

**FINAL DAMAGE ASSESSMENT AND RESTORATION PLAN AND
ENVIRONMENTAL ASSESSMENT
FOR THE KOPPERS SITE,
CHARLESTON, SOUTH CAROLINA**

May 17, 2017

Prepared by:

National Oceanic and Atmospheric Administration

on behalf of

U.S. Department of Commerce

U.S. Fish and Wildlife Service

on behalf of the

U.S. Department of the Interior

South Carolina Department of Health and Environmental Control

and

South Carolina Department of Natural Resources

Executive Summary

This Final Damage Assessment and Restoration Plan and Environmental Assessment (Final DARP/EA) outlines the intent to restore salt marsh and benthic habitat at two sites within the Charleston Harbor estuary. These restoration actions are to compensate the public for natural resources and resource services that were injured, lost, or destroyed due to releases of hazardous substances from the National Priorities List (NPL) Superfund site known as the Koppers Co., Inc. (Charleston Plant) NPL Site (Koppers Site or Site) in Charleston, South Carolina. The proposed projects include hydrologic restoration, invasive species removal, and habitat protection through a conservation easement.

Starting as early as 1942, wood treatment and fertilizer manufacturing facilities were located at the Koppers Site. These facilities released hazardous substances into wetland and river habitat in and near the Ashley River in Charleston. Approximately 140 acres of tidal marsh and creeks, as well as groundwater, were impacted by the released hazardous material. Contaminants included polycyclic aromatic hydrocarbons (PAHs) consistent with those found in creosote, and heavy metals. A Natural Resource Damage Assessment (NRDA) determined that both intertidal and subtidal habitats have been affected by this contamination.

This Final DARP/EA proposes to compensate the public for the assessed injuries by restoring approximately 70 acres of salt marsh habitat on the Ashley River, as well as approximately 40 acres of salt marsh and benthic habitat on Long Branch Creek in Charleston. These projects will serve the public by improving habitat quality for natural resources, and natural resource services, injured at the Site.

This DARP/EA has been drafted in anticipation of funding for the implementation of the preferred alternative being available following settlement with Beazer East, Inc., the Responsible Party.

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1 INTRODUCTION

1.1 OVERVIEW

This Final Damage Assessment and Restoration Plan and Environmental Assessment (Final DARP/EA) outlines a proposal to restore salt marsh and benthic habitat at two sites within the Charleston Harbor estuary to compensate the public for natural resources, including ecological services, injured, lost or destroyed due to releases of hazardous substances from the National Priorities List ("NPL") Superfund site known as the *Koppers Co., Inc. (Charleston Plant) NPL Site* ("Koppers Site" or "Site") in Charleston, South Carolina. The two proposed projects include hydrologic restoration, invasive species removal, and habitat protection through a conservation easement.

This Final DARP/EA has been developed by the following Federal and State natural resources trustees: the National Oceanic and Atmospheric Administration (NOAA) of the U. S. Department of Commerce, the United States Fish and Wildlife Service (USFWS) on behalf of the U.S. Department of the Interior (DOI), the South Carolina Department of Health and Environmental Control (SCDHEC), and the South Carolina Department of Natural Resources (SCDNR), on behalf of the South Carolina Governor's Office (collectively, "the Trustees").

1.2 PROPOSED ACTION, PURPOSE AND NEED

Proposed Action. The Trustees are proposing to carry out restoration activities at property associated with Drayton Hall, a historic plantation on the Ashley River in Charleston, South Carolina, and along Long Branch Creek, also located in Charleston.

The Drayton Hall project site is a semi-impounded brackish marsh, where tidal flow is partially restricted by a relict dike constructed after 1939. The Drayton Hall project consists of three components: 1) restoring tidal hydrology and salt marsh functions in a 70-acre partially impounded brackish marsh located across the Ashley River from the historic Drayton Hall plantation; 2) eliminating existing stands of common reed (*Phragmites australis*), an invasive non-native species that spreads rapidly, replacing native salt marsh vegetation, and 3) establishing a conservation easement to ensure long-term preservation of the restored marsh, and the immediate uplands buffer.

The Long Branch Creek project aims to restore tidal salt marsh and benthic habitat within Long Branch Creek, Charleston, South Carolina by removing three undersized, failing 48" pipes running under the West Ashley Greenway; and creating a breach that will provide natural tidal exchange above and below

the causeway, and eliminate whitewater and pooling effects on the surrounding marsh. Approximately 45 acres of marsh are expected to be enhanced as a result of the Long Branch Creek project.

Purpose. The purpose of the Proposed Action is to restore salt marsh and benthic habitat at the two sites identified to compensate the public for natural resources, including ecological services, injured, lost or destroyed due to releases of hazardous substances from the Koppers Site. The Koppers Site consists of former wood treatment and fertilizer manufacturing facilities located adjacent to the Ashley River, which have released hazardous substances into wetland and river habitat in and adjacent to the river.

The purpose of this document is to, first, outline the Trustees' damage assessment and restoration planning process related to the Koppers Site, including the injuries quantified through the Natural Resource Damage Assessment (NRDA), and, second, describe restoration actions that will address those injuries.

Need. In order to achieve this purpose, the Trustees must evaluate alternative restoration measures that will adequately compensate the public for the injured resources, and services provided by those resources, associated with the Koppers Site.

1.3 AUTHORITY

This Final DARP/EA was prepared jointly by the Trustees pursuant to their respective authority and responsibilities as natural resource trustees under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. § 9601 *et seq.*; the Federal Water Pollution Control Act, 33 U.S.C. § 1251, *et seq.* (also known as the Clean Water Act or CWA), and other applicable federal or state laws, including Subpart G of the National Oil and Hazardous Substances Contingency Plan (NCP), at 40 C.F.R. §§ 300.600 through 300.615, and DOI's CERCLA NRDA regulations at 43 C.F.R. Part 11 (NRDA regulations) which provide guidance for this restoration planning process under CERCLA.

Under these regulations, the Trustees are responsible for recovering damages for injury to natural resources caused by a release of hazardous substances. Damages may include: 1) the cost of restoring the injured natural resources or ecological services to baseline conditions (i.e. conditions without a release); and 2) the value of recreation and ecological service losses from the time of injury until baseline is restored.

1.4 NEPA COMPLIANCE

Actions undertaken by the Trustees to restore natural resources or services under CERCLA and other federal laws are subject to the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 *et seq.*, and the regulations guiding its implementation at 40 C.F.R. Parts 1500 through 1517. NEPA outlines the responsibilities of federal agencies, including environmental documentation. In general, federal agencies contemplating implementation of a major federal action must produce an environmental impact statement (EIS) if the action is expected to have significant adverse impacts on the quality of the human environment. When it is uncertain whether a contemplated action is likely to have significant impacts, federal agencies prepare an environmental assessment (EA) to evaluate the need for an EIS. If the EA demonstrates that the proposed action will not significantly impact the quality of the human environment, the agency issues a Finding of No Significant Impact (FONSI), which satisfies the requirements of NEPA, and no EIS is required.

NOAA is the lead agency for preparing the DARP/EA. In accordance with NEPA and its implementing regulations, this Final DARP/EA summarizes the current environmental setting, describes the purpose and need for restoration actions, identifies alternative actions, assesses their applicability and potential impact on the quality of the physical, biological and cultural environment, and summarizes the opportunity the Trustees provided for public participation in the decision-making process. Based on the EA integrated into this document and the analyses described in Section 7, the federal Trustees (NOAA and USFWS) conclude that the impacts associated with the ecological restoration actions identified herein do not meet the threshold requiring an EIS and, accordingly, issue a FONSI (Appendix B).

1.5 PUBLIC PARTICIPATION

The Trustees prepared a Draft DARP/EA to provide the public with information on the natural resource injuries and service losses associated with the Koppers Site; the restoration objectives that have guided the Trustees in developing this plan; the restoration alternatives that have been considered; the process used by the Trustees to identify preferred restoration alternatives; and the rationale for their selection. Public review of the Draft DARP/EA is an integral and important part of the restoration planning process and is consistent with applicable state and federal laws and regulations, including NEPA and its implementing regulations, and the guidance for restoration planning found within 43 C.F.R. Part 11. Notice of the Draft DARP/EA's availability for public review was published in *The Post and Courier* on October 21, 2016 (Appendix C). No public comments were received during the 30-day review period.

1.6 ADMINISTRATIVE RECORD

The Trustees have maintained records documenting the information considered and actions taken by the Trustees during this restoration planning process, and these records collectively comprise the

Trustees' administrative record (AR) supporting this Final DARP/EA. Information and documents, including any public comments submitted on the DARP/EA, are included in this AR as received or completed. These records are available for review by interested members of the public. Interested persons can access or view these records at the offices of:

Christine Sanford-Coker, Regional Director
Region 7 South Carolina DHEC/EQC Office
1362 McMillan Avenue, Suite 300
Charleston, SC 29405
Phone: 843-953-0150
Fax: 843-953-0151
Email: sanforcc@dhec.sc.gov

Arrangements must be made in advance to review or to obtain copies of these records by contacting the person listed above, or the Trustee Council Lead (Howard.Schnabolk@noaa.gov). Access to and copying of these records is subject to all applicable laws and policies including, but not limited to, laws and policies relating to copying fees and the reproduction or use of any materials that are copyrighted.

2 OVERVIEW AND HISTORY OF THE SITE

This section summarizes the site history, response actions that were undertaken, and the Trustees' assessment of resource injuries and compensation requirements related to the Site.

2.1 SITE BACKGROUND

The following information was excerpted from the most recent Five Year Review Report for the Koppers Site prepared by the U.S. Environmental Protection Agency (EPA) (Zeller, 2013).

The Koppers Site is approximately 102 acres in size, and is located in "the neck" area of the city of Charleston, on the west side of the peninsula formed by the Ashley and Cooper rivers (Figure 2.1). The current use of the area surrounding the Site to the north, south, and east consists of a mixture of industrial, commercial, and residential properties. The Site has been employed for a variety of industrial uses since the early 1900's.

From 1940 to 1978, the Koppers Company operated a wood-treatment facility on approximately 45 acres of the Site that is generally bounded on the north by Milford Street, on the south by Braswell Street, on the east by the King Street Extension, and on the west by the Ashley River. Wood-treatment activities primarily consisted of treating raw lumber, utility poles, and railroad cross-ties with creosote. Pentachlorophenol and copper chromium arsenate (CCA) were also used as wood preservatives for a period of time. The bulk of wood treatment activities were conducted in the eastern portion of the Site, near what is now Interstate 26.

Figure 2.1: Koppers Site Map

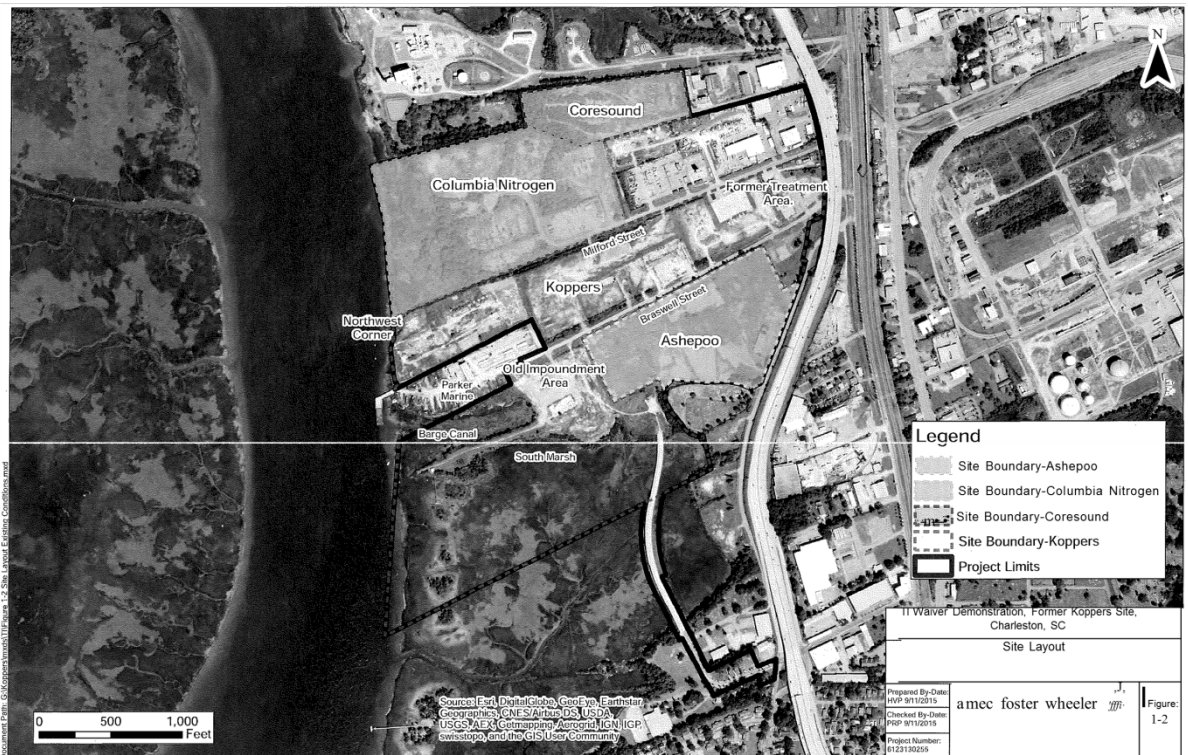


Figure provided by South Carolina Department of Health and Environmental Control

The remaining 57 acres of the Site, located south and adjacent to the former Koppers property, were 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 Ashepool 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. EPA incorporated these 57 acres into the Site boundaries to determine the environmental impact that the previous dredging operations had on the Ashley River and neighboring tidal marsh.

Beazer East, Inc., the Responsible Party (RP), is the successor in interest of the Koppers Company, Inc. and is thus the same corporation that operated the former wood treatment plant at the Site. After discontinuing operations at the Site in 1978, Beazer East sold all the property it owned within the Site boundaries. Beazer East reacquired a majority of the Site through property acquisitions in 1993 and 1998 and held that property until the third quarter of 2003 when Ashley I LLC purchased the parcels previously owned by Beazer East. The property transfer from Beazer East to Ashley I LLC was conveyed by a limited warranty deed that included among other items prohibitions on residential development and groundwater use (e.g. institutional controls).

At this time, the Koppers Site is largely vacant. The Parker Marine property (western end of Braswell) is used for marine manufacturing. Part of the Site is also used for parking by the neighboring City of Charleston Public Services Operations. Previously, the Site was one of three former Hazardous Waste Sites slated for a "mixed-use" redevelopment project called "Magnolia", but that effort was suspended in 2010, when Ashley I LLC and Ashley II LLC defaulted on their loan. In 2015, plans to revive the Magnolia project were announced by a new group of investors. Plans to redevelop the Site are contingent on all cleanup goals being achieved and having the Site removed from the National Priority List (Charleston Regional Business Journal, July 27, 2015).

2.2 SUMMARY OF RESPONSE ACTIONS

The Site was proposed to the Superfund's National Priority List (NPL) in February 1992 and became Final on the NPL in December 1994. In January 1993, a Site-wide Remedial Investigation/ Feasibility Study (RI/FS) was initiated by Beazer East under an Administrative Order on Consent (AOC) with EPA. An Interim Action Record of Decision (ROD) was issued by EPA in March 1995. The Interim Action ROD was a source control effort designed to eliminate off-Site migration of non-aqueous phase liquid (NAPL) via surface water conveyances and shallow groundwater in close proximity to the former wood treatment area. The Final Site-wide remedy was issued by EPA in an April 1998 ROD. The Final ROD was a multi-media response action that selected remedies for surface/subsurface soils, sediments of drainage ditches, groundwater and NAPL, surface water, contaminant transport pathways, and sediments within the Ashley River, barge canal, and north/south/northwest tidal marshes. Two "Explanation of Significant Differences" (ESDs) have been added to the April 1998 ROD. An ESD was issued in August 2001 that changed the Ashley River remedy from enhanced sedimentation to placement of an engineered, subaqueous cap. In April 2003, an ESD was issued for the barge canal and northwest corner of the site. This ESD changed the barge canal remedy from placement of an engineered, subaqueous cap to natural deposition and monitored natural recovery; and changed the groundwater NAPL component for the northwest corner from active NAPL recovery with extraction wells, to immobilization using stabilization and solidification techniques.

The various remedy components were implemented and constructed via three primary mobilization efforts conducted in February 1999 for Site soils and drainage ditch sediments, June 2001 for the Ashley River sediments, and March 2003 for the south tidal marsh and NAPL groundwater. The net present worth of the remedy implemented at the Site was estimated at \$20.4 Million, and generally included the following components:

- Excavation of 22,000 tons of soil with off-Site disposal in a Subtitle C landfill;
- Placement of a protective engineered soil cover over approximately 40 acres;

- Reconstruction of approximately 3,600 linear feet of surface water drainage ditches to eliminate contaminant transport pathways;
- Excavation of 1,500 tons of sediment and restoration of an estimated 1,300 linear foot reach of the tidal creek in the north marsh;
- Excavation of 2,500 tons of sediments and restoration of an estimated 2 acre area of the south tidal marsh;
- Placement of geotextile, a 2-inch sand cover, and a cement-stabilized cap over 3 acres of the Ashley River;
- Monitored Natural Recovery (MNR) for the 3.2 acre barge canal;
- In-situ bioremediation for the northwest tidal marsh, and portions of the south tidal marsh;
- Solidification/stabilization of a 17,500 square foot area in the northwest corner of the Site to immobilize residual NAPL; and
- Active groundwater and NAPL recovery via extraction wells in the former treatment area and old impoundment area.

The Final Remedial Action report was submitted in August 2003 and approved by EPA in September 2003. The Site reached construction completion status with approval of the Preliminary Close Out Report (PCOR) on September 25, 2003. Full-scale NAPL and groundwater recovery via extraction wells has been conducted in the former treatment area and old impoundment area since October 2003. Quarterly O&M reports on the performance of the recovery system have been submitted since the first quarter of 2004. As of the most recent 5-Year Review Report (2013), an estimated 14,000 gallons and 9,600 gallons of NAPL have been recovered from the former treatment area and old impoundment area, respectively. Groundwater conditions remain favorable for biodegradation of the dissolved contaminants at the site.

2.3 ASSESSMENT OF RESOURCE INJURIES AND COMPENSATION REQUIREMENTS

This section describes the approach used to estimate the ecological service losses and presents the results of these assessments. The term *ecological services* means the “physical and biological functions performed by the resource including the human uses of those functions. These services are the result of the physical, chemical, or biological quality of the resource” (43 C.F.R. §11.14(nn)).

The evaluation of the injury and services lost can be viewed in its entirety in Section 4.

2.3.1 Injury Determination and Quantification

The Trustees’ assessment of natural resource injuries focused on identifying the injury or losses of natural resources which were likely or known to have resulted from Site contamination. This includes

any resource injuries due to the remedies undertaken. Available data indicate that groundwater, soils, sediments, and surface water in the vicinity of the Koppers Site have been contaminated with a wide variety of organic and inorganic contaminants, including polycyclic aromatic hydrocarbons (PAHs), heavy metals, pesticides, dioxins, and dibenzofurans. For the purposes of determining injury to natural resources, the Trustees decided to consider only those contaminants that could be clearly linked to operations at the former wood treatment facility. These include total PAHs and five heavy metals (arsenic, copper, chromium, lead, and zinc). These compounds have been shown to cause a range of toxic responses in marine and estuarine organisms including mortality, reduced growth, and diminished reproductive capacity. These compounds are designated as “hazardous substances” under CERCLA, a designation that includes solutions and mixtures of these substances. See 42 U.S.C. §9701(14) (A) and 40 CFR §116.4. Heavy metals do not degrade naturally in marine and estuarine sediments and will persist in the environment.

Using data and other information developed as part of the Remedial Investigation process, as well as information on these contaminants in the existing scientific literature, the Trustees assessed impacts to natural resources. The Trustees found that resources or resource services were injured or lost due to the release of hazardous substances to intertidal and subtidal habitats in the vicinity of the Koppers Site, and were injured or lost as a result of the excavation and capping undertaken as part of the remedy. The Trustees then used this information to estimate the total potential loss of wetland acre-service years represented by the natural resource injuries associated with the Site.

2.3.2 Injury Assessment Strategy

The goal of this assessment is to determine the nature and extent of injuries to natural resources and to quantify the resulting resource and service losses, thus providing a technical basis for evaluating the need for, type of, and scale of restoration actions. As described above in Section 1.2, this assessment process is guided by the NRDA regulations under CERCLA 43 C.F.R. Part 11. For the Koppers Site, the Trustees pursued an assessment approach based on information gathered during the CERCLA remedial process. This approach is advantageous because much of the data needed for the CERCLA process are useful in evaluating injuries.

The injury assessment process occurs in two stages: 1) injury evaluation and 2) resource and service loss quantification. To evaluate potential injury to resources, the Trustees reviewed existing information, including Remedial Investigation data, ecological risk assessments, and scientific literature. The Trustees considered several factors as part of the assessment, including, but not limited to:

- specific natural resources and ecological services of concern;
- evidence indicating exposure, pathway and injury;

- type, degree, spatial, and temporal extent of injury; and
- types of restoration actions that are appropriate and feasible.

The Trustees determined an injury had occurred, and identified the nature of the injury. To undertake this effort, an understanding of the contaminants was necessary. Following the identification of the contaminants, it is possible to evaluate those resources that have been adversely affected by releases from the Site. The evaluation of the Contaminants of Concern (COCs) and their pathways to ecological receptors is described in Section 4.2.

