DRAFT

RESTORATION PLAN AND ENVIRONMENTAL ASSESSMENT FOR THE PALMER BARGE WASTE SITE, PORT ARTHUR, JEFFERSON COUNTY, TEXAS

January 12, 2007

Prepared by:
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Texas Commission on Environmental Quality
Texas Parks and Wildlife Department
Texas General Land Office
and
The United States Fish and Wildlife Service
on behalf of the
U.S. Department of the Interior

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LIST OF ACRONYMS AND ABBREVIATIONS

AR	Administrative Record
BLRA	Baseline Human Health Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
CWA	Federal Water Pollution Control Act or Clean Water Act
CZMA	Coastal Zone Management Act
DMMA	Dredge Material Management Area
DSAY	Discounted Service Acre Year
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
EqDSAY	Equivalent Discounted Service Acre Year
ESA	Endangered Species Act
ESI	Expanded Site Investigation
FONSI	Finding of No Significant Impact
FWCA	Fish and Wildlife Coordination Act
GLO	Texas General Land Office
GSU	Gulf States Utilities
HEA	Habitat Equivalency Analysis
HRS	Hazard Ranking System
MEF	Marsh Equivalency Factor
NCP	National Oil and Hazardous Substances Contingency Plan
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NRDA	Natural Resource Damage Assessment
OPA	Oil Pollution Act
ORS	Old River South
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PRP	Potentially Responsible Party
RCIE	Reasonably Conservative Injury Evaluation
RI/FS	Remedial Investigation/Feasibility Study
RP/EA	Restoration Plan/Environmental Assessment
SLERA	Screening Level Ecological Risk Assessment
SVOC	Semi-Volatile Organic Compound
TCEQ	Texas Commission on Environmental Quality
TNRCC	Texas Natural Resource Conservation Commission

TPWD	Texas Parks and Wildlife Department
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
VOC	Volatile Organic Compound
WMA	Wildlife Management Area

EXECUTIVE SUMMARY

This Restoration Plan/Environmental Assessment describes and outlines the natural resource damage assessment (NRDA) and subsequent restoration for the Palmer Barge Superfund Site. The Palmer Barge Superfund Site is located 4.5 miles east-northeast of Port Arthur, Texas. The property was used as a municipal landfill from 1956-1982. The Palmer Barge Marine cleaning operation started in 1982 and terminated in 1997. Site operations included cleaning, degassing, maintenance, and inspection of barge and marine equipment. The Site was placed on the National Priorities List on July 27, 2000 due to the presence of volatile organic compounds, semi-volatile organic compounds, pesticides, polychlorinated biphenyls and metals on- and off-Site.

The Natural Resource Trustees ("Trustees") conducted a NRDA to address natural resources, including ecological services, injured, lost or destroyed due to releases of hazardous substances from the Site. This damage assessment was part of a cooperative and integrated assessment process with four Potentially Responsible Parties ("PRPs") at the Site, including: E.I. du Pont de Nemours and Company, Texaco Inc., Ashland Inc., and Kirby Inland Marine.

In this draft RP/EA the Trustees propose that their natural resource damages claim be compensated by PRP construction of tidal wetland, pursuant to an Administrative Settlement. Under applicable laws and the terms of the Administrative Settlement, the damages recovered by the Trustees may only be used to plan, implement, and oversee the creation or enhancement of 1.7 acres of estuarine wetlands in the Neches River basin as a means of restoring natural resources and services comparable to those injured or lost at the Palmer Barge Site. In an effort to expedite the restoration project and to increase efficiency, the Trustees and PRPs plan to tier this restoration project off another wetland creation project by requiring that additional acreage (1.7 acres) be included in the implementation of the existing project. The purpose of the existing project is to create estuarine wetland by pumping slurried dredge spoil material from an upland area into an open water area. The already existing project is being conducted for compensation of a NRDA claim for the Chevron refinery in Port Arthur, TX.

1 INTRODUCTION

This Draft Restoration Plan and Environmental Assessment (Draft RP/EA) has been developed by the Texas General Land Office (GLO), the Texas Commission on Environmental Quality (TCEQ), the Texas Parks and Wildlife Department (TPWD), the National Oceanic and Atmospheric Administration (NOAA) of the U. S. Department of Commerce, and the United States Fish and Wildlife Service (USFWS) on behalf of the U.S. Department of the Interior (DOI), (collectively, "the Trustees") to address natural resources, including ecological services, injured, lost or destroyed due to releases of hazardous substances from the Palmer Barge Site in Jefferson County, Texas (the Site).

The Draft RP/EA identifies the restoration action(s) that the Trustees would prefer to implement as part of a settlement that the Trustees jointly recovered for natural resource damages attributed to the Site. The Trustees pursued a cooperative, integrated assessment approach with four Potentially Responsible Parties ("PRPs") at the Site, including: E.I. du Pont de Nemours and Company, Texaco Inc., Ashland Inc., and Kirby Inland Marine ("PRP Group"). A cooperative assessment approach, wherein collected data is shared between the PRPs and the Trustees, generally results in a time and/or cost savings to all parties. During this cooperative process, the Trustees and PRPs reached different conclusions concerning natural resource injuries, but nevertheless arrived at a mutually acceptable natural resource damages settlement.

In this Draft RP/EA, the Trustees propose that their natural resource damages claim be compensated by PRP construction of tidal wetland, pursuant to an Administrative Settlement. Under applicable laws and the terms of the Administrative Settlement, the damages recovered by the Trustees may only be used to plan, implement, and oversee the creation or enhancement of 1.7 acres of estuarine wetlands in the Neches River basin as a means of restoring natural resources and services comparable to those injured or lost at the Site. As such, the public loss of natural resources or natural resource services will be compensated by enhanced habitat and/or ecological services at the restoration site.

In an effort to expedite the restoration project and to increase efficiency, the Trustees and the PRP Group plan to combine this restoration project with another wetland creation project by requiring that additional acreage (1.7 acres) be included in the implementation of the existing project at Old River South. The purpose of the existing project is to create estuarine wetland by pumping slurried dredge spoil material from an upland area into an open water area. Mounds will be created by the placement of the slurried material, resulting in the creation of wetlands with a high proportion of fringe habitat. This design should provide maximal habitat for fish nurseries and will contribute to the restoration of the area hydrology. The already existing project is being conducted for compensation of a Natural Resource Damage Assessment (NRDA) claim for the Chevron refinery in Port Arthur, TX.

1.1 AUTHORITY

This Draft RP/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 natural resource damage assessment regulations at 43 C.F.R. Part 11 (NRDA regulations) which provide guidance for this restoration planning process under CERCLA.

1.2 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 and its implementing regulations outline the responsibilities of federal agencies under NEPA, including for preparing 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 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. For a proposed restoration plan, if a FONSI determination is made, the Trustees may then issue a final restoration plan describing the selected restoration action(s).

In accordance with NEPA and its implementing regulations, this Draft RP/EA summarizes the current environmental setting; assesses the injury to or loss of natural resources or ecological services associated with the Site; 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. This information has been used to make a threshold determination as to whether preparation of an EIS is required prior to selection of the final restoration action. Based on the EA integrated into this document, the federal Trustees – NOAA and USFWS – do not believe that the proposed restoration action meets the threshold requiring an EIS, and pending consideration of public comments on this Draft RP/EA, propose to issue a Finding of No Significant Impact as described in Section 7.

1.3 PUBLIC PARTICIPATION

The Trustees have prepared this Draft RP/EA for public review and comment. It provides the public with information on the natural resource injuries and service losses assessed in connection with the Site, the resource restoration objectives that guided the Trustees in developing this plan, the restoration alternatives that were considered, the process used by the Trustees to identify the preferred restoration alternative and the rationale for its selection. Public review of this Draft RP/EA is the means by which the Trustees seek comment on the analyses used to define and quantify the resource injuries and losses as well as on the restoration action proposed for use to compensate for those injuries and losses. As such, it is an integral and important part of the NRDA process and is consistent with all applicable state and federal laws and regulations, including NEPA and its implementing regulations, and the regulations guiding assessment and restoration planning under CERCLA at 43 C.F.R. Part 11.

This Draft RP/EA is being made available for review and comment by the public for a period of 30 days. The deadline for submitting written comments on the Draft RP/EA is specified in one or more public notices issued by the Trustees to announce its availability for public review and comment. Comments are to be submitted in writing to:

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The Trustees will consider all written comments received prior to approving and adopting a Final Restoration Plan/Environmental Assessment (Final RP/EA). Written comments received and the Trustees' responses to those comments, whether in the form of plan revisions or written explanations, will be summarized in the Final RP/EA.

1.4 ADMINISTRATIVE RECORD

The Trustees have maintained records documenting the information considered and actions taken by the Trustees during this assessment and restoration planning process, and these records collectively comprise the Trustees' administrative record (AR) supporting this Draft RP/EA. Public comments submitted on this Draft RP/EA, as well as the Final RP/EA, will be included in this AR. The AR records are available for review by interested members of the public. Interested persons can access or view these records at the offices of:

Jessica White
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1445 Ross Avenue
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Dallas, TX 75202
Phone: 214-665-2217
Fax: 214-665-6460
Email: Jessica.White@noaa.gov

Arrangements must be made in advance to review or to obtain copies of these records by contacting the person listed above. Access to and copying of these records are 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 copyrighted material.

2 PURPOSE AND NEED FOR RESTORATION

This section generally describes the Site, summarizes the response actions which were undertaken and the Trustees' assessment of resource injuries and compensation requirements related to the Site, and provides more detailed information on the physical, biological and cultural environments in the area affected by releases of hazardous substances from the Site.

2.1 OVERVIEW OF THE SITE

Located 4.5 miles east-northeast of Port Arthur, Texas on Old Yacht Club Road, the Site (Figure 2.1) encompasses approximately 17 acres bordered by Sabine Lake and the State Marine Superfund Site. The land on which the Site resides consists of deposited spoils from the dredging of the Intracoastal Waterway. The Site was originally used as a municipal landfill for the City of Port Arthur, which operated the landfill from 1956 until the mid-1980s. In 1982, the city of Port Arthur sold the property to John Palmer, President of Palmer Barge Line, Inc. The property was then used as a marine barge cleaning operation (Palmer Barge Marine) from 1982 until 1997. Operations performed at the Site included cleaning, degassing, maintenance, and inspection of barges and marine equipment. Cleaning operations included removing sludges and other residual material by pressure steaming the vessel holds, engines and boilers. Waste gasses and liquids generated at the Site were managed by flare (to burn excess gasses) and multiple above-ground storage tanks (to contain liquid waste).

In October 1994, Wrangler Capital assumed all claims from the Palmer Barge Line, Inc. Wrangler Capital purchased the Palmer Barge Line from receivership in July 1997, and the company ceased operations on the property. Currently the Site is owned by Chester Slay, who is removing scrap metal from the site and redeveloping it into a boat maintenance facility.

TCEQ, formerly the Texas Natural Resource Conservation Commission or TNRCC, Region 10 staff conducted an investigation of soil and sediment on the Site in 1998 to determine potential contaminant sources. Five areas of stained soil were identified on-Site and sampling results indicated the presence of metals, semi-volatile organic compounds (SVOCs), and pesticides in on-Site soil. Metals and SVOCs were also detected in offshore sediment adjacent to the Site. In October 1999, the U.S. Environmental Protection Agency (EPA) Region VI office conducted an Expanded Site Investigation (ESI) to determine presence and nature of contamination both on-Site and off-Site. Analytical results of samples indicated the presence of volatile organic compounds (VOCs), SVOCs, pesticides, polychlorinated biphenyls (PCBs), and metals. The Site was placed on the National Priorities List (NPL) July 27, 2000.

