concerns as far as long-term leachates. We are going to do some additional leachate tests that will not impact the 2.3 acres on top of the barge canal. If it does, we believe and we will construct a disposal facility that will be adequately protective. That may include additional capping. It may include some clay layers.

There are some engineering alternatives there to take care of that problem. That is our part of the design issue that we will address appropriately.

In conclusion, I have done a lot of talking. I've really scanned over this. I know you have some questions. I hope you do anyhow.

This is a table that I just pulled from the proposed plan that kind of summarizes it up. What we are talking about doing here, we are looking at about, $11.75 million of cleanup split up into four general areas; soil and drainage ditch sediments; talking about the off-site or the excavation of 12,000 tons of soil; reconstruction of about three quarters of a mile of drainage ditches and then the additional capping, the replacement of 24.5-acre tract over mildly impacted material.

Groundwater and NAPL, we are looking at three objectives in the source areas. The three objectives are removal to maximum practical containment of those source areas and then potential restoration of the containments in those areas via extraction well containment and possibility of additional extraction wells if needed and maybe even in-situ vertical insertion wells; $4 million.

With the sediments, we're proposing

enhanced sedimentation, $541,000; and barge canal subaqueous capping, 880,000. And then in the tidal marshes, talking about dredging, capping and off-site disposal in the north and south tidal for a total of 1.75 acres and then in-situ bioremediation in both shores that had not demonstrated toxicity and also in the northwest tidal marsh.

And as far as lead impacted,soil, excavation of all soil over 1,140 ppm and disposal of that unit into the barge canal. That is all I have prepared at this point in time.

I do want to mention again and what is very important is your comments, and that is why we are here tonight. I really enjoy this part of the process. It's getting out and talking to the public and concerned citizens, consultants, engineering, whatever the case may be and to encourage other comments.

We are right in the middle of a 30-day public comment period which started April 3rd and it goes to May 2nd. I will notify all of you now that if somebody needs additional time, there are provisions to extend that comment period by 30 days. If anybody needs an additional 30 days, we will be happy to extend that kind of period if someone needs

it.

What we expect to do after the conclusion is take a good look at all the comments received. If comments are favorable or if there are comments that we feel we can address and talk with individuals and make sure those comments are adequately addressed and remedied, we will sign and document the final remedy selection in what we call a record of decision.

That record of decision will really outline the performance standard of EPAs selected remedy and will also include a responsive summary to all comments received at this public meeting and any written comments as well. We expect probably to finalize that decision in June or July of this year. It will be this summer or maybe early fall, but it will happen this year.

Following that we are going to continue, as I mentioned, with the interim remedial action of operations of that system. we expect to be finished with construction of the Hagood ditch by the end of May easily. We will continue to operate and eventually tie that system into groundwater remediation.

Following that, probably the first thing

as far as the EPA, you'll probably see excavation of soil begin immediately. We will probably talk about it with Beazer and see. We are kind of up against some pretty tight schedules regarding soil contamination and removal. If the company is willing, we might proceed. It depends how quickly we can get together with Beazer.

I will say EPA is going to endeavor to bring in some additional responsible parties as I mentioned, and we have some lead onsite we don't believe Beazer is responsible for. We are talking with that company now.

As I mentioned, we are working with them to address the ongoing source in the south tidal marsh, and we are probably going to implement this lead impacted soil remedy.

Again, the last note that I am going to make and, again, make one more point, public participation is encouraged. Superfund authorization is coming up. The public's participation is only going to get more involved in any reauthorization of Superfund. I couldn't be more enthused about that.

We don't live in Charleston. I would like to live in Charleston. You-all live here, and you-all need to be comfortable with what we are

proposing to do. If it doesn't meet your expectation, I want to see if we can't modify our plans or address your concerns appropriately.

With that, I am going to stop talking here for a little bit and get a drink of water. I want to give Ms. Shannon Craig who is with Beazer and has worked with us for the last four years and give her a minute to share her concerns or support, whatever it may be, of this remedy. With that, Shannon.

MS. CRAIG: Thanks, Craig. I am only going to take a few minutes. I'm sure you'll be glad to hear that. This was a great presentation and very informative. I just wanted an opportunity to be back with you again.

This is the third public meeting I have attended as the environmental manager for Beazer. I work for Beazer. Our offices are in Pittsburgh. I have been coming to Charleston quite a bit, actually since I have been involved with the site since 1990.

We are glad to be at this point in the circle of process. We are happy that the investigation and the studies are finished. It's time to move forward with implementing EPA plans and tying it in with the interim remedial actions that

have already started.

Once remediation is done, we hope to, we plan to turn the property that we own now into a productive industrial use and hoping to be able to increase the tax base with the City of Charleston, hoping to create jobs for the citizens of Charleston and of course some return on this to help us pay for what we have had to spend for remediation.

It's to all of our advantage to move forward in a timely manner. I just wanted to come up and say we are in support of EPAs plans. We feel it's protective of both the public health and environment. I look forward to getting back here with you. Thank you.

MR. ZELLER: With that, we are at the Q and A process here, the Q and A position of our proposal. Again, I think I am pretty familiar with all the aspects of this site. I would be happy to handle any questions, if you would like to ask any. There are various state representatives here. Any questions of state employees, feel free.

Again, there are representatives of the company here. The table is now open and clear for any questions from anybody if you have any.

You guys are going to be that easy on

me?

MR. GOODWIN: Craig, could you comment a little bit on the points of dispute between the EPA and the state and cleanup levels and just what that means.

MR. ZELLER: Sure, be glad to. There is generally, I would say, three points of disagreement. Two of them pertain to soil and one of them pertains to groundwater. I will handle the easy one first.

The good news on the groundwater is that EPA and the State of South Carolina agree on the objectives. And I don't want to speak on behalf of my DHEC counterparts, I will try and be accurate in my summary. If I misspeak, please feel free to speak up.

We do agree on the three objectives. We agree on three source areas. We agree those three source areas and that the objectives of those, the remediation in the area should be removal of NAPL to the maximum practical containment and then restoration of aqueous containment.

I believe it's fair to say the state does not believe from the data that is currently, available on the hydrogeological characteristics of the aquifer, the number of wells that we have

currently proposed will be sufficient to meet those objectives.

They're talking about it's not aggressive enough. And we have kind of tabled that dispute to say they may be correct, but what we would like to do is start with the number of wells we have proposed at this time.

And if those do not meet the objectives based on the period review process with DHEC and everybody else involved, if we are not meeting those objectives with the approach on the table now, we have committed to install additional wells if need be and maybe possibly install or adoption of in-situ technology.

It's just kind of a different philosophy really. We would like to start slow. We want to incorporate more of an interim phase and then scale up. That's actually pretty -- again, we agree on the end result. We don't necessarily agree on the tidbits and details in between. We do agree on the end result.

The two other issues are fairly more substantive; one is more of an excavation number and overall protective issue; generally summed up, how clean is clean argument. If I can find the

appropriate slide. I guess, really, the second issue of dispute is over the excavation number.

As I mentioned, EPA is proposing to excavate soil based on concentrations that will give us 12,000 tons of soil. DHEC has proposed a more conservative or more protective cleanup goal of 39,000 tons, which triples the tonnage involved. And there is also a disagreement over how I guess the overall size of the cap is. We are at 24.5 acres capped. The state would prefer 30 acres.

The big difference you might guess is over the actual excavation number. We basically triple the tons involved. And we will be saving a substantial amount of money based on the data that we have. We are adequately being protected with 12,000 tons and the cap of 24.5 acres.

As I mentioned, the big problem that we have there is really what we believe to be a statutory thing. If you look at the residual risk number and what the potential risk would be posed to a future onsite worker, if you excavate 12,000 tons, you are right smack dab in the middle of our range.

We could, by law, select 12,000. We are being adequately protective of the human element in the environment. We want to push that to the more

1 protective end of the risk and cap 24.5 acres. It's
2 our contention -- DHEC disputes this. They are
3 preserving their rights -- the excavation of 39,000
4 tons and then the cap of 31 acres actually takes us
5 outside the risk range. DHEC disagrees with that.
6 We respect that disagreement. That's
7 why we feel a 30-acre cap goes outside the risk
8 range. We don't believe we have the authority to
9 require cleanup to that level.
10 The third and last issue really of
11 disagreement is over lead contaminated soil. It's
12 over a cleanup goal issue. Again, how clean is clean
13 argument. The model that I mentioned earlier that
14 assumes a pregnant woman working onsite, and there is
15 absorption, ingestion or absorption on skin,
16 potential impact on the fetus, looks at a bunch of
17 input. It's a model that looks at congestion rate
18 and days exposure and the big number is overall
19 absorption.
20 There are absorption factors that we are
21 proposing; 12 percent absorption. We believe that 12
22 percent is adequate. There's basic disagreement with
23 the model. We are proposing 1,150 ppm. DHEC is
24 proposing 630.
25 The large disagreement with absorption,

we are going with 12 percent and the state is preferring 16 percent. Basically, that difference in number equates end results to about 600 ppm difference. That's it basically. That's the three issues.

MR. HAYNES: That's pretty accurate.

MR. ZELLER: A side issue; I am using their number of 630. You might imagine the volume of soil is tremendously different; basically doubled for sake of conversation. All of that soil would not be able to be put into the barge confinement. DHEC is looking to put-some of the material in the barge canal and the remainder they're proposing off-site disposal for that.

MS. MIRECKI: Where would that be if you had wells?

UNIDENTIFIED VOICE: Repeat that.

MS. MIRECKI: Where would that be?

MR. HAYNES: Let me introduce myself. My name is Richard Haynes. I am the state project manager; counter equivalent to Craig. For additional wells, we would agree on the areas of groundwater remediation. We would increase the number of wells up front in the same three areas.

MR. GOODWIN: In all three?

MS. MIRECKI: Would these be necessary wells? You probably have it pretty deep in this area.

MR. HAYNES: We don't think that we have a lot of NAPL sitting lower than intermittent level. We have intermediate clay across the site fairly consistent. We had two wells on top that are all pretty clean, very clean. Levels are above that. It's pretty non-detectable. We feel like the intermediate clay is holding it down presently. There is some disagreement on the extent of what is in the intermediate clay area.

MR. ZELLER: It's a long process. We eventually have -- we took about four months, to be honest with you, and had some pretty high level meetings with our state counterparts. We were hoping to get on with this proposal in December, try to beat the Christmas rush. We have closed the gap considerably from where we were at six months ago. We haven't been able to get all the way there. I guess that's all I can say.

As far as reiterating what Richard said, intermediate clay layer immediately above the water on top of the Koppers land appears to be very competent, about ten feet thick; have not detected

any NAPL, not any contamination.

MS. MIRECKI: How about PCP or arsenic?

MR. ZELLER: No. The big issue in groundwater is really Creosote or NAPL, whatever you want.

MS. MIRECKI: PCP is going to come from Creosote.

MR. ZELLER: Creosote is polynuclear aromatic hydrocarbons. PCP is a separate wood preservative, I guess, stored in separate vessels, treated in a separate pressure vessel as well, and it was entirely different than wood preservatives. It's more of an insecticide. And we do have PCPs in the groundwater, but the big problem driving most of this groundwater remediation is presence of Creosote; in this case, Creosote. We have oil in some places. I call it oil. It looks like oil.