The Trustees used the data generated during the RI/FS to determine the acreage encompassed by each of nine "Areas of Potential Ecological Concern" (APECs), where elevated levels of contaminants were found. The Trustees then used multiple lines of evidence, including contaminant concentrations, benthic community analyses, toxicity studies, and food web analyses, as well as peer-reviewed scientific literature and best professional judgment, to develop estimates of the percentage of injury in each APEC. The Trustees used the year after CERCLA was passed (1981) to begin the calculation of time-based injury duration. Therefore, injuries that may have occurred from wood treating operations from 1940 through 1980 are not considered. The Trustees also made conservative estimates (in favor of the natural resources) of the duration of the natural recovery period for each APEC, based on contaminant concentrations and the effects of planned remediation on likely duration of injury. Where sediment/soil removal was carried out, we assumed 100% injury at the time of excavation with a linear 10-year recovery period.

2.4 RESTORATION-BASED ASSESSMENT APPROACH

This assessment was designed for injury assessment and restoration planning to occur simultaneously, utilizing a restoration-based approach. Under a restoration-based approach, the focus of the assessment is on quantifying the injuries and/or losses in natural resources and ecological services in ways that facilitate the identification of restoration projects that will compensate the public with the same level, type and quality of resources and ecological services that were lost. This restoration-based assessment approach is consistent with the CERCLA NRDA regulations, which allow restoration planning to be included as part of the Assessment Plan Phase, where available data are sufficient to support their concurrent development (43 C.F.R. §11.31).

2.5 RESTORATION SCALING STRATEGY

Scientific literature, knowledge of South Carolina estuaries, and a Habitat Equivalency Analysis (HEA) were used to identify appropriate restoration projects that would effectively compensate for the natural resource injury. The HEA shows how many discounted-service-acre-years (DSAYs) can be credited for

a given restoration project. The DSAYs are then converted to the amount of acreage that would be necessary for compensation for a specific type of injured habitat. Inputs that are considered include relative habitat productivity, current level of impairment and threat level of human encroachment.

3 AFFECTED ENVIRONMENT

This section provides descriptions of the physical and biological environments in the vicinity of the Koppers Site as well as areas that may be affected by restoration actions, consistent with NEPA. The descriptions include environments affected or potentially affected by the release of hazardous substances and areas targeted for restoration activities. The physical environment includes the surface waters and sediments of Charleston Harbor as well as the Ashley, Cooper, Wando, and Stono Rivers. The biological environment includes a wide variety of fish, shellfish, wetland vegetation, birds and other organisms. The descriptions below have been adapted from the Charleston Harbor Special Area Management Plan (SCDHEC/OCRM, 2000).

3.1 THE PHYSICAL ENVIRONMENT

Charleston Harbor Watershed

The Charleston Harbor Watershed lies entirely within the South Carolina Coastal Plain and consists of sedimentary deposits of sand, gravel, clay, marl, and limestone resting on metamorphic and igneous rocks. Overlying these deposits are marine and riverine sediments and a thin veneer of sand, clay, and shell comprising Pleistocene and Recent formations. The watershed is composed of 63% uplands, 19% open water, 11% freshwater wetlands, 6.5% estuarine marsh, and less than 0.5% estuarine tidal creeks. Upland land use patterns within the watershed are 61.6% forested, 11% urban, 9.3% forested wetlands, 7.7% non-forested wetlands, 6.3% scrub/shrub/disturbed, 3.8% agricultural and grasslands, and 0.3% barren. Federal, state, county, and municipal governments own 302,122 acres (122,267 hectares) of the forested watershed lands. Farmers, corporations, and private individuals own the remaining 638,820 acres (258,527 hectares) or 68% of the total forested lands within the watershed. The forests are composed of approximately 45% loblolly, slash, and short- and long-leaf pines, and 20% oak/hickory hardwoods. Annual precipitation is 49 inches per year (124.9 cm). The wide variety of habitats present in the estuary support a diverse array of flora and fauna.

Within the watershed is the Charleston Harbor Estuary, located in the central portion of South Carolina's coastline and formed by the confluence of the Ashley, Cooper, and Wando rivers (Figure 3.1). An estuary is a mixing zone where freshwater from the land and saltwater from the sea meet, providing habitat for salt water and freshwater organisms and those that live in between. Highly dynamic, estuaries are influenced by the salinity gradient that extends from pure seawater to

freshwater upriver, and the tide that provides the energy that mixes the fresh and saltwater. The average depth of the estuary basin is 12 feet (3.7 m) at mean low water (MLW), but navigation channels have been deepened to 40 feet (12.2 m) MLW. The mean tidal range is 5.2 feet (1.6 m), and spring tides average 6.2 feet (1.9 m). Water temperatures range from 38°F to 87°F (3.5°C to 30.7°C) and average 67°F (19.4°C). Salinities range from 0 to 35.6 parts per thousand within the estuary. Similarly, dissolved oxygen levels range from 0 to 17.1 milligrams per liter averaging 7.3 mg/l over the entire estuary.

Figure 3.1: Aerial View of Charleston Harbor



Cooper River

The Cooper River watershed is extremely complex due to the initial diversion of water from the Santee River to the Cooper River as part of the Santee-Cooper Hydroelectric Project in 1941, and the subsequent re-diversion of water from the Cooper River back into the Santee River in 1985. The lower component of the Cooper River basin extends 50 miles (81 km) from the Pinopolis Dam to the mouth of the Cooper River on the north side of the Charleston peninsula where it flows into Charleston Harbor.

This section of the river drains almost 1400 square miles (3,625 km²) of midlands and lowlands, including fresh and brackish wetlands. The West Branch Cooper River is 17 miles (26.5 km) long and flows from the Tail Race Canal at Moncks Corner to its junction with the East Branch. This reach is a meandering natural channel bordered by extensive tidal marshes, old rice fields, and levees in varying states of disrepair. The area contains volumes of poorly defined overbank storage and immeasurable flows because of broken levees between the channel and old rice fields. The East Branch Cooper River is 7.6 miles (12.3 km) long and flows from its headwaters in Hell Hole Bay to its junction with the West Branch, commonly referred to as the "Tee". The East Branch is a tidal slough throughout its 7.5 miles (12 km) length. The river then flows 17.7 miles (28.5 km) to its junction with the Charleston Harbor basin on the north side of the Charleston peninsula.

Ashley River

The Ashley River flows approximately 31 miles (50 km) from its headwaters in Cypress Swamp in Berkeley County to its junction with the Intracoastal Waterway on the south side of the Charleston City Peninsula, where it empties into the lower harbor basin. The river basin drains a 216-square-mile (900 km²) area of marsh and lowlands, spread out over Dorchester, Berkeley, and Charleston counties. Depths of the natural channel in the river range from 5.9 to 36 feet (1.8 to 11.0 m) and are influenced by tidal action throughout the river's entire length. The Ashley River and associated salt marsh habitat experience strong semi-diurnal tides, with tidal ranges that amplify progressively upstream. The extent of saltwater intrusion on the river varies greatly with the hydrologic condition of the basin. During extremely dry periods, with little freshwater draining from Cypress Swamp, saltwater extends throughout most of the Ashley River. During periods of heavy precipitation, saltwater can be limited to the lower part of the river below Drayton Hall. The banks of the river are dominated by *Spartina* marshes.

Wando River

The Wando River is a tidal river that flows approximately 24 miles (38 km) from its headwaters in I'on Swamp in Charleston County to its junction with the Cooper River on the north side of the Charleston City Peninsula. The river drains 120 square miles (310 km²) of marsh and lowlands, and its depth ranges from 5 feet to 42 feet (1.5 to 12.8 m). The Wando is influenced by tidal action throughout its entire length, and estuarine waters extend into the creeks that form its upper limits. Like the Ashley River, the tide ranges are amplified as they progress upstream. The Wando River has the best water quality of the three rivers. Above the Wando Terminal the water quality is suitable for harvesting clams, mussels, and oysters for human consumption. Extensive *Spartina* and *Juncus* marshes dominate the banks of the River.

Stono River

The upper Stono River watershed is located in Dorchester and Charleston Counties and consists primarily of the Stono River and its tributaries from Log Bridge Creek to Wappoo Creek (Elliott Cut). The watershed occupies 156,936 acres of the Lower Coastal Plain and Coastal Zone regions of South Carolina. There are a total of 502.9 stream miles in the Stono River watershed and 8.6 square miles of estuarine areas. The Stono River, itself, is a tidal channel that communicates with the Ashley River by way of Wappoo Creek (Elliott Creek) before flowing through the Stono Inlet into the Atlantic Ocean southwest of Charleston Harbor. The Kiawah and Folly rivers converge with the Stono River near its mouth. The only direct freshwater discharge to the Stono River is by way of overland runoff from rainfall events. Mean tidal ranges in the Stono River at Wappoo Creek are 5.2 feet during normal tides and 6.8 feet during spring tides. Shellfish harvesting is generally approved in the lower Stono River (below Wappoo Creek), but is either restricted or prohibited above this point due to high fecal coliform levels.

3.2 THE BIOLOGICAL ENVIRONMENT

The tidal currents provide a highly diverse habitat for the plants and animals common to the Charleston Harbor Estuary. Marsh vegetation is extensive in the estuary due to the gently sloping coastal plain and the tidal range. The estimated acreage of the marshes in this area exceeds 52,000 acres (21,000 ha) of which 28,500 acres (11,500 ha) consist of brackish and salt marsh, 18,500 acres (7,500 ha) consist of freshwater marsh, and approximately 5,000 acres (2,000 ha) lie within impoundments. A diverse assemblage of plant species typically found throughout the Southeast is found within the estuary, with the distribution determined by salinity and the duration of inundation. The tidal marshes of the Ashley and Wando rivers reflect a strong marine influence, with salt and brackish water marshes existing throughout almost all of their length. The Cooper River marshes exhibit a wide range of vegetation, changing markedly from salt to brackish to freshwater species. The flow rate and salinity of the Cooper has been significantly altered by the diversion of the Santee into the Cooper and the 1985 diversion project.

The shallow marsh habitats of the Charleston Harbor Estuary provide seasonal year-round habitats for a diverse assemblage of adult and juvenile finfish and crustaceans. Trust resources of concern include all fishery resources dependent on the area, including transient and permanent species, benthic sediments, and organisms that rely on the benthic sediments. Specific biological trust resources include spotted sea trout (*Cynoscion nebulosus*), Atlantic croaker (*Micropogonias undulates*), red drum (*Sciaenops ocellatus*), black drum (*Pogonias cromis*), summer flounder (*Paralichthys dentatus*), sheepshead (*Archosargus probatocephalus*), Eastern oyster (*Crassostrea virginica*), blue crab (*Callinectes sapidus*), grass shrimp (*Palaemonetes pugio*), and penaeid shrimp (*Penaeus* spp.). Additionally, benthic (bottom dwelling) resources such as copepods, polychaetes, mollusks and amphipods occupy vegetated and open water areas. The highly productive marshes provide abundant

food resources for early life history stages. The shallow-water marsh also serves as a refuge by providing a diversity of habitat and by excluding predators from the upper reaches of the estuary. These advantages result in reduced competition, lower mortality, and faster growth rates. Many of these species are either commercially or recreationally valuable. The estuary contributes approximately 20% and 8% of the state's shrimp and crab landings, respectively. Spot, Atlantic croaker, red drum, spotted seatrout, flounder, and catfish inhabit the estuary and are recreationally important. The estuary also supports numerous ecologically important species such as bay anchovy and grass shrimps, which serve as food for economically and recreationally important species. Young of several species of finfish that are spawned in the lower estuary or ocean enter the shallows of the estuary as juveniles and stay until they reach larger sizes or until lowering winter temperatures drive them seaward. The Charleston Harbor estuary is also considered nursery and forage habitat for the federally endangered shortnose sturgeon, *Acipenser brevirostrum*.

The spatial distribution of benthic organisms in the Charleston Harbor estuary is similar to that of other estuaries along the mid-Atlantic, southeast and gulf coasts of the United States. Numerically dominant species include mollusks, polychaetes, oligochaetes, nematodes, and amphipods. Among the three river systems, average diversity values are lower in the Cooper River than in the Ashley and Wando rivers. The lower diversity in the Cooper River may reflect adverse effects from the greater number of industrial and port facilities in this system as compared to the other two river systems.

3.3 THE SOCIAL AND ECONOMIC ENVIRONMENT

The greater Charleston area is better known as the Trident Region and is comprised of portions of Berkeley, Charleston, and Dorchester counties. The area includes twenty-five incorporated communities ranging in size from Jamestown in Berkeley County, with a population of approximately 76, to the City of Charleston with about 133,579 residents (U.S. Census Bureau, 2014). It is one of the fastest growing regions nationwide, with Berkeley and Dorchester in the top 100 fastest growing counties in the country, and Charleston County growing by 8.8% between April 1, 2010 and July 1, 2014, according to the United States Census Bureau. The total population of the three counties combined was estimated to be 727,689 as of 2014. Administratively, their respective county councils and the combined Berkeley-Charleston-Dorchester Council of Governments (COG) serve the counties.

Although there are no major industrial dischargers in the Ashley River watershed, there are several minor industrial dischargers, as well as three major and several minor wastewater treatment facilities (SCDHEC, 2013). Other sources of pollution affecting the Ashley River and Cooper River/Charleston Harbor watersheds include nonpoint source runoff from the City of Charleston and other urban areas, industrial facilities, marina facilities, and from forested and agricultural lands. Several diked, dredged material disposal areas are located in the Charleston Harbor area, with the largest being the Clouter

Creek Disposal area on the Cooper River. The water quality of the harbor's tidal saltwater is rated as suitable for fishing and boating, but not for swimming, and the harvesting of oysters, mussels and clams is prohibited. However, reviews of data collected by SCDHEC reveal that the water quality within the basin often meets higher standards for dissolved oxygen and fecal coliform than the ratings indicate.

Among the three river systems that form the Charleston Harbor Estuary, the Cooper River has the greatest number and density of industrial and port facilities. The majority are located on the western shore and include the former U.S. Navy port facilities, commercial facilities associated with the State Ports Authority, and numerous private companies. To accommodate shipping traffic, a 45-foot (13.7 m) deep navigation channel is maintained in the lower Cooper River and extends 20 miles (32 km) upstream from the mouth of the river.

In 1954, Bushy Park Industrial Area was established along the east bank of the Back River and the west bank of the Cooper River. To provide freshwater to the industrial complex, the Back River was dammed near its confluence with the Cooper River and the 11-km Durham Canal was constructed as a freshwater supply from the upper Cooper River. Downstream of its confluence with the Back River, the east bank of the Cooper River is dominated by several industries, while the west bank is dominated by dredged-material disposal areas. The lower Cooper River is classified as SB. Class SB waters are tidal saltwaters suitable for primary and secondary contact recreation, crabbing, and fishing, except harvesting of clams, mussels, or oysters for market purposes or human consumption. These waters are also suitable for the survival and propagation of a balanced indigenous aquatic community of marine fauna and flora.

The Ashley River has the second largest number of industrial and commercial facilities, most of them located along the eastern shoreline. Much of the remaining upland area on both sides of the river supports residential developments. The lower portion of the Ashley River below Bacon's Bridge is classified as SA. Like Class SB waters, Class SA waters are tidal saltwaters suitable for primary and secondary contact recreation, crabbing, and fishing, except harvesting of clams, mussels, or oysters for market purposes or human consumption. These waters are also suitable for the survival and propagation of a balanced indigenous aquatic community of marine fauna and flora. Class SA waters have more stringent standards for dissolved oxygen and fecal coliform bacteria than Class SB waters, however.

The Wando River presently has the least upland development compared to the other two river systems, except in its lower reaches. In that area on the eastern shore, the State Ports Authority maintains the Wando Terminal facility. There are also several residential communities present and/or being developed on this shoreline. Large dredged material disposal areas are located on Daniel Island,

which forms the western shoreline of the Wando River. Detyens Shipyard is the only industrial discharger on this river, and it is classified as a minor discharge. The upper Wando River above the Wando Terminal is classified as SFH (Shellfish Harvesting). SFH waters are tidal saltwaters suitable for shellfish harvesting and uses listed for Class SA and Class SB waters. The lower Wando River is classified as SA, with water quality similar to that of the Ashley River.

The Charleston Harbor area also contains some of the most significant historic and archeological sites in the United States. Cultural resources include historic buildings, structures and sites, unique commercial and residential areas, unique natural and scenic resources, archeological sites, and educational, religious, and entertainment areas or institutions. In some areas, preservation programs are effective in maintaining these resources. In other areas, these resources are being lost or neglected primarily because of limited knowledge.

4 INJURY AND SERVICE LOST EVALUATION

This section describes how the Trustees assessed the injury to natural resources at the Koppers Site. This included determining a pathway for contamination, identifying contaminants of concern, and calculating the loss of resources and ecological services they provide.

A separate and distinct groundwater injury at the Koppers Site was evaluated by the SCDHEC. The groundwater injury evaluation can be viewed in Section 10: Appendix A.

4.1 PATHWAYS OF CONTAMINATION TO TRUST RESOURCES

A *pathway* is defined as the route or medium (for example, water or soil) through which hazardous substances are transported from the source of contamination to the natural resource of concern (43 C.F.R. § 11.14). The Trustees concluded that the transport pathways to habitats of concern were surface water/soil transport from the Site to intertidal and subtidal habitats of the Ashley River, as well as the discharge of “free product” (i.e., non-aqueous phase liquid, or NAPL) and contaminated ground water to these habitats.

Industrial operations and waste disposal practices at the Site resulted in the presence of contamination in areas utilized by wildlife and other ecological receptors of interest. Results of the Remedial Investigation and subsequent studies conducted by the Trustees indicated that soils, sediments and water were contaminated with Site-related constituents.

4.2 CONTAMINANTS OF CONCERN (COCs)

One of the early steps of the damage assessment was to identify which chemicals should be included on the list of Contaminants of Concern (COCs). The Trustees participated in this evaluation during the Remedial Investigation process by determining which contaminants released from the Site could pose a risk to ecological receptors.

The Trustees determined that the contaminants threatening trust natural resources were polycyclic aromatic hydrocarbons (PAHs) and heavy metals, especially arsenic, chromium, copper, lead, and zinc. These hazardous substances were found in the surface soils, surface waters, sediments, groundwater, and adjacent wetlands at or near the Site.

4.2.1 Polycyclic Aromatic Hydrocarbons (PAHs)

PAHs are ubiquitous in the environment, and can originate from natural processes, such as forest fires and volcanic eruptions, as well as from human activities. PAHs can enter aquatic environments from oil spills, as well as a variety of industrial activities. Sediments heavily contaminated with industrial PAH wastes have been shown to cause elevated PAH body burdens and increased frequency of liver neoplasia in fishes (Eisler, 1987). PAHs are released from wood treated with creosote (a chemical compound used as a preservative) and are known to cause cancer, reproductive anomalies, and immune dysfunction; to impair growth and development; and to cause other impairments in fish exposed to sufficiently high concentrations over periods of time (NMFS, 2010).

The Koppers Company performed wood-treating operations at the Site from 1942 until 1977. The primary wood-treating operations on the property consisted of treating raw lumber and utility poles with creosote, a distillate of coal tar and a complex mixture of PAHs. The Site is contaminated with PAHs consistent with those found in creosote. The Trustees have determined that creosote contamination at the Site is the main driver of toxicity. While other Parties were potentially responsible for PAH contamination, only the Koppers source is responsible for disposing creosote. Thus, the Koppers PAH contribution is the main toxicity driver contamination at the Site. The Trustees have restricted their damage assessment to Koppers-only (i.e. Beazer East) constituents, and have determined that Beazer East is the party primarily responsible for the Site injury.

4.2.2 Metals

In addition to creosote, both pentachlorophenol (Penta) and copper chromium arsenate (CCA) were used as wood preservatives on the Koppers Site. CCA is made from the oxides of [chromium](#), [copper](#) and [arsenic](#). Coal, the raw material for the manufacture of creosote, contains

trace levels of various toxic metals including chromium, copper, lead, and zinc. In addition, the petroleum used as a carrier for Penta can also display a significant concentration of toxic metals. Metals, unlike the organic constituents of wood preserving waste, are not readily degraded or detoxified, and may pose a long-term environmental hazard.

4.2.2.1 Arsenic

Arsenic (As) occurs naturally in rocks and soil, water, air, and plants and animals. It can be further released into the environment through natural activities such as volcanic action, erosion of rocks and forest fires, or through human actions. Approximately 90 percent of industrial arsenic in the U.S. is currently used as a wood preservative, but arsenic is also used in paints, dyes, metals, drugs, soaps and semi-conductors. High arsenic levels can also come from certain fertilizers and animal feeding operations. Industry practices such as copper smelting, mining and coal burning also contribute to arsenic in our environment.

Arsenic can occur in many inorganic and organic species, with a wide variety of chemical and toxicological properties. In general, inorganic arsenicals are more toxic than organic arsenicals, and trivalent forms are more toxic than pentavalent forms. Arsenic is bioconcentrated by organisms, but not biomagnified in the food chain. Early life stages are generally most sensitive. Large interspecies differences in sensitivity have been reported, even among those closely related taxonomically. Arsenic in salt water has been demonstrated to cause reduced survival, growth, sexual reproduction, and metabolic activity in various species of plants and animals. In birds and mammals, arsenic toxicosis can cause a variety of physiological and behavioral abnormalities, as well as death.