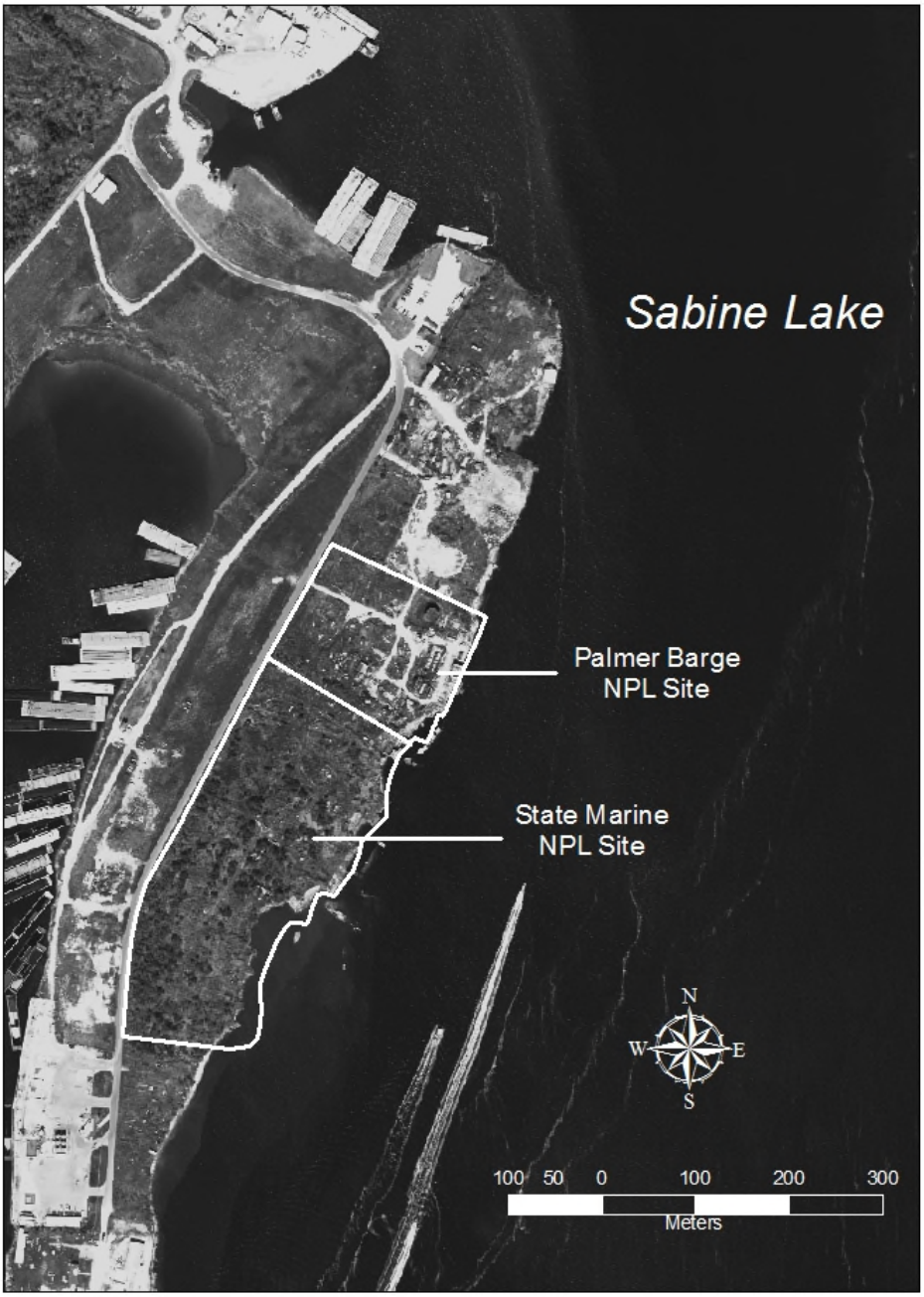

Figure 2.1 Palmer Barge Site Map

2.1.1 Human Use Characteristics

Palmer Barge NPL Site is located within the city limits of Port Arthur in Jefferson County, Texas. The Site is located on a strip of land known as Pleasure Islet, which was formed by deposition of dredge spoils generated during the construction of the Sabine-Neches Canal. Thus, the first human use of the Site was as a dredge containment cell. Historically the Site has been used as a landfill and barge maintenance facility. The entire Site is considered to be a nonresidential, restricted-access industrial area which is expected to maintain that use indefinitely. The Site meets the TCEQ definition of nonresidential property (30 T.A.C. § 335.552(4)), which is "industrial property with Standard Industrial Classification (SIC) of Major Group 29 that is not used for human habitation or for other purposes with a similar potential for human exposure." The current property owner intends to utilize the Site as a boat maintenance facility. Bordering the Site is another NPL listed site known as the State Marine Site, which is also an industrial property. These industrial usages and overall setting significantly limit public access to or use of the Site for other purposes by humans. Sabine Lake borders both the Palmer Barge Site and the State Marine Site. This lake receives a large amount of human use for both commercial and recreational fishing, recreational boating, and water transportation.

2.1.2 Surface Water Characteristics

The surface water hydrology of the region is dominated by slow moving, naturally occurring drainage systems including marshes and bayous**.** No surface water bodies are present on the Site, although it is partially bordered by Sabine Lake. Both groundwater and surface runoff from the Site flow towards the lake. A sheet pile bulkhead occupies nearly 90% of the approximately 400-foot shoreline area.

2.1.3 Habitat Characteristics

Land cover on the Site consists of isolated patches of plant cover in early successional stages, including smooth cordgrass (*Spartina alterniflora*), saltgrass (*Distichlis spicata)*, and widely scattered small trees and shrubs such as southern brush wax-myrtle (*Myrica cerifera*) and salt bush (*Atriplex sp*.).

Sabine Lake and the associated wetlands constitute a tidal system that is an important nursery area for estuarine trust resources. Species known to occupy the habitats provided by Sabine Lake and associated wetlands include, but are not limited to, spotted sea trout (*Cynoscion nebulosus*), sand trout (*Cynoscion nothus)*, Atlantic croaker (*Micropogonius undulatus*), red drum (*Scienops ocellatus*), black drum (*Pogonius cromis*), southern flounder (*Paralichthys lethostigma*), sheepshead (*Argosargus probatocephalus*), blue crab (*Callinectes sapidus*), white shrimp (*Litopenaeus setiferus*) and brown shrimp (*Farfantepenaeus aztecus*). Additionally, benthic resources such as copepods, polychaetes, mollusks, and amphipods occupy vegetated and open water areas.

Sabine Lake is an estuary that is used as a commercial and recreational fishery. The habitats of several federally- and state-listed species including, the bald eagle (*Haliaeetus leucocephalus*), black rail (*Laterallus jamaicensis*), brown pelican

(*Pelecanus occidentalis*), gulf salt marsh snake (N*erodia clarkia*), Texas diamondback terrapin (*Malaclemys terrapi*), and the American swallowtailed kite (*Elanoides forficatus*), are found near the site. In addition, the Sabine National Wildlife Refuge, Sydney Island and Dooms Island bird rookeries, and 13 miles of wetland frontage are located within 15 miles of the Site.

2.2 SUMMARY OF RESPONSE ACTIONS

In 1996 the TCEQ (then known as the TNRCC) conducted a multi-media inspection of the Site to determine the status of the facility's compliance with the Federal Clean Air Act. The investigation revealed the presence of several, unpermitted chemical compounds. Large areas of contamination by hazardous materials were identified at the Site. Other violations included unpermitted construction of tanks and equipment. These findings triggered further investigation by both EPA and TCEQ.

In 1996, EPA and TCEQ conducted a preliminary ESI to evaluate the nature and extent of on- and off-Site contamination. Analytical data from this evaluation indicated the presence of both organic and inorganic contaminants in soil samples collected from locations surrounding the numerous above ground storage tanks at the Site. There were also hazardous constituents found in the shallow near-shore sediments of Sabine Lake. Several polynuclear aromatic hydrocarbons (PAHs; such as acenaphthylene, anthracene, benzo(a)pyrene, chrysene, and fluoranthene), numerous pesticides, PCBs (including Aroclor 1254), and metals such as nickel and arsenic exceeded relevant screening guidelines (NOAA, 1999).

In April 2000, EPA completed a hazard ranking system (HRS) analysis of the Site. The purpose of HRS is to preliminarily evaluate risk to human health and the environment due to exposure to Site contamination, and to determine if the risk rises to the level of national significance. Based on the results of the HRS analysis, the Site was placed (finalized) on the NPL on July 27, 2000.

EPA authorized an emergency removal action for reduction of on-Site contamination in August 2000. Emergency removal activities included removal of wastes, treatment of existing wastewater, and sludge stabilization.

An Administrative Order on Consent was signed by both the PRP Group and EPA in 2002. The Remedial Investigation/Feasibility Study (RI/FS) for the Site began in February 2003. Field sampling has been completed and a Final RI Report was submitted to EPA in January 2005. In support of the RI/FS process, a Baseline Human Health Risk Assessment (BLRA) and a Screening Level Ecological Risk Assessment (SLERA) were prepared and submitted to EPA on March 4, 2005. The purposes of the BLRA and SLERA were to identify any existing or potential risks to human health and the environment resulting from exposure to Site related contaminants. EPA provided comments on the BLRA and SLERA on March 28, 2005. The PRP Group submitted responses on April 20, 2005 and May 16, 2005 and EPA agreed to the proposed revisions. The BLRA and the SLERA were submitted as final to EPA on June 10, 2005.

In June 2005, the PRP Group submitted a draft FS identifying a preferred remedial alternative of excavation / off-Site disposal with institutional controls. This remedy would consist of the excavation of impacted surface soils from each response area and off-Site disposal of the excavated soils at a permitted facility. Proprietary institutional controls would be implemented as part of this alternative. A draft FS was submitted to EPA on June 10, 2005. EPA provided comments about the FS to the PRP group on June 29, 2005, and responses were submitted to EPA on July 15, 2005. The Record of Decision for the Site was signed on September 30, 2005.

2.3 ASSESSMENT OF RESOURCE INJURIES AND COMPENSATION REQUIREMENTS

The Trustees' goal in this NRDA process has been to reliably identify the nature and extent of natural resource injuries attributable to Site-related contaminants, to identify injuries from response actions planned or undertaken, to quantify the resulting resource and ecological service losses[1], and to provide the technical basis for determining the need for, type of, and amount of restoration appropriate to compensate the public for those losses. The remainder of this section provides an overview of the Trustees' assessment strategy for this Site, including the approaches used to evaluate potential injuries to specific resources, quantify associated losses, and identify the preferred restoration action proposed in Section 6.

As noted in subsection 1.1, the assessment process is guided by the NRDA regulations issued under CERCLA and found at 43 C.F.R. Part 11. For the Palmer Barge Site, the Trustees and the PRP Group identified an assessment approach that could be performed in conjunction with the remedial investigations undertaken and the response planning pertinent to the affected areas. This "integrated" approach permits data sharing, since much of the data needed to support remedial planning can be useful in evaluating and estimating natural resources injuries. Additionally, such integration typically results in time and cost savings, and promotes efficiency in the overall process. Further, NRDAs undertaken with the cooperation of PRPs avoid costly litigation and expedite restoration of the environment.

The Trustees sought to directly link injury assessment and restoration planning, so these processes would occur simultaneously and allow restoration-based compensation to be defined more directly and quickly. In a restoration-based assessment, injuries to and/or losses of natural resources and ecological services are quantified in ways that facilitate the identification of restoration projects that serve to compensate the public with the same level, type and quality of resources, or resource services, as were lost. The restoration-based assessment approach is consistent with the CERCLA NRDA regulations at 43 C.F.R. § 11.31. They allow restoration planning to be included as part of the Assessment Plan Phase where available data are sufficient to support their concurrent development.

[1] *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)).

2.3.1 Injury Assessment and Loss 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, including any injury which may have occurred due to the remedies undertaken. The injury assessment process occurs in two stages: 1) injury evaluation, and 2) resource and service loss quantification. The Trustees considered several factors when making this evaluation, including, but not limited to:

- the specific natural resource and ecological services of concern;
- evidence indicating exposure, pathway and injury;
- the mechanism by which injury occurred;
- the type, degree, spatial and temporal extent of injury; and
- types of restoration actions that are appropriate and feasible.

To evaluate potential injury to resources for the Site, the Trustees reviewed existing information, including remedial investigation data, ecological risk assessments, and scientific literature, and applied their collective knowledge and understanding of the function of the terrestrial and aquatic ecosystems at and near the Site. Identifying and understanding the contaminants of concern (COCs) for the Site, as well as their pathways to and potential effects on ecological receptors, is key to the Trustees' approach to injury assessment. PAHs and heavy metals were identified as the primary COCs for NRDA purposes for the Site.

For each resource category (either a group of organisms or a habitat type) that was potentially affected, the Trustees identified a pathway linking the injury to releases from the Site, determined whether an injury is likely to or has occurred, and identified the nature of the injury. An understanding of the important contaminants was necessary. The evaluation of the COCs and their pathways to ecological receptors is described in the next two sections. Following the identification of the contaminants, the Trustees undertook an evaluation of those resources that were adversely affected by releases from the Site.

Based upon data collected during remedial activities, the Trustees focused the injury assessment on metals and PAHs as the primary contaminants of potential concern (COPCs) for NRDA purposes. These COPCs were found in the shallow shelf (near-shore) sediments of Sabine Lake adjacent to the Site.

The Trustees found that natural resources or resource services were lost due to the presence of hazardous substances (at concentrations sufficient to elicit adverse effects in exposed organisms) in certain environmental media on- and off-Site. The Trustees used this information to conservatively (i.e., in favor of the natural resources) estimate

the total potential loss of wetland acre-years represented by the natural resource injuries associated with the Site.

To assess injury to benthic resources that rely on the tidally-influenced sediments contaminated by releases of hazardous materials from the Site, the Trustees worked cooperatively with the PRP Group and used logistic regression modeling (Field et al., 2002) to estimate injury. Logistic regression modeling allowed the Trustees to estimate the probability of toxicity to benthic organisms in the assessment area based on the known sediment chemistry concentrations on-Site.

2.3.2 Preliminary Restoration Strategy

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 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).

Habitat Equivalency Analysis (HEA), scientific literature, and knowledge of Texas estuaries were used to determine how much credit could be realized from a restoration project, such as enhancing a degraded environment or preserving an existing environment. Various inputs are considered, such as the level of ecological services currently provided at the proposed location, the threat of destruction of the habitat by human encroachment, and the potential for inundation. HEA calculates the quantity of habitat (in the form of discounted service acre years, or DSAYs) that can be generated as credits for a given restoration project. The DSAYs may then be converted into the amount of acreage that, if constructed, would be necessary to provide compensation for a specific type of injured habitat. If the project entails the preservation of existing habitat rather than construction of new habitat, the amount of acreage necessary for compensation usually increases.