MR. CHISOLM: I have a community concern. I thought the ditches that you dig, there is notification of the community on both sides. Also, there's a small community on the other side which is Silver Hill.

I want to know -- I don't think the, community got involved when Beazer were in there. We were not notified what was going on. Within the

community, we don't understand what was going on in the community. We want to know why people not notified and leaving us blind to the situation, getting ourselves exposed to anything.

We would like to know how our community can be notified if we need to be decontaminated; kids playing in the dirt and close to the park.

And I notice when Beazer was there, they put down some test ditches that they are digging on the other side behind the power company. I want to know whether it's taken care of.

MR. ZELLER: Do you live there?

MR. CHISOLM: In Rosemont.

MR. ZELLER: We are glad you are here. I apologize we haven't been able to get to interested citizens. Mr. Goodwin was hired as technical assistance adviser for the community, tried to reach out and keep your people informed. We've spoken pretty continually with Mel and tried to keep you-all informed. That's a fairly tough task. We talked yesterday particularly when we were actually starting onsite physical construction, for instance, the ditch would be halfway excavated. We can understand your concerns. We, I guess, had been telling people that had been coming to these

meetings, expect to see some excavation pretty soon.

I guess maybe the brutal reality in the digging up, there may be concerns over potential exposure. I can understand. We will do everything we can in the future and make sure y'all are informed of actual physical construction. Glad you are here tonight. You can help me by talking to your neighbors and spreading the word. Hey, the EPA or Beazer construction are digging up this ditch.

I hope you now know, in the next wave, we'll probably dig up Hagood Avenue and finish that construction. We've got that orange construction fence up there. I know it's not real desirable with the ditch being open. I know we got to get over that short-term thing. It's been there a long time, longer than anybody wants it.

We're trying to make something a little bit better. Everybody has to exercise patience in the next couple of weeks. You will see once that excavation is done we are actually going to place -- concrete is going to be poured in place.

MR. CHISOLM: I understand that clearly too. There is a small family planting a garden, just off of that slope. I don't think they know the condition that they are getting themselves involved

in. We need to know what is going on. You can talk to a small group, but you got to get to the master ones. Some of the people that are shut in, really doesn't know. I didn't know what was going on.

I understand Beazer was there in 1990 or 1992 and was testing the ground and digging holes. We didn't know anything about it.

MR. ZELLER: Let me ask you a question. That's a very valid concern. I can definitely see where you are coming from.

There is going to be a lot of work in the next couple of years. Regarding Rosemont, the closest it's going to get to you, beside what is going on now, is the excavation of that north side tidal marsh; this area. This is probably a few years away, probably two years, a good year anyhow.

As you know, this is Rosemont, the area I think you are talking about, the garden right back in this area. This is Hagood Avenue here. This is going to be very close to citizens.

How would you suggest or recommend that we, in the upcoming activities, how do you want to be notified? Door to door? Do you want mailers? We will be glad to do anything that we can. Believe me, one of the frustrating things on our side is to know

what is effective. We really want to keep you informed. What works?

MR. CHISOLM: I think mailing would be the best thing. That way it can get to everyone and still get the information around.

MR. ZELLER: Very good. Something very simple like a paragraph or two?

MR. CHISOLM: Yes.

MR. ZELLER: Very good suggestion.

MR. GOODWIN: I want to reiterate the suggestion we were discussing yesterday as much as possible and give the community advance notice of when specific things are going to be done on the site. If we know that, it's a lot easier to communicate within the four-mile group of people and with the people that are sort of developing some of the out-reach materials.

MR. ZELLER: Good. Again, very good point. We'll try to do followup on that. Let me ask you a question. Would it be fair to say that the neighborhood we want to target mailings would be Rosemont, four miles and Silver Hill?

MR. CHISOLM: Right.

MR. ZELLER: Would that be an inclusive list?

MR. CHISOLM: Yes.

MR. ZELLER: Easily accomplished. I can see people walking door to door stuffing things in the mail boxes.

MS. MIRECKI: I don't see that as being feasible. If you mailed something from a company I never had any dealings with, I throw it in the trash. I don't think mailing is the answer. What he said about the shut-in people or elderly looking at something from EPA, even if it has rules on it, they are not going to read it.

MR. ZELLER: You wouldn't call it junk mail.

MR. GOODWIN: From a neighborhood association.

MR. CHISOLM: A combination.

MR. DUBOIS: I think if you do your part, mail it, you've done your part. If I throw it away, that's my business. If you do your part and mail it and get to the residents, it's up to me to read it.

MS. PEURIFOY: Most of Rosemont is on our mailing list. We went door to door and took all the addresses down. The problem we have, we mail things out, so many come back. I got a stack of fact

sheets we got back. Maybe we can work with a tag group and come up with a better way of getting that information.

MR. CHISOLM: I didn't receive anything.

MR. ZELLER: Did you sign our list today coming in?

MR. CHISOLM: Yes.

MR. ZELLER: We will definitely continue mailing.

MR. CHISOLM: I was watching this operation ever since 1992 when they had data between residents and give us the Superfund EPA. That was the worst site that they found. I called Beazer many years ago trying to get some information. They said they were just in the middle of testing something; never got anything back from Beazer.

MR. ZELLER: Never got anything back?

MR. CHISOLM: I spoke to one of the technicians onsite and never got anything.

MR. ZELLER: Monitoring wells you are talking about?

MR. CHISOLM: Right.

MR. ZELLER: Those monitoring wells are in the corner of the marsh right about here. There are two monitoring wells. The area we are concerned

with is the area impacted which is the tidal marsh, basic tidal creek.

MR. CHISOLM: It had runoff in it.

MR. ZELLER: We have heard concerns about that garden. In fact, we looked at it yesterday. And do you know who owns that?

MR. CHISOLM: Yes.

MR. ZELLER: It's very possible you need to look at it for there to be a potential exposure. Sure, there needs to be first a potential transport pathway and how are Creosote or how are contaminants in general going to get into that garden.

We can take a look at it and possibly, if it looks like there is a potential for concern, we have a field component, we could look with our laboratory and probably pull a couple samples. That way, allay their fears.

MR. CHISOLM: I think you might not be aware.

MR. ZELLER: Is that your garden?

MR. CHISOLM: No, not my garden.

MR. ZELLER: Have they expressed concerns?

MR. CHISOLM: If you don't know what you are doing, you continue to do it, apparently they

might not know.

MR. GOODWIN: Do you test the things that grow in the garden when they are eventually produced?

MR. ZELLER: PAH are not bio-degradable. We would be happy to take a look. I wouldn't mind going and taking a look, see if there is a potential for contaminant transport.

MR. GOODWIN: And metals.

MR. ZELLER: First thing before we dig it up, we want to look more at the soil and see if we have something. We need to hear those concerns and do our best to see if we can address it to your satisfaction.

MS. MIRECKI: You mentioned a bioremediation for the lead in the south marsh.

Are you at liberty to elaborate to say what that remediation amount is?

MR. ZELLER: Shannon, you want to address that? There is a firm out of Gulf Bridge, Florida that is working on not only the PAH but also working on some plants that uptake inorganics. Then you harvest the plants. That's generally --

MS. MIRECKI: Bioremediation.

MR. ZELLER: That's generally what we

are talking about. Admittedly, it's very innovative. A lot of technology is tried and true that works about everytime and gives you guaranteed. Then you got that stuff that shows promise and needs study, needs case study. It needs a Koppers or some other site. We should go out and see if it works.

We are not making any rash promises this is going to be the silver bullet that takes care of everybody's contamination problem. You need to take some educated risks every now and then.

The in-situ vertical circulation cells in the groundwater, I think it's probably emerging past innovative and looking fairly widespread. Beazer used it in quite a few sites. Lots of other companies got some tremendous advantages. Most notable, you don't have to treat groundwater. It's just reinjected; accomplishes the same thing without treatment.

It has limitations as far as what contaminants it's going to work for. You need to test it out. That is as far as the lead goes, inorganics; basically, taking it up.

MS. STAFFORD: Would you please explain enhanced sedimentation, driving the piles into the edge.

MR. ZELLER: Sure. Let me see how to explain this differently than I have already. You have seen the marshes. You have seen these snow fences that have slats. And as the sand blows, it actually catches that sand and holds it in place. We are going to try and construct a fence using piles; the same thing.

We are going to have probably -- if you look at this diagram here, again, the spacing is to be determined, but these things are probably going to be as close as a foot apart. And the water in the Ashley has very fine particles that, if you got a glass of Ashley River and held it up, it would be mud. Engineers and aquatic chemists call that total suspended solids, very fine particles. Okay.

If you allow that glass of Ashley River water to sit for, say, a couple hours might do it, and you came back the next day or whatever and looked, I would bet you would have about that much sediment, and on the top you are going to have water that's going to be relatively clear.

We are going to do the same thing with this fence. Instead of a long fence that they use in sand dunes, our fence is going to be piles. We are going to do the same thing. These piles are going to

decrease the water velocity.

Very similar to, if you pick up a glass of water, the velocity, if you didn't shake it, is going to be zero. As that velocity drops, the particles fall out. Same theory in this enhanced sedimentation; decrease the water velocity. As the water velocity decreases, the sediment that is actually naturally suspended is going to fall out.

And based on some of the discussions and evaluation reports that we have looked at locally, as well as some reports from scientists that have helped us in Mississippi, have said that this does work. it has never to our knowledge or to my knowledge been done for covering of contaminated sediments. It has more widespread use, as I mentioned, to stop erosion and to hold on to some upland area that may be falling into a highly erosive river or something. Does that help you?

MR. DUBOIS: My mind actually traveled to the same place. You don't know this is going to work, and you are going to try something new. Why are you going to try something new instead of something that has worked somewhere else?

MR. ZELLER: Well, it has worked. All right.

MR. DUBOIS: You said it wasn't used for contaminants.

MR. ZELLER: It hasn't been used for contaminants. Its direct correlation is direct application. It has been used where, if you have an erosive environment, sediments very quickly erode away. This is being used to enhance or to stop that erosive nature in a very similar way you would pull up a snow fence to stop sand dunes from eroding.

Y'all know you need sand dunes to protect from beach or wave erosion. Same theory; except in this case, instead of clean sediments being eroded away in the Ashley River, we actually have impacted that. We would like to contain them in place and not go anywhere. Okay.

At Wigley Point, the Corps has used this for reclamation purposes; to reclaim land that was being eroded away. It has worked very quickly in a matter of couple years. They had marsh grass coming up through this stuff. Okay.

We are trying to get the best of both worlds, to be honest. We believe it's going to work. Okay. If it does not work and we are wrong and we can't get something, we can't modify the design to get the rate of deposition that we feel we need then,

yes, we will go back to the old tried and true method and likely come back in with a sand blanket, if it's necessary. Okay.

We don't believe that we are going to have to do that sand blanket after the fact. I believe on the data we have, there is enough data to proceed and give this thing a shot.

We honestly wouldn't be sitting here telling you that this is some magic bullet. We don't know. We do take educated risks. We have to do that to be on the front edge of science, but we try to make educated risks that are not going to end up making a bad situation worse. We don't think that is the case. We honestly believe this is going to work.