4.2.2.2 Chromium

Chromium is naturally occurring in soils, rocks, plants, and animals. Human activities (electroplating, leather tanning, textile industries, and wood preserving) also release chromium into the environment. Trivalent chromium, Cr (III), and hexavalent chromium, Cr (VI), are the two principal forms of Cr in the environment. The fate of Cr in aquatic systems varies depending on the form of the metal that is released and the environmental conditions in the receiving water system. Generally, Cr (III) forms associations with sediment, while Cr (VI) remains in the water column. Both forms of Cr are toxic to aquatic organisms, with Cr (VI) being the more toxic of the two. Dissolved Cr is highly toxic to aquatic plants and invertebrates, with short- and long-term exposures causing adverse effects on survival, growth, and reproduction. Fish are generally less sensitive to the effects of Cr than are invertebrates. Exposure to elevated levels of sediment-associated Cr causes acute and chronic toxicity to sediment-dwelling organisms. Dietary exposure to Cr can also adversely affect survival, growth, and reproduction in avian and mammalian wildlife species.

4.2.2.3 Copper

Copper (Cu) can be released into the environment from both natural processes and human activities. Examples of natural sources are wind-blown dust, decaying vegetation, and forest fires. A few examples of human activities that contribute to copper release are mining, metal production, wood preserving, and phosphate fertilizer production.

Copper leaches from treated wood products in a dissolved state. Once in the aquatic system, it can rapidly bind to organic and inorganic materials in suspension. The adsorbed material may then settle and become incorporated into the sediments. Although copper may stay bound in sediments, it may also be re-suspended, dissolved in interstitial water or reenter the water column depending upon biotic, physical, and chemical conditions at the site. This copper may be taken up by organisms that inhabit or ingest benthic sediments. Additionally, the copper could be taken up by some species of plants or algae and reintroduced to the ecosystem via consumption or decomposition of these plants. For many species, the greatest probability of adverse effects is from long-term accumulation of copper in sediments. Copper leached into sediments near CCA-treated wood in aquatic environments have been found to accumulate in benthic and epibenthic organisms. Other animals can acquire elevated levels of copper indirectly through trophic transfer, and may exhibit toxic effects at the cellular level (DNA damage), tissue level (pathology), organism level (reduced growth, altered behavior and mortality) and community level (reduced abundance, reduced species richness, and reduced diversity) (NMFS, 2010).

4.2.2.4 Lead

Although lead (Pb) may be released into the environment from natural sources, most of the Pb that occurs in aquatic systems has been released due to human activities. Depending on the form of Pb that is discharged, Pb can remain dissolved in the water column or become associated with sediments upon release to aquatic systems.

Lead has been shown to be neither essential nor beneficial to living organisms. While dissolved Pb generally is not acutely toxic to aquatic organisms, longer-term exposure to relatively low levels of this substance can adversely affect the survival, growth, and reproduction of fish, invertebrates, and, to a lesser extent, aquatic plants. Exposure to elevated levels of sediment-associated Pb causes acute and chronic toxicity to sediment-dwelling organisms. In birds and mammals, dietary exposure to elevated levels of Pb can cause damage to the nervous system and major organs, reduced growth, impaired reproduction, and death.

4.2.2.5 Zinc

Zinc (Zn) is released into the environment as a result of various human activities, including electroplating, smelting and ore processing, mining, municipal wastewater treatment, combustion of fossil fuels and solid wastes, and disposal of Zn-containing materials. In aquatic systems, Zn can be found in several forms, including the toxic ionic form, dissolved forms (i.e., salts), and various inorganic and organic complexes. While Zn can form associations with particulate matter and be deposited on bottom sediments, sediment-associated Zn can also be remobilized in response to changes in physical-chemical conditions in the water body.

The acute toxicity of dissolved Zn is strongly dependent on water hardness; however, chronic toxicity is not. Long-term exposure to dissolved Zn has been shown to adversely affect the survival, growth, and reproduction of fish, invertebrates, and aquatic plants. Exposure to sediment-bound Zn may cause reduced survival and behavioral alterations in sediment-dwelling organisms. In birds and mammals, dietary exposure to elevated levels of Zn can cause impaired survival, growth, and health.

4.3 INJURY ASSESSMENT & FINDINGS

The Trustees chose a Reasonably Conservative Injury Evaluation (RCIE) approach to assess injuries to benthic and terrestrial organisms resulting from releases from the Site. The RCIE approach uses data from the CERCLA Remedial Investigation (RI), literature values, and a HEA to estimate natural resource injuries. An important element of the RCIE for the Koppers Site was the decision by the Trustees to focus exclusively on injury to the benthic community. The rationale behind this decision was two-fold. One, injury and subsequent restoration scaling to the benthic community could be conducted in a protective yet cost-effective manner. Two, restoration for benthic injury would provide additional ecological service flows to other resources (e.g., fish, birds, and wildlife) potentially injured at the Site. Biological resources that may have been injured, but which are not included in this damage assessment, are listed in 4.3.2.

4.3.1 Aquatic Ecological Services at the Site and the Benthic Community

Aquatic habitats associated with the Koppers Site provide multiple ecological services. These services are defined here as the benefits that flow from one habitat, natural resource, or species to another. The relative health and function of a given habitat affects the ecological services flowing to another. At the Koppers Site, many ecological services are provided—or are directly affected—by the benthic community (the focus of the injury assessment). The benthic community is composed of populations of organisms living in or closely associated with bottom sediments. The community is dominated by microbes; meiofaunal and macrofaunal invertebrates, such as annelid worms (e.g., polychaetes and oligochaetes), crustaceans (e.g., shrimp and crabs), and mollusks (e.g., oysters and clams); and certain finfishes. These animals live within the sediment (infaunal invertebrates), on the surface of

sediments or hard substrata (epifaunal invertebrates), or near the sediment-water interface (demersal fishes and crustaceans).

This benthic community provides a number of ecological services to the broader estuary, of which only a subset are explicitly described here. The benthic community at the Koppers Site is the primary element and controlling influence over carbon flow and nutrient cycling in estuaries. Benthic animals represent essentially all the standing stock for secondary production. Because they ingest sediment and organic detritus containing refractory carbon and nutrients, benthic organisms are the essential link in the passage of carbon and nutrients to higher trophic levels (e.g., finfish). In this role, the benthic community supports almost all trophic levels in the Ashley River system near the Koppers Site. Larger members of the benthic community (head-down worm feeders, burrowing mollusks, foraging fish, crabs, and shrimp) infuse oxygen downward to highly reducing (hypoxic/anoxic) sediments while moving nutrient-rich deep sediments up towards the surface. This bioturbating activity also alters the redox zone and affects nutrient cycling (Lee and Swartz 1980, McCall and Tevesz 1982, Krantzberg 1985, Matisoff 1995).

In short, the benthic community provides and/or directly affects essential ecological services related to carbon flow, nutrient cycling and standing stock. Loss or reduction of these services provided at the Koppers Site, therefore, would likely have adverse effects on other biological communities and ecological service flows in broader the Ashley River system.

Major categories of services are briefly described below.

Primary Production – Primary production is the fixation of abiotic carbon by plants using solar energy. At this Site, aquatic plants include emergent and submerged wetland vegetation (e.g., *Spartina*), attached flora (e.g., benthic algae) as well as photosynthetic microflora (e.g., diatoms).

Organic Detritus Production – Organic detritus is produced by the incomplete decomposition of organic matter derived from dead plants, dead animals and animal feces. Organic detritus, along with dissolved organic matter, are very important sources of energy and nutrients in the estuarine food web.

Secondary Production – Secondary production is the biomass growth of heterotrophic microbes and animals (largely benthic fauna) that are supported by organic detritus and primary productivity.

Tertiary Production - Tertiary production is the biomass growth of upper trophic level animals (e.g., flounder, red drum, birds, amphibians, reptiles, and semi-terrestrial mammals) that are supported by lower trophic level production.

Nutrient Cycling - While primary, secondary and tertiary production (see above) generally represents *carbon flow* through successive trophic levels, *nutrients cycle* among marsh compartments (sediment, water, and biota). In estuarine environments, abiotic nutrient cycling is largely controlled by the reduction/oxidation (redox) state of sediments as well as sediment/water interactions. Redox, in turn, is controlled by sediment organic matter, biota activity (e.g., bioturbation) and diurnal/semi-diurnal cycles (e.g., tides, photoperiod). Nutrients taken up by plants and animals are essential to vital processes such as growth and reproduction. Microorganisms decompose and mineralize nutrients via aerobic and anaerobic processes. Important nutrients include nitrogen, phosphorus, iron, manganese, sulfur, magnesium, and silicon.

Physical Habitat - Salt marshes in the Koppers Site area provide habitat for many organisms. Ecological services provided by these physical habitats include refuge from predation, shelter from high-energy storm events, forage areas as well as protected nursery areas for the growth and development of larval/juvenile life stages. A three-dimensional, time-variant landscape is created in the salt marsh by the combined presence of sediment, tidal water, oyster shells and stands of vegetation. Sediments, in particular, provide essential habitat for numerous salt marsh organisms. Many spend their entire lives entirely within or closely associated with the sediment substrate. Primary producers in the marsh (emergent plants like *Spartina*, macroalgae and benthic diatoms) require sediments to physically grow and reproduce. The shells of live and dead oysters provide substrate for large populations of non-reef building encrusting organisms such as bryozoans, sponges, barnacles, mussels, anemones, worms, slipper shells and algae. Some species of fish (e.g., gobies, blennies, oyster toad) reproduce only in the open shells of recently deceased oysters. These small resident fish, in turn, represent secondary production and provide forage for larger predators such as flounder, red drum and striped bass.

4.3.2 Ecological Services Not Evaluated in this Injury Analysis

The previous sections established that the benthic community provides, as well as significantly affects, many ecological services in the Ashley River. Consequently, the injury analysis focuses on adverse effects to the benthic community, resulting from the release of the identified COCs. Services not evaluated in this analysis include the following:

- 1) Primary productivity by emergent vegetation (e.g., *Spartina*) and benthic flora
- 2) Primary and secondary productivity by water column organisms
- 3) Tertiary productivity by higher trophic level resources (e.g., predatory fish)
- 4) Trustee resources such as migratory birds, mammals and reptiles
- 5) Services provided by the upland portion of the Site
- 6) Ecological services lost as a result of exposure to chemicals other than total PAHs and the five selected metals (e.g., dioxins/furans, pentachlorophenol).

To the extent that the above services are not evaluated, this analysis may not be fully protective of Trustee resources. This uncertainty is balanced by some of the assumptions and approaches taken in the following injury analysis and subsequent compensatory scaling using Habitat Equivalency Analysis (HEA).

4.3.3 Using Sediment Benchmarks to Evaluate Benthic Injury

Sediment benchmarks are chemical concentrations demonstrated by the scientific community to be associated with adverse impacts (e.g., toxicity) to aquatic biota (Burton 1992, EPA 1992, Ingersoll et al. 1997). The set of benchmarks that the Trustees chose to evaluate adverse impacts to the benthic community at the Koppers Site was that developed by Long et al. (1995, 1998). This set of benchmarks includes an Effects Range-Low (ER-L) value and an Effects Range-Median (ER-M) value for each of contaminant analyzed. ER-Ls and ER-Ms were developed by regressing large datasets of synoptic sediment chemistry and biological effects information. The datasets focused largely on the results of sediment bioassays examining acute toxicity to benthic organisms (primarily amphipods). The ER-L and ER-M correspond to the 10th and 50th percentile of effects concentrations, respectively. ER-Ms represent elevated concentrations above which biological effects are highly probable (Long and MacDonald 1998). The Trustees used these benchmarks to calculate ER-M quotients for total PAHs and five individual metals in each of the nine APECs. In accordance with ecological risk assessment guidance from EPA Region 4, the Trustees also used the results of Site-specific sediment toxicity testing to reduce uncertainty and help estimate service loss. These bioassays were conducted as part of EPA's RI at the Koppers Site.

4.3.4 Estimating Percent Loss of Benthic Services

Past (pre-remedial) and residual (post-remedial) injury levels were estimated for each APEC. Within each APEC, areas that were actively remediated were considered separately from areas that were not actively remediated (i.e., those areas where "monitored natural recovery" was the selected remedy). Percent service level losses within each of the nine APECs were estimated based on multiple lines of evidence. These lines of evidence included ER-M quotients (as described above) and comparisons to individual ecological benchmark values; toxicity testing; benthic community analyses; and a food web analysis to determine if benthic organisms were providing contaminated food to upper trophic level receptors.

Table 4.1: Benthic Services Lost Before and After Remediation

APEC Site	Service Level Loss Pre-Remediation	Lines of Evidence	Service Level Loss Post-Remediation*
South Marsh (Excavated)	80%	<ul style="list-style-type: none"> - PAHs exceed NOAA Effect-Range - Median Benchmark (E-RM) - Metals mean ERM-Q > 1 - Demonstrated toxicity to amphipods, grass shrimp - Benthic community data mixed - Benthos providing contaminated food to higher trophic levels 	100%
South Marsh (Non-Excavated)	50%	<ul style="list-style-type: none"> - PAHs exceed E-RM Benchmark - Metals mean ERM-Q >1 - Demonstrated toxicity to amphipods, grass shrimp - Potential reduction in benthic community (abundance and diversity) - Benthos providing contaminated food to higher trophic levels - Relatively small change in sediment chemistry over 8 years 	50%
North Marsh (Sand-Capped)	80%	<ul style="list-style-type: none"> - PAHs exceed E-RM Benchmark - Metals mean ERM-Q > 1 - Demonstrated toxicity to amphipods, grass shrimp - Benthic community data mixed - Benthos providing contaminated food to higher trophic levels - Free creosote product observed repeatedly seeping out of North Marsh capped area 	100%
North Marsh (Uncapped)	40%	<ul style="list-style-type: none"> - Metals E-RM Quotient (ERM-Q) > 1 - Benthos providing contaminated food to higher trophic levels - Demonstrated grass shrimp toxicity 	40%
Northwest Marsh	20%	<ul style="list-style-type: none"> - PAHs and metals both exceed NOAA Effect-Range Low Benchmark (E-RL) - Demonstrated toxicity to amphipods (benthos) - Benthos providing contaminated food to higher trophic levels 	20%
Ashley River (Capped)	70%	<ul style="list-style-type: none"> - Assume faster recovery in sand cap area than in non-capped areas 	100%
Ashley River (Uncapped)	70%	<ul style="list-style-type: none"> - PAHs exceed E-RM Benchmark - Metals exceed E-RL Benchmark - Demonstrated toxicity to mysids, polychaetes (benthos) - Mixed benthic community results; Benthos providing contaminated food to higher trophic levels 	70%
Barge Canal	70%	<ul style="list-style-type: none"> - PAHs exceed E-RM Benchmark - Metals exceed E-RL Benchmark - Benthic community data indicate low species density, and few species - Benthos providing contaminated food to higher trophic levels - Recent data indicate PAH levels all still greater than E-RL Benchmark - Log recovery curve allows for faster rate of initial recovery as canal fills in. 	70%

* APECs where remediation occurred (excavation or capping) had residual benthic services lost at 100% because of the remediation activity (excavation or capping). However, these sites were estimated to return to baseline levels more rapidly than non-remediated sites.

4.3.5 Habitat Equivalency Analysis (HEA)

Habitat Equivalency Analysis, or HEA, (NOAA, 2000) is an accounting tool used to determine the amount of compensatory restoration required to replace the lost services that would have been provided by the injured habitat. The restoration project should be sufficient to provide enough ecological service gains to offset the total service losses resulting from the injury.

Ecological services are quantified by the relative function (in %) of a given habitat over a given time period. For example, one acre of a fully functional benthic habitat provides one benthic “service-acre-year.” An injured acre of benthic habitat that provides only 50% of the baseline services provides ½ of a “service-acre-year,” and so on. Baseline is defined as the relative services that would have been provided had the contamination not occurred, inclusive of any and all other stressors on the system such as development, offsite pollution, diminished water quality, etc. All service levels are established relative to baseline.

Since services occur across time, a discount factor is applied to make all values comparable into equivalent terms. A 3% discount rate has been adopted throughout NRDA and is applied here as well. The resulting time-adjusted measure of ecological services is now as “discounted-service-acre-year” (DSAY).

4.3.5.1 HEA for the Koppers Site

Inputs to the HEA for the Koppers Site were based on multiple lines of evidence and conservative assumptions¹. A number of generic, conservative assumptions were associated with all of the areas that were assessed: 1) the HEA is an appropriate scaling tool, 2) injury began in 1981, 3) full recovery of the injured resources occurs some years into the future, depending on extent of contamination and other factors, and 4) restoration will begin in 2017. Injury levels were assumed to be constant from 1981 until the time of the RI or presumptive remedial action, as appropriate. (It should be noted that, although the restoration has not yet been initiated, the assumption that it will be completed in 2017 served as the basis for calculating compensatory credits in the HEA, and for subsequent discussions with the Responsible Party, which resulted in an agreement in principle on a restoration project and partial cash settlement.

The Trustees determined the number of affected acres of habitat in each APEC. In doing so, the Trustees sought to balance the cost and complexity of the injury assessment with the need for more

¹ The term “conservative assumption” indicates that the value of the parameter in question would tend to favor the natural resource and the public’s interests in injured natural resources when used in the analysis.

precision in determining the degree of injury. Building on estimates of services lost summarized in Table 4.1, the trustees calculated the DSAYs lost due to the injury that the public would need to be compensated for (Table 4.2). In the second part of the HEA, compensatory habitat restoration provides “credit” inputs that are used to project the amount of services generated over time by a restoration activity such as salt marsh creation. Credit inputs may include parameters such as the number of years to maturity, how long a project is expected to last, and rate of natural recovery (Table 4.3). For purposes of assessing the Koppers Site, the HEA was used to estimate the size of tidal salt marsh restoration or other estuarine habitat necessary to make the public whole. Since one restoration type is being applied to injuries across multiple habitats types, the injuries are scaled to equivalent relative value. Results of the HEA performed by the Trustees indicate that proposed restoration alternatives adequately offset the approximately 525 DSAYs lost from injury (Table 4.4). Details on these restoration alternatives can be seen in Section 5.

Table 4.2: HEA Analysis Summary of Injuries at the Koppers Site.

Area of Concern	Size (acres)	Years Until Recovery (yr return to baseline)	DSAYs Lost Due to Injury	Scaling	Tidal Salt Marsh DSAY equivalents
Barge Canal	3.2	10 2015	82.13	5	16.43
Northwest Marsh	1.8	10 2015	13.20	1	13.20
Ashley River (uncapped)	0.69	10 2015	17.71	5	3.54
Ashley River (cement cap)	0.2	No recovery	10.46	5	2.09
Ashley River (sand cap)	2.02	5 2010	50.35	5	10.07
North Marsh (uncapped)	7.32	15 2020	112.70	1	112.70
North Marsh (capped)	1.02	10 years to 90% 10% loss perpetuity 2015	32.94	1	32.94
South Marsh (non-excavated)	13.72	30 2035	295.21	1	295.21

South Marsh (excavated)	1.28	10 2015	38.09	1	38.09
Total DSAYs required to offset injury					524.26

HEA assumes 5:1 ratio for services provided by marsh:subtidal sediments (applies to barge canal and Ashley River).

Table 4.3: HEA Assumptions for Compensatory Restoration Projects

INPUT PARAMETER	DRAYTON HALL	LONG BRANCH CREEK	OYSTER CREATION
Year project initiated	2017	2017	2017
Years to maximum recovery	10	10	3
Maturity curve functional form	Linear	Linear	Linear
Pre-project Service Provision	50%	60%	0%
Maximum Service Provision	85%	85%	100%
Relative productivity of restored natural habitat	100%	100%	360% *
Time horizon for service production of restored habitat	50 yrs	50	50

* Estimated productivity: 1 acre of intertidal oyster habitat is equivalent to 3.6 acres of salt marsh (Peterson et al., 2007)

Table 4.4: HEA Summary for Compensatory Restoration Alternatives

Restoration Alternative	DSAYs Gained (per acre of restoration)	Habitat Productivity (1 acre marsh: 3.6 acre intertidal oyster reef)	Project Acreage	Conservation Easement (CE)?	Total DSAYs of Injury Offset	Total Percent Offset (by Restoration Alternative)
					Alternative 1	
1: Drayton Hall*	4.99	100	70	YES	350	97% + CE Benefit
1: Long Branch Creek	3.57	100	45	NO	161	
					Alternative 2	
2: Drayton Hall	4.99	100	70	YES	350	94% + CE Benefit
2: Oyster Reef	16.28	360	2.4	NO	141	

Drayton Hall Project includes a conservation easement that will protect the restoration project and buffering upland in perpetuity. While not included in the HEA, it provides additional restoration value.

5 RESTORATION PLANNING PROCESS

5.1 RESTORATION OBJECTIVE

The overall objective of the restoration planning process is to identify restoration alternatives that are appropriate to restore, rehabilitate, replace or acquire natural resources and their services equivalent to natural resources injured or lost as a result of releases of hazardous substances. The restoration planning process may involve two components: primary restoration and compensatory restoration. Primary restoration actions are actions designed to assist or accelerate the return of resources and services to their pre-injury or baseline levels. In contrast, compensatory restoration actions are actions taken to compensate for interim losses of natural resources and services, pending return of the resources and their services to baseline levels.

In this instance, remedial actions undertaken at the Site are expected to protect natural resources in the vicinity of the Site from further or future harm and presumably allow natural resources to return to pre-injury or baseline conditions within a reasonable period of time. Under these circumstances, it was unnecessary for the Trustees to consider or plan for primary restoration actions. Accordingly, this Final DARP/EA only addresses the need for compensatory restoration action.

In accordance with NRDA regulations, the Trustees and Beazer East identified and evaluated a reasonable range of project alternatives that could be used to restore or enhance estuarine marsh habitat in the Charleston Harbor area. The projects identified came from a broad survey of the Charleston Harbor area conducted by consultants for Beazer East and the Trustees. The Trustees reviewed available information on these projects and consulted with individuals knowledgeable of specific projects or of the benefits and feasibility of the alternatives, based on project design. In identifying and evaluating these alternatives, the Trustees also sought to ensure the restoration action selected would be capable of providing multiple benefits or services, thus providing the greatest overall benefit to the public. The restoration project alternatives were considered carefully by the Trustees based on the criteria outlined below. All project alternatives, including the Trustees' selected alternative, are discussed in Section 5.0 of this DARP/EA.