3 THE AFFECTED ENVIRONMENT

In restoration planning, the Trustees emphasis has been on the areas and resources directly affected by Site releases, however, the Trustees have also recognized that the injured resources are part of a larger ecological system - the Sabine Lake Estuary. Accordingly, in developing this Draft RP/EA, appropriate restoration opportunities within that system have been considered. Under this approach, natural resource Trustees are better able to compensate for resource injuries while also taking into account the multiple ecological and human use benefits of restoration within the larger ecosystem.

This section provides additional information on the physical, biological and cultural environments within the Sabine Lake Estuary, in which the restoration action proposed in this Draft RP/EA would occur, consistent with NEPA. The information in this Section, together with other information in this document, provides the basis for the Trustees' evaluation of the potential environmental impacts of the alternative restoration actions listed in Section 5 (Restoration Alternatives Comparison) as well as the potential restoration action identified in Section 6. The scope of the environmental impacts addressed in this Draft RP/EA include wildlife, fish and invertebrates, essential fish habitat, threatened and endangered species, farmland and urban development, recreation resources, water and sediment quality, air quality, cultural resources, hazardous and toxic waste and environmental justice.

3.1 THE PHYSICAL ENVIRONMENT

Sabine Lake is Texas' eastern-most estuary, covering some 90,000 acres. It is largely co-owned and regulated by the states of Texas and Louisiana. The estuary lies in a river valley formed during the last glacial period. The primary freshwater influx to the lake is from the Sabine and Neches Rivers. Bayous entering Sabine Lake include Lighthouse, Fourge, Greens, Madame Johnson, Johnsons, Willow, and Black. Along with the Sabine River, the lake forms the boundary between Louisiana and Texas. The Sabine Lake ecosystem has five times more marshland than the Galveston Bay complex.

Except for a few miles near its head, the Neches River serves as a boundary stream, forming the county lines between Van Zandt and Smith, Smith and Henderson, Henderson and Cherokee, Cherokee and Anderson, Cherokee and Houston, Houston and Angelina, Angelina and Trinity, Angelina and Polk, Angelina and Tyler, Tyler and Jasper, Jasper and Hardin, Hardin and Jefferson, and Jefferson and Orange Counties.

The Sabine River starts in Hunt County and forms the boundary lines between Rains and Van Zandt, Van Zandt and Wood, Wood and Smith, and Smith and Upshur Counties. After crossing most of Gregg County, the river forms portions of the county lines between Harrison and Gregg, Rusk and Panola Counties before it bends more sharply across Panola County. At the thirty-second parallel in the southeastern corner of

Panola County the Sabine River becomes the state boundary between Texas and Louisiana, and thus the eastern boundary of Shelby, Sabine, Newton, Orange, and Jefferson Counties.

The Sabine River flows for 555 miles, has a total drainage basin area of 9,756 square miles, of which 7,426 is located in Texas and the remainder located in Louisiana. Average annual precipitation is between thirty-seven inches at its source and fifty inches at its mouth. The Sabine River discharges the largest volume of water at its mouth of all Texas rivers. Average runoff within 97 percent of the Sabine River basin during the 1941-1967 period was about 640 acre-feet per square mile.

The Neches River has a drainage area estimated at 10,011 square miles. Abundant rainfall in the basin results in a flow of some 6,000,000 acre-feet per year. Major tributaries to the Neches River include the Angelina River (which drains one-third of the basin area), Bayou La Nana, Ayish Bayou, Pine Island Bayou, Village Creek, Kickapoo Creek, and Flat Creek.

3.2 THE BIOLOGICAL ENVIRONMENT

The wetlands of the Sabine Lake/Neches River Estuary contribute nutrients to and enhance productivity of Sabine Lake as well as serve as important nursery and adult habitat for a variety of oligohaline and marine fish and invertebrate species. Sabine Lake is a low-salinity, estuarine embayment of the Gulf of Mexico and is characterized by shallow, productive waters. The Neches River in the vicinity of the Site is tidally influenced and is part of the Sabine Lake/Neches River Estuary. Phytoplankton, zooplankton, and aquatic invertebrates living in these habitats provide food web support for a diversity of fish and bird species. Marine species utilizing the marsh include, but are not limited to, spotted seatrout (*Cynoscion nebulosus*), sand seatrout (*Cynoscion arenarius*), Atlantic croaker (*Micropogonius undulatus*), red drum (*Scienops ocellatus*), black drum (*Pogonius cromis*), sheepshead (*Argosargus probatocephalus*), blue crab (*Callinectes sapidus*), white shrimp (*Litopenaeus setiferus*), brown shrimp (*Farfantepenaeus aztecus*), and southern flounder (*Paralichthys lethostigma*).

The waters of the Sabine Lake/Neches River Estuary support species important for commercial and recreational usage and provide habitat for the following organisms: white shrimp and brown shrimp, blue crab, eastern oyster (*Crassostrea virginica*), spotted seatrout, sand seatrout, Atlantic croaker, red drum, black drum, southern kingfish (*Menticirrhus americanus*), Gulf kingfish (*Menticirrhus littoralis*), sheepshead, southern flounder, striped mullet (*Mugil cephalus*), sea catfish (*Galeichthys felis*), Gulf menhaden (*Brevoortia patronus*), and gafftopsail catfish (*Bagre marinus*). In addition, numerous other estuarine and marine resources are found in Sabine Lake/Neches River Estuary including bay anchovy *(Anchoa mitchilli*), silver perch (*Bairdiella chrysoura*), bull shark (*Carcharhinus leucas*), sheepshead minnow (*Cyprinodon variegatus*), gizzard shad (*Dorosoma cepedianum*), Gulf killifish (*Fundulus grandis*), code goby (*Gobiosoma robustum*), pinfish (*Lagodon rhomboides*), spot (*Leiostomus xanthurus*), silversides (*Menidia* spp.), Gulf flounder (*Paralichthys albigutta*), bluefish

(*Pomatomus saltatrix*), Spanish mackerel (*Scomberomorus maculatus*), bay squid (*Lolliguncula brevis*), hard clam (*Mercenaria mercenaria*), grass shrimp (*Palaemonetes pugio*), and common rangia (*Rangia cuneata*).

The sediments within the estuary support benthic organisms, including annelid worms, small crustaceans (amphipods, isopods, copepods, juvenile decapods), mollusks, and other small bottom-dwellers in salt marshes and unvegetated, subtidal sediments. Among these benthic organisms are herbivores (eating algae or other live plant material), detritivores (feeding on decaying organic matter in surface sediments or sediment-bound nutrients and organic substances that are not generally available to epiphytic or pelagic organisms), carnivores (preying on other benthic organisms), and omnivores (a combination). These organisms provide the nutritional base for developing stages of many finfish and shellfish and, thus, affect all trophic levels in the Sabine Lake/Neches River Estuary.

The Sabine Lake/Neches River Estuary is home to a variety of plant species that are typical of species found in estuarine wetlands including cordgrasses (smooth cordgrass, *Spartina alterniflora,* and saltmeadow cordgrass, *S. patens*), saltwort (*Batis maritima*), glasswort (*Salicornia virginica*), seashore saltgrass (*Distichlis spicata*), saltmarsh bulrush (*Scirpus maritimus*), sea oxeye (*Borrichia frutescens*), and marsh elder (*Iva frutescens*).

3.3 THE CULTURAL AND HUMAN ENVIRONMENT

The Texas coast enjoys a rich history, dating back thousands of years. Early inhabitants of the region included the Eyeish and Atacapa Indians. The Spanish began populating Texas in the early 1700s and German immigration to some parts of the Texas coast was prevalent during the 1800s, although the Neches River area was not among the earliest areas affected by these migrations. The Neches River/Sabine Lake area cultural environment was influenced by immigration of Anglo-American settlers from neighboring Louisiana.

During the Civil War, Sabine Pass, at the south of Sabine Lake, was a major center for the shipment and trade of cotton in exchange for vital supplies, arms, and medicine for the Confederate Army. Union ships actively sought to blockade harbors and disrupt shipments along the Gulf Coast. In a small but notable victory, Confederate forces repelled an attempted 1863 invasion of Texas by Union naval gunboats convoying Union soldiers at Sabine Pass near Port Arthur. Sabine Pass Battleground State Historical Park, a 57.6-acre park located in Jefferson County to the south, encompasses lands and resources that were part of this historic period.

In addition to being part of Texas' cultural history, the Sabine Lake/Neches River Estuary supports both recreational and commercial fishing. Recreational fishing occurs throughout the estuary, including in the vicinity of the Site. Species fished in the estuary include blue crab, red drum, black drum, spotted sea trout, southern flounder, Atlantic croaker, striped mullet, and sea catfish. The fish most commonly harvested from

Sabine Lake are comprised of red and black drum, spotted sea trout, sheepshead, and flounder. The Sabine Lake/Neches River Estuary also supports several important commercial fisheries. Large numbers of blue crab are harvested in the lake, as well as in the surrounding salt marshes and throughout the rest of the estuary. White shrimp and brown shrimp are economically important species found in the Sabine Lake system. Commercial harvest of finfish also occurs at low levels. These human activities are dependent upon the condition of the coastal and marine habitats.

4 PROPOSED INJURY AND SERVICE LOSS EVALUATION

This section of the Draft RP/EA describes the Trustees' proposed assessment of natural resource injuries due to hazardous substances released at the Palmer Barge Site.

The evaluation and estimate of potential natural resource injuries presented in this Section was developed by the Trustees, within a joint technical workgroup formed by the Trustees and the PRPs as part of a cooperative NRDA process. In evaluating and estimating injuries within this workgroup, a 'Reasonably Conservative Injury Evaluation' (RCIE)[2] approach was applied. The workgroup used historical data, scientific literature on contaminant effects, and the results of the ecological risk assessment for the Site. Indeed, all available relevant analytical data resulting from remedial investigations conducted by the EPA or TCEQ for the Site were used.

Although developed cooperatively within the workgroup, the assessment approach and resource injury and loss evaluation presented in this Section is that of the Trustees, as the Trustees are solely responsible for ensuring that this evaluation and its outcome are consistent with the goals of the NRDA process.

4.1 SCOPE OF INJURY ASSESSMENT

As a threshold evaluation, the nature and extent of the contamination at the Site that could be attributed to hazardous substance releases was examined. Areas with hazardous substances potentially from the Site were identified as 'assessment areas.' Within these general areas, the potential for natural resource injuries was then considered further based on the presence of hazardous substances at levels of concern (*i.e.*, concentrations with potential to adversely affect natural resources or services). Areas in which Site contaminants were not likely to pose a substantial potential for injury to natural resources or services were excluded from further analysis in this process.

This threshold evaluation considered information from many sources, including the results of the RI for the Site; records and information bearing on past and present operations at the Site; scientific literature; as well as the Trustees' knowledge and understanding of the ecosystem in this area. Because much of this information arises

[2] The RCIE approach uses conservative values and assumptions, i.e., those favoring natural resources and the public's interests in injured resources, to address or resolve uncertainties in assessment analyses. The approach, thus, tends to result in an upper-end estimate of how much injury occurred or how much restoration is required. RCIE assumptions are often used in initial analyses to guide Trustees in determining the appropriate level of effort to apply in obtaining more refined estimates. Sometimes, as is the case for most of the assumptions used in this assessment, the cost to develop more precise estimates or further refine parameters used in the analysis would exceed the potential resulting change in the cost of restoration. In these instances, the use of conservative assumptions in the final analysis, rather than developing more precise point estimates, results in an overall cost savings to PRPs while still protecting the public's interest in obtaining sufficient restoration for the injuries.

from recent investigations of the Site conducted or supported by the USEPA, there is a high technical confidence that areas identified in this evaluation are appropriate for evaluating injury to natural resources and services associated with Site releases.

This threshold evaluation indicated the potential for injury to natural resources from hazardous substances released at the Site, and to the biota utilizing these areas. Accordingly, the Trustees' injury and service loss evaluation focused on resource injuries and losses in these areas.

4.2 PATHWAYS OF CONTAMINATION TO TRUST RESOURCES

Identifying and understanding the COCs for the Palmer Barge Site, as well as their pathways to and potential effects on ecological receptors, is critical to the Trustees' approach to injury assessment. A *pathway* is defined as the route through which hazardous substances are transported from the source of contamination via various exposure media (for example, water or soil) in the environment to the natural resource of concern (43 C.F.R. § 11.14). 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 RI and laboratory analyses indicated that soils and sediments were contaminated with hazardous materials, thereby providing a pathway for exposure to natural resources.

4.3 CONTAMINANTS OF CONCERN (COCS)

One of the earliest steps of the damage assessment was to identify which hazardous materials identified at the Site should be included on the list of COCs. The Trustees participated in this evaluation during the RI process by determining which contaminants released from the Site could pose a risk to ecological receptors.