MR. DUBOIS: What are the signs that you know it's not going to work?

MR. ZELLER: Very good question. We are continuing to monitor batch surveys. That's nothing more than take a depth finder, get a presituation, get our piles in place, take a sounding along this 1,500-foot part of the river and determine the elevation.

What you would do, survey the water, Say the level is at five feet today. We have sediments at this point that is 15 feet below water

surface. You establish elevation of that sediment. Then you come back in and we determine what the period of monitoring will be; monthly, probably not bi-annual; maybe yearly most definitely.

We will come back in and say a year later and denote how far below the water table or the surface of water the sediment is. If it's now a foot higher than it once was, we know this thing is working; that we are getting sediments.

If it's three feet lower than it once was, oh, no, we have recreated an erosion environment; things aren't working. We don't think that is going to happen. I'm just showing you an example.

We will be able with surveys to determine if we are getting accumulation, status quo or erosion. There's a proposal to do aerial surveys. We will get something that allows us to, in real time, determine if this thing is adequately covering up that sediment.

What we hope to do is get at least a foot cap that we put out there; at least a foot thick, maybe 18 inches thick. We hope over a short period of time, and we are told that it does work, that sooner or later what would be to me a very

desired feature five years from now, would be that portion of the Ashley River out to the channel has had so much sediment that the dynamics have changed and that now you went from a subtle environment, inundated water to marsh 1,500 feet long.

You will be surprised how quickly sediment quickly accumulates in there, how quickly renegades of spot tide end up resurfacing. It has promise. We're very hopeful. Again, if we're wrong and we miscalculated, we will fix it. That's going to be guaranteed. That's going to be written.

MR. GOODWIN: Two questions. Do you plan to test the deposits of the sediments for contaminants?

MR. ZELLER: Sure. We expect that the sediments are going to club.

MR. GOODWIN: Since we don't know where the sediment is coming from or if the potential contaminants are going to be arrested, at that point, it might be a prudent thing to do.

MR. ZELLER: I agree.

MR. GOODWIN: The other question, is there any possibility of doing this on a pilot scale before you drive 800 pilings into it?

MR. ZELLER: I think a pilot scale

would be probably having an evaluation of lessons learned from other projects.

MR. GOODWIN: The only question I have, those similar projects have to be very similar geologically in terms of profile, water transport, sediment origin. I haven't seen anything. Maybe you know of some things that aren't reported.

I don't think we know right now very much about the current sedimentation rates or origins, and I don't know if you know the influence of a river that's not flowing one way.

Plus the other thing that counterbalances it is that it's an active shipping area. We have things churning up the water that may affect sediment. That's why it's a little problematic what has happened.

MR. ZELLER: I see where you are going. A pilot study is going to take time. This thing is going to take time. This is not going to be a six-month deal, boom, you got sediment. A pilot study is going to take time.

I think we'd probably like to jump right in and try this thing as opposed to the alternatives, which are dredging and some very costly material handling dilemmas, which $541,000 sounds like a lot

of money to you, and it is a lot of money. In relative comparison to what could be $19 million for dredging, $541,000 is a blue light special.

And we believe, sure, that cost is important. We predict it's equally as effective if you can take care of the problem more cost effectively, cheaper, same degree of protectiveness. That's an easy one. That's win-win for everybody involved.

That's my major concern about the pilot study. If we have to do a pilot study for two years, it might cost us as much. If you are concerned how it would perform in the Ashley, maybe it would be beneficial to look at the pilot plan we had in place for 30 years; this old dilapidated dock of the Ashepoo Phosphate. It might be beneficial to see if those piles worked. They are still sitting there. They are pretty tight. We were out there yesterday. I wonder if we got sedimentation around those.

MR. GOODWIN: I wonder.

MR. ZELLER: I wonder.

MR. GOODWIN: Interesting model.

MR. ZELLER: There is your pilot. They have been there. I would hope to see a nice little mound. We can take a look at it. As far as pilot

scale, I would rather just get right into it and get the clock ticking, get those piles, get the fence in place and see.

What is real slick about this, you can see where the piles are going to extend out. It's going to be a real great transition here. This is going to be reconstructed into tidal marsh; real nice transition.

We are going to create five additional tidal marshes as a result of remediation that's a functional habitat; more productive than it is currently. Understand what I am saying7

MR. GOODWIN: What is the depth where the piles are going to be driven?

MR. ZELLER: The profile in that river is amazing. The width varies. I say it's 100 feet -- the number escape me. The first 100 feet, the slope is very gentle. It kind of drops off fairly moderately. Then it drops to 30 feet, like that, in a matter of ten feet.

That's a formerly dredged channel. It's no longer dredged. They consider it an active project. It's staying open for them is what the deal is. That channel is not sitting in rapidly enough moving traffic for them to dredge.

Also, we talked about it, and it's not an active shipping channel because of some of the bridges that are there. It is highly used for recreational purposes; lots of ski boats.

UNIDENTIFIED VOICE: Does the environmental reuse of this site involve dock access?

MR. ZELLER: For instance, Tommy Parker has not expressed a desire to leave. He wants me to leave. But Parker runs a marine service business right here, and he constructed a new dock just last summer. And he put in a couple hundred piles himself, and so I think Tommy is there for the long run.

Beazer now owns what used to be Braswell shipyard, and they have that dry dock. And Beazer, I think, is looking at some subsidiary business and maybe even leasing. Braswell is involved with them in some discussion and legal battles, trying to get to use the old shipyard. Finally, they got approved for the shipyard and use of one of their docks.

Braswell has been leasing this property from Beazer on a year by year basis, trying to get that settled. I believe that has been settled. I believe Braswell is going to leave within a year. At that point in time, it's Beazer's property.

Now, dock access is key. We want to maintain and allow the current owners to have access to the dock. That's another added feature to enhance sedimentation. It doesn't mess with the existing land use. Dredging around there would be a technical challenge, to say the least, as you can well imagine.

MS. GESS: On page 15 of your fact sheet, it says South Carolina DHEC does not feel that EPAs residual risk methodology gives an appropriate representation of the actual risks that would remain. What is the remaining?

MR. HAYNES: It's primarily how EPA calculates that approach. That was an unusual method in developing how they calculated those risks. Our concerns are that the residual risk looks at 100 acres of the whole, and there are portions of the site under EPAs proposed plan that will have levels of contamination significant for what we would call cleanup. If you break the site down into small portions or parcels, there will be areas still left that have excavation cleanup. That's our concern.

MS. GESS: Thank you.

MR. ZELLER: I guess we would respond to that and I believe we have, when we are done as far as capping goes, we are going to cap everything

that is greater than two parts per million which is Creosote, which we feel that's adequate.

UNIDENTIFIED VOICE: How is that capping going to affect the land use in there? Is any of that going to be useable, or is that going to be a site that can't be used?

MR. ZELLER: That's our full intent. That's why we are going with crush stone cap. Our full intention is to return this property to future industrial use. There is currently industry operating there. They have been operating through the whole investigation.

It's going to be a challenge, as you might expect, during excavation on some of these people. It's going to be a short-term disruption for some people. We can work around that. Our intent is to return that to future industrial quickly as possible.

And Beazer has pretty much -- they have owned a large chunk of that. They are pretty much in control. What they want to do with it, I think there is a commitment definitely from what I understand to return that to whatever the case may be.

As far as future use, I don't know what they have in mind. It's going to be very consistent

with what the current use is. We don't see condos going in there for instance. It will be future industrial. That's how it's zoned in the Charleston city plans.

That's why we have selected this particular scenario. That Braswell property is excellent. As long as you are not out there eating soil and rubbing that stuff all over your hair and skin and everything else, there is no risk.

When we are done with this remedy and with the cap installed and excavation of hot spots is completed, it will be protected to anybody's standards. Anybody else?

MR. GOODWIN: Just two more. Under the alternative for the groundwater, what containments are involved there?

MR. ZELLER: Containment? You mean as far as containment is going to be achieved via extraction wells?

MR. GOODWIN: Extraction wells are the containment?

MR. ZELLER: Yes, they are the containment.

MR. GOODWIN: Last one; do we know anything about the pH of surface or subsurface runoff

in the area of the contamination? Is that former acid treatment area affecting the pH of the runoff to an extent it would mobilize any of that lead that might end up in the barge canal?

MR. ZELLER: We took local water, Ashley water. We took water from the barge canal --

MR. GOODWIN: I was thinking more about the water that comes into the barge canal by surface water or subsurface runoff.

MR. ZELLER: What is coming in the area is -- let me get a map here.

The ditch that we are having a problem with where the low pH was, where we are having a problem with this is Ashepoo. The large portion of this, they are bagging and mixing granulation. Everything that is under here is what is from bagging granulation; not real clean; real dusty, not really resulting in decontamination.

The nasty part is this acid chamber. They manufactured acid using pretty complex chemistry. They stored that in lead-lined vats. Okay. And I have been told by this company, at the time they had to clean the vats, they cleaned the acid in the soil.

The pH condition that we are concerned

about that is under two standard units is in this ditch. It's not obvious in this picture. There is drainage that continues to dump in the south tidal marsh. The PH condition we are concerned about moving on right now is in this general area.

See this little access road? That's the old Ashley dock. That's where the majority of levels over 1,150 and the PH is in that area. You can see how they are basically two different areas. As far as the PH coming into the barge canal runoff, coming in from this surface ditch and the PH is basic -- not basic -- it's neutral. I want to say it's 12.

That's a very good concern that we can address in the leaching of this; in looking at the long-term leaching and confined disposal facility. We are going to have to look at what the expected pH and water chemistry of the Ashley and barge canal is, and we will take that into consideration.

The last thing, believe me, we want to do is recontaminate or impact marsh that we just spent $1 million to clean.

MR. ROGERS: You might want to look at pH levels to try to solve that.

MR. ZELLER: What Ian mentioned, we

have non-time critical removal, which is a mini cleanup. That action is going to focus on the former acid chamber area. It's going to look at delineating potential impacts in the groundwater, delineating any level of lead and arsenic in the soil itself and also delineating low pH levels in the groundwater and the possible solution of buffering or somehow a basic solution of some sort trying to get that, down to neutral.

I honestly believe that's what is going on. Low acid or low pH are what mobilizes lead. Otherwise, that lead is fairy immobile. When you hit it with doses of acid, it's a completely different situation. Anybody else?

Thank you very much for staying around. Please feel free to give me a call if there are any other questions. Appreciate your attendance. Thank you for sticking with us that first 15 minutes when we didn't have an overhead. Thanks for the good questions. Appreciate it.

(Thereupon, the meeting was concluded.)

CERTIFICATE OF REPORTER

I, Lora L. McDaniel, Registered Professional Reporter and Notary Public for the State of South Carolina at Large, do hereby certify that the foregoing transcript is a true, accurate and complete record.

I further certify that I am neither related to nor counsel for any party to the cause pending or interested in the events thereof.