5.2 RESTORATION SELECTION CRITERIA

In accordance with the NRDA regulations, and satisfying NEPA screening for reasonable alternatives, the following criteria were used to evaluate restoration project alternatives and identify the project(s) selected for implementation under this plan:

The extent to which each alternative is expected to meet the Trustees' restoration goals and objectives:

The primary goal of any compensatory restoration project is to provide the same quantity and quality of resources and services as those lost. The Trustees considered the potential relative productivity of restored habitat and whether the habitat is being created or enhanced. Future management of the restoration site is also a consideration because management issues can influence the extent to which a restoration action meets its objective.

The cost to carry out the alternative: The benefits of a project relative to its cost are a major factor in evaluating restoration alternatives under NRDA. Additionally, the Trustees considered the total cost of the project and the availability of matching funds, if any (which would be over and above the restoration requirement). Factors that can affect and increase the costs of implementing the restoration alternatives may include project timing, access to the restoration site (for example, with heavy equipment), acquisition of state or federal permits, acquisition of the land needed to complete a project, and the potential liability from project construction. Although a monitoring program does increase the cost of an alternative, the inclusion of an adequate monitoring component is necessary to insure that project success criteria are met.

The likelihood of success of each project alternative: The Trustees consider technical factors that represent risk to successful project construction, successful project function or long-term viability of the restored habitat. For example, high rates of subsidence at a project site are considered a risk to long-term existence of constructed habitats. Alternatives that are susceptible to future degradation or loss through contaminant releases or erosion are considered less viable. The Trustees also consider whether difficulties in project implementation are likely and whether long-term maintenance of project features is likely to be necessary and feasible. Sustainability of a given restoration action is a measure of the vulnerability of a given restoration action to natural or human-induced stresses following implementation and the need for future maintenance actions to achieve restoration objectives.

The extent to which each alternative will avoid collateral injury to natural resources as a result of implementing the alternative: Restoration actions should not result in additional significant losses of natural resources and should minimize the potential to affect surrounding resources during implementation. Projects with less potential to adversely impact surrounding resources are generally viewed more favorably. Compatibility of the project with the surrounding land use and potential conflicts with any endangered species are also considered.

The extent to which each alternative benefits more than one natural resource or service: This criterion addresses the interrelationships among natural resources, and between natural resources and the services they provide. Projects that provide benefits to more than one resource and/or yield more beneficial services overall, are viewed more favorably. This is especially important for the Koppers DARP because we limited our injury assessment only to the benthic community with the assumption that restoration for benthic injury would provide service flows for additional resources. Although recreational benefits are not an explicit objective in this Final DARP, the opportunity for a restoration

project to provide ecological benefits while also enhancing recreational use of an area was considered favorably.

The effect of each alternative on public health and safety: Projects that would negatively affect public health or safety are not appropriate.

The U.S. Department of the Interior's NRDA regulations gives the Trustees discretion to prioritize these criteria and to use additional criteria as appropriate. The evaluation of projects according to the criteria involves a balancing of interests in order to determine the best way to meet the restoration objective. The Trustees have approached restoration planning with the view that the injured natural resources/lost services are part of an integrated ecological system and that the Charleston Harbor area represents the relevant geographical area for Site restoration actions. Areas outside of this are considered less geographically relevant as restoration alternatives. This helps to ensure the benefits of restoration actions are related, or have an appropriate nexus, to the natural resource injuries and losses at the Site. The Trustees also recognized the importance of public participation in the restoration planning process, as well as the acceptance of the projects by the community. Alternatives were considered more favorably if complementary with other community development plans/goals.

NEPA and the NRDA regulations required the Trustees to evaluate the "No Action" alternative, which for compensatory restoration equates to "No Compensation." Under this alternative, the Trustees would take no action to compensate for interim losses associated with the evaluated natural resources.

5.3 FIRST TIER SCREENING OF RESTORATION ALTERNATIVES

The Trustees developed a list of more than 50 potential restoration opportunities in the Charleston Harbor area. The consultants for Beazer East identified several other potential restoration projects specifically intended to compensate for ecological injuries at the Koppers Site. The Trustees, working cooperatively with Beazer East, narrowed the list of projects using the following screening factors:

- Preference for restoration projects that could be implemented in the short term
- Preference for restoration projects with a strong nexus to the injured resources
- Preference for restoration projects with a high degree of habitat enhancement
- Preference for restoration projects that limit disruption to existing resources

As a result of applying the above first-tier screening factors, the Trustees and Beazer East identified the following alternatives as potential restoration projects for the Site:

- Daniel Island Marsh Restoration –Create Restore salt marsh by removing dredge spoils in order to reestablish elevations that would allow for tidal inundation.
- Filbin Creek Flap Gate Removal – Enhance salt marsh by removing flap gates in order to restore tidal hydrology.

- Nelson Creek Rice Dike Removal or Breaching - Removal or breaching of a relict dike in order to restore tidal hydrology and enhance 13 acres of salt marsh habitat.
- Pine Bark Road Rice Dike Removal or Breaching– Restore six acres of salt marsh habitat by breaching or removing a relict dike to restore tidal hydrology.
- Popperdam Creek Rice Dike Removal or Breaching (Air Force Base Property) –Removal or breaching of a relict dike in order to restore tidal hydrology and enhance 22 acres of salt marsh habitat.
- Drayton Hall Rice Dike Removal or Breaching– Restore 70 acres of salt marsh habitat by breaching relict dike to restore tidal hydrology.
- Long Branch Creek Greenway Culvert Replacement –Enhance 45 acres of salt marsh on 155 acres of degraded marsh by replacing undersized culverts with a pedestrian bridge.
- Charleston Area-Oyster Reef Creation/Restoration - Create or restore oyster reefs in and around the Charleston Harbor area by planting shell to provide a suitable substrate on which oyster larvae could settle and grow.
- No Action.

5.4 SECOND TIER SCREENING OF RESTORATION ALTERNATIVES

As result of a second tier qualitative screening (Table 5.1), several of the alternatives described in the previous section were dropped from further consideration. (Subjective screening summarized in Table 5.1 is based on a scale of zero to +3). Projects were removed from consideration due to circumstances such as land ownership concerns, impacts to neighboring land parcels, logistical difficulties, and excessive cost.

Table 5.1: Summary of Trustees' Second Tier Screening of Restoration Alternatives

Restoration Alternative	Implementable in short-term	Strong nexus between injured & restored habitats	Amount of habitat function enhancement	Avoids injury to existing resources	Retain for detailed analysis
Daniel Island Marsh Creation	No	+++	+++	Yes	No
Filbin Creek Flap Gate Removal	No	+++	++	Yes	No
Nelson Creek Rice Dike Removal or Breaching	No	+++	++	Yes	No
Pine Bark Road Rice Dike Removal or Breaching	No	+++	+	Yes	No
Popperdam Creek (Air Force Base) Rice Dike Removal or Breaching	N/A (project secured by Air Force separately)	+++	++	Yes	No
Drayton Hall Rice Dike Removal or Breaching	Yes	+++	+++	Yes	Yes
Long Branch Creek Greenway Culvert Replacement	Yes	+++	+++	Yes	Yes
Charleston-Area Oyster Reef Creation/Restoration	Yes	+++	+++	Yes	Yes
No action	Yes	0	0	0	Yes

Scale of zero to +3.

5.5 SCALING THE PREFERRED RESTORATION PROJECT

The Trustees considered the “Drayton Hall Rice Dike Removal or Breaching” (“Drayton Hall”), “Charleston-Area Oyster Reef Creation/Restoration” (“Oyster Reef”) and “Long Branch Creek Greenway Culvert Replacement” (“Long Branch Creek”), as well as the “No action” alternative in developing the DARP/EA. In compliance with CERCLA NRDA regulations and NEPA, the selection of the restoration alternative was finalized after public review and comment (October 21– November 21, 2016).

5.5.1 Habitat Equivalency Analysis Credit Model

The preferred restoration project should provide sufficient habitat creation and/or enhancement to compensate the public for the losses outlined in Section 4.0 (and summarized in Table 4.2). Using scientific literature and knowledge of South Carolina estuaries, the Trustees evaluated the last four restoration alternatives identified in Table 5.1 in order to determine the amount of credit (i.e., the number of DSAYs) that would be generated by each of these four alternatives (Table 5.2).

Table 5.2: Habitat Equivalency Analysis Summary of Restoration Credits to Offset Injury

Restoration Alternative	Restoration Project	Project Acreage (acres)	Conservation Easement (CE)?	Discount Service Acre Years (DSAYs)	Percent of Injury Offset (Injury = 524.26 DSAYs)
1		115		511	97% + CE Benefit
	Drayton Hall Rice Dike Breaching	70	YES	350	
	Long Branch Creek Culvert Replacement	45	NO	161	
2		72.4		491	94% + CE Benefit
	Drayton Hall Rice Dike Breaching	70	YES	350	
	Oyster Reef Creation	2.4	NO	141	
3				0	0%
	No Action	0	NO	0	

Due to the size of the injury, and the estimated credits for each project above, the Trustees developed restoration alternatives that combine the Drayton Hall project with either the Long Branch Creek or the Oyster Reef Creation options (See Section 6).

5.6 GEOGRAPHIC PROXIMITY OF PROJECTS

The projects selected for more detailed analysis are located in or near the Charleston Harbor estuary. The Drayton Hall site is located approximately 10 miles upriver from the Koppers Site. The Long Branch Creek site is approximately 8 miles to the south of Charleston Harbor, and less than 10 miles from the Koppers Site. The oyster reef restoration action would occur within the Charleston Harbor estuary as well, though the exact reef creation site has not been chosen.

6 RESTORATION ALTERNATIVES AND SELECTION

6.1 RESTORATION ALTERNATIVE 1: DRAYTON HALL AND LONG BRANCH CREEK MARSH RESTORATION PROJECTS

Drayton Hall

The Drayton Hall project consists of three components: 1) restoring tidal hydrology and salt marsh functions in a partially impounded brackish marsh located across the Ashley River from the historic Drayton Hall plantation, 2) eliminating existing stands of *Phragmites australis*, an invasive non-native species that spreads rapidly, replacing native salt marsh vegetation; and 3) establishing a conservation easement to ensure long-term preservation of the restored marsh, and the immediate uplands buffer. Hydrologic restoration and invasive species removal are restoration actions that improve the health and function of benthic and marsh habitat and the ecological services they provide.

The Drayton Hall site is a semi-impounded brackish marsh, where tidal flow is partially restricted by a relict dike constructed after 1939. The site is located on the north side of the Ashley River, across from the historic Drayton Hall plantation (Figure 6.1). The project property and surrounding uplands are owned by the National Trust for Historic Preservation. The site is approximately 70 acres, with a mixture of marsh grasses including *Spartina spp.*, *Juncus roemerianus*, and the invasive *Phragmites australis*.

Figure 6.1: Drayton Hall Project Site Map

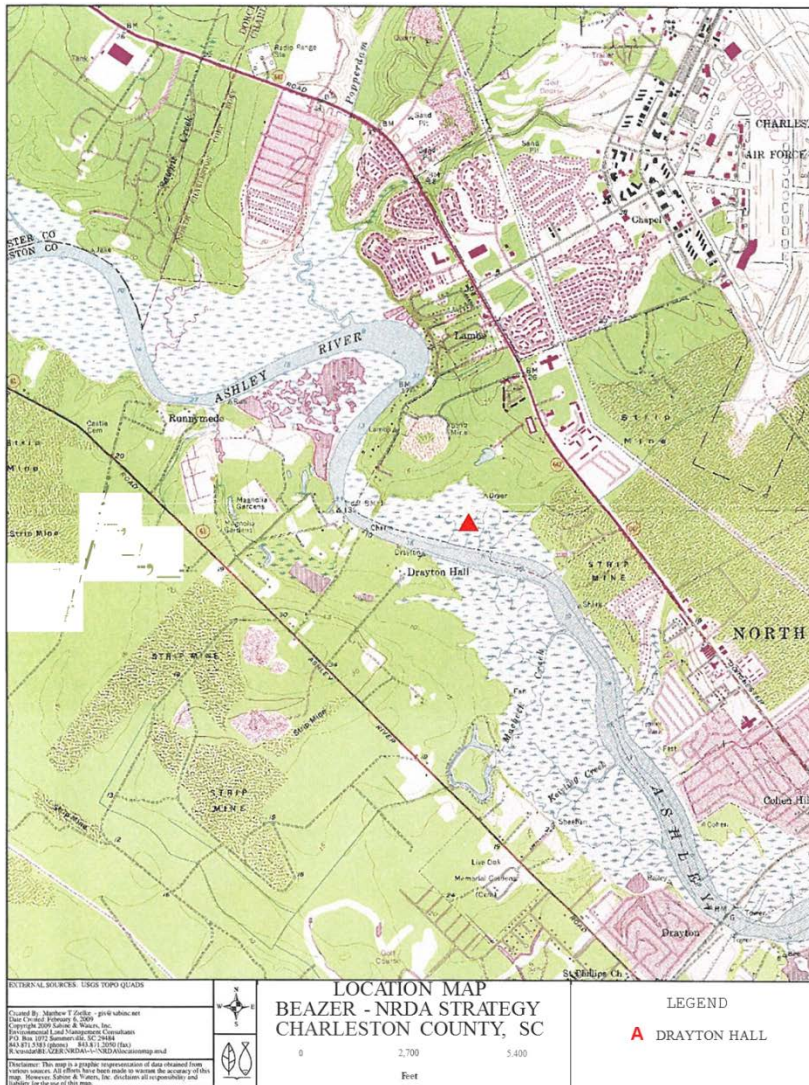


Figure provided by Beazer East

Restoring tidal flow will be achieved by breaching the existing dike at several locations associated with historical tidal creeks, and reconnecting the upper and lower reaches of these remnant tidal creeks. The current dike is broken on both the western and eastern ends. A total of five new breaches will be created in the dike using a track hoe (Figure 6.2).

Figure 6.2: Breach Locations at Drayton Hall Project Site.

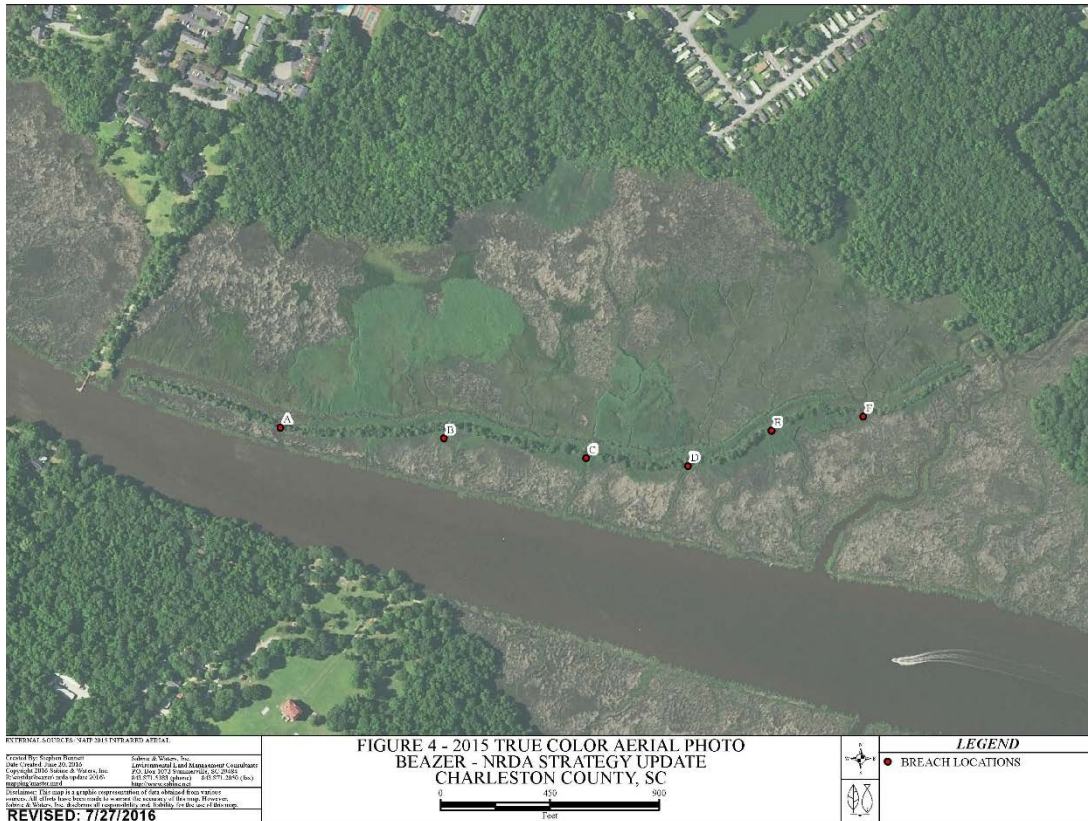


Figure provided by Beazer East

Each of the five breaches will be dug out 15-20 feet wide and will be graded down to an elevation slightly above the surrounding marsh. All spoil will be placed on the dike. Coconut mat will be staked over the fresh spoil piles to minimize erosion back into the marsh. The track hoe will be brought in and conduct activities by barge (river and canal) which will reduce damage to the marsh. Any damage that is sustained will be minimized by leveling marsh to the original grade and, if necessary, replanting with *Spartina alterniflora*.

Pedestrian surveys of the impaired marsh revealed several stands of *Phragmites*. *Phragmites* is an exotic and invasive species that spreads rapidly and replaces the natural vegetation. An appropriate herbicide labeled for aquatic use will be used to eradicate the invasive species, per best practices approved by the Trustees.

Long Branch Creek

The project consists of enhancing and restoring approximately 45 acres of tidal salt marsh and fishery habitat within Long Branch Creek, Charleston, South Carolina (Figure 6.3). Work includes removing three undersized, failing 48" pipes running under the West Ashley Greenway (Greenway) and creating a breach that will provide tidal exchange above and below the causeway. Like the Drayton Hall project, restoring natural hydrology to the salt marsh system will improve the overall health and function of benthic and marsh habitat.

Figure 6.3 Satellite View of the Long Branch Creek Project Site



Image provided by City of Charleston (Google Earth)

The Greenway is a 9-mile trail parallel to US Highway 17 that serves as the collector spine for the majority of the bicycle / pedestrian trail system in the West Ashley area of Charleston. At the location where the Greenway crosses Long Branch Creek, 3 pipes serve as the only hydrological connection for the creek upstream of the Greenway, which is severely impaired. The undersized pipes restrict tidal flow leading to water backup and whitewater effects, increased sedimentation, and increased erosion along the causeway and creek banks. Over 75% of the causeway has eroded, which is now at risk of failure; and the marsh immediately adjacent to the causeway is highly impaired by the unnatural flow of water.

The project will create a 10-15-foot breach in the Greenway, remove the pipes, and construct a 50-foot footbridge or install a box culvert. The breach will allow a natural tidal exchange above and below the causeway. Eliminating the pooling and whitewater effects will reduce shoreline erosion and sedimentation, and improve both benthic and fisheries habitat. Additionally, public access to the upper reaches of Long Branch Creek will be improved. A longer-term goal for the project is to catalyze additional efforts to remove other impediments from Long Branch Creek, and improve the overall health of the 155 acre salt marsh system.

6.1.1 Evaluation of Alternative 1

This alternative provides an opportunity for cost-effective estuarine habitat enhancement through hydrologic restoration. Both the Drayton Hall and Long Branch Creek projects restore degraded salt marsh habitat by improving tidal hydrology. Anticipated benefits from these actions include improving the quality of benthic and fishery pelagic habitat provided by salt marsh. Detritus derived from the decomposition of *Spartina* and other plant species forms the basis of the tidal marsh food web. This material is consumed by organisms such as plankton, clams, crabs, snails, and some fish, which are, in turn, a source of food for higher trophic level organisms in the estuarine food web, including federally protected migratory birds. In addition to being a source of food, tidal marshes provide nursery grounds and protection from predators for a wide range of aquatic organisms. Tidal marshes enhance the water quality of adjacent open waterbodies by acting as filters, absorbing nutrients and pollutants from upland areas, while at the same time protecting those upland areas from erosion due to storms and sea level rise.

Federally managed species that utilize this type of habitat during various life stages include red drum and penaeid shrimp. Other species of commercial, recreational and ecological importance include Atlantic croaker, spot, Atlantic menhaden, blue crab, killifish and striped mullet. In turn, these fish provide prey for Spanish and king mackerel, cobia, and others managed by the South Atlantic Fisheries Management Council (SAFMC), and for migratory species such as sharks and billfishes managed by NOAA. The Atlantic Coastal Fish Habitat Partnership (ACFHP) identifies estuarine marsh as priority habitat in its Conservation Strategic Plan.

It is expected that the restored marshes will be largely self-sustaining, require minimal intervention following construction to achieve functional success, and would provide an uninterrupted flow of services into the future. Additionally, the conservation easement will ensure protection for the restored marsh, as well as preserving the buffering upland.

6.2 RESTORATION ALTERNATIVE 2: DRAYTON HALL SITE AND OYSTER REEF CREATION

Drayton Hall

See Section 6.1

Oyster Reef Creation

Eastern oysters (*Crassostrea virginica*) create complex habitats utilized by numerous finfish, invertebrates, wading birds, and mammals. Oysters improve water clarity and quality as they filter large quantities of water and transfer nutrients from the water column to the benthos. Intertidal populations of oysters form natural breakwaters that protect shorelines and fringing marshes from erosion. Declines in oyster populations are associated with adverse effects on other species, reduced water quality, and ecosystem alterations.