That process led the Trustees to focus on PAHs and select metals*, i.e*., chromium, copper, lead, nickel and zinc, as the contaminants threatening trust natural resources for this Site. These hazardous substances were found in the surface soils, surface waters, sediments, and groundwater, and adjacent wetlands at or near the Site.

4.3.1 Organic Contaminants

Polynuclear Aromatic Hydrocarbons (PAHs)

PAHs are organic contaminants that tend to sorb to particulates and sediments. PAHs can bioaccumulate but do not tend to biomagnify because PAHs are rapidly metabolized (Eisler, 1987). PAHs are not very soluble in water and have a strong affinity for particles in aquatic systems, particularly fine particles with high organic content. Fine particles containing PAHs are easily transported downstream with prevailing water currents. The PAHs with high solubilities (such as naphthalene) may remain dissolved in surface water, while those with lower solubilities are likely to form associations with colloidal material or suspended particulates. Hence, PAHs are commonly associated with suspended particulates in aquatic systems. While PAHs associated with suspended particulates may be photochemically degraded,

biodegraded, transported to other areas, and/or incorporated into aquatic biota, deposition and consolidation with bedded sediments probably represents one of the most important environmental fate processes for this class of compounds. Thus, sediments represent the major environmental sink for these compounds.

Water-borne PAHs can be acutely lethal to invertebrates, fish, and amphibians; long-term exposure to sub-lethal levels can impair survival, growth and reproduction. Similarly, exposure to sediment-associated PAHs can adversely affect the survival, growth, and reproduction of benthic invertebrates. Fish investigations have shown that exposure to PAH contamination can induce mortality and a variety of internal and external abnormalities. Sediments heavily contaminated with industrial waste PAHs have directly caused increased body burdens and increased frequency of liver neoplasia in fishes (Eisler, 1987).

4.3.2 Metals

Site sediments contained aluminum, arsenic, barium, cadmium, copper, manganese, nickel and vanadium. Site soils contained all of the previous metals in addition to chromium, lead, and zinc. Lead, zinc, nickel, chromium, and copper are all elemental metals found naturally in the earth's crust, usually at low levels. These metals can also be found in industrial wastes.

Chromium

Chromium (Cr) may be released into the environment from a number of municipal and industrial sources. Trivalent Cr, Cr (III), and hexavalent Cr, 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.

Copper

Copper (Cu) may be released into the environment from a variety of agricultural, municipal, and industrial sources. In aquatic systems, Cu tends to become associated with dissolved materials or suspended particles, including both organic and inorganic substances. Over time, these forms of Cu tend to become associated with biological tissues and bottom sediment. Copper, particularly the dissolved form, is highly toxic to aquatic organisms, causing effects on the survival, growth, and reproduction of fish, invertebrates, and plants. Exposure to elevated levels of sediment-associated Cu causes acute (i.e., short-term) and chronic (i.e., long-term) toxicity to sediment-dwelling organisms. While avian and mammalian wildlife species tend to be less sensitive to the effects of Cu than are aquatic organisms, dietary exposure to elevated levels of Cu can cause organ damage, reduced growth, and mortality.

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 is not highly 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.

Nickel

Nickel (Ni) is released into the environment from natural sources and human activities, with the burning of fossil fuels and the processing of Ni-bearing ores being the most important sources. Unlike many other metals, Ni is considered to be highly mobile in aquatic ecosystems, repeatedly cycling between the water column, bottom sediments, and biological tissues.

While there is little information available with which to assess the effects of sediment-associated Ni, exposure to dissolved Ni is known to adversely affect the survival, growth, and reproduction of amphibians, fish, invertebrates, and aquatic plants. In birds and mammals, dietary exposure to elevated levels of Ni can result in reduced growth and survival.

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.

4.4 EVALUATION OF INJURY

As noted earlier, the Trustees and the PRP Group formed a joint technical workgroup and used an RCIE approach[3] to evaluate and estimate potential resource injuries attributable to releases from the Site. In applying the RCIE approach, the workgroup made use of all available evidence, including data from other site investigations, values from existing scientific literature and the substantial collective experience within the workgroup.

The reduction in ecological services provided by the injured resource was used by the Trustees to measure the injury to natural resources as a result of releases of hazardous substances from the Site. This quantification also accounts for the time required for the injured resources to recover through natural or enhanced means to their pre-release condition by including this data.

To assess injury to benthic resources that rely on the tidally-influenced sediments contaminated by releases of hazardous materials from the Site, the Trustees worked cooperatively with the PRP Group, and used logistic regression modeling (Field et al., 2002) to estimate injury. Logistic regression modeling allowed the Trustees to estimate the probability of toxicity to benthic organisms in the assessment area based on the known sediment chemistry concentrations on-Site. The Trustees, in collaboration with the PRP Group, compiled an MS-Access database of sediment chemistry environmental investigations pertinent to the natural resources assessment area with a query to calculate the Logistic Regression Model P-max scores. Logistic regression modeling allowed the probability of toxicity to be predicted based upon the existing sediment chemistry concentrations measured at each station on the Site. QM (Query Manager) was used to calculate logistical regression P-Max scores, where the P-max value is the maximum of the probabilities of toxicity of each modeled hazardous substance in the sample. For the purposes of this particular Site evaluation, the Trustees and the PRPs agreed that P-Max score would serve as the estimated measure of injury to benthos resources. Thus, using this approach, if the P-Max score from the logistic regression model is 80% at a sample station, then the service loss was set to

[3] See footnote 2 for explanation of RCIE approach.

80%. The Trustees then determined the total area-weighted average loss of benthos services for each of the relevant habitat/operable unit combinations at the site (Table 4.1).

4.4.1 Habitat Equivalency Analysis – Quantifying Losses (the 'Debit Model')

The Trustees used HEA (NOAA, 2000) as a calculation tool to determine the amount of compensation (in the form of acreage) needed to replace injured habitat. HEA provides a logical framework for determining the appropriate scale of restoration projects and provides a cost-effective alternative to conducting protracted assessments. The scale, or size, of a restoration project should be such that it provides enough ecological service gains to offset the total of the losses. Losses are quantified as lost resource habitat and ecological service areas. Restoration projects are scaled to provide habitat resources and ecological services comparable (equivalent) to the lost habitat resources and ecological services.

In general, HEA is a technique that is used to balance "debits" (injured habitat or other resource service losses) that have occurred as a result of releases of hazardous substances against compensatory "credits" (habitat restoration projects) by calculating them in a common metric (DSAYs). HEA also uses a discount factor to account for the difference in time that the restoration services are delivered. Because the losses occur in different time periods, the relevant losses are not directly comparable. To make the losses that occur in different time periods comparable, a discount factor is applied to the losses to determine "discounted service-acre-years," or DSAYs.

In order to estimate compensatory restoration requirements, Trustees analyzed all available data to estimate the percent loss of resource services and the time to full natural resource recovery. Injuries to the natural resources at the Site were quantified by calculating the reduction in ecological services from the injured resource and loss of services resulting from releases of contamination at the Site. This quantification included accounting for the time required for the injured resources to recover through natural or enhanced means to their pre-release condition.

Inputs to the HEA for the Site were based on sediment chemistry analytical results and conservative assumptions[4].

[4]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 natural resources when used in the analysis. The assumed value therefore leads to an upper-end estimate of how much injury occurred or how much restoration is required. Often these assumptions are used in initial analyses to guide the Trustees in determining the appropriate level of effort to apply in obtaining more refined estimates. Sometimes, as is the case for most of the assumptions used in this injury assessment, the cost of developing refined estimates for parameters would exceed the potential reduction in the cost of restoration. In these instances, the use of conservative assumptions in the final analysis, rather than developing more precise point estimates, results in an overall cost savings to the PRPs while still protecting the public's interest in obtaining sufficient restoration for the injuries.

The Trustees also made the following additional assumptions:

1) HEA is an appropriate assessment tool;

2) The appropriate discount rate is 3%;

3) The appropriate base year (i.e. the year from which the discount is applied) is 2004;

4) The onset of injury was 1981; and

5) Restoration would be initiated in 2006.

Other specific values used in the HEA debit model are shown in Table 4.1.

Table 4.1 – Habitat Equivalency Analysis debit input parameter values for Palmer Barge NPL Site Habitats

Input Parameter		
Assessment Area	Shallow Shelf Sabine Lake Palmer	Shallow Shelf Sabine Lake Palmer (North)
Habitat Equivalency Factor	4.51:1	4.51:1
Acres Injured	0.73	0.6
Levels of Ecological Services at Time of Injury (baseline)	100%	100%
Initial Level of Injury (LOS)	100%	100%
Years Until Recovery	300	300
Restored Habitat Level of Ecological Services	*100%*	*100%*
Remediated Area Ecological Service level after Recovery	*100%*	*100%*
Total Lost DSAYs	*34*	*28*
Total Net Lost EqDSAYs	***7.5***	***6.2***
Total Acres Required	***0.9***	***0.8***

4.4.2 Assessment Area

The assessment area was divided into primary and secondary components (Figure 4.1). The primary assessment area consists of approximately 4.4 acres of intertidal and shallow-water sediments in upper Sabine Lake adjacent to the Site for which there is abundant data from the RI. As such, the boundaries of the primary assessment area were determined generally by the extent of sediment quality data obtained in the RI for the Site. This area was bounded to the west by the upland portion of the Site and to the

east by the Sabine-Neches Canal. The Sabine-Neches Canal is a regularly dredged waterway and acts to generally inhibit the further migration of contaminants from the Site into Sabine Lake.

Figure 4.1 - Palmer Barge Site Assessment Areas and Vicinity, Jefferson Co., Texas.

The northern boundary of the primary assessment area was defined by extending the upland boundary of the Site out into Sabine Lake until its intersection with the Sabine-Neches Canal. As previously mentioned, this boundary was generally defined by the

availability of existing sediment quality data. The southern boundary of the primary assessment area was similarly defined by extending the upland boundary between the Site and the State Marine NPL Site out into Sabine Lake to the Sabine-Neches Canal. It should be noted that the State Marine NPL Site lies immediately adjacent to the south of the Site and the operations and resulting COPCs were essentially identical to those at the Site. As such, it was determined that contaminants located to the south of the primary assessment area should be attributed to releases from the State Marine NPL Site.

The secondary assessment area lies to the north of the primary assessment area and consists of approximately 3.1 acres of intertidal and shallow-water sediments in upper Sabine Lake. The west-northwest face of the secondary assessment area extends north-northeast approximately 480 feet from the north corner of primary assessment area to the end of the adjacent property's bulkhead (to a small slip), thence approximately 240 feet along a line generally described by the southwest edge of the slip to the Sabine-Neches Canal. Limited sediment quality data exists for this assessment area. It was determined that, due to decreasing proximity to the Site , levels of COCs in the sediments of this area would likely be less than those found in the primary assessment area and that any transport of COCs from the primary area would result in a decreasing gradient of contamination within the secondary assessment area.

The Trustees took a reasonable worst-case approach to the evaluation of potential injury in this area by assuming that levels of Site–related COCs would occur in the same proportion as those identified within the primary assessment area, which lies immediately adjacent to the Site. This conservative approach to the delineation of potential injury to benthic habitats within the secondary assessment area would tend to favor the affected natural resources and the public's interests when used in this analysis. The use of conservative assumptions in this analysis, rather than developing more precise point estimates, results in an overall cost savings to the PRP Group while still protecting the public's interest in obtaining sufficient restoration for potential injuries to natural resources.

4.4.3 Equivalent Injured Acres Ratio

The benthic resource losses being assessed were for injuries occurring in open water habitats. For these injuries, the preferred compensatory restoration project involves creation and enhancement of brackish marsh, a habitat with higher ecological productivity relative to that of open water bottom. Comparing DSAYs generated in different habitat types is complicated because of the different functions habitats provide. To scale restoration-based compensation, it is necessary to convert the open water habitat losses to their 'equivalent' in the target restoration habitat, i.e., a factor for relative habitat productivity that is applied to allow comparison across habitat types.

The Trustees decided that the habitat productivity of each area should be compared to the habitat productivity of a natural wetland. The Trustees had already developed a wetland conversion factor for the Lavaca Bay NPL Case (marsh equivalency factor: 4.51 acres of water bottom = 1 acre of tidal wetland) (Texas Trustees, 2000). The

Trustees decided that the same ratio could be used as a conversion factor for the Sabine Lake Estuary wetlands because, in their professional knowledge, similar wetland functions were represented.

A ratio was used to compare ecological losses and/or gains across different habitat types to allow the habitat productivity of an injured habitat to be compared. Dividing the "raw" DSAYs by the marsh equivalency factor converts the losses to comparable units, i.e., Equivalent DSAYs (EqDSAYs). Dividing the "raw" open water DSAYs by the MEF converts the losses to comparable units, i.e., 60 open water DSAYs / 4.51 = 13.3 EqDSAYs. Approximately 13.3 marsh equivalent DSAYs are needed to compensate for injuries at the Site.