APRIL 29, 1997

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I N D E X

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COLLOQUY

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ATTACHMENT 2

WRITTEN COMMENTS RECEIVED DURING FORMAL COMMENT PERIOD

<IMG SRC 98102WT>

Bureau of Ocean and Coastal Resource Management
Christopher L. Brooks, Bureau Chief

April 10, 1997

Mr. Craig R. Zeller
Remedial Project Manager
U.S. Environmental Protection Agency- Region IV
Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, Ga. 30303

Re: Koppers Superfund Project
Charleston County

Dear Mr. Zeller:

The above referenced project appears to be a Federal Activity in the Coastal Zone of South Carolina. Because of the Federally approved Coastal Zone Management Plan for this area, you will need to comply with the Federal Consistency provisions of the Coastal Zone Management Act, as found in 15 CFR 930. Your Statement of Consistency should include a detailed description of the activity, its associated facilities, and their coastal zone effects, and comprehensive data and information sufficient to support the Federal agency's consistency statement (see 15 CFR 930.39).

Enclosed for your convenience is a copy of 15 CFR 930. If you have any information that would indicate that CERCLA activities are exempt from the Federal Consistency Provisions of the CZMA, please contact me.

<IMG SRC 98102WU>

cc: Christopher L. Brooks
H. Stephen Snyder
Richard A. Haynes

<IMG SRC 98102WV>

Bureau of Ocean and Coastal Resource Management
Christopher L. Brooks, Bureau Chief

April 10, 1997

Mr. Craig R. Zeller
Remedial Project Manager
U.S. Environmental Protection Agency- Region IV
Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, Ga. 30303

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15 CFR 930

Federal Consistency with Approved Coastal Management Programs

(1-1-94 edition)

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May 30, 1997

VIA FEDERAL EXPRESS

Mr. Craig Zeller
Remedial Project Manager
United States Environmental Protection Agency
Region IV
100 Alabama Street, S.W.
Atlanta, Georgia 30303

RE: Proposed Plan Fact Sheet, Koppers Company, Inc. (Charleston Plant) NPL Site

Dear Mr. Zeller:

Beazer East, Inc. ("Beazer") hereby submits these comments in response to the United States Environmental Protection Agency's ("EPA's" or the "Agency's") Proposed Plan Fact Sheet (the "Proposed Plan") for the Koppers Company, Inc. (Charleston Plant) NPL Site (the "Site"). In general, Beazer supports EPA's Proposed Plan and commends EPA's efforts to propose a remedy which, consistent with the primary goals of the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"), provides for the overall protection of human health and the environment, complies with applicable or relevant and appropriate requirements ("ARARs") and is cost-effective and technically practicable.

I. Introduction

To provide context for Beazer's comments, the following paragraphs summarize EPA's Proposed Plan and activities related to EPA's selection of its preferred alternative. In January 1993, Beazer agreed to perform a Remedial Investigation/Feasibility Study ("RI/FS") for the Site. EPA and the South Carolina Department of Health and Environmental Control ("SCDHEC") provided oversight on all work conducted during the RI/FS and commented on Beazer's RI and FS reports. EPA performed both a human health risk assessment and an ecological screening level risk assessment for the Site. Beazer, however, also performed a human health risk assessment on its own initiative which was submitted in October, 1994 and an ecological risk assessment which was submitted as part of the FS for the Site. In response to the potential risks calculated in EPA's Human Health Baseline Risk Assessment ("BRA") **1**, Beazer recommended that action be taken to address the presence of non-aqueous phase liquids ("NAPL") in the Hagood Avenue and Milford Street drainage ditches. Thereafter, EPA issued a Record of Decision for an Interim Action ("IRM ROD"). Beazer performed the work pursuant to a "friendly" unilateral order issued by EPA under º 9606 of CERCLA. Beazer is in the process of implementing the IRM ROD.

The Proposed Plan comprehensively addresses surface and subsurface soil, drainage ditch sediments, groundwater and NAPL, surface water, constituent transport pathways, and sediments of the Ashley River, Barge Canal, and North, South and Northwest Tidal Marshes. For the soil and drainage ditches, EPA has determined that soils which exceed the 5 x 10 -5 risk level will be excavated (i.e., soils exceeding 20 parts per million ("ppm") B(a)P-TE in surface soil and 275 ppm in subsurface soil). This will result in the removal of an estimated 12,000 tons of soil and ditch sediment. A cap to eliminate the dermal exposure and ingestion pathways will be placed over approximately 24.5 acres of remaining soil so that remaining potential risk is equal to 1.1 x 10 -6. The proposed alternative for NAPL and groundwater involves the installation of groundwater and NAPL extraction wells in the Northeast Corner, the Old Impoundment Area and the Former Treatment Area. A monitoring program will also be established to gauge the effectiveness of the system.

1 Beazer did not agree with the methods EPA used to calculate potential risk or the resultant levels of potential risk represented in the BRA.

EPA has selected enhanced sedimentation as the means to increase the natural sedimentation process in the Ashley River. For the Barge Canal, the proposed remediation will involve subaqueous capping using an estimated 28,000 cubic yards of fill. Designated areas within the North and South Tidal Marshes will be excavated and capped. The remaining soils in the South Tidal Marsh and the soils in the Northwest Marsh will be bioremediated in place. Lastly, EPA is proposing that lead-impacted soils located south of the Barge Canal at concentrations exceeding EPA's cleanup goal of 1,150 mg/kg will be excavated and utilized as a base fill layer for the capping of the Barge Canal. These soils, as discussed below, are not related to wood treating operations and are attributed by EPA to operations of the former Ashepoo Phosphate/Fertilizer Works, which was owned and operated by Conoco Inc. ("Conoco") and Agrico Chemical Company ("Agrico").

II. The Use of Innovative Approaches and Remedial Methodologies Is Consistent With the Goals of CERCLA

Section 105(a)(10) of CERCLA requires the evaluation of innovative technologies for inclusion as part of the remedy and EPA encourages the use of innovative technology. 55 Fed. Reg. 8714 (March 8, 1990). The Proposed Plan incorporates several innovative approaches and remedial methodologies. Beazer endorses these approaches and technologies as described below.

A. Enhanced Sedimentation

Enhanced sedimentation was selected over capping, or dredging and capping, in the Proposed Plan for the Ashley River. This remedial alternative provides the most cost-effective remedial solution to observed toxicity in the Ashley River sediments located adjacent to the Site. It also provides the same level of ecological risk reduction as the other alternatives evaluated while greatly reducing, if not eliminating, the short term risks of implementing the alternative. The other alternatives evaluated (capping, and dredging and capping) are less desirable in that they would completely eliminate one of the ecological environments (benthic habitat) that this remedy is designed to protect.

Recommendation:

Beazer supports the use of enhanced sedimentation and recommends that EPA include it as the Ashley River remedy in the ROD.

B. In-Situ Sediment Bioremediation

In-situ bioremediation was selected in the Proposed Plan for remediation of sediments that contain concentrations of constituents that were not found to be toxic to benthic organisms. This innovative technology increases the rate of natural processes that are expected to result in reduction of organic constituents of concern in tidal marsh sediments. This technology has been developed by industry in cooperation with the Navy at its experimental station in Pensacola, Florida. By proposing its use at this Site, EPA is furthering the development of this technique consistent with its goal of encouraging the use of innovative technologies. Beazer believes that such initiatives will allow the refinement and development of this and other in-situ technologies for addressing sediments here and around the country.

The Proposed Plan states that pilot testing of this approach would be needed to select and appropriate mix of nutrients and bacteria to optimize performance. Beazer would like to clarify that the pilot testing would consist of a bench scale test to select this mix and that on-Site pilot testing would not be performed. On-Site pilot testing would not be practical, because of the high cost of monitoring in comparison to the cost of implementing this remedy and the time associated with conducting a pilot test. It is more practical from both a time and cost standpoint to implement the remedy in all of the selected areas and then monitor the results.

Because in-situ sediment bioremediation is an emerging technology, the extent of constituent concentration reduction that may be achieved is unknown. The performance goal established, therefore, would be that Beazer would implement the technology and monitor the results. This

approach is appropriate because in-situ sediment bioremediation is being used in portions of the marsh where sediment toxicity to benthic organisms was not observed. Therefore, Beazer's goal is to improve the condition of the marshes. In areas of the marshes where toxicity to benthic organisms was observed, other methods of remediation were evaluated in the FS and other types of performance goals would be appropriate.

Recommendation:

Beazer recommends that EPA retain the use of this technology in the ROD.

C. Value Engineering

A value engineering analysis was performed to select the soil cleanup goal that maximizes the risk reduction per ton of soil remediated. Such an approach not only maximizes the cost-effectiveness of soil remediation, but also directs the soil remediation towards the areas where the maximum potential risk exists.

Recommendation:

Beazer recommends that EPA retain the soil cleanup goals calculated using the value engineering analysis.

D. In-Situ Wells

In-situ wells, which collect NAPL and either treat or enhance bioremediation of dissolved constituents, were included in the FS as an alternative to be evaluated along with traditional NAPL extraction alternatives. This emerging technology will reduce the NAPL collection costs while providing the same level of risk reduction as the other more traditional technologies included in the FS. Additionally, this technology was included in the FS as a contingent alternative should it be determined by monitoring that the dissolved phase plume is not contained by natural processes.

In addition to this use, Beazer requests that EPA provide flexibility in the ROD by allowing the use of this technology in place of the more traditional extraction well technology selected in the Proposed Plan. If pilot testing confirms that the in-situ technology can be applied at this Site, the cost of NAPL collection will be reduced because of the reduced water treatment cost.

Recommendations:

Beazer recommends that the ROD provide sufficient flexibility to allow the use of in-situ wells at the Site. Additionally, Beazer recommends that the use of in-situ wells be retained as a contingent alternative to be used if monitoring shows that the dissolved phase plume is not being contained by natural processes.

E. Performance Goals

As an initial matter, Beazer takes exception to EPA's use of the phrase "performance standards" in the Proposed Plan. Although EPA states that the groundwater treatment system will be operated and maintained to meet certain "treatment standards," Beazer believes that EPA's description of those "standards" is written as an expectation or "goal" rather than as strict standards. For example, the first "standard" to be achieved is the treatment or removal of NAPL to the extent practicable. Clearly, by its own terms, this "standard" recognizes that total NAPL removal may be impossible. Thus, it is more appropriately characterized as a goal. Because of the nature of the COPCs at the Site and the proposed use of innovative technologies, Beazer cannot be held to the attainment of strict standards which would require the use of alternate technologies should the standard ultimately be unattainable. Beazer cannot be expected to utilize innovative technologies without some assurance from EPA that once that technology is shown to be effective

through bench studies, EPA will accept the results of its implementation in the field, even if those results fall short of complete removal or treatment of the COPC.

Other performance goals have been identified by EPA in the Proposed Plan in place of specifying the details of the proposed remediation. For example, EPA has utilized the measurement of toxicity to benthic organisms as a cleanup goal instead of specifying a cleanup level for sediments in the Ashley River and tidal marshes. This performance goal provides an approach to remediating sediments which utilizes the organisms that EPA is protecting as the measure of the effectiveness of remediating marsh and river sediments. As a result, Beazer will have greater flexibility in implementing the ROD. As new information is developed during remedial activities, the approach to remediation can be adjusted within the scope of the ROD without the delay and administrative burden of formally amending the ROD. The use of performance goals will enable Beazer to efficiently and cost-effectively remediate the Site while at the same time provide EPA with control over the outcome of the remedial action.