The oyster project would create additional oyster reef habitat in the Charleston Harbor estuary. This would involve constructing one or more intertidal oyster reefs, encompassing approximately 2.4 acres (total). It is anticipated that this project would eventually provide ecological services equivalent to those of a natural oyster reef of equivalent size. Under this alternative, the SCDNR would place and maintain a foundation of purchased or recycled oyster shell cultch, on which oyster spat could settle and grow into mature oysters. These oysters would serve as the “keystone” species in the development of a functional oyster reef community.

The precise location(s) for this alternative has not been selected; however, several potential sites within the Charleston Harbor estuary have been identified. Final site selection will include identifying intertidal bottom firm enough to sustain oyster propagation, and measuring the proposed cultch footprint with a Global Positioning System (GPS). Data from the GPS is transferred into the SCDNR's Geographic Information System (GIS) and maps are produced on digital imagery acquired by SCDNR's remote sensing oyster mapping project. Once the GIS calculates the footprint, the intertidal shoreline area will be staked with 1" diameter PVC poles before planting shells at high tide. Oyster shells will be floated off a barge during a tidal planting cycle within the designated area by high pressure water cannon. Raking or dispersal of shells is sometimes required after planting to obtain desired coverage and thickness.

6.2.1 Evaluation of Alternative 2

This alternative provides an opportunity for cost-effective estuarine habitat enhancement by combining salt marsh restoration with oyster reef creation. In addition to the benefits expected from the Drayton Hall project—including, but not limited to, benthic and pelagic habitat improvement—the oyster reef creation project would be expected to improve water quality and increase habitat complexity and species diversity in the vicinity of the proposed project. It is anticipated that the constructed oyster

reefs would be largely self-sustaining, require minimal intervention following construction to achieve functional success, and would provide an uninterrupted flow of services into the future.

The SAFMC has designated oyster reefs as essential fish habitat (EFH). Federally managed species that utilize this type of habitat during various life stages include red drum and penaeid shrimp. Other species of commercial, recreational and ecological importance include Atlantic croaker, spot, Atlantic menhaden, blue crab, killifish and striped mullet.

In turn, these fish provide prey for Spanish and king mackerel, cobia, and others managed by the SAFMC, for migratory species such as sharks and billfishes managed by NOAA, and for federally protected migratory birds. In South Carolina, oyster reefs generate biodiversity and are identified as critical habitats of concern in both the State Conservation Plan and SCDNR's Comprehensive Wildlife Conservation Strategy.

6.3 RESTORATION ALTERNATIVE 3: NO ACTION

Under this alternative, the Trustees would take no action to create, restore, or enhance estuarine marsh services to compensate for the resource losses attributed to the Koppers Site. The Trustees determined that natural resources or ecological resource services were lost due to injuries caused by releases of hazardous substances from the Site. While the remedial activities addressed the actions needed to allow injured resources to recover, the remedial activities did not compensate the public for ecological resource service losses. Such compensation serves to make the public whole for the full harm done to natural resources injured by the release of hazardous substances from the Site.

6.3.1 Evaluation of No Action Alternative

Under the No Action alternative, no restoration, rehabilitation, replacement, or acquisition actions would occur. If the No Action alternative is selected, there would be no restoration or replacement of the lost resources and their services and the public would not be made whole for past injuries from releases from the Site. The No Action Alternative would not meet the Restoration Criteria.

- Relationship to Injured Resources and Services - The No Action alternative would not provide for restoration, replacement, enhancement or acquisition of resources.
- Consistency with the Restoration Goals – The No Action alternative would not provide for restoration of injured biological resources.

Compliance with Laws – While consideration of the No Action alternative is required by NEPA, this alternative would not meet the requirements and goals of CERCLA and the NRDA process under

CERCLA to provide for restoration that compensates the public for the injury and loss of the natural resources and services caused by releases of hazardous substances from the Site.

The No Action alternative is considered in this Final DARP/EA as required by NEPA. The Trustees found that the No Action alternative would not meet the purpose and need for restoration under this Final DARP/EA nor the responsibilities of the Trustees under CERCLA, including as defined by NRDA processes under CERCLA.

6.4 ALTERNATIVE PROPOSED FOR SELECTION

While Alternatives 1 and 2 meet the criteria outlined in Sections 4.2 – 4.4, Alternative 1 is the alternative proposed for selection because it will most effectively compensate the public for natural resource injuries related to the Site (See Table 5.2). This alternative is more closely linked to the injured benthic and salt marsh habitat and services, and better able to restore and enhance like-habitat, and provide the same quantity and quality of resources lost. Additionally, the Long Branch Creek project creates opportunities for further restoration actions along the Long Branch Creek system.

7 NEPA ENVIRONMENTAL CONSEQUENCES ANALYSIS

This section describes the Trustees' NEPA analysis of the environmental consequences arising from the proposed actions, including the alternative proposed for selection. For the actions identified in this Final DARP, the appropriate context for considering potential significance of the actions is local as opposed to national or worldwide.

7.1 SCOPE OF THE NEPA ANALYSIS

This Final Environmental Assessment (Final EA) describes the major potential impacts of the proposed action of carrying out restoration activities at Drayton Hall and Long Branch Creek in Charleston, South Carolina. The Final EA analyzes the potential direct, indirect, and cumulative ecological, social, and economic impacts associated with two alternatives.

In considering the Proposed Action, NOAA National Marine Fisheries Service (NMFS) is responsible for complying with a number of Federal regulations, including NEPA. As such, the purpose of the Final EA is to provide an environmental analysis to analyze the potential effects of NMFS' Proposed Action to inform its decision-making process and to encourage and facilitate public involvement in the

environmental review process. Under NEPA, a Final EA is prepared to determine if any significant environmental impacts are likely to be caused by a proposed action. If the Final EA does not identify significant impacts, a FONSI is prepared to document the decision maker's determination and to approve the proposed action. If at any time during preparation of the Final EA it appears that significant impacts would result from the proposed action, the agency would halt development of the Final EA and begin preparation of an EIS to more thoroughly evaluate the potential impacts and potential ways to reduce or mitigate those impacts.

The following definitions were generally used to characterize the nature of the various impacts evaluated with this EA.

Short-term or long-term impacts. These characteristics are determined on a case-by-case basis and do not refer to any rigid time period. In general, short-term impacts are those that would occur only with respect to a particular activity or for a finite period. Long-term impacts are those that are more likely to be persistent and chronic.

Direct or indirect impacts. A direct impact is caused by a proposed action and occurs contemporaneously at or near the location of the action. An indirect impact is caused by a proposed action and might occur later in time or be farther removed in distance but still be a reasonably foreseeable outcome of the action. For example, a direct impact of erosion on a stream might include sediment-laden waters in the vicinity of the action, whereas an indirect impact of the same erosion might lead to lack of spawning and result in lowered reproduction rates of indigenous fish downstream.

Minor, moderate, or major impacts. These relative terms are used to characterize the magnitude of an impact. Minor impacts are generally those that might be perceptible but, in their context, are not amenable to measurement because of their relatively minor character. Moderate impacts are those that are more perceptible and, typically, more amenable to quantification or measurement. Major impacts are those that, in their context and due to their intensity (severity), have the potential to meet the thresholds for significance set forth in Council of Environmental Quality (CEQ) regulations (40 CFR 1508.27) and, thus, warrant heightened attention and examination for potential means for mitigation to fulfill the requirements of NEPA.

Adverse or beneficial impacts. An adverse impact is one having adverse, unfavorable, or undesirable outcomes on the man-made or natural environment. A beneficial impact is one having positive

outcomes on the man-made or natural environment. A single act might result in adverse impacts on one environmental resource and beneficial impacts on another resource.

Cumulative impacts. CEQ regulations implementing NEPA define cumulative impacts as the “impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.” (40 CFR 1508.7) Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time within a geographic area.

7.2 PREFERRED ALTERNATIVE: DRAYTON HALL AND LONG BRANCH CREEK PROJECTS

See Section 6.1 for project description.

7.2.1 Impact of Preferred Alternative and No Action Alternative

The Trustees evaluated the potential for restoration actions associated with all proposed alternatives to impact the following: the physical environment (air and noise pollution, water quality, geological and energy resources, and contaminants), the biological environment (benthos, finfish, vegetation, wildlife, and endangered species), socioeconomic environment (environmental justice, recreation, commercial fishing, traffic, and cultural resources), and the potential for cumulative impacts.

7.2.1.1 Physical Environment

Air Quality: There would be minor, short-term, direct, adverse impacts because of construction activities. Exhaust emissions from heavy equipment would occur during the construction phase, but the amounts would be small and temporary. Adverse impacts would be short-term because air quality would return to present levels immediately after construction.

No Action: Air quality conditions would remain as they are, and there would be no adverse impacts to air quality from construction activities.

Water Quality: There would be minor, short-term, direct, adverse impacts because of earth moving activities associated with breaching the relict dike and the Greenway; and removing the culverts, increasing turbidity and sedimentation in the immediate construction area and nearby water bodies. Increased suspended sediments can affect benthic filter feeders and young fish by damaging gills and feeding tissues. However, best management practices (containment berms, erosion control, etc.) will be employed to minimize the extent, duration, and intensity of water quality impacts. Post-construction, water quality should stabilize, and there should be moderate-to-major, beneficial, long-term impacts to water quality because of improved benthic habitat.

No Action: Under this alternative, there may be long-term indirect, adverse impacts to water quality because impaired benthic and salt marsh habitat would continue to degrade and may result in reduced habitat function which includes acting as a filter for surface and groundwater inputs. Additionally the long-term beneficial impacts to water quality anticipated from the compensatory actions would not occur.

Noise: Minor, short-term, direct, adverse impacts would occur because of earth-moving equipment. During the construction phase, wildlife in the immediate vicinity of the site may be temporarily disturbed. Community residents and/or recreational users may adjust their activities (e.g., boating and biking) due to noise as well. Adverse impacts would be short-term because noise levels would return to present conditions immediately after construction.

No Action: Noise conditions would remain as they are, and there would be no adverse impacts from construction activities.

Geology: Breaching the dike at several points will impact the geology by adjusting the hydrology and providing more tidal influx into the currently impaired marsh land. Likewise, the shift in hydrology at Long Branch Creek may alter the geology immediately surrounding the causeway. These would be moderate, long-term beneficial impacts because these shifts in the landscape strengthen the habitat being restored. While construction activities at both sites will have direct, short-term impacts to geology, any adverse impacts would be greatly offset by the long-term beneficial impacts of the improved hydrologic system.

No Action: There would be minor long-term, indirect adverse impacts to the geology under this alternative because of continued erosion, sedimentation, and reduced hydrologic connectivity.

Energy: There would be no impacts because the project sites are not associated with energy production, transport, or infrastructure.

No Action: Under this alternative, there would be no impacts because energy production, transport, or infrastructure would remain as is.

Contaminants: There would be no impacts to human health and safety because construction will not occur at the Superfund site or any other contaminated area; therefore, contaminated sediments are not being disturbed.

No Action: Under this alternative, there would be no change in any current contaminant level or current public health threat.

7.2.1.2 Biological Environment

Benthos: There would be minor, direct, short-term, adverse impacts because construction activities may disrupt substrate and increase sedimentation, affecting benthic organisms temporarily. However, best management practices (containment berms, erosion control, etc.) should be employed to minimize the extent, duration, and intensity. Post-construction, sedimentation is to be reduced at Long Branch Creek, and there would be moderate-to-major, long-term, beneficial impacts to benthos at both sites because of the restored habitat.

No Action: Under this alternative, there would be minor, long-term adverse impacts to benthic organisms as the salt marsh habitat continued to degrade from impaired hydrology and increased invasive species coverage.

Finfish: There would be minor, direct short-term, adverse impacts because construction activities would temporarily strain fish habitat and populations in the immediate project area. Indirect adverse impacts may relate to feeding, gas exchange, spawning, and other natural behaviors. However, moderate, long-term, beneficial impacts would be expected due to the enhancement of salt marsh habitat through compensatory actions.

No Action: Under this alternative, there would be minor, long-term adverse impacts to finfish as the salt marsh habitat continued to degrade from impaired hydrology and increased invasive species coverage.

Vegetation: There would be minor, short-term, adverse impacts to some vegetation because of construction activities and altered hydrology. Some species that would be impacted include *Spartina* spp., and *Juncus*. Best practices will be employed during construction to minimize damage injury to the marsh vegetation. Replanting will also be undertaken, as appropriate. Additionally, the Drayton Hall project will provide a moderate-to-major long-term, beneficial impact to native plant populations by removing the invasive *Phragmites* stands. There will also be indirect long-term beneficial impacts to native marsh vegetation because of the improved hydrology, and overall enhancement of salt marsh habitat.

No Action: Under this alternative, there would be long-term adverse impacts to native marsh vegetation because the invasive *Phragmites* stands would likely expand, and further degrade the marsh.

Wildlife: There would be minor, short-term, adverse impacts because noise and construction activities may temporarily disrupt wildlife. There would be long-term, indirect, beneficial impacts to wildlife through the enhancement of salt marsh habitat.

No Action: Under this alternative, there would be minor, long-term adverse impacts to wildlife as the salt marsh habitat continued to degrade from impaired hydrology and increased invasive species coverage.

7.2.1.3 Socioeconomic Environment

Environmental Justice: This alternative does not have the potential to negatively or disproportionately affect minority or low-income populations in the area, including economically, socially, or in terms of conditions affecting their health. There would be long-term, indirect, beneficial impacts because proposed activities are expected to restore an environment that is of equal benefit to all area residents.

No Action: Under this alternative, there would be no long-term beneficial impacts to the public from improved habitat. Additionally, the lack of meaningful recovery would have indirect, adverse impacts on the economic and social well-being of all residents.

Recreation: There would be minor, short-term, direct adverse impacts because construction activities may temporarily impact recreational use of the Greenway and areas of the Ashley River (Drayton Hall project site). Impacted activities include walking, biking, and water uses such as boating and fishing. There would be long-term, indirect beneficial impacts to recreation because restored habitat may enhance recreational activities through improved water quality, wildlife viewing, and recreational fishing.

No Action: Under this alternative, there would be no adverse impacts from construction activities. However, there would be long-term, direct, adverse impacts at the Long Branch Creek site because erosion at the Greenway caused by impaired hydrology would continue, and likely lead to reduced or denied public access at that section of the Greenway.

Commercial fishing: There would be minor, short-term direct, adverse impacts because construction activities could deter commercial fishing (e.g., commercial crab pot, shrimp seine, bait trap fisheries) in the vicinity of the Drayton Hall site. However, there are anticipated long-term, beneficial indirect impacts to commercial fisheries from the improved habitat for these species of interest.

No Action: Under this alternative, commercial fisheries would continue uninterrupted. However, there could be long-term, indirect adverse impacts to commercial fishing if populations of species of interest declined due to lack of quality habitat.

Traffic: There would be no impacts to traffic at the Drayton Hall site because the proposed alternative does not include roads and, therefore, motorists would not be affected. There would be minor short-

term adverse impacts at the Long Branch Creek site because access to the Greenway at the construction site would be limited for a finite period of time.

No Action: Under this alternative, there would be no impacts because transportation infrastructure would not be modified or disrupted.

Cultural Resources: There would be minor beneficial indirect impacts to nationally significant cultural, scientific, or historic resources because the proposed restoration actions will maintain or enhance “viewsheds” for Drayton Hall and Long Branch Creek. The Drayton Hall site is owned by the National Trust for Historic Preservation, and is within the “viewshed” of Drayton Hall Plantation, a National Trust Historic Site located on the opposite side of the Ashley River. The National Trust is supportive of the proposed project, provided the view from Drayton Hall remains essentially unchanged. The Trustees and Beazer East will continue to closely coordinate all restoration activities with the National Trust and their local representatives, to avoid any adverse impact to Drayton Hall or its viewshed. Aside from the proposed breaches in the dike that currently restricts tidal exchange between the semi-impounded wetland and the Ashley River, the view from Drayton Hall will remain undisturbed. Any vegetation on the dike that is removed or injured as a result of construction activities, will be promptly replaced with native plant species of comparable size, so that the post-construction view from Drayton Hall is not discernibly different from the pre-construction view. Additionally, the Long Branch Creek’s anticipated improvement to the health of salt marsh will improve the landscape and viewshed along the creek’s stretch of the Greenway.

No Action: Under this alternative, there would be no impacts because cultural, scientific, and historic resources would remain as they currently stand.

7.2.2 Cumulative Impacts of Preferred Alternative

The alternative proposed for selection (including both Drayton Hall and Long Branch Creek restoration actions) is expected to result in cumulative, long-term, beneficial impacts by increasing the area and ecological function of salt marsh habitat, including increased habitat stability. Approximately 130 acres of marsh will be directly impacted by restoration, and the overall ecological function of the larger salt marsh system at both sites will be benefitted by the restored hydrologic function and removal of invasive species. Additionally, it is anticipated that the Long Branch Creek restoration project will catalyze additional restoration actions by the City of Charleston along the creek, extending the restoration footprint into further stretches of the salt marsh system.

The project actions would not result in any change to the economic activity in the area, and the restoration would contribute to the overall ecological health of the area. There is the direct potential to improve water quality through reduced sedimentation. The creation and enhancement of wildlife habitat

supplements existing habitat in the region. A net cumulative beneficial impact may result from the synergy with future restoration activities. Further, the proposed actions are intended to compensate the public, i.e., make the public and the environment whole, for resources injuries caused by releases of hazardous substances into the watershed.

7.2.3 Cumulative Impacts of No Action Alternative

The No Action alternative is expected to result in cumulative negative impacts and would not provide the conditions necessary for recovery of the injured resources. With No Action, natural resources and their services would not return to baseline, and interim service losses would not be compensated.

7.3 NON-PREFERRED ALTERNATIVE: DRAYTON HALL AND OYSTER REEF CREATION

See Section 6.2 for project description.

7.3.1 Impact of Non-Preferred Alternative and No Action Alternative

7.3.1.1 Physical Environment

Air Quality: There would be minor, short-term, direct, adverse impacts because of proposed construction activities. Exhaust emissions from heavy equipment would occur during the construction phase, but the amounts would be small and temporary. There would be no long-term adverse impacts to air quality because air quality would return to present levels immediately after construction.

No Action: Air quality conditions would remain as they are, and there would be no adverse impacts to air quality from construction activities.

Water Quality: There would be minor, short-term, direct, adverse impacts because of earth moving activities associated with breaching the relict dike, increasing turbidity and sedimentation in the immediate construction area and nearby water bodies. Indirect impacts from increased suspended sediments can affect benthic filter feeders and young fish by damaging gills and feeding tissues. However, best management practices (containment berms, erosion control, etc.) should be employed to minimize the extent, duration, and intensity of water quality impacts. Post-construction, water quality should stabilize, and there would be moderate-to-major, long-term, beneficial impacts to water quality because of the increased and improved benthic habitat.

No Action: Under this alternative, there may be long-term indirect, adverse impacts to water quality because impaired benthic and salt marsh habitat would continue to degrade and may result in reduced habitat function which includes acting as a filter for surface and groundwater inputs. Additionally the

long-term beneficial impacts to water quality anticipated from the compensatory actions would not occur.

Noise: Minor, short-term, direct, adverse impacts would occur because of earth-moving equipment and the vessel used to transport shell to the oyster reef creation site. The noise associated with these actions may temporarily disturb wildlife and community residents in the immediate vicinity of the sites. However, the noise from would not exceed the daily or average noise-range for the Charleston waterways, and there would be no long-term adverse impacts because noise would return to regular levels once construction ceased.

No Action: Noise conditions would remain as they are, and there would be no adverse impacts from construction activities.

Geology: The proposed action would create or enhance oyster reefs in the Charleston Harbor estuary, and this would change the immediate bathymetry, as well as alter hydrology (with regard to Drayton Hall). These are long-term beneficial impacts because the alterations allow new or strengthened habitat to persist.

No Action: Under this alternative, there would be minor, long-term indirect adverse impacts to geology because of restricted hydrologic connectivity. Geologic alterations would not occur from building reefs, and, therefore, the long term beneficial impacts anticipated from the compensatory actions would not be realized.

Energy: There would be no impacts because the project sites are not associated with energy production, transport, or infrastructure.

No Action: Under this alternative, energy production, transport, or infrastructure would remain as is.

Contaminants: There would be no impacts to human health and safety because construction will not occur at the Superfund site or any other contaminated site; therefore, contaminated sediments are not being disturbed.

No Action: Under this alternative, there would be no change in any current contaminant level or current public health threat.

7.3.1.2 Biological Environment

Benthos: There would be minor, short-term, direct adverse impacts because construction activities may disrupt substrate and increase sedimentation, affecting benthic organisms temporarily. However, best

management practices (containment berms, erosion control, etc.) should be employed to minimize the extent, duration, and intensity. Both restoration actions would provide moderate-to-major, long-term, beneficial impacts to benthos because of the newly established or restored benthic habitat.

No Action: Under this alternative, there would be minor, long-term adverse impacts to benthic organisms as the salt marsh habitat continued to degrade from impaired hydrology and increased invasive species coverage.

Finfish: There would be minor, short-term, adverse impacts because construction activities may temporarily strain fish habitat and populations in the immediate project area. Indirect adverse impacts may relate to feeding, gas exchange, spawning, and other natural behaviors. However, moderate, long-term, beneficial impacts would be expected due to the enhancement of essential fish habitat, including salt marsh and oyster habitat through compensatory actions.

No Action: Under this alternative, there would be minor, long-term indirect adverse impacts to finfish organisms as the salt marsh habitat continued to degrade from impaired hydrology and increased invasive species coverage.