5 THE RESTORATION PLANNING PROCESS

The goal of restoration planning under CERCLA is to identify actions appropriate to restore, rehabilitate, replace or acquire natural resources or services equivalent to those 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 designed to assist or accelerate the return of a resource, including its services, to pre-injury or baseline conditions. In contrast, compensatory restoration actions serve to compensate for the interim loss of resource services due to injury, pending the return of the resource to baseline conditions or service levels. The scale of a compensatory restoration project depends on the nature, extent, severity, and duration of the resource injury. Primary restoration actions that speed resource recovery reduce interim losses, as well as the amount of restoration required to compensate for those losses.

In this instance, remedial actions undertaken or anticipated at the Site (removal of contaminated soil, followed by backfilling the excavated area and offsite disposal of material, and natural attenuation for the sediments) are expected to protect natural resources in the vicinity of the Site from further or future harm and to allow benthic resources to return to pre-injury or baseline conditions within a reasonable period of time. Under these circumstances and the rapid return of benthic communities through recruitment, it is unnecessary for the Trustees to consider or plan for primary restoration actions. Accordingly, this Draft RP/EA focuses only on defining appropriate compensatory restoration actions.

The Trustees have approached restoration planning with the view that the injured benthic resources and associated services lost are part of an integrated ecological system and that the Sabine Lake Estuary represents the relevant geographical area for appropriate restoration actions. This helps to ensure that the benefits of restoration actions are related, or have an appropriate nexus, to the benthic resource injuries and losses being assessed for the Site.

In accordance with the NRDA regulations, the Trustees identified and evaluated a reasonable range of project alternatives capable of restoring ecological services comparable to those lost due to injury to benthic resources at the Site. These alternatives were identified by first searching for potential projects within the watershed, including the results of other recent marsh projects. The results include an inventory of coastal projects in Texas developed for and submitted to the Texas Coastal Coordination Council in June 2000[5]. The alternative projects identified by the Trustees

5 This inventory of projects (GLO Contract No 99-123R) was developed with public input, including those as obtained at a public meeting in the Beaumont/Port Arthur area held on May 24, 2000.

were then subjected to a first tier of screening (described in Section 5.3) to narrow the field of project alternatives to those considered in this plan. The "No Action" alternative was also included for consideration, as required by NEPA and the CERCLA NRDA regulations. These alternatives were then evaluated more carefully by the Trustees based on the criteria outlined below. Each alternative, the results of that evaluation, and the restoration action(s) that the Trustees are proposing for implementation on the basis of that evaluation, are identified in the remaining sections of this document.

5.1 RESTORATION STRATEGY

The initial search and screening process led the Trustees to identify a preferred strategy for effecting restoration to compensate for benthic losses under this plan - estuarine marsh creation or enhancement. Converting other habitats to open water bottom is generally not favored or appropriate as a restoration strategy as it necessitates the loss of important resources and services that other habitats provide. Estuarine wetlands support benthic resources, have the capacity to replace the array of ecological services lost, and are ecologically more productive than open water bottom as a habitat, making this approach to providing compensatory services more efficient Further, intertidal marshes in coastal Texas, including those within the Sabine Lake Estuary, are continually being converted to open water habitat due to inundation from subsidence and salt-water intrusion. Their increasing prevalence due to these processes makes open water areas a lesser-valued habitat, and an undesirable means of effecting restoration. Estuarine marsh creation or enhancement helps address a critical problem in this environment - the loss of these wetlands in the estuary. Consistent with this strategy, all project alternatives considered in this plan represent opportunities to create or enhance estuarine marsh in this watershed.

5.2 RESTORATION SELECTION CRITERIA

In accordance with the NRDA regulations, 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 a level and quality of resources and services comparable to those lost. In this plan, that goal is met through the stated restoration objective: to provide for the creation of sufficient habitat acreage in the Sabine-Neches River basin to compensate for the natural resource injuries and service losses attributed to hazardous substance releases at the Site. The Trustees considered the habitat in terms of relative productivity and the nature of the project (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. Additionally, the

Trustees considered the total cost of the project, the potential for partnering in an existing restoration project, and availability of matching funds. Factors that can affect and increase the costs of implementing the restoration alternatives may include project timing, access to the restoration site (for example, use of 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 presence of an adequate monitoring component is considered a positive attribute because documenting project performance is essential to determining the need for any mid-course corrections necessary to ensure long term success.

- *The likelihood of success of each project alternative*: The Trustees consider technical factors that represent risk to successful project construction and 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 the potential for difficulties in project implementation and whether long-term maintenance of project features is necessary and/or feasible. Sustainability of a restoration action is a measure of its vulnerability 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 losses of natural resources and affects to surrounding resources during implementation should be minimal. 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. For example, although recreational benefits are not an explicit objective in this Draft RP/EA, the opportunity for a restoration project to enhance recreational use of an area was considered favorable.
- *The effect of each alternative on public health and safety*: Projects having a negative impact on public health or safety are not appropriate.

The NRDA regulations give the Trustees discretion to prioritize these criteria and to use additional criteria as appropriate. In developing this Draft RP/EA, the first criterion listed has been a primary consideration, because it is paramount to ensuring that the restoration action will compensate the public for the injuries to benthic resources attributed to Site releases, consistent with the proposed assessment of compensation requirements for the Site.

5.3 SCREENING OF RESTORATION ALTERNATIVES

Given the relatively small acreage requirements for compensatory restoration associated with the Site, the Trustees were determined to promote efficient and cost-effective restoration planning. Fortunately, the Trustees had recently performed an extensive analysis of available restoration alternatives in the Sabine Lake area in support of the settlement of the NRDA claim for the Old Gulf Oil Refinery Site in the near vicinity. In settlement of that claim, Chevron USA, Inc. ("Chevron") agreed to create at least 83 acres of estuarine marsh habitat, 30 acres of coastal wet prairie, as well as enhance 1332 acres of wetland by hydrologic improvement.

Given that:

1) the injuries which occurred at the Old Gulf Oil Refinery Site and the Palmer Barge Site were similar in kind;
2) the natural resource services lost at the two sites were similar in kind;
3) the legal planning requirements, including requirements under State and Federal law, at the two sites were similar; and
4) both sites required some form of restoration or enhancement of marsh habitat in the general Sabine Lake area,

the Trustees concluded that the "Screening of Restoration Alternatives" for the Palmer Barge Site would involve the same analysis that had recently been completed for the Old Gulf Oil Refinery Site. As such, they "tiered" the Site analysis from the recently completed Old Gulf Oil Refinery Site analysis. [6]

In support of the Old Gulf Oil Refinery Site "Restoration Screening Alternatives" analysis, the Trustees developed a list of potential alternatives for consideration to compensate for losses at the Site. The Trustees then narrowed the list by considering the following screening factors:

[6] A copy of the complete analysis performed by the Trustees for the Old Gulf Oil Refinery Site may be found in the final "Restoration Plan and Environmental Assessment" for the Old Gulf Refinery, Port Arthur, Jefferson County, TX, which was published on March 9, 2004. A copy of this document may be obtained by contacting:

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- Preference for restoration projects which 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 which limit disruption to existing resources.

By following the screening process described above, the Trustees evaluated eleven restoration alternatives in a Tier 1 screen as potential restoration projects for the Site. Table 5.1 depicts the results from the Tier 1 assessment.

Table 5.1 - Summary of Tier 1 Screening of Restoration Alternatives

RESTORATION ALTERNATIVE	IMPLEMENTABLE IN SHORT TERM	STRONG NEXUS BETWEEN INJURED HABITATS	AMOUNT OF HABITAT FUNCTION ENHANCEMENT	AVOIDS INJURY TO EXISTING RESOURCES	RETAIN FOR DETAILED ANALYSIS?
Marsh Creation & Wet Prairie Creation, Old River South Unit	+	+	++	0	YES
Construction of water control structures, JD Murphree WMA	+	++	++	0	YES
Marsh Enhancement/Salt Bayou-Star Lake Inverted Siphon	0	0	+	-	YES
Water Control Structure, Keith-Clam Lake	+	+	++	0	YES
Marsh Creation, Rose Hill	--	+	++	0	NO
Marsh Creation, Bessie Heights Dredge Project	--	+	++	0	NO
Marsh Creation, Bessie Heights Terracing Project	+	+	0	0	NO
Marsh Creation via Terracing, Old River North Unit	+	+	0	0	NO
Accelerated Transition FW to estuarine marsh, Salt Bayou	+	+	-	--	NO
Rice Field Freshwater marsh/Bottomland Hardwood Forest Restoration - Upper Taylor Bayou	0	--	+	-	NO
No action*	+	0	0	0	YES*

*The 'No Action' alternative must be retained for consideration according to NEPA and NRDA regulations.

(++) indicates very positive, (+) indicates positive, (0) indicates neither positive nor negative, (-) indicates negative, and (--) indicates a very negative relationship between the project and that criterion.

In Tier 2 of the Restoration Screening Analysis for the Old Gulf Oil Refinery Site, the Trustees comprehensively analyzed the five viable restoration project alternatives that remained after the Tier 1 screening, including the "No Action" alternative. The highest priority criteria for evaluation of alternatives were those based upon a restoration project's ability to provide appropriate compensation, its likelihood of success, and its benefits to resources. In evaluating each project alternative based on these criteria, the Trustees identified two preferred project locations. In compliance with CERCLA NRDA regulations and NEPA, the selection of the preferred restoration alternative was finalized following public review and comment on the Draft RP/EA published for the Old Gulf Oil Refinery Site.

The goal of the process for the Old Gulf Oil Refinery Site was the identification and implementation of expeditious and cost-effective restoration actions. It was also important that the benefits of restoration actions have an appropriate nexus to the natural resources and resource service injuries and losses at the Old Gulf Oil Refinery Site. The evaluation of the various projects and the ranking of each project are presented in Table 5.2.

Table 5.2 - Summary of Tier 2 Evaluation of Restoration Alternatives

(++) indicates very positive, (+) indicates positive, (0) indicates neither positive nor negative, (-) indicates negative, and (--) indicates a very negative relationship between the project and that criterion.

Restoration Alternative	Consistency with Restoration Objective (incl. future management)	Likelihood of Success (incl. technical feasibility)	Cost of Restoration	Avoid - Minimize Resource Injury	Maximize Resource Benefits	Effect on Public Safety
Marsh Creation & Wet Prairie Creation, Old River South Unit	++	+	0	++	++	0
Construction of Water Control Structures, J.D. Murphree WMA	+	++	+	++	+	0
Water Control Structure, Keith-Clam Lake	0	+	-	+	+	0
Inverted Siphon, Star Lake	0	+	-	+	+	0
No Action	-	+	+	-	-	0

After analyzing all of the viable restoration alternatives, and rejecting the "No Action" alternative as unviable, the Trustees proposed, for the Old Gulf Oil Refinery Site, that a suite of projects be implemented, including:

- Marsh construction and enhancement in the Old River South Unit of the lower Neches Wildlife Management Area (WMA), adjacent to Sabine Lake near Port Arthur, Jefferson County, Texas. Construction of estuarine marsh consisting of a minimum of 60-70% vegetation and 30-40% open water (the "Marsh Complex") via the beneficial use of dredge material. The original material from the construction of the Gulf States Utilities (GSU) canal presently stored in a Dredge Material Management Area (DMMA) adjacent the WMA will be used to create a field of sediment mounds ('pimple mounds') and terraces. Construction of a low water plug in the lower end of the Ferry Road Canal and addition of eight culverts under Ferry Road will ensure adequate surface water circulation and exchange. The Marsh Complex will be built by pumping slurried dredge material to create mounds and terracing of existing sediments in open water areas.
- Construction of coastal wet prairie (the "Coastal Wet Prairie"). Following the removal of sediments to be used for creation of the marsh complex, the DMMA will be graded into a landscape of swales, mounds, and ponds and planted with wet prairie plants native to southeastern Texas.
- Construction of water control structures and levees necessary to restore and enhance the hydrology and improve wildlife management in impoundments 8, 9, and 10 of the J.D. Murphree WMA located near the City of Port Arthur, Jefferson County, Texas. The water levels within these wetlands are managed by the TPWD. The project consists of constructing a water control structure and a low terrace within an adjacent ditch and plugging an existing ditch in the project area.

After re-reviewing the "Restoration Screening Alternatives" analysis for the Old Gulf Oil Refinery Site, the Trustees conclude that:

1) The "No Action" alternative will not adequately compensate the public for natural resource injuries at the Palmer Barge Site.
2) The benefits of the kind of restoration actions undertaken at the Old Gulf Oil Refinery site have an appropriate nexus to the natural resources and resource service injuries and losses at the Palmer Barge Site.
3) The preferred restoration alternative for the Old Gulf Oil Refinery Site has an ecological and a geographical relationship to injured resources and lost services at the Palmer Barge Site.
4) Due to the relatively small (1.7 acre) size of the restoration project required for compensation at the Palmer Barge Site, it would be cost efficient to combine this project with the restoration planned for the Old Gulf Oil Refinery Site by requiring that the latter Site construct additional wetland acreage as part of the planned project at Old River South.

As such, the Trustees' proposed preferred restoration alternative to address injury to natural resources and natural resource services at the Site is to add 1.7 acres of

wetland to the Marsh Complex component of the restoration planned for the Old Gulf Oil Refinery Site.