Recommendation:

Beazer supports the use of performance goals rather than performance standards and recommends that EPA utilize performance goals in the ROD.

F. Capping of Additional Areas

EPA has proposed the use of capping in combination with excavation of soil. This concept provides additional risk reduction at a lesser cost than some of the other remedial techniques. By combining techniques, EPA will achieve removal of the soils with the highest potential risk and containment of soils with lower potential risk. This approach cost-effectively reduces the overall risk at the Site.

Recommendation:

Beazer recommends that EPA set forth the concept of combining capping with excavation of soils in the ROD.

III. Residual Risk Calculations

Residual risk calculations were used to assist in selecting cleanup goals by calculating the potential risk which would remain following the remediation of soil (i.e., assuming that the tons of soil which exceed the specific cleanup goal were removed and replaced with soil of an assumed background concentration). This approach is superior to deriving cleanup goals ("CUGs") directly from the assumptions used in the baseline risk assessment, where all soils with concentrations greater than CUGs are remediated. Under the baseline risk assessment approach, the potential risk associated with the remediated site is less than the allowable risk level used to establish the CUGs. As a result, the remediation performed is more extensive than required to protect public health.

In contrast, use of the residual risk approach to define the extent of remediation achieves the stated public health protection goals, which can be demonstrated by re-running the baseline risk assessment using the post-remediation constituent concentrations. The residual risk approach calculates the post-remediation risk and therefore, is a better method to calculate cleanup levels than reliance upon the baseline risk assessment. This approach to post-remediation risk assessment also focuses the remedial activities on the areas of the greatest potential risk and maximizes the risk reduction achieved.

Recommendation:

For these reasons, Beazer supports EPA's use of residual risk in calculating volumes of soil for excavation and recommends that EPA utilize residual risk methodology in the ROD.

IV. The Human Health Baseline Risk Assessment Overestimates the Potential Risk at the Site

Although Beazer supports the remedies selected in the Proposed Plan, Beazer believes that these remedies actually are more protective than the Proposed Plan represents. Contrary to the position taken by the South Carolina Department of Health and Environmental Control ("SCDHEC")(See discussion below at Section XII), Beazer believes that EPA's BRA uses unduly conservative assumptions that result in an overestimation of potential risk at the Site. Beazer has commented on EPA's risk assessment in the past and requests that those comments be included in the Administrative Record for this Site. Beazer has developed additional information on the potential risks that EPA calculated for the Hagood Avenue drainage ditch and the derivation of the lead remediation goal for soils. Each of these issues is discussed in more detail below.

A. Potential Risks at the Hagood Avenue Drainage Ditch Are Overestimated in the BRA.

The BRA examined four potential exposure pathways at Hagood Avenue and the marsh into which it drains (incidental ingestion of surface water and sediment, and dermal contact with surface water and sediment). Of these pathways, dermal contact with surface water is responsible for the majority of potential risk. This is also the pathway with which the greatest uncertainty is associated. Beazer believes that many of the assumptions employed in the BRA are likely to overestimate potential risk. For example, EPA has based its dose estimation for the surface water exposure pathway on skin permeability constants (K p) taken from EPA guidance (1992) and applied them using total chemical concentration in water (not dissolved chemical concentration). Two aspects of this method are incorrect: the K p values themselves and the chemical concentrations used in the EPA risk assessment. When these are corrected for, the potential exposures and risks associated with PAH decrease by about 1000-fold. The EPA risk assessment has also used exposure frequency assumptions that greatly overestimate likely exposures associated with the Hagood Avenue ditch. When more representative exposure frequencies and exposed surface areas are employed, potential risks decrease by about 175-fold. The net effect of using more reasonable dermal permeability and exposure frequency and contact assumptions is a decrease of about 175,000-fold in the estimated potential risks reported in EPA's risk assessment.

The remainder of this subsection presents alternative assumptions, the basis for those assumptions, and the effect the use of those assumptions have on the estimate of potential risk from dioxin and PAH (the constituents of potential concern to which most of the potential risk is attributed).

1. EPA's Selection of Dermal Absorption Constants Results in the Overestimation of the Rate of Absorption

a. General Critique of EPA's Method for Predicting K p Values

The K p value for benzo(a)pyrene was applied to benzo(a)pyrene toxic equivalents, and the K p value for 2,3,7,8-TCDD was applied to TCDD-toxic equivalents. Neither of these K p values is derived from experimental data on the compounds of interest or chemicals with similar physicochemical properties. They are estimated values derived from a regression equation that resulted from fitting a curve to a large data set of data of chemicals of different classes. The parameters in the regression equation are molecular weight and octanol-water partition coefficient (Kow). These K p are scientifically incorrect, as discussed in detail in Attachment A.

Recommendation:

Beazer recommends that EPA re-evaluate the dermal permeability constants employed in the assessment of potential risk associated with PAH and dioxins and furans in surface water and employ permeability constants that are derived from chemicals and data with K ows similar to those of PAH and dioxins and furans.

2. EPA's Dermal Surface Water Exposure Assumptions Overestimate COPC Availability

EPA's surface water risk assessment is based on the concentration of total chemicals in surface water. Dermal risk assessment, however, should be based on dissolved chemical concentration, because all experimental and predicted K p data listed in EPA (1992) are based on aqueous solutions. See Attachment B. The concentrations of PAHs and dioxin and furan congeners in the surface water drainage pathways exceed their solubilities in water. However, these chemicals cannot be dissolved in the aqueous phase at levels exceeding their solubilities. Accordingly, a reasonable approach for risk assessment is to assume that the chemicals are present as dissolved species at their solubility limits and that the difference between the measured concentration and the solubility limit represents either particle-bound chemical or chemical present in a free organic phase. An aqueous K p value is appropriate for the dissolved fraction. If the nondissolved fraction is particle-bound, then very little dermal absorption of the nondissolved fraction would occur. However, if the nondissolved fraction is assumed to be present in a free organic phase, then absorption might occur. A health-protective approach would be to use the most conservative K p value from studies with free organic phases.

For the potentially carcinogenic PAHs, EPA applied the highest possible estimated aqueous K p for benzo(a)pyrene (0.02 cm/hr) to all benzo(a)pyrene toxic equivalents. The highest possible organic phase K p for benzo(a)pyrene is 0.0003 cm/hr based on an experiment with benzo(a)pyrene in crude oil, Yang et al. (1989) When this approach is used, the resulting estimate of dermal absorption of potentiailly carcinogenic PAHs is over 1,000 times less than the dermal absorption predicted by the EPA risk assessment.

No experimentally determined aqueous K p is available for any dioxin congeners. Organic phase K p values range from 4 x 10 -5 to 6 x 10 -4 cm/hr. The highest possible organic phase K p is 0.0006 cm/hr based on an experiment with 2,3,7,8-TCDD in mineral oil. Weber et al. (1992) It is assumed that the aqueous phase K p for 2,3,7,8-TCDD is 10 times the organic phase K p. It is also assumed that the K p values for 2,3,7,8-TCDD are applicable to the total TCDD-Toxic Equivalent concentrations. When this approach is used, the resulting estimate of dermal absorption dioxin and furan congeners is over 700 times less than the dermal absorption predicted by the EPA risk assessment.

Recommendation:

Beazer recommends that EPA re-evaluate the potential exposure and risks associated with surface water in the Hagood Avenue ditch and account for the finding that only a fraction of the total COPC concentration measured in surface water is dissolved. The K p values derived by EPA are only applicable to the dissolved fraction.

3. EPA's Hagood Avenue Exposure Assumptions Are Excessive

The BRA assumed that all of the hands, arms, feet and legs of a child (age 1 to 6) would be exposed to surface water in the Hagood Avenue drainage ditch 2.6 hours per day, 24 days per year a total of 62.4 hours per year for six years. These assumptions represent excessive exposure to surface water and sediments in a drainage ditch with steep banks, low flow and stagnant waters located immediately adjacent to the road. These characteristics are unlikely to be attractive to children. Therefore the most likely exposure at this location is zero. A conservative estimate might assume that hands and feet (total surface area of 872 cm 2) come into contact with surface water and sediment in this ditch for 15 minutes per day for no more than six days per year for the assumed six year period. Use of such assumptions would lead to a reduction in potential exposure and risk of about 175-fold.

Recommendation:

Beazer recommends that EPA re-evaluate its exposure assumptions for the Hagood Avenue drainage ditch and employ assumptions that are more representative of the drainage ditch.

B. EPA's Derivation of the Lead Remediation Goal for Soils Is Based on Unrealistic Exposure Assumptions

1. Subsurface Soils.

The Proposed Plan recommends a surface and subsurface remedial goal for lead of 1150 mg/kg. This goal was derived using the Lead Uptake/Biokinetics Model (Model). The EPA has modified the Model to protect the developing fetus of a hypothetical future female industrial worker. The Proposed Plan has recommended application of this remedial goal to both surface and subsurface soils. Even if one accepts all of the assumptions used to derive this remedial goal, which Beazer does not (see below), the assumption that any industrial worker, let alone a pregnant worker, will contact subsurface soil 219 days per year for 25 years (as assumed by EPA) is unrealistic. The only receptors assumed to contact subsurface soils by the BRA are utility workers and then only at a frequency of 12 days per year. Beazer believes that the assumption of 12 days per year of contact with subsurface soil is still conservative and likely to overestimate any actual contact but is far more appropriate to use than 219 days per year. If 12 days per year of exposure to subsurface soil is assumed, then a subsurface soil remedial goal for lead of 20,987 ppm can be derived simply by replacing the 219 day per year exposure frequency with a 12 day per year exposure frequency.

Beazer also recognizes that application of the Model to protection of a fetus is a departure from past practice and required the derivation and application of new pharmacokinetic constants. To date, Beazer has not fully evaluated all of these new pharmacokinetic constants, but reserves the right to provide its analysis of their use to EPA at a future date.

Recommendation:

Beazer recommends that EPA re-evaluate its lead exposure assumptions and upwardly adjust the subsurface soil lead cleanup goal in the ROD to be consistent with exposure assumptions used for other COPCs.

2. Surface soils

Beazer is not providing detailed comments on the model used by the Technical Review Workgroup for Lead (TWG) for surface soil at this time. Beazer, however, reserves the right to comment on the model at a future date. Beazer would like to make clear that the combination of the pharmacokinetic constants and exposure assumptions used by the TWG has the potential to result in surface soil cleanup levels that are more stringent than necessary to achieve the target (protective) blood lead level. The effect of some of these assumptions have been presented to EPA at the EPA Lead Validation Workshop (Bowers 1996).

Recommendation:

Beazer recommends that EPA validate the model and use Site-specific mean background blood levels and geometric standard deviations when developing surface soil lead cleanup levels.

C. EPA's Use of the H-Statistic to Estimate Exposure Point Concentrations (EPCs) Is Flawed

EPA's final human health baseline risk assessment used EPCs based upon a "nearest neighbor" evaluation of COPC concentrations for surface and subsurface soils. Beazer strongly concurs with this approach and believes it removes some of the bias associated with the approach typically used at most Superfund sites to estimate EPCs. Specifically it accounts for the bias associated with directed sampling plans that results from oversampling of areas anticipated to have elevated COPC concentrations. The flaw in EPA's derivation of EPCs, however, is that the risk assessment combined this approach with the H-statistic **2** to estimate final EPCs. Beazer does not believe the use of the H-statistic to estimate an upper bound of the arithmetic mean is appropriate, even when combined with the nearest neighbor evaluation. The H-statistic assumes that the COPC concentration at each sampling location is independent. It is not. The violation of this fundamental assumption by the H-statistic leads to EPCs that overestimate the surface

2 The H-statistic is a statistical procedure the EPA utilized to estimate EPCs.

and subsurface soil COPC concentration representative of long-term exposures at the Site.