Vegetation: There would be minor, short-term, adverse impacts to some vegetation because of construction activities and altered hydrology. Species that would be impacted include *Spartina* spp., and *Juncus*. Best practices will be employed during construction to minimize damage to the marsh vegetation. Replanting will also be expected, as appropriate. Additionally, the Drayton Hall project will provide a beneficial impact to native plant populations by removing the invasive *Phragmites* stands. Improved hydrologic connectivity will strengthen native marsh vegetation over time.

No Action: Under this alternative, there would be long-term direct, adverse impacts to native marsh vegetation because the invasive *Phragmites* stands would like expand, and further degrade the marsh.

Wildlife: There would be minor, short-term, adverse impacts because noise and activities associated with construction may temporarily disrupt wildlife. There would be long-term, indirect, beneficial impacts to wildlife through the enhancement of coastal habitat, including oyster reef habitat.

No Action: Under this alternative, there would be minor, long-term adverse impacts to wildlife as the salt marsh habitat continued to degrade from impaired hydrology and increased invasive species coverage.

7.3.1.3 Socioeconomic Environment

Environmental Justice: This alternative does not have the potential to negatively or disproportionately affect minority or low-income populations in the area, including economically, socially, or in terms of conditions affecting their health. There would be long-term, indirect, beneficial impacts because proposed activities are expected to restore an environment that is of equal benefit to all area residents.

No Action: Under this alternative, there would be no long-term beneficial impacts to the public from improved habitat. Additionally, the lack of meaningful recovery would have indirect, adverse impacts on the economic and social well-being of all residents.

Recreation: There would be minor, short-term, adverse impacts because construction activities may temporarily impact recreational use of the rivers (at the project sites). Impacted activities include boating and fishing. There would be long-term, indirect beneficial impacts to recreation because restored habitat may enhance recreational activities through improved water quality, wildlife viewing, and recreational fishing.

No Action: Under this alternative, there would be no adverse impacts from construction activities.

Commercial fishing: There would be minor, short-term, adverse impacts because construction activities could deter commercial fishing (e.g., commercial crab pot, shrimp seine, bait trap fisheries) in the vicinity of the project sites. However, there are anticipated long-term, beneficial indirect impacts to commercial fisheries from the improved habitat (including EFH) for these species of interest.

No Action: Under this alternative, commercial fisheries would continue uninterrupted. However, there could be long-term, indirect adverse impacts to commercial fishing if populations of species of interest declined due to lack of quality habitat.

Traffic: There would be no impacts to traffic because the proposed alternative does not include roads or other transportation infrastructure.

No Action: Under this alternative, there would be no impacts because infrastructure would not be modified or disrupted.

Cultural Resources: There would be minor beneficial impacts to national significant cultural, scientific, or historic resources because the proposed action will enhance the “viewshed” for Drayton Hall. The Drayton Hall site is owned by the National Trust for Historic Preservation, and is within the viewshed of Drayton Hall Plantation, a National Trust Historic Site located on the opposite side of the Ashley River. The National Trust is supportive of the proposed project, provided the view from Drayton Hall remains

essentially unchanged. The Trustees and Beazer East will continue to closely coordinate all restoration activities with the National Trust and their local representatives, to avoid any adverse impact to Drayton Hall or its viewshed. Aside from the proposed breaches in the dike that currently restricts tidal exchange between the semi-impounded wetland and the Ashley River, the view from Drayton Hall will remain undisturbed. Any vegetation on the dike that is removed or injured as a result of construction activities, will be promptly replaced with native plant species of comparable size, so that the post-construction view from Drayton Hall is not discernibly different from the pre-construction view. Additionally, there would be no impacts to cultural resources at the oyster reef creation site because the site chosen will be purposely selected to avoid National Historic Sites, as well as nationally significant cultural, scientific, and historic resources.

No Action: Under this alternative, cultural, scientific, and historic resources would remain as they currently stand.

7.3.2 Cumulative Impacts of Non-Preferred Restoration Alternative

This alternative (including both Drayton Hall and oyster reef actions) is expected to result in cumulative, positive impacts by increasing the area and ecological function of salt marsh and oyster habitat, including increased habitat acreage and stability. Approximately 70 acres of marsh and will be directly affected by restoration, and an additional 3 acres of oyster reef could be created.

The project actions would not result in any change to the economic activity in the area, and the restoration would contribute to the overall ecological health of the area. There is the direct potential to improve water quality through the establishment of filter feeding benthos. The creation and enhancement of wildlife habitat supplements existing habitat in the region. A net cumulative beneficial impact may result from the synergy with past restoration activities. Further, the proposed actions are intended to compensate the public, i.e., make the public and the environment whole, for resources injuries caused by releases of hazardous substances into the watershed.

7.3.3 Cumulative Impacts of No Action Alternative

The No Action alternative is expected to result in cumulative negative impacts and would not provide the conditions necessary for recovery of the injured resources. With No Action, natural resources and their services would not return to baseline, and interim service losses would not be accounted for.

8 COMPLIANCE WITH OTHER KEY FEDERAL STATUTES, REGULATIONS AND POLICIES

8.1 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT, 16 U.S.C. § 1801 *ET SEQ.*

Congress enacted amendments to the Magnuson-Stevens Fishery Conservation and Management Act (Public Law 94-265) in 1996 that established procedures for identifying Essential Fish Habitat (EFH) and required interagency coordination to further the conservation of federally managed fisheries. Rules published by NMFS (50 C.F.R. §§ 600.805 - 600.930) specify that any Federal agency that authorizes, funds or undertakes, or proposes to authorize, fund, or undertake an activity which could adversely affect EFH is subject to the consultation provisions of the above-mentioned act and identifies consultation requirements.

The South Atlantic Fishery Management Council identified the proposed project area as EFH for shrimp (*Penaeus* spp.), red drum, and the snapper grouper complex. In accordance with regulations, the Trustees requested consultation from NMFS on the proposed restoration alternatives. Upon review of the DARP/EA, NMFS has no objection to the proposed projects and offers no EFH additional conservation recommendations to reduce the impacts to EFH and fishery species (Section 13: Appendix D).

8.2 ENDANGERED SPECIES ACT OF 1973, 16 U.S.C. § 1531 *ET SEQ.*

The Endangered Species Act of 1973 (ESA) directs all federal agencies to conserve endangered and threatened species and their habitats to the extent their authority allows. Protection of wildlife and preservation of habitat are central objectives in this effort. Under the ESA, the Department of Commerce (through NOAA) and the Department of the Interior (through USFWS) publish lists of endangered and threatened species. Section 7 of the Act requires federal agencies to consult with these agencies to minimize the effects of federal actions on these listed species.

The South Carolina Ecological Services Office (SCESO) of the USFWS provided a list of all federally threatened and endangered species, as well as additional candidate and at-risk species, known to occur in Charleston County (Table 8.1). The Charleston Harbor Estuary's habitat provides general support for any threatened or endangered species migrating through or utilizing the habitat. The general locale where the restoration actions would occur are not within designated critical habitat for any listed species. Certain listed species under the authority of USFWS may occur within or near the project areas, including the wood stork and the West Indian manatee. The Atlantic and shortnose sturgeon, under the authority of NOAA, may also occur within or near the project areas, and were

considered under the EFH consultation. In order to limit potential impacts to the manatee, the Trustees will ensure that manatee protection guidelines, provided by the SCESO, are followed during construction activities (Appendix D). The Trustees initiated consultation with USFWS and provided determinations that the proposed restoration projects may affect, but are not likely to adversely affect listed species under USFWS authority. The proposed projects will likely improve listed species habitat. USFWS concurred with the Trustees' determinations. (Section 13: Appendix D).

Table 8.1: At-Risk, Candidate, Endangered, and Threatened Species – Charleston County

CATEGORY	COMMON NAME/STATUS	SCIENTIFIC NAME	SURVEY WINDOW/ TIME PERIOD	COMMENTS
Amphibian	Frosted flatwoods salamander (T, CH)	<i>Ambystoma cingulatum</i>	January 1-April 30	Larvae present in breeding ponds
	Gopher frog (ARS)	<i>Lithobates capito</i>	Breeding: October-March	Call survey: February-April
Bird	American wood stork (T)	<i>Mycteria americana</i>	February 15-September 1	Nesting season
	Bachman's warbler (E)	<i>Vermivora bachmanii</i>	May 1-June 15	Breeding
	Bald eagle (BGEPA)	<i>Haliaeetus leucocephalus</i>	October 1-May 15	Nesting season
	Black-capped petrel (ARS)	<i>Pterodroma hasitata</i>	April-October	offshore water primarily
	Black rail (ARS)	<i>Laterallus jamaicensis</i>	May-July	
	MacGillivray's seaside sparrow (ARS)	<i>Ammodramus maritimus macgillivrayii</i>	May-June	
	Piping plover (T, CH)	<i>Charadrius melodus</i>	July 15-May 1	Migration and wintering
	Red-cockaded woodpecker (E)	<i>Picoides borealis</i>	April 1-July 31	Nesting season
	Red knot (T)	<i>Calidris canutus rufa</i>	August 1-May 31	Migration and wintering
Crustacean	None Found			
Fish	American eel (ARS)	<i>Anguilla rostrata</i>	March 1-May 30; October 1-December 15	Temperature dependent: normally (17-20°C); can be found between 13-25°C
	Atlantic sturgeon* (E)	<i>Acipenser oxyrinchus*</i>	February 1-April 30	Spawning migration
	Blueback herring (ARS)	<i>Alosa aestivalis</i>	Mid-January-mid May	Peak: March-April
	Shortnose sturgeon* (E)	<i>Acipenser brevirostrum*</i>	February 1-April 30	Spawning migration
Insect	Monarch butterfly (ARS)	<i>Danaus plexippus</i>	August-December	Overwinter population departs: March-April
	Rare skipper (ARS)	<i>Problema bulenta</i>	May; July-September	Two brood periods
Mammal	Finback whale* (E)	<i>Balaenoptera physalus*</i>	November 1-April 30	Off the coast
	Humpback whale* (E)	<i>Megaptera novaengliae</i>	January 1-March 31	Migration off the coast
	Rafinesque's big-eared bat (ARS)	<i>Corynorhinus rafinesquii</i>	Year round	Found in mines, caves, large hollow trees, buildings, and bat towers
	Right whale* (E)	<i>Balaena glacialis</i>	November 1-April 30	Off the coast
	Tri-colored bat (ARS*)	<i>Perimyotis subflavus</i>	Year round	Found in mines and caves in the winter
	West Indian manatee (E)	<i>Trichechus manatus</i>	May 15-October 15	In coastal waters
Mollusk	None Found			
Plant	American chaffseed (E)	<i>Schwalbea americana</i>	May-August	1-2 months after a fire
	Bog asphodel (ARS*)	<i>Narthecium americanum</i>	June-July	
	Boykin's lobelia (ARS)	<i>Lobelia boykinii</i>	May-July/August	
	Canby's dropwort (E)	<i>Oxypolis canbyi</i>	Mid-July-September	
	Carolina bishopweed (ARS)	<i>Ptilimnium ahlesii</i>	May-July	
	Ciliate-leaf tickseed (ARS)	<i>Coreopsis integrifolia</i>	August-November	
	Godfrey's privet (ARS)	<i>Forestiera godfreyi</i>	April-June	
	Hedge-nettle	<i>Stachys caroliniana</i>	Late June-August	Can be confused with <i>S. floridana</i>
	Pondberry (E)	<i>Lindera melissifolia</i>	February-March	
	Seabeach amaranth (T)	<i>Amaranthus pumilus</i>	July-October	

CATEGORY	COMMON NAME/STATUS	SCIENTIFIC NAME	SURVEY WINDOW/ TIME PERIOD	COMMENTS
Reptile	Eastern diamondback rattlesnake (ARS)	<i>Crotalus adamanteus</i>	Most of the year	Peak: April-November
	Green sea turtle ** (T)	<i>Chelonia mydas</i> **	May 1-October 31	Nesting and hatching
	Kemp's ridley sea turtle ** (E)	<i>Lepidochelys kempi</i> **	May 1-October 31	In coastal waters
	Leatherback sea turtle ** (E)	<i>Dermochelys coriacea</i> **	May 1-October 31	Nesting and hatching
	Loggerhead sea turtle ** (T, CH)	<i>Caretta caretta</i> **	May 1-October 31	Nesting and hatching
	Southern hognose snake (ARS)	<i>Heterodon simus</i>	Most of the year	
	Spotted turtle (ARS)	<i>Clemmys guttata</i>	February-mid April	

- * Contact National Marine Fisheries Service (NMFS) for more information on this species
- ** The U.S. Fish and Wildlife Service (FWS) and NMFS share jurisdiction of this species
- ARS Species that the FWS has been petitioned to list and for which a positive 90-day finding has been issued (listing may be warranted); information is provided only for conservation actions as no Federal protections currently exist.
- ARS* Species that are either former Candidate Species or are emerging conservation priority species
- BGEPA Federally protected under the Bald and Golden Eagle Protection Act
- C FWS or NMFS has on file sufficient information on biological vulnerability and threat(s) to support proposals to list these species
- CH Critical Habitat
- E Federally Endangered
- P or P - CH Proposed for listing or critical habitat in the Federal Register
- S/A Federally protected due to similarity of appearance to a listed species
- T Federally Threatened

These lists should be used only as a guideline, not as the final authority. The lists include known occurrences and areas where the species has a high possibility of occurring. Records are updated as deemed necessary and may differ from earlier lists.

For a list of State endangered, threatened, and species of concern, please visit <https://www.dnr.sc.gov/species/index.html>.

8.3 CLEAN WATER ACT, 33 U.S.C. § 1251 ET SEQ.

The Clean Water Act (CWA) is the principal law governing pollution control and water quality of the nation's waterways. Section 404 of the law authorizes a permit program for the beneficial uses of dredged or fill material. The Army Corps of Engineers (USACE) administers the program. In general, restoration projects that move material into or out of waters or wetlands of the United States require 404 permits. A CWA 404 permit will be obtained, if required, in order to implement any restoration action selected in this Final DARP/EA.

8.4 RIVERS AND HARBORS ACT, 33 U.S.C. § 401 ET SEQ.

The Rivers and Harbors Act regulates development and use of the nation's navigable waterways. Section 10 of the Act prohibits unauthorized obstruction or alteration of navigable waters and vests the Corps with authority to regulate discharges of fill and other materials into such waters. Restoration actions that must comply with the substantive requirements of Section 404 must also comply with the substantive requirements of Section 10. Although not anticipated for the preferred restoration project, any such permit would be obtained, as required, in order to implement any restoration action selected in this Final DARP/EA.

8.5 COASTAL ZONE MANAGEMENT ACT, 16 U.S.C. § 1451 *ET SEQ.*, 15 C.F.R. PART 923

The goal of the Coastal Zone Management Act (CZMA) is to encourage states to preserve, protect, develop, and, where possible, restore and enhance the nation's coastal resources. Under Section 1456 of the CZMA, restoration actions undertaken or authorized by federal agencies within a state's coastal zone are required to comply, to the maximum extent practicable, with the enforceable policies of a state's federally approved Coastal Zone Management Program. NOAA and the USFWS found the restoration actions identified in this Final DARP/EA to be consistent with the South Carolina Coastal Zone Management Program, and submitted that determination to the South Carolina Office of Ocean and Coastal Resource Management for review and concurrence via letter dated January 4, 2017. South Carolina Office of Ocean and Coastal Resource Management has provided its conditional concurrence with that determination, which will be confirmed pending finalization of the Drayton Hall project conservation easement (Section 13: Appendix D).

8.6 FISH AND WILDLIFE CONSERVATION ACT, 16 U.S.C. § 2901 *ET SEQ.*

The Fish and Wildlife Conservation Act of 1980 provides for the consideration of impacts on wetlands, protected habitats and fisheries. The restoration actions described herein will enhance estuarine habitat, which will benefit both game and non-game fish and wildlife.

8.7 FISH AND WILDLIFE COORDINATION ACT, 16 U.S.C. § 661 *ET SEQ.*

The Fish and Wildlife Coordination Act (FWCA) requires that federal agencies consult with USFWS, NMFS, and state wildlife agencies regarding activities that affect, control, or modify waters of any stream or bodies of water, in order to minimize the adverse impacts of such actions on fish and wildlife resources and habitat utilizing these aquatic environments. Coordination is taking place by and between NMFS, the USFWS and SCDNR, the appropriate state wildlife agency. This coordination is also incorporated into compliance processes used to address the requirements of other applicable statutes, such as Section 404 of the CWA. The restoration actions described herein will have a positive effect on fish and wildlife resources.

8.8 MARINE MAMMAL PROTECTION ACT, 16 U.S.C. § 1361 *ET SEQ.*

The Marine Mammal Protection Act provides for the long-term management of and research programs for marine mammals. It places a moratorium on the taking and importing of marine mammals and marine mammal products, with limited exceptions. The Department of Commerce is responsible for whales, porpoise, seals, and sea lions. The Department of the Interior is responsible for all other marine mammals. The restoration actions described in this Final DARP/EA will have no effect on marine mammals.

8.9 MIGRATORY BIRD CONSERVATION ACT, 16 U.S.C. § 715 *ET SEQ.*

The proposed restoration actions will have no adverse effect on migratory birds. In fact, several species of migratory birds are likely to benefit from the enhancement of salt marsh habitat.

8.10 NATIONAL HISTORIC PRESERVATION ACT, 16 U.S.C. § 470 *ET SEQ.*

The selected restoration actions will not adversely impact properties listed in or eligible for listing in the National Register of Historic Places. NOAA and the USFWS found the restoration actions identified in this Final DARP/EA would not adversely impact properties listed in or eligible for listing in the National Register of Historic Places, and submitted that determination to the South Carolina State Historic Preservation Office via letter dated January 4, 2017. The South Carolina State Historic Preservation Office has concurred with this assessment (Section 13: Appendix D).

8.11 INFORMATION QUALITY GUIDELINES ISSUED PURSUANT TO PUBLIC LAW 106-554

Information disseminated by federal agencies to the public after October 1, 2002, is subject to information quality guidelines developed by each agency pursuant to Section 515 of Public Law 106-554 that are intended to ensure and maximize the quality of such information (i.e., the objectivity, utility and integrity of such information).

8.12 EXECUTIVE ORDER 12898 (59 FED. REG. 7629) - ENVIRONMENTAL JUSTICE

This Executive Order requires each federal agency to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. EPA and the Council on Environmental Quality (CEQ) have emphasized the importance of incorporating environmental justice review in the analyses conducted by federal agencies under NEPA and of developing mitigation measures that avoid disproportionate environmental effects on minority and low-income populations. The Trustees have concluded that there are no low income or ethnic minority communities that would be adversely affected by any of the selected restoration alternatives.

8.13 EXECUTIVE ORDER NUMBER 11514 (35 FED. REG. 4247) - PROTECTION AND ENHANCEMENT OF ENVIRONMENTAL QUALITY

A Final Environmental Assessment is integrated within this Final DARP. Environmental analyses and coordination have taken place as required by NEPA.

8.14 EXECUTIVE ORDER NUMBER 11990 (42 FED. REG. 26,961) - PROTECTION OF WETLANDS

The proposed restoration actions will not result in adverse effects on wetlands or the services they provide, but rather will provide for the enhancement and protection of wetlands and wetland services.

8.15 EXECUTIVE ORDER NUMBER 12962 (60 FED. REG. 30,769) - RECREATIONAL FISHERIES

The selected restoration actions will not result in adverse effects on recreational fisheries, but rather will help ensure the enhancement and protection of such fisheries.

8.16 VIOLATION OF ENVIRONMENTAL PROTECTION LAWS

The selected restoration actions do not require, nor do the Trustees anticipate, any violation of federal, state or local laws designed to protect the environment incident to, or as a consequence of, the implementation of the selected actions. The selected restoration actions can be implemented in compliance with all applicable environmental laws.

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10 APPENDIX A: GROUNDWATER INJURY ASSESSMENT & FINDINGS

10.1 SCOPE:

This section evaluates the injuries to groundwater caused by the release of hazardous substances at this Site. The Site-specific information and variables necessary to evaluate and develop the surrogate value for groundwater damages were obtained from the South Carolina Department of Health and Environmental Control's (SCDHEC's) Koppers Site - Charleston NPL Site File.

10.2 INTRODUCTION:

SCDHEC has reviewed the Site file and has determined that groundwater injuries exist as a result of discharge from the Koppers Site. This report provides a discussion of the methodology used to evaluate/conduct the injury assessment of the area of impacted groundwater.

10.3 BACKGROUND/SITE DESCRIPTION:

The groundwater contamination plume was delineated during the Remedial Investigation at the Site. The remedy description for the groundwater was outlined in the ROD issued by EPA in April of 1998 (USEPA 1998), and the ESD issued by EPA in August of 2003. The remedy includes full scale recovery of impacted ground water and creosote underlying the former treatment area and old impoundment areas of the Site. Remedial activities were initiated in October 2003. Performance reports indicate that greater than 30,000 gallons of creosote have been recovered from the shallow and intermediate water bearing zones underlying these two areas since full scale recovery was initiated. A comprehensive environmental monitoring program is being conducted to ensure the cleanup approach remains adequately protective of human health and the environment.

10.4 PURPOSE AND NATURAL RESOURCE VALUES:

The purpose of the groundwater claim is to redress injuries to groundwater, and the ecological services groundwater provides, as a result of hazardous discharges at the Koppers Site. The State of South Carolina considers groundwater to be one of the State's natural resources, acknowledging that "clean" water is important economically and ecologically to the well-being of the State, and that the quality of the groundwater influences surface water quality, water supply quality, and the health of aquatic ecosystems. Thus, not only is groundwater important as a potable drinking water source, but also as an integral part of the ecosystem of this State.