5.4 SUMMARY OF SETTLEMENT

The settlement of natural resource damage claims will be proposed in an Administrative Settlement between the Trustees and the PRPs. This Draft RP/EA recommends adding acreage requirements to an existing restoration project as the preferred alternative for resolving natural resource liability at the Site.

The Implementation and Monitoring Plan for Restoration Projects (Implementation Plan) associated with the Old Gulf Oil Refinery Site contains monitoring protocols, certification criteria, and corrective action requirements and limits for the proposed Old River South Estuarine Marsh Complex and Coastal Wet Prairie Restoration Project (ORS Marsh Project). Similar requirements will apply to the additional acreage created as a result of resolution of liability for the Site.

The monitoring program will identify when the project has met success criteria.

The ORS Marsh Project restoration actions will be located on a State of Texas WMA, which is managed by TPWD, a signatory to the Consent Decree associated with the Old Gulf Oil Refinery Site and the Administrative Settlement associated with the Palmer Barge Site.

5.5 GEOGRAPHIC PROXIMITY OF PROJECTS

All of the restoration alternatives identified for the Site are within the general area of the city of Port Arthur and would have geographic proximity to the Site. The project in the Old River Unit of the Neches River WMA is located 3 miles north of the Site, and is the closest to the Site of all the projects evaluated by the Trustees. The J.D. Murphree project is located approximately 15 miles southwest of the Site. The Keith-Clam Lake project is located approximately 15 miles south-southwest of the Site. The Salt Bayou project is the most removed and is located approximately 27 miles southwest of the Site.

6 EVALUATION OF RESTORATION ALTERNATIVES

6.1 PREFERRED RESTORATION ALTERNATIVE : MARSH CREATION VIA BENEFICIAL USE OF DREDGED SEDIMENT

The restoration project site is located southeast of Highway 73 between the Rainbow Bridge and Bridge City, Texas in Orange County. The project site is within the Old River South Unit of the southern section of Lower Neches River WMA (Lower Neches WMA). The Lower Neches WMA is owned and operated by TPWD. As proposed, approximately 1.7 acres of coastal wetlands would be created through addition to the ORS Marsh Project. The wetland enhancement and construction efforts would be designed to increase marsh habitat functions and increase habitat diversity at the project site.

The goals of the additional wetland acreage creation would be to:

- restore wetland habitat by re-establishing bottom elevations necessary for the growth of emergent plant communities in open water;
- increase wildlife utilization of the area by increasing the available habitat;
- increase utilization by aquatic organisms and freshwater biota by increasing the habitat quality; and
- decrease the rate of loss of emergent marsh habitat.

6.1.1 Existing Habitat

The ORS Marsh Project site contains approximately 158 acres of shallow open water, 237 acres of intertidal marsh and mudflats, 195 acres of wet coastal prairie, and 27 acres of uplands. The site also contains a 30-acre DMMA and a 34 acre mitigation site. Historically, the open water area of the site contained a continuous freshwater marsh with minimal water. Saltwater intrusion and erosion of surface sediments caused destruction of marsh acreage and resulted in a conversion to open water habitat. Geological subsidence contributed to the lowering of bottom elevations such that the area of interest could no longer support growth of emergent vegetation.

The open water areas currently provide low quality habitat for benthic and epi-benthic communities. This habitat is also poor quality for estuarine finfish, invertebrates, wading birds, and shore birds. These areas appear to be too deep for utilization of mudflats and consumption of benthos by birds. The open water areas do not provide valuable habitat to aquatic organisms due to the potential for heat stress and turbidity.

The ORS Marsh Project site currently provides limited opportunities for TPWD permitted recreational activities of non-consumptive (e.g. bird watching, photography and boating)

and consumptive (i.e., hunting, fishing, and crabbing) nature, and has significantly restricted public access via Hwy 73.

6.1.2 Proposed Action (Construction of 1.7 acres of intertidal emergent wetlands)

Wetland construction within open water areas will be accomplished through the beneficial use of dredge material found in either the DMMA located on the project site or from the use of a portion of the alternative borrow area. Prior to the use of material from the DMMA and alternative site, the upper layer of vegetation, roots, and some soil would be scraped off and stockpiled for on-site disposal by TPWD. The material found in the DMMA and alternative borrow site will be slurried and pumped to the open water areas to construct intertidal islands (or mounds) appropriate for colonization of emergent vegetation.

The DMMA and alternative borrow areas, which are currently characterized as poor quality upper marsh and uplands, would be returned to their historical condition as coastal wet prairie. This will be accomplished through the removal of the fill material to reestablishing the original elevations of these areas (which were lower). This action would restore historic sheet flow patterns and allow re-growth of wet coastal prairie vegetation. The area will also be seeded to expedite the establishment of coastal prairie plant community.

If some or all of the DMMA and alternative borrow area are not used to fill in the open water, these areas will be cleared of all existing vegetation and graded to create a higher quality upper marsh. The area would then be seeded with coastal wet prairie vegetation and planted with *Spartina patens* and *Scirpus maritimus* to encourage colonization of the area with desirable upper marsh species.

This project would result in a variety of habitats including: supra-tidal marsh (supporting *Spartina patens, Scirpus maritimus* and *Spartina spartinae*), emergent intertidal marsh (supporting *Spartina alterniflora* and *Juncus sp*.), mudflats, protected open water (with depths conducive to wading bird foraging), and enhanced coastal wet prairie.

6.1.3 Evaluation of Alternative

The restoration project area is within the Sabine Lake system and provides numerous opportunities for estuarine marsh creation and enhancement though the reestablishment of elevations needed to support marsh vegetation. Hydraulic placement of dredge material is a proven, cost-effective technique for creating marsh wetlands along the Texas coast. A pilot project utilizing the evaluated marsh creation technique conducted by Chevron in the Old River South Unit in June 2002 performed well and remains stable as of April 2005. Examples of marshes created by this method are numerous in southeast Texas, and monitoring has shown it to be a successful method to establish functional low-salinity habitat. The technique also recovers valuable wetland soil material often lost to the local sediment budget.

The dredge material for the project is to be mined from a "new work" DMMA created when the Gulf States Utilities (GSU) Cooling Water Canal was constructed. This material will be slurried into mounds and terraces in a manner similar to that used in creating the successful pilot project. This method represents a very cost-effective approach to marsh restoration. The construction technique will encourage development of numerous channels to enhance tidal exchange, marsh productivity, and species utilization of the restored area. Subsequent planting and grow-out will help stabilize the material.

The beneficial use of the confined dredge material also avoids potential effects or disruptions to other habitats or resources. Some short-term impacts to natural resources such as temporary turbidity or other localized effects on surface water quality may occur, but these effects are generally minimal and limited in duration.

The marsh restoration of this project can be implemented without additional land acquisition costs because the restoration site is owned by TPWD. Siting restoration within the WMA will result in a larger area of protected, heterogeneous habitat than would be possible at other locations. Further, as a designated WMA managed by TPWD, the area is already dedicated to the long-term preservation and conservation of natural resources, including estuarine habitats. This management framework is fully consistent with the Trustees' restoration goal for this assessment. Under these conditions, the created marsh will be self-sustaining, require limited or no active intervention following construction and initial plantings to achieve functional success, and will provide an uninterrupted flow of services into the future. The nature of the project and the setting for construction would present no human health or safety issues beyond those met by standard procedures for safe construction. TPWD supports this restoration effort and no public opposition to this project has been apparent during scoping by the Trustees.

Ecological and Socio-Economic Impacts

This restoration is expected to accomplish the following:

- increase habitat diversity;
- increase and enhance utilization of the area by fish and wildlife;
- help stop the loss of emergent marsh habitat in the vicinity of the restoration site;
- re-establish elevation conditions necessary for the growth of emergent plant communities;
- decrease the rate of water flow across the site;
- decrease the rate of sediment loss; and
- increase the rate of sediment accretion.

The habitat types that will be created include the following:

- supra-tidal marsh (supporting Gulf cordgrass [*Spartina spartinae*] and saltmeadow cordgrass [*S. patens*]);
- emergent intertidal marsh along edges;
- intertidal mudflats; and
- isolated pockets of deeper water.

The following resources are expected to utilize the newly created marsh habitat:

- redfish;
- speckled trout;
- killifish;
- other finfish;
- shrimp;
- crabs;
- other benthic invertebrates;
- avian species (i.e., migratory, wading and shore birds); and
- other wildlife (i.e., mink and muskrat).

By increasing the habitat value of this area, it is expected to enhance the carrying capacity and biological productivity of the system and result in increased numbers of fish and shellfish available for harvest. These ecological effects will indirectly benefit humans by contributing to opportunities for recreation and enjoyment of the project area and the Lower Neches WMA through activities such as boating, bird watching, hunting, and fishing. Implementation of the project will involve the temporary use of equipment or activities that will increase noise and the level of human activity in the project area for a short period of time. No other negative socio-economic effects are expected due to this project. For more information on the ecological and socio-economic effects of the preferred project, refer to Section 7.0 – NEPA Considerations.

6.2 NON-PREFERRED ALTERNATIVE (NO ACTION)

Under this alternative, the Trustees would take no action to create or restore estuarine marsh services to compensate for the resource losses attributed to the Site releases.

Evaluation of No Action Alternative
The Trustees determined that natural resources or ecological resource services were lost due to injuries caused by releases of hazardous substances from the Site. Based upon these injuries, the Trustees identified habitats with reduced or lost ecological

services due to the hazardous substances released at the Site. Remedial activities were conducted to remove sources of hazardous substances from the Site. While this action will allow injured natural resources to recover, it does not compensate the public for ecological resource service losses. Such compensation serves to return to the public resources or services which were lost due to hazardous substance releases at the Site. In this assessment, the Trustees know of restoration projects that are able to restore injured natural resources and ecological service losses at the Site.

Under CERCLA, the Trustees sought compensation for these interim losses on behalf of the public through actions that restore, replace, or provide services equivalent to those lost. Under the "no action" alternative, restoration actions needed to make the environment and the public whole for its losses would not occur. This is inconsistent with the goals of natural resource damage provisions under CERCLA, and the compensation objective of this restoration plan. Thus, the Trustees have determined that the "no action" alternative *(*i.e., no compensatory restoration) must be rejected on that basis.

7 NEPA, ENDANGERED SPECIES ACT, & ESSENTIAL FISH HABITAT: ANALYSIS AND PRELIMINARY FINDING OF NO SIGNIFICANT IMPACT

7.1 NEPA SIGNIFICANCE ANALYSIS AND PRELIMINARY FINDING OF NO SIGNIFICANT IMPACT

As noted in Section 1.2, NEPA requires federal agencies to produce an environmental impact statement (EIS) if they are contemplating implementation of a major federal action expected to have significant impacts on the quality of the human environment. NEPA defines the human environment comprehensively to include the "natural and physical environment and the relationship of people with that environment". 40 C.F.R. § 1508.14. All reasonably foreseeable direct and indirect effects of implementing a project, including beneficial effect, must be evaluated. 40 C.F.R. § 1508.8. Federal agencies prepare an environmental assessment (EA) to consider these effects and 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.

In accordance with NEPA and its implementing regulations, an EA is integrated into this Draft RP/EA. The main body of this document summarizes the environmental setting, describes the purpose and need for restoration, identifies the alternatives considered, assesses their applicability and potential environmental consequences and summarizes the opportunity the Trustees provided for public participation in the development of this Draft RP/EA.

This section of the document specifically addresses the factors and criteria that federal agencies are to consider in evaluating the potential significance of proposed actions, as identified in Section 1508.27 of the NEPA regulations. 40 C.F.R. § 1508.27. The regulations explain that significance embodies considerations of both context and intensity. In the case of a site-specific restoration project, as proposed in this Draft RP/EA**,** the appropriate context for considering significance of the action is local, as opposed to national or worldwide.

With respect to intensity of the impacts of the proposed restoration action, the NEPA regulations (40 C.F.R. § 1508.27) suggest consideration of ten factors:

- likely impacts of the proposed project;
- likely effects of the project on public health and safety;
- unique characteristics of the geographic area in which the project is to be implemented;
- controversial aspects of the project or its likely effects;

- degree to which possible effects of implementing the project are highly uncertain or involve unknown risks;
- precedential effect of the project on future actions that may significantly affect the human environment;
- possible significance of cumulative impacts from implementing this and other similar projects;
- effects of the project on National Historic Places, or likely impacts to significant cultural, scientific, or historic resources;
- degree to which the project may adversely affect endangered or threatened species or their critical habitat; and
- likely violations of environmental protection laws.

These factors, along with the federal Trustees' preliminary conclusions concerning the likely significance of impacts of the proposed restoration action, are discussed in detail below.

According to the Department of the Interior Departmental Manual Part 516 DM8.5A(11), NRDA restoration plans prepared under sections 107, 111, and 122(j) of CERCLA, section 311(f) of the CWA, and OPA are designated as categorical exclusions when they are planned to result in only minor or negligible change in the use of the affected areas. The Departmental Manual defines categorical exclusions as classes of actions which do not individually or cumulatively have a significant effect on the human environment. The Trustees feel this Draft RP/EA meets the criteria necessary to claim a categorical exclusion for NEPA according to DOI, but have chosen to present the NEPA analysis in the interest of thoroughness.