Recommendations:

Beazer recommends that EPA use geostatistical techniques to derive unbiased EPCs that account for both the non-random nature of sampling at this Site and account for the spatial dependance of COPC concentrations in surface and subsurface soils at this Site. Beazer further recommends that EPA use such geostatistical techniques to develop EPCs for other media, including surface water and sediment.

V. EPA's Ecological Risk Assessment Should Be Considered Only As a Screening Level Risk Assessment

Beazer believes that the EPA Environmental Response Team (EPA-ERT) ecological assessment ("ERT Assessment") must be considered to be a screening level risk assessment, rather than a baseline risk assessment, because it does not include Site-specific information and it utilizes constituent maximum values. In contrast, Beazer's ecological risk assessment, which is included in the FS, relies on Site-specific information and, therefore, is a more appropriate baseline risk assessment. The purpose of a baseline ecological risk assessment is to provide the risk manager with all information including quantitative risk estimates and qualitative assessments to enable the risk manager to make management decisions. Beazer's baseline ecological risk assessment ("BERA") satisfied these criteria.

Beazer has provided specific comments on the ERT draft assessment which were submitted to EPA in letters dated August 2, 1996 and August 15, 1996. Most of these comments were not addressed in the final ERT Assessment. Additionally, the Trustees submitted comments on Beazer's draft BERA. Beazer addressed many of those comments in its final BERA. Beazer has included responses to the remaining Trustee comments in a letter submitted to EPA on May 27, 1997.

Recommendation:

Beazer commends EPA's use of Beazer's BERA and the available Site-specific information to make its risk management decisions in the Proposed Plan.

VI. The Remedy for the Drainage Ditches Should Not Require Design to City of Charleston Future Flow Rates

Beazer agrees with EPA's stated objectives for the drainage ditches: (1) remove all ditch sediment with concentration greater than the 5 x 10 -5 cleanup goal; (2) remove and/or control the transport of NAPL and/or dissolved phase constituents from the drainage ditch, and (3) reconstruct the drainage ditch to provide for adequate drainage that is consistent with its future land use. The Proposed Plan, however, calls for reconstruction of the drainage ditches to handle a 10-year, 24-hour storm. Beazer is concerned about the practicality of reconstructing existing the drainage ditches (e.g., the Braswell Street Drainage Ditch) to carry potential future City of Charleston design flows and believes that the ditches should be reconstructed to carry the flows that the existing ditches can handle. This concern is raised because there is limited room on the Site to expand the ditches to carry the capacity required to meet future City of Charleston design flows and the drainage ditches are located between properties not included within the Superfund Site and roadways and are collocated with existing utilities such that reconstruction to meet the design flows may not be possible.

In addition to the physical impracticality associated with expanding the ditches, Beazer believes that the Agency is without statutory authority to require such expansion. Reconstruction of the ditches to the extent suggested by EPA would exceed the CERCLA definition of "remediation." Expanding the ditches to meet the 10 year, 24-hour storm criteria would constitute a capital improvement outside the realm of response costs for which Beazer is responsible.

Recommendation:

Beazer requests that EPA, at a minimum, either reconsider the need to meet City of Charleston design flows or include flexibility in the ROD for alternative design criteria.

VII. The Remedy for Soils Should Include the Option for Either On-Site or Off-Site Disposal

The soil remedy discussed in the Proposed Plan includes the excavation of an estimated 12,000 tons of soil (this represents a cleanup level of 20 ppm B(a)P-TE in surface soil and 275 ppm in subsurface soil). Under the proposed remedy, the soil will be disposed off-Site. The FS, however, also evaluated the feasibility of on-Site disposal of the excavated soil. As depicted in the following chart, Options 3A (off-Site disposal) and 3B (on-Site disposal) are rated equally.

Alternative No.	Alternative	Cost
3A	Off-Site Disposal an estimated 12,000 tons	$3,313,000
3B	On-Site Disposal an estimated 12,000 tons	$3,077,000

The current cost differential between these two options is relatively small and the difference in cost will vary based on the volume of soil and sediments that are remediated. However, the LDRs for woodtreating wastes were promulgated on May 12, 1997. Although a two-year capacity variance exists, excavation may not be completed by this deadline. As a result, increased disposal costs for impacted soils due to the LDRs will upset the cost balance between on-Site and off-Site disposal in favor-of on-Site disposal. As off-Site disposal costs increase, the on-Site Landfill may be more cost-effective while achieving the same level of risk reduction as the off-Site disposal option. Although EPA has proposed the excavation of an estimated 12,000 tons of soil, Beazer believes that Alternative 5C described in the FS (excavation of an estimated 5,300 tons of soil and an 11 acre cap) is the most cost-effective, protective and ARAR-compliant alternative. However, as a compromise to address concerns raised by the State, Beazer agreed to excavate an estimated 12,000 tons of soil and cap 11 acres. **3** Because the LDRs have been promulgated, to utilize an on-Site landfill, the Site must be designated as an Area of Contamination ("AOC") in accordance with the National Contingency Plan (55 Fed.Reg. 8758-8760, March 8, 1990). Furthermore, Beazer believes that EPA should retain Alternative 5C as a contingent alternative in the ROD should Beazer be unable to complete the soil remedy by May 11, 1999 (the end of the LDR capacity variance period).

Recommendation:

EPA has selected Option 3A, "Excavation and Off-Site Disposal." Beazer requests that (1) EPA broaden this alternative in the ROD to include either off-Site or on-Site disposal; (2) the Site be designated as an AOC; (3) the selection of the ultimate disposal option be retained for the remedial design stage; and (4) EPA retain Alternative 5C in the ROD as an option, should Beazer be unable to complete the soil remedy by May 11, 1999.

3 As discussed below, it is apparent that the SCDHEC has rejected Beazer's proposal. Although Beazer remains willing to implement Alternative 3A, that willingness is conditioned upon Beazer's ability to complete the soil remedy prior to end of the LDR capacity variance period on May 11, 1999. If, due to the State's nonconcurrence with the remedy, Beazer is unable to complete the soil remedy by that date, Beazer believes that EPA should require only that Alternative 5C be met.

VIII. The Groundwater Remedy Presented in the FS Is Protective

The preferred groundwater remedy identified in the FS (Alternative 3) consists of a phased approach utilizing 14 wells. However, pursuant to discussions with SCDHEC on January 14, 1997, Beazer, in the spirit of cooperation and compromise, offered to include additional wells as part of the groundwater remedy to address the concerns expressed by Richard Haynes on behalf of SCDHEC. Beazer's proposed additions to the groundwater remedy addressed in the FS included the installation of three shallow and three intermediate water-bearing unit recovery wells and the recovery of NAPL from two existing recovery wells. Rather than select a groundwater/NAPL alternative described in the FS, EPA's proposed remedy includes Beazer's January 14, 1997 compromise offer to include additional wells.

It appears from SCDHEC's discussion in the State Acceptance section of the Proposed Plan, that Beazer's offer to install additional wells is not acceptable to SCDHEC. Because Beazer believes that Alternative 3 as proposed in the FS is protective and further because Beazer proposed the additional wells for the sole purpose of compromise with SCDHEC, Beazer believes that Alternative 3 as proposed in the FS and Alternative 4 (as a contingent alternative) should be adopted in the ROD. Selection of Alternatives 3 and 4 as the groundwater remedy satisfies EPA's goals because these alternatives utilize a mixture of technologies, including emerging in-situ technologies and a phased approach to implementing the remedy. Because Beazer is committed to collecting NAPL to the extent possible, this approach allows the most cost-effective implementation of the remedy.

Recommendation:

Beazer recommends that the groundwater remedy be implemented in a phased manner and that the ROD reflect the 14 wells discussed in the FS as the initial phase of the groundwater remedy.

IX. EPA Must Clearly Differentiate Between Remedial Activities and Restoration Activities in the Barge Canal

Beazer concurs that capping is the most suitable alternative for the Barge Canal. However, Beazer would like to correct a misunderstanding regarding this alternative which may stem from the discussion of the alternative in the FS. The alternative, as set forth in the FS and as currently described in the Proposed Plan, combines both "response" work encompassed by Sections 107(4)(A) and (4)(B) of CERCLA and "restoration" which is a form of compensation for natural resource damages which may be sought by Trustees pursuant to Section 107(4)(c). As specified in the FS, the habitat enhancements which were included as a component of this remedial alternative were evaluated to partially satisfy CERCLA requirements related to compensation under Section 122(j)(2) of CERCLA.

As you know, Beazer has been engaged in discussions with the Natural Resource Trustees with the goal of developing an acceptable restoration plan which would address the alleged impact(s) on natural resources of constituents of concern from the woodtreating operations. Based upon Beazer's analysis of these alleged impacts, establishing a tidally-influenced hydrologic regime in the Barge Canal would constitute restoration sufficient to compensate for any such alleged damages. Therefore, in developing the remedial alternative for the Barge Canal, Beazer analyzed more than the work necessary to remediate the area of potential ecological concern, Beazer analyzed the effort necessary for the potential restoration project. Thus, the work described in Alternative 2B includes efforts which go beyond remediation (response work) and which constitute "restoration" of natural resources. Alternative 2B describes the cubic yards necessary for both response work and restoration work, but does not break them out individually.

The remediation goal for the Barge Canal is to "contain COC-impacted sediments." As indicated in the FS, this goal will be accomplished by the placement of a cap over the approximate 3.2 acre Barge Canal. The amount of fill necessary for such a cap is approximately 4700 cubic yards. As described in the FS, during pre-design, a precondition topographic survey to determine elevations of existing Spartina alterniflora communities will be performed. That survey will indicate the extra amount of fill necessary to define target and threshold elevations that would ensure the establishment of a tidally-influenced hydrologic regime. For the FS purpose of estimating the total amount of fill necessary, the existing topography map of the Barge Canal and areas of established Spartina were used to estimate required fill volume, resulting in a total estimate of 28,000 cubic yards. In addition, the design of the proposed cap discussed in this alternative takes into account the parameters necessary to establish a tidally-influenced hydrologic regime ("two foot top layer prepared mixture meeting specific requirements for organic content pH and particle size").

Recommendation:

To the extent that the work and costs contained in Alternative 2B are necessary to restore natural resources rather than to remediate the impact of hazardous substances or remediate the consequences of implementation of the remedy, they should not be discussed in the ROD as a component of this remedial alternative. While Beazer remains open to considering implementation of these restoration measures, Beazer believes that these measures and associated costs should be removed from the ROD and that Alternative 2B and its costs should be revised to reflect only a remedial cap.