Despite the absence of current direct human consumption of the State's groundwater, groundwater is considered a valuable natural resource to the citizens of South Carolina. Groundwater acts as a source of water (base flow) to support wetlands, helps prevent saltwater intrusion, and is important to the management of other ecological habitats. The State considers groundwater potentially to be a critical source of water for direct human consumption in the future. According to SC statutes all groundwater in SC is considered Class GB, which would be considered as potential drinking water. Especially with the increasing frequency of drought and growth of the human population, the demand for potable water is increasing rapidly.

While the groundwater resources cannot be restored in kind, a natural resource value still must be determined in order to seek an appropriate restoration project or compensation for injuries to this valuable resource. SCDHEC has developed a surrogate valuation methodology (consistent with New Jersey's Office of Natural Resource Restoration Methodology) to determine the scale of compensatory restoration or monetary compensation necessary to redress the injury to the State's groundwater resources resulting from discharges at contaminated Sites. The goal is to use the surrogate value both to assess the value of the resource that has been injured and to identify the scope of an appropriate restoration project or compensation.

10.5 GROUNDWATER NATURAL RESOURCE INJURY VALUATION:

The following facts were considered during the groundwater injury valuation:

- This evaluation is for groundwater injury only. Damages to other natural resources are evaluated separately in this Final DARP/EA.
- This natural resource injury assessment includes only the groundwater injury arising from the plume(s) of groundwater contamination originating at the Site.
- The time period selected for the past damages is from 1993 (i.e., when the Remedial Investigation for the Site was initiated) and not from the time period when the contamination could have been released to the environment (i.e., from the 1940-1978 Site operation period).
- The area utilized for the calculations was based on information submitted by Koppers' contractor and approved by SCDHEC.

Although the time period for the non-aqueous phase liquid (NAPL) contaminated groundwater to be restored is unknown, the time period selected for the groundwater damage calculation is capped at 30 years. SCDHEC generally agreed to the current configuration of the groundwater remedial system, but

believes that uncertainty exists regarding the actual amount of time needed to attain groundwater standards. This uncertainty is due to constraints placed on the treatment area by the physical features of the Site.

The following is a description of the formula used to determine a surrogate groundwater injury value and an explanation of the variable for the calculation. It should be recognized that the surrogate groundwater injury is likely valued low due to the above stated assumptions.

Surrogate Groundwater Injury Value = contaminant plume area x annual recharge rate x duration of the injury x water rate

Where,

Contaminant plume area = total square feet of the contaminated groundwater plume determined during the Remedial Investigation. For this Site, the approximate area of contaminated groundwater was calculated using the GIS/Arc View software that used the groundwater plume maps provided in the 100% Remedial Design Report. This total area is 393,750 square feet.

Annual Recharge Rate = annual groundwater recharge rate for the specific regional area. The annual recharge used in the calculation was 1.67 feet/year (20 inches/year). The Federal Remediation Section in the SCDHEC Bureau of Land and Waste Management provided this information.

Duration of Injury = number of years that the contamination will be present in the groundwater above the groundwater quality standards (starting from the time the contamination was investigated until the groundwater quality standards have been met). The ten (10) year period represents the time from Remedial Investigation to Remedial Action. The thirty (30) year period is the estimated period of time the selected remedy will meet the groundwater quality standards.

Water Rate = price of water obtained from the Public utilities. The water rate used is \$1.66/100 cu. feet, which was obtained from Charleston CPW in December 2015.

For calculating the existing volume of contaminated groundwater, the calculated groundwater plume area was multiplied by the depth of groundwater. The depth of existing contaminated groundwater (35 feet) was approximated from the depths at which the existing extraction wells are screened.

10.6 CONCLUSIONS:

Based on the formula presented above the total surrogate value of the groundwater injuries for this Site was determined to be \$665,390.26 (see Table 10.1). This dollar value does not account for time and

effort SCDHEC spent to develop this assessment. Pursuant to an agreement in principal signed by both Beazer East and SCDHEC, Beazer East agreed to pay SCDHEC the negotiated sum of \$390,000.00 for the groundwater injury, as well as all past costs related to the groundwater claim, including past costs incurred subsequent to that agreement.

Table 10.1 Summary of the Groundwater Claim for the Koppers Site.

Description	Dollar Value
Contaminated groundwater from 1993-2003 (time period from RI to RA)	\$109,155.38
Existing contaminated groundwater	\$228,768.75
Contaminated groundwater for time to remediate groundwater to MCLs	\$327,466.13
Total groundwater surrogate value	\$665,390.26

11 APPENDIX B: FINDING OF NO SIGNIFICANT IMPACT

FINDING OF NO SIGNIFICANT IMPACT

Final Damage Assessment and Restoration Plan and Environmental Assessment for the Koppers Site, Charleston, South Carolina

Background:

Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Natural Resource Trustee Agencies (Trustees), including the National Oceanic and Atmospheric Administration (NOAA), the U.S. Fish and Wildlife Service on behalf of the Department of the Interior, the South Carolina Department of Health and Environmental Control, and the South Carolina Department of Natural Resources, on behalf of the South Carolina Governor's Office prepared the Koppers NRDA Damage Assessment and Restoration Plan and Environmental Assessment (DARP/EA). The DARP/EA evaluates restoration alternatives for natural resource injuries incurred from historical releases of contaminants from the National Priorities List Superfund site known as the Koppers Site in Charleston, South Carolina.

Starting as early as 1942, wood treatment and fertilizer manufacturing facilities were located at the Koppers Site. These facilities released hazardous substances into wetland and river habitat in and near the Ashley River in Charleston. Approximately 140 acres of tidal marsh and creeks, as well as groundwater, were impacted by the released hazardous material. Contaminants included polycyclic aromatic hydrocarbons (PAHs) consistent with those found in creosote, and heavy metals. A Natural Resource Damage Assessment (NRDA) determined that both intertidal and subtidal habitats were affected by this contamination. The Trustees identified restoration activities that would compensate the public for this resource injury. The DARP/EA is intended to guide implementation of NRDA restoration activities and analyze the environmental impacts of the alternatives considered by the Trustees to restore, replace, rehabilitate, and/or acquire the equivalent of the injured natural resources and their services.

Restoration Projects:

The Trustees cooperatively developed the Final DARP/EA, which examines and evaluates potential projects to restore injured natural resources in the Charleston Harbor watershed. As a result of this evaluation, the Trustees selected the Drayton Hall Restoration Project, and the Long Branch Creek Restoration Project as the selected restoration alternative. The Drayton Hall project will restore tidal hydrology to an impounded brackish marsh, remove existing stands of the invasive *Phragmites australis*, and ensure long-term preservation through a conservation easement. The Long Branch Creek project will restore natural tidal exchange and reduce current whitewater effects by removing a tidal restriction. The Drayton Hall and Long Branch Creek

projects will restore 70 acres of salt marsh and 40 acres of salt marsh and benthic habitat, respectively.

Public Involvement:

Throughout the NRDA process, the Trustees have made information available to the public. The Trustees sought the public's input on a draft version of the DARP/EA. Public review of the Draft RP/EA occurred between October 21, 2016, and November 21, 2016. No public comments were received.

Alternatives Considered Under CERCLA:

The Trustees considered the “Drayton Hall Rice Dike Removal or Breaching” (“Drayton Hall”), “Charleston-Area Oyster Reef Creation/Restoration” (“Oyster Reef Creation”) and “Long Branch Creek Greenway Culvert Replacement” (“Long Branch Creek”), as well as the “No action” alternative in developing the DARP/EA. Due to the size of the injury, and the estimated credits for each project above, the Trustees developed restoration alternatives that combine the Drayton Hall project with either the Long Branch Creek or the Oyster Reef Creation options. In compliance with CERCLA NRDA regulations and NEPA, the selection of the restoration alternative was finalized after public review and comment (October 21– November 21, 2016).

Environmental Consequences:

NEPA requires an analysis of the effects of federal actions on the quality of the human environment. The Federal Trustees have determined it is appropriate to combine the DARP and NEPA impacts analysis into one document, and have included an evaluation of alternatives for restoration under both CERCLA and NEPA in the DARP/EA.

NOAA’s Companion Manual (Jan 13, 2017) for NOAA’s Administrative Order (NAO) 216-6A (April 22, 2016) contains criteria for determining the significance of the impacts of a proposed action. In addition, the Council on Environmental Quality (CEQ) regulations at 40 C.F.R. § 1508.27 state that the significance of an action should be analyzed both in terms of "context" and "intensity." The significance of this action is analyzed based on the NAO 216-6 criteria and CEQ's context and intensity criteria. The criteria listed below are relevant to making a Finding of No Significant Impact, and have been considered individually, as well as in combination with the others, and include:

(1) Can the proposed action reasonably be expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson Stevens Act and identified in Federal Management Plans (FMPs)?

Response: No. As documented in the Final DARP/EA, the Trustees do not expect the selected projects to cause substantial damage to the ocean and coastal habitats and/or

essential fish habitat as defined under the Magnuson-Stevens Act. Any short-term and temporary localized impacts from the restoration activities, such as those associated with dike and berm breaching, would be minimized by the use of Best Management Practices (BMPs). As documented in the Final DARP/EA, the Trustees expect the selected projects to result in long-term, beneficial impacts to coastal habitat and associated species by increasing the area and ecological function of salt marsh habitat, including increased habitat stability.

(2) Can the proposed action be expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area (e.g., benthic productivity, predator prey relationships, etc.)?

Response: No. The selected project is not expected to have any substantial impacts beyond a local level; the beneficial impacts on ecosystem function and species biodiversity would not be substantial at a regional or larger scale. As documented in the Final DARP/EA, the proposed projects are expected to result in major/moderate long-term beneficial impacts to plants and wildlife, providing additional habitat to support recovery of these sensitive communities and resulting in greater habitat complexity, diversity, and productivity. The project is expected to increase the availability and quality of salt marsh habitats. As such there would be an expected increase in ecosystem function and species biodiversity. Any potential adverse impacts are expected to be minimal, short term, localized, and not expected to decrease function or species biodiversity.

(3) Can the proposed action reasonably be expected to have a substantial adverse impact on public health and safety?

Response: No. The selected projects are not expected to have any impacts on public health and safety. The implementation of the proposed restoration projects would not present any unique physical hazards to humans.

(4) Can the proposed action reasonably be expected to adversely affect endangered or threatened species, their critical habitat, marine mammals, or other non-target species?

Response: No. The selected projects are not expected to adversely affect endangered or threatened species, their critical habitat, marine mammals, or other non-target species. Overall, the selected projects are expected to benefit species through improved habitat availability and function.

(5) Are significant social or economic impacts interrelated with natural or physical environmental effects?

Response: No. The Trustees do not expect there to be significant adverse social or economic impacts interrelated with natural or physical environmental effects of the selected projects. It is anticipated that the selected projects will provide positive social interactions with the natural environment.

(6) Are the effects on the quality of the human environment likely to be highly controversial?

Response: No. The effects on the quality of the human environment from the proposed action are not highly controversial. The selected projects are anticipated to have long-term, beneficial impacts to the human environment through improved public access to natural resources, and protected viewsheds. These impacts have not shown to be controversial.

(7) Can the proposed action reasonably be expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers, essential fish habitat, or ecologically critical areas?

Response: No. The project area and associated environment includes salt and estuarine marsh, benthic habitat, tidal creeks, and coastal rivers. While these areas do contain unique characteristics, the proposed project is expected to be beneficial to the unique ecological characteristics of the area, and improve ecological function. Furthermore, no unique or rare habitat would be destroyed due to the restoration proposed in the DARP. Additionally, the projects will not adversely affect National Historic Places or cultural, scientific, or historic resources. Consultation with the South Carolina State Historic Preservation Office pursuant to Section 106 of the National Historic Preservation Act was already undertaken and concurrence was received.

(8) Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

Response: No. The project area is well known to the project implementers, and project implementation techniques are not unique, controversial, or untried.

(9) Is the proposed action related to other actions with individually insignificant, but cumulatively significant impacts?

Response: No. The Trustees evaluated the restoration project selected in the Final DARP/EA in conjunction with other known past, proposed or foreseeable closely related projects and determined that there are no significant cumulative impacts. The projects

will only temporarily impact resources during construction activities and will utilize all BMPs to minimize these impacts. Cleanup activities and other restoration projects that may occur in the vicinity would similarly incorporate BMPs. Over the mid- and long-term, the project will be wholly beneficial with no potential for incremental contribution to significant cumulative impacts.

(10) Is the proposed action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural or historical resources?

Response: No. As noted above, the project will not adversely affect National Historic Places or cultural, scientific, or historic resources, and all necessary consultations and concurrences have taken place.

(11) Can the proposed action reasonably be expected to result in the introduction or spread of a non-indigenous species?

Response: No. The Drayton Hall project expects to reduce invasive, non-indigenous species through improved hydrology and species removal, and the Long Branch Creek project may reduce likelihood of invasive species establishment through improved hydrologic and ecological function and stability.

(12) Is the proposed action likely to establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration?

Response: No. The selected restoration projects are not expected to set a precedent for future actions that would significantly affect the human environment or represent a decision in principle about a future consideration.

(13) Can the proposed action reasonably be expected to threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment?

Response: No. Implementation of the selected projects would not require any violation of federal, state or local laws designed to protect the environment.

(14) Can the proposed action reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?

Response: No. As described above and in the Final DARP/EA, the Trustees evaluated the restoration projects and determined that there are no significant cumulative impacts.

DETERMINATION

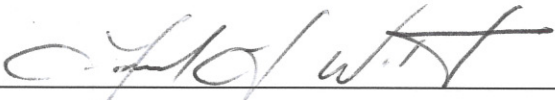
Based upon an environmental review and evaluation of the "Final Damage Assessment and Restoration Plan and Environmental Assessment for the Koppers Site, Charleston, South Carolina," as summarized above, it is determined that implementation of the restoration plan does not constitute a major Federal action significantly affecting the quality of the human environment under the meaning of Section 102(2)(c) of the National Environmental Policy Act of 1969 (as amended). Accordingly, an environmental impact statement is not required for this action.



Patricia A. Montanio
Director, Office of Habitat Conservation
National Marine Fisheries Service

6/12/2017

Date



David G. Westerholm
Director, Office of Response and Restoration
National Ocean Service

6/12/2017

Date



United States Department of the Interior

FISH AND WILDLIFE SERVICE

1875 Century Boulevard
Atlanta, Georgia 30345

In Reply Refer To:
FWS/R4/ES/NRDA

JUN 27 2017

Corinna McMackin
Natural Resource Section
NOAA General Counsel Office
263 13th Ave S, Suite 177
St. Petersburg, Florida 33701

Dear Ms. McMackin:

The U.S. Fish and Wildlife Service (Service) has reviewed the Finding of No Significant Impact (FONSI) for the Koppers Damage Assessment and Restoration Plan and Environmental Assessment (DARP/EA) for the Koppers National Priorities List (NPL) Site in Charleston, South Carolina. The DARP/EA was developed as part of a Natural Resource Damage Assessment for the Koppers NPL Site. It describes natural resource injuries determined to be a result of the release of hazardous substances at and from the Koppers NPL Site and evaluates the environmental impacts of proposed compensatory restoration actions. The National Oceanic and Atmospheric Administration (NOAA) is the lead federal agency for this effort, while the Service is a cooperating agency.

The Service concludes that the DARP/EA adequately describes the actions planned by the natural resource trustee agencies, which include the South Carolina Department of Natural Resources in addition to the Service and NOAA. The analysis and findings are appropriate to describe the nature, scope, and scale of the planned actions and the process for public comment is appropriate for the planned actions.

The Service agrees with NOAA's conclusion that the implementation of the proposed Drayton Hall restoration project, which includes the restoration of tidal hydrology to an impounded marsh and the removal of invasive species, and the Long Branch Creek project, which includes the restoration of tidal hydrology in a restricted marsh, as described in the DARP/EA will not significantly impact the quality of the human environment. Therefore, the Service concurs with NOAA's FONSI determination.

If you have any questions concerning this matter, please contact Anthony Sowers, Toxicologist, Coastal Georgia Ecological Service, at (912) 832-8739 ext. 3 or anthony_sowers@fws.gov.

Sincerely yours,

Cynthia K. Dohner
Regional Director

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PUBLIC NOTICE
NATIONAL OCEANIC
AND ATMOSPHERIC
ADMINISTRATION
ON BEHALF OF
U.S. DEPARTMENT
OF COMMERCE
U.S. FISH AND
WILDLIFE SERVICE
ON BEHALF OF THE
U.S. DEPARTMENT OF
THE INTERIOR
SOUTH CAROLINA
DEPARTMENT OF
HEALTH AND ENVI-
RONMENTAL CONTROL
AND SOUTH CAROLINA
DEPARTMENT OF
NATURAL RESOURCES

NOTICE OF
AVAILABILITY OF
DRAFT DAMAGE
ASSESSMENT AND
RESTORATION
PLAN/ENVIRONMENTAL
ASSESSMENT FOR
KOPPERS

Notice is hereby given that the Draft Damage Assessment and Restoration Plan and Environmental Assessment (Draft DARP/EA) for the Superfund site known as Koppers Co., Inc. (Charleston Plant) in Charleston, South Carolina is now available to the public for review and comment. This document was jointly developed by the state and federal natural resource trustee agencies listed above (the "Trustees") to address natural resource injuries and losses resulting from releases of hazardous substances from the Koppers Site. The Draft DARP/EA outlines the Trustees' damage assessment and restoration planning process related to the Koppers Site, and describes the restoration actions that the Trustees propose to compensate the public for these natural resource injuries and losses.

This Draft DARP/EA was prepared jointly by the Trustees pursuant to their respective authority and responsibilities as natural resource trustees under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. § 9601 et seq.; the Federal Water Pollution Control Act, 33 U.S.C. § 1251, et seq. (also known as the Clean Water Act or CWA), and other applicable federal or state laws, including Subpart G of the National

Oil and Hazardous Substances Contingency Plan (NCP), at 40 C.F.R. §§ 300.600 through 300.615, and DOI's CERCLA/NRDA regulations at 43 C.F.R. Part 11 (NRDA regulations) which provide guidance for this restoration planning process under CERCLA.

The Draft DARP/EA is available for downloading at <https://darrp.noaa.gov/hazardous-waste/koppers-co-inc>

Comments Due Date: We will consider public comments received on or before November 21, 2016. We encourage electronic submissions, but will also accept comments received at the physical address provided below.

To submit comments, request a hard copy of the Draft DARP/EA, or for further information, please contact: Howard Schnabolk, NOAA Restoration Center, 2234 South Hobson Avenue, Charleston, SC 29405, howard.schnabolk@noaa.gov, 843-740-1328, AD# 180940

Legal (843) 937-5504 Fax: (843) 937-5473
www.postandcourier.com

13 APPENDIX D: CONCURRENCE LETTERS

MAGNUSON-STEVEN FISHERY CONSERVATION AND MANAGEMENT ACT

ENDANGERED SPECIES ACT

COASTAL ZONE MANAGEMENT ACT

NATIONAL HISTORIC PRESERVATION ACT



UNITED STATES DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office

263 13th Avenue South

St. Petersburg, Florida 33701-5505

<http://sero.nmfs.noaa.gov>

June 7, 2016

F/SER47:JD/pw

(Sent via Electronic Mail)

Mr. Howard Schnabolk
NOAA Restoration Center
2234 South Hobson Avenue
Charleston, South Carolina 29405-2413

Dear Mr. Schnabolk:

NOAA's National Marine Fisheries Service (NMFS) reviewed your letter dated May 24, 2016, and the draft *Damage Assessment and Restoration Plan for the Koppers Site, Charleston, South Carolina* (DARP), dated February 10, 2016. NOAA (representing the U.S. Department of Commerce), the U.S. Fish and Wildlife Service (representing the U.S. Department of the Interior), and the South Carolina Departments of Natural Resources and Health and Environmental Control (representing the South Carolina Governor's Office), collectively "the Trustees," propose to restore salt marsh and benthic habitat within the Charleston Harbor estuary to compensate the public for damage to natural resources from releases of hazardous substances at the National Priorities List Superfund site known as the Koppers Site in Charleston County. The Trustees are taking this action under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act, and the proposed restoration includes hydrologic restoration and invasive species removal at Drayton Hall and Long Branch Creek. The Trustees have determined the proposed restoration would not have a net adverse impact to essential fish habitat (EFH) or federally managed fishery species. As the nation's federal trustee for the conservation and management of marine, estuarine, and anadromous fishery resources, the NMFS provides the following comments and recommendations pursuant to authorities of the Fish and Wildlife Coordination Act and the Magnuson-Stevens Fishery Conservation and Management Act.

The Koppers Site is a former wood treatment facility. The Trustees determined the groundwater, soils, sediments, and surface water in the vicinity of the Koppers Site have been contaminated by chemicals linked to site operation, including polycyclic aromatic hydrocarbons (PAHs) and five heavy metals (arsenic, copper, chromium, lead, and zinc). DARP Section 2.2 describes steps taken to remedy these contaminants. The Trustees also determined impacts to natural resources occurred to intertidal and subtidal habitats due to release of hazardous substances from the Koppers Site and due to the excavation and capping undertaken as part of the remedy. The Trustees used Habitat Equivalency Analysis (HEA) to quantify these losses and report them in wetland acre-service years. The Trustees also used HEA to evaluate restoration options and propose an amount of restoration appropriate for offsetting the damage to natural resources. After examining eight alternative restoration projects, the Trustees propose restoring 70 acres of salt marsh habitat by removing or breaching a relict dike to restore tidal hydrology at Drayton Hall and enhancing 45 acres of salt marsh on 155 acres of degraded marsh by replacing



undersized culverts with a pedestrian bridge where the West Ashley Greenway crosses Long Branch Creek.