7.2 LIKELY IMPACTS OF THE PREFERRED ALTERNATIVE

7.2.1 Nature of Likely Impacts

The proposed restoration action is intended to compensate for injuries to natural resources at the Site and consists of coastal marsh habitat restoration. Marsh construction would provide increased nursery, foraging, and cover habitat for critical species that inhabit the area. Increased habitat support for birds and other wildlife species would also benefit recreational uses of the area.

Marsh creation would result in some impacts to existing habitats, such as open water and unvegetated, subtidal sediments. Heavy industrialization and development as well as subsidence and erosion have resulted in a loss of many square miles of wetland habitat each year. Restored marshes provide most of the services generated by unvegetated, subtidal sediments, but marsh habitat is much more productive and would provide additional services. The existing open water habitat would be transformed into an emergent wetland habitat, and created marshes would consist of approximately 40% unvegetated open water bottoms. The replacement of open water by vegetated wetland results in a net benefit to the natural environment. Wetlands provide a source of organic carbon, which supplies the energy required to support the estuarine food web.

As proposed, marsh creation in the Old River South Unit area would also benefit the currently degraded upper marsh and upland habitats of the DMMA. Conversion of these habitats to emergent wetland habitat would result in an increase in productivity and a net benefit to the environment.

7.2.2 Effects on public health and safety

The Trustees evaluated the potential for the proposed restoration action to impact public health and safety by considering the following: air and noise pollution, water use and quality, geological resources, soils, topography, environmental justice, energy resources, recreation, traffic, and contaminants.

Air Quality: Minor temporary adverse impacts would result from the proposed activities. Exhaust emissions from earth-moving equipment and/or supply boats contain air pollutants, but these emissions would only occur during the construction phase of the project, the amounts would be small, and should be quickly dissipated by prevailing winds. There would be no long-term negative impacts to air quality.

Noise: Noise associated with supply boats and earth-moving equipment represents a short-term adverse impact during the construction phase. It may periodically and temporarily disturb wildlife in the immediate vicinity of the site, or cause movement of wildlife away from the site to other ecologically suitable areas of the estuary. Similarly, recreating humans may avoid this area due to noise during construction, but as with wildlife, such disruption will be limited to the construction phase, and there are many comparable substitute recreation sites readily available within the area. No long-term affects would occur as a result of noise during construction.

Water Quality: In the short term, during the period of construction, earth moving activities (either the mining or placement of sediments) will increase turbidity in the immediate vicinity of restoration site to some degree, though actions during construction (*e.g.*, turbidity curtains) may be taken to minimize this effect. After construction is completed, the sediments should stabilize rapidly. Over the longer term, the proposed restoration action will re-establish, enhance and increase estuarine marsh at the site, aid in the future retention of sediments, and help improve local water quality via filtration of larger volumes of water as a result of more frequent exchange.

Geology: Neither of the components of the proposed restoration action includes activities with the potential to directly or indirectly affect, positively or negatively, the geology of the area.

Energy: No energy production, transport, or infrastructure occurs in the immediate vicinity of the restoration site. Further, neither of the components of the proposed action involves activities or potential results that could directly or indirectly affect, positively or negatively, energy production, transport, or infrastructure in this area of coastal Texas.

Recreation: The noise and increased turbidity of surface waters arising from earth-moving activities during project construction are expected to discourage and decrease recreational activities in the vicinity of the site during construction. Any such affect will be limited to the period of construction and should be minor, however, as there are many comparable substitute recreation sites readily available within the area. Over the longer term, the proposed restoration action will increase the quality, productivity and quantity of marsh habitat in this area. The marsh habitat in the area is a foundation for many recreational activities (i.e., fishing, hunting, bird watching) and the improvement in site conditions will enhance opportunities for, and quality of, a variety of recreational uses.

Traffic: Both land- and water-based equipment traffic will occur or increase at the site during the period of construction. Temporary disruptions may result from this traffic. Once construction is complete, the added land- and water-based equipment traffic will end. No long-term impacts to traffic in the area are indicated.

Contaminants: The Trustees do not expect marsh creation activities or construction of water control structures to have any impacts on public health and safety. The marsh that would result from implementation of the restoration project would not present any unique physical hazards to humans. No pollution or toxic discharges would be associated with marsh creation or water control structure installation.

7.2.3 Unique characteristics of the geographic area

Open water, unvegetated, subtidal benthic sediments, and degraded emergent marsh occur at the project site. These habitats are not unique in the upper Texas coast near the city of Port Arthur. At several coastal sites, degraded marsh and open water are displacing highly functional wetland habitat, resulting in a net loss of habitat productivity. Therefore, no unique or rare habitat would be destroyed since degraded marsh and open water are neither unique nor rare. In addition, no desirable habitat will be destroyed because the restoration of wetlands in this project will result in a net increase of productivity. Finally, the habitat affected by this restoration project will not be lost, but will be restored to historical conditions since it is located in areas that previously supported wetlands.

7.2.4 Controversial aspects of the project or its effects

The Trustees do not expect any controversy to arise in connection with this restoration project. Wetland creation has been implemented, through both beneficial use of dredge material and the terracing method, by these and other Trustees in Texas and Louisiana, with no adverse reaction from the public. Current governmental policy supports the creation of wetlands along the Gulf Coast of Texas. The Trustees anticipate that the citizens of Texas would support either of these wetland restoration projects.

7.2.5 Uncertain effects or unknown risks

The Trustees do not believe there are uncertain effects or unknown risks to the environment associated with implementing the proposed restoration actions. The Trustees would conduct a thorough site survey and engineering analysis to address any significant uncertainties before implementing the proposed restoration project.

7.2.6 Precedential effects of implementing the project

The Trustees have pursued wetland creation projects to compensate for other natural resource damage claims in Texas. Wetland creation projects are regularly implemented along the Texas coast to protect against erosion, address sediment losses, and to preserve or restore coastal habitats. Such projects have been accomplished through both the beneficial use of dredge material and the terracing method. The proposed restoration actions, therefore, set no precedents for future actions that would significantly affect the quality of the human environment.

7.2.7 Possible significant, cumulative impacts

Project effects will be cumulative in the sense that the creation of marsh will provide resource services into the future. The Trustees, however, know of no impacts to the environment to which the proposed restoration actions would contribute that, cumulatively, would constitute a significant impact on the quality of the human environment. All proposed projects would only restore a habitat type – low salinity marsh – that originally existed and naturally occurred in the area. Further, the actions proposed in this Draft RP/EA are intended to restore habitat services to offset the natural resource loss of equivalent habitat services attributable to the Site. The restoration of these services is designed to make the public whole, i.e. compensation for injuries to natural resources. The proposed restoration actions also are not part of any systematic or comprehensive program or plan to address the conditions along the Texas coast or in the Old River South Unit area.

7.2.8 Effects on National Historic Sites or nationally significant cultural, scientific, or historic resources

The Trustees are not aware of any previously recorded archeological sites located in the area of the proposed project. Further, as a fairly remote aquatic environment, the topographical setting of the area has a low potential to harbor resources of cultural or historical significance. This is consistent with archeological survey information utilized by the US Army Corps of Engineers (USACE) for an area immediately adjacent to the restoration project site (USACE Statement of Findings; Permit Application SWG-01-27-004). The Trustees believe that the proposed restoration actions will not affect any designated National Historic Site or any nationally significant cultural, scientific, or historical resources.

7.2.9 Effects on endangered or threatened species

The Trustees know of no direct or indirect impacts of the proposed restoration actions on threatened or endangered species, or their designated critical habitats. The general locale where the restoration actions would be sited is not critical habitat for any listed species.

7.2.10 Violation of environmental protection laws

The proposed restoration actions will not result in any violation of federal, state, or local laws designed to protect the environment. The Trustees do not anticipate any such violation incident to or as a consequence of the implementation of either of the proposed actions. The restoration actions proposed can be implemented in compliance with all applicable environmental laws.

7.3 PRELIMINARY CONCLUSION & FINDING OF NO SIGNIFICANT IMPACT ON THE QUALITY OF THE HUMAN ENVIRONMENT

In accordance with 40 C.F.R. § 1501.5 and § 1501.6, NOAA is the lead agency and USFWS is a cooperating agency for the purposes of this NEPA assessment. As part of the environmental review process for the proposed restoration actions, the analysis in this Section and throughout the Draft RP/EA has lead the federal Trustees to conclude that adding additional acreage requirements to the Old River South Unit Marsh Project will not, if implemented, result in any significant impacts on the quality of the human environment. The proposed restoration project would provide beneficial habitat to the biological environment found within the project area. The project also will not adversely impact the cultural and human environment, but rather will provide additional opportunities for recreational and commercial fishing by improving the habitat for fish and other aquatic organisms dependent upon estuarine environments. Pending the public review and comment process, significant impacts are not expected to be identified for the Proposed Restoration Alternative; thus, no EIS is expected for the restoration action outlined herein.

Pending the public review and comment process, a FONSI based upon this Draft Environmental Assessment, would fulfill and conclude all requirements for compliance with NEPA by the federal Trustees.

7.4 ENDANGERED AND THREATENED SPECIES

The Endangered Species Act of 1973 instructs federal agencies to carry out programs for the conservation of endangered and threatened species and to conserve the ecosystems upon which these species depend. Numerous endangered and threatened species are seasonal or occasional visitors to the Sabine Lake/Neches River Estuary coastal ecosystem.

Endangered and threatened species known to occur in the Texas Gulf Coast Prairies and Marshes Ecoregion or adjacent marine waters are listed in Table 7.1 (TPWD, 1997). Fifteen of these species- including the brown pelican (*Pelecanus occidentalis*), reddish egret (*Egretta rufescens*), white-faced ibis (*Plegadus chihi*), wood stork (*Mycteria americana*), whooping crane (*Grus americana*), bald eagle (*Haliaeetus leucocephalus*), Arctic peregrine falcon (*Falco peregrinus tundrius*), piping plover (*Charadrius melodus*), Eskimo curlew (*Numenius borealis*), green sea turtle (*Chelonia mydas*), Kemp's ridley sea turtle (*Lepidochelys kempi*), loggerhead sea turtle (*Caretta caretta*), Texas tortoise (*Gopherus berlandieri*), scarlet snake (*Cemophora coccinea*), and South Texas siren (*Siren* sp.) - have been documented in or are believed to utilize the estuary. Most species would be present in the estuary incident to migration through the area. None of these species were considered to be exposed or at risk of injury due to hazardous substance releases at the Site. The estuary's habitats provide general support for any threatened and endangered species migrating through or utilizing these communities. Because the proposed project will provide beneficial habitats, no adverse impacts are expected on any endangered or listed species found within the project area.

Table 7.1 - Federal and State Endangered or Threatened Species in Coastal Texas

Common Name	Scientific Name	Status
Mammals		
West Indian manatee	*Trichechus manatus*	FE, SE
White-nosed coati	*Nasua narica*	ST
Birds		
Brown pelican	*Pelecanus occidentalis*	FE, SE
Reddish egret	*Egretta rufescens*	ST
White-faced ibis	*Plegadus chihi*	ST
Wood stork	*Mycteria americana*	ST
Whooping crane	*Grus americana*	FE, SE
Swallow-tailed kite	*Elanoides forficatus*	ST
Bald eagle	*Haliaeetus leucocephalus*	FT, ST
White-tailed hawk	*Buteo albicaudatus*	ST
Peregrine falcon	*Falco peregrinus*	FE, SE
Arctic peregrine falcon	*Falco peregrinus tundrius*	FE, ST
Attwater's greater prairie-chicken	*Tympanuchus cupido attwateri*	FE, LE
Piping plover	*Charadrius melodus*	FT, LT
Eskimo curlew	*Numenius borealis*	FE, SE
Sooty tern	*Sterna fuscata*	ST
Botteri's sparrow	*Aimophila botteri*	ST
Reptiles		
Green sea turtle	*Chelonia mydas*	FT, LT
Kemp's ridley sea turtle	*Lepidochelys kempi*	FE, SE
Loggerhead sea turtle	*Caretta caretta*	FT, ST
Alligator snapping turtle	*Macroclemy temminckii*	ST
Texas tortoise	*Gopherus berlandieri*	ST
Scarlet snake	*Cemophora coccinea*	ST
Indigo snake	*Drymarchon corais*	ST

Common Name	Scientific Name	Status
Northern cat-eyed snake	*Leptodeira septentrionalis*	ST
Smooth green snake	*Liochlorophis vernalis*	ST
Timber (canebrake) rattlesnake	*Crotalus horridus*	ST
Amphibians		
Black-spotted newt	*Notophthalmus meridionalis*	ST
South Texas siren (large form)	*Siren sp.*	ST
Houston toad	*Bufo houstonensis*	FE, SE
Fish		
Blue sucker	*Cycleptis elongatus*	ST
River goby	*Awaous tajasica*	ST
Plants		
Black lace cactus	*Echinocereus reichenbachii*	FE, SE
South Texas ambrosia	*Ambrosia cheiranthifolia*	FE, SE
Slender rush-pea	*Hoffmannseggia tenella*	FE, SE

The Endangered Species Act (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 DOI (through USFWS), publish lists of endangered and threatened species. Section 7 of the Act requires federal agencies to consult with these departments to minimize the effects of federal actions on these listed species. The restoration actions described in this Draft RP/EA are not expected to adversely impact any threatened or endangered species. The restoration would create or enhance habitats which are essential components of the ecosystems supporting such species. Informal consultation procedures have been initiated with the USFWS and with the NOAA National Marine Fisheries Service (NMFS) in order to ensure the restoration action is implemented in accordance with applicable provisions of the ESA.