Thus, any discussion in the ROD relating to the "Capping of Barge Canal Sediments" alternative should read as follows:

Under this alternative, impacted sediments in the 3.2 acre Barge Canal would be capped. An estimated 4700 cubic yards of fill is required to meet this objective. Engineering controls would be needed to control the release of suspended sediments during construction. Total present worth = $275,000.

X. The Placement of Lead-Impacted Soil in the Barge Canal May Not Be the Most Appropriate Remedy.

EPA presented three alternatives in the Proposed Plan for lead-impacted soils. Alternative 1 is the No Action Alternative which consists of deed restrictions to limit future land use. The net present worth presented for this Alternative is $13,000. Alternative 2 is the Containment Alternative and it includes capping of soils that exceed the cleanup goal for lead and arsenic. The net present worth of this Alternative is $1,051,000. Alternative 3 is the Confined Disposal Option. This Alternative includes excavation of a portion of the lead-impacted soils, placement of the soils in the Barge Canal and capping of the remaining soils that exceed the capacity of the Barge Canal. A cost is not provided in the Proposed Plan for this Alternative.

EPA correctly characterized the lead-impacted soil as attributable to Conoco's and Agrico's former Ashepoo Phosphate/Fertilizer Works, and not related to woodtreating operations. Accordingly, Beazer is not responsible and will not pay for any response costs associated with remediation of lead-impacted soils in the Barge Canal. As noted in EPA's Proposed Plan, EPA has not provided cost estimates for the implementation of Alternative 3. EPA has stated that incremental costs are expected for the design and material handling and will be estimated in the final ROD. Beazer agrees that there will be increased costs for implementation of Alternative 3. These costs could include, but would not be limited to, significant costs to design a suitable containment that would be acceptable to all reviewing regulatory agencies, material handling costs, monitoring costs and capping costs for the soils that would not be placed in the Barge Canal due to lack of capacity.

In addition to these costs, Alternative 3 presents increased "costs" in terms of risk associated with the disposal of the lead-impacted soil. For example, under Alternative 3, the disposal of these soils in the Barge Canal could result in potential future liability should these soils leach or become exposed due to unanticipated erosion. Beazer is not responsible for the lead-impacted soils and should not be subjected to increased exposure to liability resulting from the management of these soils. Accordingly, Beazer opposes the placement of lead-impacted soil in the Barge Canal absent receipt of a covenant not to sue from EPA for releases to the Barge Canal of constituents from the lead-impacted soils and a covenant not to sue from the Natural Resource Trustees for any natural resource damages related to placement of the lead-impacted soils in the Barge Canal.

Beazer believes that Alternative 2 would provide the same level of risk reduction as Alternative 3 (which EPA selected in the Proposed Plan), and that Alternative 2 could potentially be implemented at a lower cost than Alternative 3. Alternative 2 describes the cap as consisting of a subgrade material, compacted common fill, and a vegetative top. Several types of caps and capping materials could be utilized that would meet the remedial objectives for these soils. Beazer suggests, therefore, that the ROD for these soils provide the flexibility to allow for the selection of capping materials during detail design.

Recommendations:

Beazer recommends that EPA clearly state in the ROD that Conoco and Agrico are responsible for all response costs associated with the lead-impacted soils. Beazer further recommends that EPA provide flexibility in the ROD to allow the implementation of Alternative 2 or 3 (provided the above-discussed covenants are provided). Both Alternatives provide equal levels of risk reduction. Beazer also recommends that the ROD provide flexibility in the design of Alternative 2 to allow the selection of the cap during detailed design phase.

XI. The Promulgation of Universal Treatment Standards ("UTS") for the Wood Treating Wastes Will Increase the Costs of the Remedy

The UTS for EPA Hazardous Waste Nos. F032, F034 and F035 were promulgated on May 12, 1997 and a two-year capacity variance was established for impacted soil and debris. As discussed in the FS, the new treatment standards will have a significant impact on the remedial technologies evaluated. The new standards will result in significantly increased treatment costs which will correspondingly increase the remedial costs estimated in the Proposed Plan. Under ideal circumstances, Beazer and EPA could work together to facilitate completion of all portions of the remedy where costs are impacted by soil disposal (e.g., soils/ditch sediments). **4** However, as discussed below, unless the State concurs with the remedy, rapid initiation of the remedy may be impossible due to the uncertainty associated with the State's position. As a result, the potential exists that the foundation for the proposed remedy may be undermined by the promulgation of the UTS for wood preserving wastes because all cost estimates in the FS for management of soil and debris will no longer be valid once the LDR capacity variance period ends.

Recommendation:

Beazer recommends that EPA work with Beazer to resolve the State's issues and to facilitate the implementation of the remedy within the variance period. As a contingent measure, EPA should designate the Site as an AOC and include an on-Site disposal option in the ROD.

4 In the Alternative, EPA could designate the Site as an AOC thereby making the LDRs inapplicable to the management of Site soils and allow for the use of an on-Site landfill, as discussed above.

XII. The State of South Carolina Nonconcurrence with the Remedy Poses Significant Implementation Issues

The Proposed Plan states that the State of South Carolina does not concur with the proposed remedies and includes a discussion under the section entitled "State Acceptance" drafted by SCDHEC which sets forth its position. It appears that SCDHEC believes that EPA's remedy could include more stringent cleanup levels and additional wells for groundwater remediation. Beazer does not believe that SCDHEC has a valid basis for objecting to the Proposed Plan. Moreover, Beazer believes that South Carolina's nonconcurrence will create confusion and the likelihood that EPA and the State might seek inconsistent and/or duplicative action at the Site. The potential wasted resources and transaction costs which may be expended as a result of these unresolved political differences cannot be justified.

At a minimum, it will be difficult to determine how or whether to implement the soil components of the remedy. For example, Beazer will not be able to cap any areas of the Site unless it is assured that the State will not require further excavation. Furthermore, selection of the most cost-effective treatment/disposal option for soils will depend upon the volume of soils involved. Until the State's position is determined, it would be arbitrary for EPA to require Beazer to utilize off-Site disposal only to later decide that additional soils require excavation and the added volume, in hindsight, would have made on-Site disposal more cost-effective. Under the worst case, such a decision could result in a delay in excavation until the LDR capacity variance expires. In that case, Beazer would face even higher treatment costs or the construction of an on-Site landfill that could have contained the soils sent off-Site had it been utilized from the beginning of the project. From these examples, it is clear that much uncertainty will exist regarding the implementability of the soil portion of the ROD until the State issues are resolved.

A. EPA and the State of South Carolina Have Not Followed Applicable Guidance and the NCP

As an initial matter, Beazer believes that the agencies have not followed EPA guidance to resolve their differences. According to EPA's "Guidance on Preparing Superfund: Decision Documents, the Proposed Plan, the Record of Decision, Explanation of Significant Differences, the Record of Decision Amendment," Office of Emergency and Remedial Response, July, 1989 ("Decision Document Guidance"), when a dispute arises between the lead and support agencies, the dispute resolution process specified in the Memorandum of Understanding or the process specified in Subpart F of the National Contingency Plan ("NCP") should be utilized. Decision Document Guidance, p. 3-7. See Attachment C. The MOU between EPA Region IV and SCDHEC sets forth a dispute resolution protocol. See Attachment D. Under the protocol, the parties are to confer in good faith to attempt to resolve any disagreements. MOU, p. 31. However, the parties to the MOU recognize that "honest disagreements in technical evaluations and judgment occur among professionals and further acknowledge that such disagreements may be unresolvable..." MOU, p. 32. According to the MOU, in such circumstances, "deference will be given to the lead agency unless the disagreement is considered by the agencies to be fundamental in the selection of the remedy." Id. The parties agree that a "disagreement fundamental in nature" is one which serves to form an essential and necessary component of the remedy selection process, that, without said component, will render the remedy selection as arbitrary and capricious. Id. In that case, the parties are to refer to the formal rulemaking procedures of Section 553 of the Administrative Procedures Act. Id. Beazer does not believe that the disagreement between EPA and SCDHEC can be characterized as "fundamental in nature" as SCDHEC has acknowledged that EPA's proposed remedy "will be of benefit in the reduction of risk at the site."

Subpart F of the NCP, "State Involvement in Hazardous Substance Response," (40 C.F.R. Part 300) outlines a dispute resolution process that EPA Regions and States should use to resolve disputes that arise during the RI/FS and remedy selection process. This approach encourages the lead and support agencies' Remedial Project Managers to resolve any disputes promptly. If this cannot be accomplished, the issue could be referred to their supervisors for further EPA/State consultation. This supervisory referral and resolution process should continue, if necessary, to the level of Director of the State Agency and the Regional Administrator, respectively. If agreement still cannot be reached, the dispute should be referred to the Assistant Administrator of OSWER who serves as final arbiter.

Beazer understands that officials at the highest level of Region IV and SCDHEC conferred over the issues presented in the State Acceptance section of the Proposed Plan. Although Beazer commends EPA for its diligence, to be consistent with Decision Document Guidance, the dispute should be resolved either in accordance with the MOU or with Subpart F of the NCP. The Decision Document Guidance clearly states that "the mutual acceptance by EPA and the State is crucial to effecting cleanup at the Site." Decision Document Guidance, p. 3-8. Enforcement of the remedy without such acceptance would be arbitrary and capricious.

B. The SCDHEC's Promsed Plan Exceeds EPA's Acceptable Risk Range and Is Unsupported

SCDHEC presents it own Proposed Plan in the State Acceptance section of the EPA Proposed Plan that is significantly, $8,314,000, more expensive than EPA's. As a threshold issue, Beazer believes that EPA must respond to the SCDHEC Proposed Plan in its comments and hereby requests that EPA do so and support the EPA Proposed Plan. A comparison of the costs of the SCDHEC proposal to the EPA Proposed Plan shows that the only difference between the two is the cost of the soil and drainage ditch sediments remedy. This is true even though SCDHEC provided comments on the groundwater/NAPL remedy. The SCDHEC proposed remedy is based upon risk levels that are more stringent than EPA's acceptable risk range and is therefore, outside EPA's statutory authority. With respect to the issues raised by SCDHEC in the Proposed Plan, Beazer provides the following comments:

1. SCDHEC believes that the Proposed Plan departs from EPA's usual method of selecting remedies at the "more protective" end of the risk range.

Although it is not clear from SCDHEC's comment, SCDHEC may be referring to EPA's use of residual risk methodology to establish the soil cleanup levels. The use of residual risk technology focused the remedial activities on the areas of greatest potential risk and maximized the risk reduction achieved. EPA has utilized residual risk methodology at other NPL sites, including the Texarkana Wood Preserving Company site and the South Calvacade Wood Preserving site.