The Drayton Hall project would include restoring tidal hydrology and salt marsh functions in a partially impounded brackish marsh across the Ashley River from the historic Drayton Hall plantation and eliminating existing stands of *Phragmites australiensis*, an invasive, non-native species replacing native salt marsh vegetation. Placement of a conservation easement would ensure long-term preservation of the restored marsh and an upland buffer. Tidal flow would be restored by breaching the existing dike at the locations of historical tidal creeks and reconnecting the upper and lower reaches of these remnant tidal creeks. The dike is currently breached on both the western and eastern ends, and five new breaches would be made using a track hoe. Each of the breaches would be 15 to 20 feet wide and graded to an elevation slightly above the surrounding marsh. All spoil would be placed on the dike and covered with a coconut mat to minimize erosion back into the marsh. The track hoe would be brought to the site and work from a barge to reduce construction-related damage to the marsh. Any area damaged would be graded and planted with *Spartina alterniflora*, if needed. *Phragmites* would be controlled using an herbicide approved for this use in coastal environments.

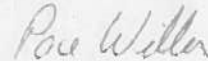
The Long Branch Creek project includes replacing three undersized, failing, 48-inch pipes running under the West Ashley Greenway with a 50-foot footbridge. The West Ashley Greenway is a nine-mile trail parallel to U.S. Highway 17. The project would create a breach in the Greenway and span the breach with a footbridge. The sewer main would be re-routed to the underside of the bridge. The draft DARP does not discuss how the excavated material would be managed; however, the Trustees supplemented the DARP by email on June 6, 2016, to address this point. The Trustees anticipate constructing the new crossing parallel to the existing culverts, allowing them to remain in service during the work. Only after the new crossing is in place and properly functioning would the Trustees remove the culverts. Standard best management practices, including continuous compost-sock silt barriers for upland areas, sheet pile barriers within the water, and floating turbidity barriers to contain any sediment becoming waterborne, would be used to control construction-related sedimentation. Excavation would take place from the center of the causeway outward to minimize exposed excavations at the water edge. Excavated material would be loaded into a container parked within a containment barrier, and the spoil materials removed to an appropriate off-site disposal location after draining. Immediately following the excavation, the contractor would install the new infrastructure and then focus efforts on establishing the new bank profile. All riprap materials would be granite, washed prior to delivery to remove any fine sediment. Any loose fill material would be contained within a geotextile matrix and covered with an appropriate geotextile material to prevent erosion. The temporary barriers would be maintained as required until the permanent stabilization (mechanical and/or vegetative) is in place and functioning properly. After the new crossing is in place, the contractor would use the same methods to isolate and remove the existing culverts. The Trustees expect the proposed Long Branch Creek restoration would lead to other restoration efforts upstream further improving the overall health of the 155-acre salt marsh system.

The NMFS has no objection to the proposed projects and offers no EFH conservation recommendations to reduce the impacts to EFH and fishery species. Further, unless project

details change from those provided in the draft DARP report, the NMFS does not expect to provide EFH conservation recommendations for the project when it is evaluated by the U.S. Army Corps of Engineers for permitting under the Clean Water Act.

The NMFS appreciates the opportunity to provide these comments. Please direct related correspondence to the attention of Pace Wilber at our Charleston Area Office. He may be reached at (843) 762-8601 or by e-mail at Pace.Wilber@noaa.gov.

Sincerely,



/ for

Virginia M. Fay
Assistant Regional Administrator
Habitat Conservation Division

cc: F/HC3, Howard.Schnabolk@noaa.gov, Krista.McCracken@noaa.gov
DHEC, trumbumt@dhec.sc.gov
SCDNR, WendtP@dnr.sc.gov
SAFMC, Roger.Pugliese@safmc.net
EPA, Laycock.Kelly@epa.gov
FWS, Karen_Mcgee@fws.gov
F/SER4, David.Dale@noaa.gov



United States Department of the Interior

FISH AND WILDLIFE SERVICE

176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407



June 27, 2016

Mr. Howard Schnabolk
Lead Administrative Trustee
NOAA Restoration Center
2234 South Hobson Avenue
Charleston, SC 29405-2413

Re: Koppers Site Restoration Project, Charleston County, South Carolina
FWS Log No. 2016-I-0520

Dear Mr. Schnabolk:

The U.S. Fish and Wildlife Service (Service) has received your June 22, 2016, letter regarding the proposed restoration of two sites near the City of Charleston, Charleston County, South Carolina. The National Oceanic and Atmospheric Administration (NOAA), the United States Fish and Wildlife Service on behalf of the U.S. Department of the Interior, the South Carolina Department of Natural Resources (SCDNR) and the South Carolina Department of Environmental Control have determined through a natural resource damage assessment (NRDA) process that natural resources and their services were lost due to releases of hazardous substances from the Superfund site known as the Koppers Site adjacent to the Ashley River. As part of the NRDA process, funds have been provided to the above agencies for use in restoration activities to compensate for lost resources. The agencies have identified two potential restoration projects, referred to below as the Drayton Hall project and the Long Branch Creek project. The NOAA Office for Coastal Management is requesting concurrence from the Service that the proposed repair project to the pier may affect, but is not likely to adversely affect threatened and endangered (T&E) species protected under the Endangered Species Act of 1973 (ESA).

Tidal hydrology and salt marsh functions will be restored in a partially impounded brackish marsh located in Drayton Hall plantation. An existing dike will be breached in several locations to restore tidal flow by reconnecting the upper and lower reaches of tidal creeks. In addition, herbicide will be used to eradicate stands of the giant reed (*Phragmites australiensis*). Finally, a conservation easement will be put in place to ensure long-term preservation of the restored marsh and the immediate uplands buffer. Approximately 70 acres of marsh are expected to be enhanced as a result of the Drayton Hall project.

The Long Branch Creek project seeks to restore tidal salt marsh and fishery habitat by removing three undersized culverts under the West Ashley Greenway and replacing them with a 50-foot long pedestrian bridge. The bridge will provide improved tidal exchange to approximately 45 acres of salt marsh.

The agencies have determined that both project areas may be considered suitable habitat for the American wood stork and the West Indian manatee. However, no suitable habitat is present on either site for the remaining T&E species known to occur in Charleston County. After consideration of the information received and the project's potential impact to T&E species, the Service concurs with your determination that the proposed restoration efforts on the Drayton Hall and Long Branch Creek sites are not likely to adversely affect T&E species. Further, no designated critical habitat for any species occurs in either project area.


Please note that due to obligations under the ESA the potential impacts of this restoration effort must be reconsidered if: (1) new information reveals impacts of this identified action may affect any listed species or critical habitat in a manner not previously considered; (2) this action is subsequently modified in a manner, which was not considered in this assessment; or (3) a new species is listed or critical habitat is designated that may be affected by the identified action.

In addition to T&E species the Service recommends that NOAA consider species that have been petitioned for listing under the ESA as well as Candidate Species. These species are collectively referred to as "At-Risk Species" (ARS). We have included a list of the ARS that may occur in Charleston County, South Carolina. Although there are no Federal protections afforded to ARS, incorporating proactive measures to avoid or minimize harm to ARS may improve their status and assist with precluding the need to list these species. Additional information on ARS can be found at:

<http://www.fws.gov/southeast/candidateconservation>

Please contact the SCDNR regarding potential impacts to State protected species. If you have any questions, please contact Mr. Mark Caldwell at (843) 727-4707, ext. 215 and reference FWS Log No. 2016-I-0520.

Sincerely,


for
Thomas D. McCoy
Field Supervisor

TDM/MAC

Manatee Guidelines

To reduce potential construction-related impacts to the manatee to discountable and insignificant levels, the Service recommends implementing the *Standard Manatee Construction Conditions*, which are as follows:

The permittee will comply with the following manatee protection construction conditions:

- a. The permittee shall instruct all personnel associated with the project of the potential presence of manatees and the need to avoid collisions with manatees. All construction personnel must monitor water-related activities for the presence of manatee(s) during May 15 - October 15.
- b. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act of 1972 and the Endangered Species Act of 1973.
- c. Any siltation barriers used during the project shall be made of material in which manatees cannot become entangled and must be properly secured, and regularly monitored to avoid manatee entrapment.
- d. All vessels associated with the project shall operate at “no wake/idle” speeds at all times while in the construction area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.
- e. If manatee(s) are seen within 100 yards of the active construction area all appropriate precautions shall be implemented to ensure protection of the manatee. These precautions shall include the operation of all moving equipment no closer than 50 feet to a manatee. Operation of any equipment closer than 50 feet to a manatee shall necessitate immediate shutdown of that equipment. Activities will not resume until the manatee(s) has departed the project area of its own volition.
- f. Any collision with and/or injury to a manatee shall be reported immediately to Jim Valade of the U.S. Fish and Wildlife Service, North Florida Field Office, at (904) 731-3116.



March 3, 2016

Mr. Howard Schnabolk
NOAA Restoration Center
2234 South Hobson Avenue
Charleston, SC 29405-

Re: Conditional Concurrence - Damage Assessment & Restoration Plan/Environmental Assessment
for the Koppers Co., Inc site, Charleston County, SC - CZC-16-1655

Dear Mr. Schnabolk:

Thank you for coordinating with South Carolina's Department of Health and Environmental Control, Ocean and Coastal Resources Management (SCDHEC OCRM) on the above referenced project pursuant to 15 C.F.R. § 930 Subpart C, Federal Consistency regulations associated with the Coastal Zone Management Act of 1972 (CZMA) as amended. Under the CZMA, federal activities which may have reasonably likely effects on any land or water use or natural resource of the coastal zone, regardless of the location, must be consistent to the maximum extent practicable with the enforceable policies of the State's federally-approved Coastal Zone Management Program.

SCDHEC OCRM is in receipt of the consistency determination dated January 6, 2017, for restoration projects developed in response to long time release of hazardous materials from the former Koppers Co., Inc. site previously located along the Ashley River near I-26 and Austin Avenue on the Charleston peninsula. As outlined in the enclosed Draft Damage Assessment & Restoration Plan/Environmental Assessment (DARP/EA), assigned Trustees (SC Department of Natural Resources, SC Department of Health and Environmental Control – Bureau of Land and Waste Management, US Department of Fish and Wildlife Service and National Oceanic and Atmospheric Administration) identified restoration actions appropriate to compensate the public for the losses to natural resources and services caused by the contamination at the Koppers Site. Specifically, the Trustees propose to undertake two restoration projects: The Drayton Hall Project, and the Long Branch Creek Project.

You may consider this response a *conditional concurrence* that the project is consistent to the maximum extent practicable with the enforceable policies of the South Carolina Coastal Zone Management Program pursuant to 15 C.F.R. § 930.4. This certification is issued for this project at this time and should not be considered an ongoing certification.

Project Description:

As stated in the DARP/EA, the Koppers Site consists of former creosote wood treatment and fertilizer manufacturing facility located on 102 acres of land adjacent to the Ashley River in Charleston, South Carolina. These facilities were established on the site at the turn of the century and were operated by multiple owners and operators through the late 1970s. The facilities released

hazardous substances into wetland and river habitat in and adjacent to the Ashley River. Approximately 140 acres of tidal marsh and creeks were impacted by the hazardous material released at the Koppers Site, which included polycyclic aromatic hydrocarbons (PAHs) consistent with those found in creosote, heavy metals, and other contaminants. South Caroling Department of Natural Resources (SCDNR), the South Carolina Department of Health and Environmental Control (SCDHEC), USFWS, and NOAA (Collectively, the Trustees) conducted a natural resources damage assessment (NRDA) of the site and determined that benthic habitat has been affected by the contamination.

The Drayton Hall restoration project site is a 70-acre semi-impounded brackish marsh across the Ashley River from the historic Drayton Hall Plantation. Tidal flow to the marsh is partially restricted by a relict dike constructed around 1939. The Drayton Hall project would consist of three components: 1) restoring tidal hydrology and salt marsh functions in the brackish marsh by breaching the existing berm in multiple locations; 2) eliminating existing stands of *Phragmites australiensis*, and invasive non-native species that spreads rapidly in marsh areas and replacing it with native salt marsh vegetation, and 3) establishing a conservation easement to ensure long-term preservation of the restored marsh and the immediate uplands buffer. This conservation easement has been coordinated and drafted with the National Trust for Historic Preservation (landowner) and the Lowcountry Land Trust.

The Long Branch Creek restoration project aims to restore tidal salt marsh and benthic habitat within Long Branch Creek, also located in Charleston near U. S. Highway 17 and the West Ashley Greenway. The project would restore the habitat by removing three undersized, 48" pipes running under the Greenway, which are failing, and creating a breach that will provide natural tidal exchange above and below the causeway. This would eliminate whitewater and pooling effects on the surrounding marsh. Approximately 45 acres of marsh are expected to be enhanced as a result of the Long Branch Creek project, which was designed in partnership with the City of Charleston.

SCDHEC OCRM Decision, SCCZMP Enforceable Policies and Conditions:

Pursuant to 15 C.F.R. § 930.4, SCDHEC *conditionally concurs* with the determination that the project is consistent to the maximum extent practicable with the following conditions below.

Applicable Enforceable Policies of the SCCZMP: (1) Guidelines for all Projects, (2) Recreation and Tourism (Parks), (3) Wildlife and Fisheries Management, (4) Dredging, (5) Erosion Control, (6) Areas of Special Resource Significance (Wetlands) and (7) Geographic Areas of Particular Concern (GAPC) and the priority of uses associated with GAPC's.

1. No work may begin until proper access/conservation easements are finalized between the Trustees and property owners of record. A copy of the easements is required to be submitted to SCDHEC OCRM.

Page 3

Conditional Concurrence - Damage Assessment & Restoration Plan/Environmental Assessment for the Koppers Co., Inc site

March 3, 2017

2. All excavated material must be disposed on upland and stabilized with appropriate best management practices to ensure sediment does not runoff into adjacent wetlands.
3. A post-construction survey (as-built) is required for the Drayton Hall site to be submitted to SCDHEC OCRM within 60 days of project completion.

Pursuant to 15 C.F.R. § 930.4, if the USACE does not agree to the above conditions, then all parties shall treat this conditional concurrence letter as an objection.

The SCDHEC concurrence relies on the following policies contained within SCCZMP: (1) Guidelines for all Projects, (2) Recreation and Tourism (*Parks*), (3) Wildlife and Fisheries Management, (4) Dredging (*Dredging and Spoil Disposal*), (5) Erosion Control (*General Erosion Control*); (6) Areas of Special Resource Significance (Wetlands), and (7) Geographic Areas of Particular Concern (GAPC) and the priority of uses associated with GAPC's in addition to S.C. Annotated Code § 48-39-10 et seq and S.C. Regulations R 30-1 *et seq.* policies contained within the of SC Coastal Zone Management Program.

Please contact me if you have any questions about this concurrence or the conditions within it. It is our intention to work with the NOAA and the FWS to address any questions that the trustees may have as to how this project is conditionally consistent with the enforceable policies of the SCCZMP.

Sincerely,



Curtis M. Joyner

Manager, Coastal Zone Consistency Section

DHEC OCRM

1362 McMillan Avenue, Suite 400

Charleston, SC 29405

843-953-0205

joynercm@dhec.sc.gov

cc: Rheta DiNovo



January 6, 2017

Howard Schnabolk
NOAA
2234 S. Hobson Ave.
Charleston, SC 29405

Re: Ashley River Marsh Restoration
Charleston, Charleston County, South Carolina
SHPO Project No. 16JS0520

Dear Mr. Schnabolk:

Thank you for your project review submittal which we received on December 15, 2016 regarding the above referenced undertaking. We received a Section 106 Project Review Form, project narrative, aerial and historic maps, and the Draft Damage Assessment and Restoration Plan and Environmental Assessment for the Koppers Site as supporting documentation for this undertaking. Please consult and provide a copy of an ArchSite(GIS) map in the future, as well as photographs of the project area. ArchSite is available online at <http://www.scarchsite.org>.

The State Historic Preservation Office is providing comments to NOAA pursuant to Section 106 of the National Historic Preservation Act and its implementing regulations, 36 CFR 800. Consultation with the SHPO is not a substitution for consultation with Tribal Historic Preservation Offices, other Native American tribes, local governments, or the public.

The Area of Potential Effect (APE) includes Drayton Hall, a property designated as a National Historic Landmark, and the Ashley River Historic District, a property listed in the National Register of Historic Places. More information regarding these listings is available on our website via <http://www.nationalregister.sc.gov/> or <http://schpr.sc.gov>. We believe the affected dike to likely be an early rice cultivation related dike that may have been improved later for duck hunting purposes. Regardless of the affected dike's date of construction or context, our office believes the dike contributes to the significance of the Ashley River Historic District, the period of significance of which ends in 1953.

Based on the submitted information, our office concurs with the assessment that no properties listed in or eligible for listing in the National Register of Historic Places will be adversely affected by this project.

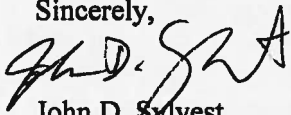
If archaeological materials are encountered during construction, the procedures codified at 36 CFR 800.13(b) will apply. Archaeological materials consist of any items, fifty years old or older,

which were made or used by man. These items include, but are not limited to, stone projectile points (arrowheads), ceramic sherds, bricks, worked wood, bone and stone, metal and glass objects, and human skeletal materials. The federal agency or the applicant receiving federal assistance should contact our office immediately.

We also recommend consulting our Rice Fields and Section 106 guidance, available at <http://shpo.sc.gov/programs/revcomp/Documents/RiceFields.pdf>.

If you have any questions, please contact me at (803) 896-6129 or jsylvest@scdah.sc.gov.

Sincerely,



John D. Sylvest
Project Review Coordinator
State Historic Preservation Office

cc: Robin Coller-Socha, USACE



January 6, 2017

Howard Schnabolk
NOAA
2234 S. Hobson Ave.
Charleston, SC 29405

Re: Long Branch Creek Restoration
Charleston, Charleston County, South Carolina
SHPO Project No. 16JS0519

Dear Mr. Schnabolk:

Thank you for your project review submittal which we received on December 15, 2016 regarding the above referenced undertaking. We received a Section 106 Project Review Form, aerial map, and the Draft Damage Assessment and Restoration Plan and Environmental Assessment for the Koppers Site as supporting documentation for this undertaking. Please consult and provide a copy of an ArchSite(GIS) map in the future, as well as photographs of the project area. ArchSite is available online at <http://www.scarchsite.org>.

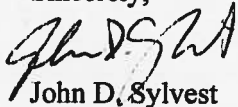
The State Historic Preservation Office is providing comments to NOAA pursuant to Section 106 of the National Historic Preservation Act and its implementing regulations, 36 CFR 800. Consultation with the SHPO is not a substitution for consultation with Tribal Historic Preservation Offices, other Native American tribes, local governments, or the public.

Based on the description of the Area of Potential Effect (APE) and the identification of historic properties within the APE, our office concurs with the assessment that no properties listed in or eligible for listing in the National Register of Historic Places will be affected by this project.

If archaeological materials are encountered during construction, the procedures codified at 36 CFR 800.13(b) will apply. Archaeological materials consist of any items, fifty years old or older, which were made or used by man. These items include, but are not limited to, stone projectile points (arrowheads), ceramic sherds, bricks, worked wood, bone and stone, metal and glass objects, and human skeletal materials. The federal agency or the applicant receiving federal assistance should contact our office immediately.

If you have any questions, please contact me at (803) 896-6129 or jsylvest@scdah.sc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "John D. Sylvest". The signature is written in a cursive style with a large initial "J" and "S".

John D. Sylvest
Project Review Coordinator
State Historic Preservation Office

cc: Robin Collier-Socha, USACE

**Koppers Superfund Site
TRUSTEE RESOLUTION
Approving the Final Damage Assessment and Restoration Plan and
Environmental Assessment
July 10, 2017**

Whereas the Office of the Governor of the State of South Carolina through the South Carolina Department of Natural Resources (SCDNR) and the South Carolina Department of Health and Environmental Control (SCDHEC), along with the Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), and the Department of Interior, U.S. Fish and Wildlife Service (USFWS) are the designated Natural Resource Trustees (Trustees) for the Koppers Superfund Site (the Site) located in Charleston, South Carolina;

Whereas, under the terms of the Memorandum of Agreement among the Trustees regarding coordination of natural resource restoration, the undersigned Trustee Council representatives have authority to vote on matters which come before the Trustee Council;

Whereas the Trustees prepared a Damage Assessment and Restoration Plan and Environmental Assessment (DARP/EA); provided the DARP/EA for public comment on October 21, 2016; and no public comments were received;

Whereas the Final DARP/EA describes the restoration alternatives proposed for selection: the Drayton Hall Marsh Restoration Project and the Long Branch Creek Marsh Restoration Project;

NOW THEREFORE, in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Environmental Policy Act (NEPA), the undersigned representatives of the Trustees hereby adopt and approve the release of the Final DARP/EA for the Koppers Site, Charleston, South Carolina.

All Trustees agree that all applicable regulatory compliance activities must be completed prior to the implementation of any selected restoration project, and that the terms and conditions of all federal and state permits must be complied with in the course of completing these projects.




June 29, 2017

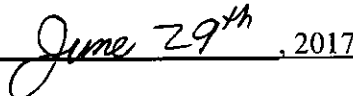
Susan B. Fulmer, Trustee Representative
South Carolina Department of Health and Environmental Control

Priscilla Wendt

6/29, 2017

Priscilla Wendt, Trustee Representative
South Carolina Department of Natural Resources


Anthony Sowers, Trustee Representative
U.S. Department of the Interior



Howard Schnabolk

7/10/2017

Howard Schnabolk , Trustee Representative
National Oceanic and Atmospheric Administration