7.5 ESSENTIAL FISH HABITAT

Congress enacted amendments to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (Public Law 94-265) in 1996 that mandated identification of Essential Fish Habitat (EFH) for Federally managed fisheries. The Magnuson-Stevens Act requires that federal action agencies that authorize, fund or undertake, or propose to authorize, fund, or undertake an activity that may adversely affect EFH, consult with NMFS regarding potential adverse impacts of their actions on EFH. Guidance and procedures for implementing the 1996 amendments to the Magnuson-Stevens Act were provided through interim final rules established by NMFS in 1997, as amended by final rules in 2002 (50 C.F.R. §§ 600.805 - 600.930). This section of the draft Restoration Plan/Environmental Assessment describes potential adverse impacts to EFH that may occur within the project site and was prepared to meet EFH consultations requirements with NMFS.

The proposed project is located within an area that has been identified by the Gulf of Mexico Fishery Management Council as EFH for post-larval, juvenile, and sub-adult red drum (*Sciaenops ocellatus*), white shrimp (*Litopenaeus setiferus*), and brown shrimp (*Farfantepenaeus aztecus*). Sub-adult brown shrimp are common in the area from March though July and rare from August through February. Juvenile brown shrimp are abundant from March through October and common from November to February. Subadult white shrimp are abundant from August through February and common from March through July; whereas juveniles are highly abundant year round. Adult red drum are rare in the project site year round, though juveniles are always common (NMFS 2002).

7.5.1 Effect on Essential Fish Habitat

Some areas of open water will be permanently impacted by the organized placement of material into the restoration site for the creation of intertidal marsh. There will be a loss of subtidal estuarine mud bottoms during the placement activities, but intertidal benthic habitat will be created in its place. Benthic organisms will establish relatively quickly within the newly created wetlands, but the assemblage of benthic invertebrates in the wetland and shallow water sediments may differ. Once intertidal elevations are restored and the project site is planted with wetland vegetation, the new marsh will provide valuable nursery habitat for numerous species, including red drum and shrimp, which utilize estuarine wetlands during early life stages. The designed wetland features, will allow circulation of tidal waters through the marsh and will provide optimum marsh vegetation/water edge interface for estuarine organism utilization.

7.5.2 Effects on the Managed Species, and Associated Species by Life History Stage

Red Drum: In the Gulf of Mexico red drum occur in a variety of habitats, ranging from depths of about 40 meters offshore to very shallow estuarine waters. They commonly occur in virtually all of the Gulf's estuaries where they are found over a variety of substrates including sand, mud and oyster reefs. Red drum can tolerate salinities ranging from freshwater to highly saline, but optimum salinities for the various life stages have not been determined. Types of habitat occupied depend upon the life stage of the fish. Spawning occurs in deeper waters near the mouths of bays and inlets, and on the Gulf side of the barrier islands. Eggs hatch mainly in the Gulf, and larvae are transported into the estuary where the fish mature before moving back to the Gulf. Adult red drum utilize estuaries but tend to spend more time offshore as they age. Estuarine wetlands are especially important to the larval, juvenile and sub-adult red drum.

Juvenile red drum are commonly found in the project site year-round and will be temporarily affected by the short term increases in turbidity during project construction, which can foul their gills. However, most red drum will likely avoid the project area during construction. Some eggs and larvae may be killed by turbidity during construction activities. Since adult red drum are rare in the project site, they should not be affected by the project.

White Shrimp: White shrimp are offshore and estuarine dwellers and are pelagic or demersal, depending on life stage. The eggs are demersal and larval stages are planktonic; both occur in nearshore marine waters. Post-larvae migrate through passes mainly from May-November with peaks in June and September. Migration is in the upper two meters of the water column at night and at mid-depths during the day. Post-larval white shrimp become benthic upon reaching the nursery areas of estuaries, where they seek shallow water with muddy-sand bottoms high in organic detritus or abundant marsh, and develop into juveniles. Juveniles are common to highly abundant in all Gulf estuaries in Texas. Post-larvae and juveniles inhabit mostly mud or peat bottoms with large quantities of decaying organic matter or vegetative cover. As juvenile white shrimp approach adulthood, they move from the estuaries to coastal areas where they mature and spawn. Migration from estuaries occurs in late August and September and appears to be related to size and environmental conditions (e.g., sharp temperature drops in fall and winter). Adult white shrimp are demersal and generally inhabit nearshore Gulf waters to depths less than 30 meters on bottoms of soft mud or silt. (Gulf of Mexico Fishery Management Council, 1998).

Juvenile and sub-adult white shrimp are found year-round in the project site and will be affected by the increase in turbidity, which can kill eggs and larvae, clog filter-feeding appendages, and interrupt primary productivity. Most white shrimp should be able to avoid the project area, though some may be buried upon initial sediment deposition.

Brown Shrimp: Brown shrimp eggs are demersal and occur offshore. The larvae occur offshore and begin to migrate to estuaries as post- larvae. In estuaries, brown shrimp post-larvae and juveniles are associated with shallow, vegetated habitats but are also found over fine sand and non- vegetated mud bottoms. Juveniles and sub-adults of brown shrimp occur from secondary estuarine channels out to the continental shelf but prefer shallow estuarine areas, particularly the soft, muddy areas associated with plant-water interfaces. Adult brown shrimp occur in neritic Gulf waters (i.e., marine waters extending from mean low tide to the edge of the continental shelf) and are associated with silt, muddy sand, and sandy substrates.

Juvenile brown shrimp are found year-round in the project site and sub-adults are found from March through July. Turbidity will affect those present, possibly killing eggs and larvae, clogging filter-feeding appendages, and interrupting primary productivity. Most brown shrimp should be able to avoid the project area, though some may be buried upon initial sediment deposition.

7.5.3 The Federal Agencys' Views and Conclusions Regarding the Effects of the Action on EFH

It is the opinion of the federal trustees that the project as proposed will not have a significant adverse effect upon EFH. While there will be permanent loss of subtidal benthic EFH (up to 1.7 acres) and some initial impacts to individual red drum and shrimp that are present during project construction efforts, these effects will be offset by

the overall increase in estuarine productivity afforded by the creation of wetlands. The proposed 1.7 acres of restoration should have an overall net benefit to the subject managed species by increasing vegetated marsh habitats in an area that has lost significant intertidal wetland acreage.

8 COMPLIANCE WITH OTHER KEY STATUTES, REGULATIONS, AND POLICIES

8.1 CLEAN WATER ACT (CWA), 33 U.S.C. § 1251 ET SEQ.

The 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, administered by USACE, for the beneficial uses of dredged or fill material. In general, restoration projects which move significant amounts of material into or out of waters or wetlands (for example, hydrologic restoration of marshes) require 404 permits. A CWA 404 permit will be obtained, if required, in order to implement any restoration action selected in this Draft RP/EA.

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

The Rivers and Harbors Act regulates the development and use of the nation's navigable waterways. Section 10 of the Act prohibits unauthorized obstruction or alteration of navigable waters and vests USACE with the authority to regulate discharges of fill and other materials into such waters. Restoration actions subject to the substantive requirements of Section 404 must also comply with Section 10 of the Act. Any such permit would be obtained, as required, in order to implement any restoration action selected in this Draft RP/EA.

8.3 COASTAL ZONE MANAGEMENT ACT (CZMA), 16 U.S.C. § 1451 ET SEQ., 15 C.F.R. PART 923

The goal of the 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 USFWS found the restoration actions identified in this Draft RP/EA to be consistent with the Texas Coastal Zone Management Program, and a determination of consistency will be submitted to the appropriate state agencies for review in parallel to the release of the Draft RP/EA.

8.4 ENDANGERED SPECIES ACT (ESA), 16 U.S.C. § 1531 ET SEQ., 50 C.F.R. PARTS 17, 222, & 224

The ESA requires all federal agencies to conserve endangered and threatened species and their habitats to the extent their authority allows. 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 departments to minimize the effects of federal actions on these listed species.

The Trustees believe the restoration action proposed in this Draft RP/EA is not likely to adversely impact any threatened or endangered species, or their critical habitats, under the ESA. The Trustees initiated an informal consultation with the USFWS and NOAA's NMFS via letters dated August 25, 2006 and February 13, 2007, pursuant to the ESA to ensure that the preferred restoration action is in accordance with all applicable provisions. These letters requested comments on and/or concurrence with the Trustees determination in this regard. The results of this consultation will be included or addressed in the Final RP/EA, and in the AR.

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

The restoration actions described herein will encourage the conservation of non-game fish and wildlife.

8.6 FISH AND WILDLIFE COORDINATION ACT (FWCA), 16 U.S.C. § 661 ET SEQ.

The 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. The purpose of FWCA is to minimize the adverse impacts of such actions to the habitat and fish and wildlife resources utilizing these aquatic environments. Coordination is taking place between the Trustees and NMFS, the USFWS, and TPWD (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.

8.7 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT, AS AMENDED AND REAUTHORIZED BY THE SUSTAINABLE FISHERIES ACT (PUBLIC LAW 104-297) (MAGNUSON-STEVENS ACT), 16 U.S.C. §§1801 *ET SEQ*.

The Magnuson-Stevens Act provides for the conservation and management of the Nation's fishery resources within the Exclusive Economic Zone (from the seaward boundary of every state to 200 miles from that baseline). The resource management goal is to achieve and maintain the optimum yield from U.S. marine fisheries. The Act also established a program to promote the protection of Essential Fish Habitat (EFH) in the review of projects conducted under federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. After EFH has been described and identified in fishery management plans by the regional fishery management

councils, federal agencies are obligated to consult with the Secretary of Commerce with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by such agency that may adversely affect any EFH.

The Trustees do not believe that the preferred restoration alternative will have a net adverse impact on EFH as designated under the Act. An informal EFH consultation was initiated with NMFS on August 9, 2006**.** Correspondence from NMFS personnel regarding this determination will be included in the Final RP/EA, as well as the AR.

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

The Marine Mammal Protection Act provides for the long-term management and study of 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 Draft RP/EA will not result in any adverse effect to marine mammals.

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

The proposed restoration action will have no adverse effect on migratory birds. It is anticipated that these organisms are likely to benefit from the establishment of new marsh habitat.

8.10 MIGRATORY BIRD TREATY ACT, 16 U.S.C. § 703 – 712

The proposed restoration action will have no adverse impacts on Migratory birds under the purview of this Act. No migratory birds will be pursued, hunted, taken, captured, killed, attempted to be taken, captured or killed, possessed, offered for sale, sold, offered to purchase, purchased, delivered for shipment, shipped, caused to be shipped, delivered for transportation, transported, caused to be transported, carried, or caused to be carried by any means whatever, received for shipment, transported or carried, or exported, at any time, or in any manner.

8.11 NATIONAL HISTORIC PRESERVATION ACT (NHPA), 16 U.S.C. § 470 ET SEQ.

Section 106 of the NHPA requires federal agencies, or federally funded entities, to consider the impacts of their projects on historic properties. NHPA regulations require that federal agencies take the lead in this process, and outline procedures to allow the Advisory Council on Historic Preservation to comment on any proposed federal action. The Trustees do not know of any cultural or historical resources within or in the vicinity of the proposed restoration sites.

8.12 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. These guidelines are intended to ensure and maximize the quality of such information (i.e., the objectivity, utility and integrity of such information). The Draft RP/EA, upon release as a draft, was identified as an information product covered by information quality guidelines established by NOAA and DOI for this purpose. The information contained herein complies with applicable guidelines.

8.13 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 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 the restoration projects identified herein.

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

A Draft Environmental Assessment is integrated within this Draft RP/EA. Environmental analyses and coordination have taken place as required by NEPA.

8.15 EXECUTIVE ORDER NUMBER 11988 (42 FED. REG. 26,951) – FLOODPLAIN MANAGEMENT

This proposed restoration action does directly or indirectly support the development of the floodplain.

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

The selected restoration actions will not result in any adverse effects on wetlands or the services they provide. It is anticipated that the restoration project will provide for the enhancement and protection of wetlands and wetland services.

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

The selected restoration actions will not result in adverse effects on recreational fisheries. It is anticipated that the restoration project will help facilitate the enhancement and protection of such fisheries.

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12 TRUSTEE COUNCIL SIGNATURES

The Trustee representatives for the Palmer Barge Site (Texas Commission on Environmental Quality, the Texas Parks and Wildlife Department, the Texas General Land Office, the National Oceanic and Atmospheric Administration, and the United States Fish and Wildlife Service, acting on behalf of the United States Department of the Interior) indicate by signature below their agreement to concur, in its entirety, with this Draft Restoration Plan/Environmental Assessment to compensate for the natural resource injuries attributed to the Palmer Barge Site.

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