As for the issue of EPA's departure from setting cleanup levels at the 1 X 10 -6 risk level, the NCP clearly provides that the 1 x 10 -6 risk level is a point of departure and that EPA has discretion to set cleanup levels anywhere within the 1 X 10 -4 to 1 X 10 -6 risk range. 40 C.F.R. º 300.430. Region IV utilized valued engineering to establish the risk level for the Site. Use of valued engineering is not new to Region IV. In fact, Region IV has utilized valued engineering to establish risk levels at the Helena Chemical Company Landfill Site, located in Fairfax, South Carolina. The SCDHEC concurred in the remedy for the Helena Chemical Company Landfill site. (See Attachment E)

Region IV has not always established the risk level at the most protective end of the range. For example, Region IV has utilized the 10 -5 risk level at the Golden Strip Septic Tank Service NPL site and the Palmetto Recycling, Inc. NPL site. (See Attachments F and G) At the Golden Strip site, EPA selected a target risk of 1 X 10 -5 for arsenic even though SCDHEC suggested a risk level of 1 X 10 -6. Although EPA and SCDHEC disagreed on the cleanup level, SCDHEC still concurred with the remedy. At the Palmetto Recycling, Inc. site, concentrations of arsenic and beryllium exceeding risks of 6 X 10 -6 and 2 X 10 -5, respectively, were left in place at the site. SCDHEC also concurred with this remedy. Other RODs identified for South Carolina sites have stated that cleanup levels will be within "EPA's risk range," implying that the levels may not all be established at the 1 X 10 -6 risk level.

2. SCDHEC suggests that the EPA BRA was not conservative enough.

Beazer strongly disagrees with SCDHEC's assessment of the EPA BRA. As discussed in great detail above and in several of the attachments, EPA's BRA overestimated potential risk for several pathways by a factor of 1000 for PAHs and 700 for dioxin and furan congeners. For the Hagood Avenue drainage ditch, potential risk was overestimated by 175,000 fold.

3. Based on its belief that a risk level of 1 x 10 -6 should be utilized, SCDHEC suggests that an estimated 39,000 tons of soil should be excavated and a 31 acre cap should be installed.

As an initial matter, Beazer believes that Alternative 5C (excavation of an estimated 5,300 tons of soil and 11 acre cap) is the most cost-effective, protective and ARAR-compliant alternative proposed in the FS. Again, however, in the spirit of compromise, Beazer has agreed to excavate an estimated 12,000 tons of soil and cap 11 acres. The soil remedy as proposed in the Proposed Plan is therefore already more conservative than necessary. Furthermore, SCDHEC's proposal does not account for the additional risk associated with excavation of greater volumes of soil.

The Proposed Plan includes a Table entitled "Determination of Soil Excavation Level" which depicts the residual risk based on the quantity of soil removed. The Table shows (1) EPA's protective risk range, (2) the B(a)P-TE soil cleanup level surface/subsurface soil ratio, (3) the estimated tons of soil to be excavated and (4) the estimated residual risk achieved. Although the Table suggests that the greatest reduction of residual risk would be realized by excavation of greater volumes of soil, it does not reflect the added short-term risk, time delay and increased cost associated with such excavation. For example, the differential in cost between excavating an estimated 12,000 tons of soil versus an estimated 39,000 tons of soil (the amount suggested by SCDHEC based on establishing cleanup levels using the BRA) is $5,236,000. Moreover, this increase in cost does not account for time delays and the added risk to the public of transportation-related accidents associated with the management of additional soil volumes. EPA must account for these added "costs" should it consider requiring the excavation of additional soils and revise the Table in the ROD. By revising the Table to reflect the actual "costs" associated with the excavation of additional soils, it will become even more evident that the proposed remedy is cost-effective and protective.

Moreover, SCDHEC's proposal also does not account for the protective value added by the cap. The following Table shows that once capping is included with excavation (Options 5A through 5D) the area of the cap determines the level of risk reduction and the volume of soil excavated has no impact on the risk reduction achieved (e.g., Options 5A and 5C include capping the same area, but 5C includes excavating a smaller volume). The resulting residual risks are the same, but Option 5C is approximately $1,200,000 less expensive because a smaller volume of soil is excavated. SCDHEC's proposal to excavate an estimated 39,000 tons would result in an even greater cost differential ($5,236,000) with a disproportionately small reduction of risk. Moreover, the above Table shows that capping 31 acres (Option 5B) (also, the second part of SCDHEC's proposal for soils) results in a residual risk which is less than EPA's protective range (8.6 X 10 -8). Thus, EPA has no authority to enforce a remedy this stringent. In fact, EPA rejected Option 5B on that basis.

Alternative No.	Alternative 1	Residual Risk Achieved	Cost	Comparison to EPA's Proposed Plan
1	No Action	NA	$13,000	N/A
2	Containment 6.7 acres capped	1 X 10 -5	$1,938,000	N/A
3A	Off-Site Disposal 12,000 tons	1 X 10 -5	$3,313,000	N/A
3B	On-Site Disposal 12,000 tons	1 X 10 -5	$3,077,000	N/A
4A	On-Site Thermal Desorption 9,000 tons Off-Site Incineration 3,000 tons	1 X 10 -5	$8,986,000	N/A
4B	On-Site Thermal Desorption 9,000 tons Off-Site Disposal 3,000 tons	1 X 10 -5	$6,436,000	N/A
4C	Off-Site Incineration 12,000 tons	1 x 10 -5	$13,513,000	N/A
5A	Excavation 12,000 tons Cap 11 acres	2.4 x 10 -6	$4,363,000 2	-$1,066,000
5B	Excavation 12,000 tons Cap 31 aGres	8.6 x 10 -8	$5,986,000 2	+$557,000
5C	Excavation 5,300 tons Cap 11 acres	2.4 x 10 -6	$3,173,000 2	-$2,256,000

1. Areas and volumes are estimated.
2. This estimate presumes that excavated soils will be disposed of off-Site.

The following alternatives were not included in the FS.

Alternative No.	Alternative l	Residual Risk Achieved	Cost	Comparison to EPA's Proposed Plan
EPA Proposal	Excavation 12,000 tons Cap 24.5 acres	1.1 X 10 -6	$5,429,000 2	0
SCDHEC Proposal	Excavation 39,000 tons Cap 31 acres	8.6 x 10 -8	$11,419,000 2	+$5,989,000

1. Areas and volumes are estimated
2. This estimate presumes that excavation soils will be disposed of off-Site.

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4. SCDHEC does not agree with EPA's phased approach to groundwater/NAPL remediation.

Although SCDHEC states that it agrees with EPA's three stated remediation objectives, and the areas requiring groundwater/NAPL remediation, it does not concur with the conceptual approach proposed by EPA. The conceptual approach presented by Beazer in the FS and proposed by EPA in the Proposed Plan is to implement the groundwater/NAPL remedy in a phased manner. Initially, seven shallow water-bearing unit wells and one intermediate water-bearing unit well were to be installed as part of the IRA. These wells were to be operated, and based on the results, recommendations would be made during the detailed design of the groundwater/NAPL remedy as to the number of wells and the placement of wells to complete the implementation of the groundwater remedy in this area. Additionally, Beazer planned to phase in withdrawals from the intermediate water-bearing unit because of concern that withdrawals from this unit may mobilize NAPL currently contained on the shallow clay. Operation of the IRA extraction system will provide data to assist in the evaluation of the potential for mobilization of NAPL. Based on this approach, the FS included a reasonable number of extraction wells in these areas and the water-bearing units of potential concern.

In the spirit of cooperation and in an attempt to satisfy SCDHEC concerns, Beazer offered to include additional wells in the groundwater/NAPL remedy beyond those which are technically justified. It is this revised groundwater/NAPL remedy that EPA included in the Proposed Plan and with which SCDHEC does not concur. **5** As discussed above, Beazer is not willing to compromise without the State's concurrence on the remedy.

Beazer firmly believes that a phased approach to the groundwater/NAPL remedy is the most effective and scientifically sound approach. As data is collected and evaluated, informed decisions can be made as to the placement and operation of extraction wells. This approach, as endorsed by EPA, is the most effective approach to this media to meet the three EPA and SCDHEC agreed upon remediation objectives. Additionally, this approach allows a cautious evaluation of extraction from the intermediate water-bearing unit that will not mobilize NAPL and potentially make conditions worse at the Site. This approach is also consistent with EPA's Presumptive Remedy Strategy on Groundwater Contamination. See Attachment H. Finally, EPA's phased approach should not be considered novel. Beazer has identified two South Carolina NPL sites which contemplate a phased approach to groundwater remediation. **6** SCDHEC has concurred with the remedies at both of these sites.

5 As discussed above, Beazer believes that since SCDHEC has rejected Beazer's offer in compromise, EPA should adopt groundwater Alternative 3 as discussed in the FS and Alternative 4 as a contingent alternative.

6 The two sites are the Kalama Specialty site and the Sangamo Weston/Twelve-Mile Creek/Hartwell PCB site. (See Attachments I and J).

Recommendations:

Beazer recommends that consistent with the MOU, SCDHEC should defer to EPA's selected remedy. Should SCDHEC not defer to EPA, Beazer recommends that EPA, nonetheless, adopt the Proposed Plan in the ROD, as modified by Beazer's comments presented herein.

Recommendation:

To avoid inconsistency, adverse impacts on implementation of the ROD and the potential that Beazer will not concur with a remedial or removal action that EPA directs Conoco/Agrico to undertake, Beazer recommends that all proposed work to be undertaken at the Site by Conoco/Agrico or other responsible entities be reviewed and approved by Beazer.

In addition to the comments presented above, Beazer believes that additional documents should be included in the Administrative Record for this Site. Accordingly, Beazer has compiled the list of documents presented at Attachment K and requests that EPA include these documents in the Administrative Record.

In conclusion, Beazer requests that the Agency give full consideration to the foregoing comments. We are prepared to discuss any of these issues further with you upon request.

<IMG SRC 98102XB>

cc: Shannon K. Craig
Paul Anderson
Douglas Simmons

<IMG SRC 98102XC>

<IMG SRC 98102XD>

May 31, 1997

Mr. Craig Zeller
Remedial Project Manager
U.S. Environmental Protection Agency - Region IV
Waste Management Division
Atlanta Federal Center
61 Forsyth Street NW
Atlanta, CA 30303

Dear Mr. Zeller

This letter is submitted on behalf of the Four Mile Hibernian Community Association in response to the Superfund Proposed Plan Fact Sheet dated March 1997 for the Koppers Co., Inc. (Charleston Plant) NPL Site.

Residents in the neighborhoods adjacent to the Koppers site wish to offer the following comments in regard to the Proposed Plan:

1. Residents are not in favor of cleanup strategies that have not beta previously shown to be effective in similar applications. Residents request site-specific documentation of results achieved at other contaminated sites where these techniques have been used. This issue is of particular concern with regard to the proposed procedure for remediating contaminated sediments in the Ashley River and adjacent marsh.

2. Residents request assurance that no further development, use, or re-use of the site is to take place until cleanup levels specified in the Final Record of Decision have been achieved, and all mitigation measures are completed. In particular, remediation objectives for groundwater/NAPL at source areas on-site must be achieved before cleanup can be considered complete.

3. Given the uncertainty of assumptions used to calculate cleanup levels for lead, residents would prefer that the more conservative assumptions used by SCDHEC be used to calculate the final cleanup level.

4. Insufficient details are provided to adequately evaluate the ramifications of cleanup Alternative 5A (additional capping) for contaminated soils. Based on the information present in the Proposed Plan, residents object to the use of crushed stone as a capping material because

(a) Large amounts of dust are likely to be generated which would negatively impact the adjacent neighborhoods; and
(b) There is no mention of means to contain the capping material in its intended location. Without some sort of retention crushed stone is likely to be scattered and thinned - particularly if there is heavy vehicle traffic on the site - reducing the effectiveness of the cap.

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