

# **DAMAGE ASSESSMENT AND RESTORATION PLAN**

## **TEXACO PIPELINE INC. CRUDE OIL DISCHARGE**

**LAKE BARRE, LOUISIANA  
May 16, 1997**

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**Exhibit #1**

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## INTRODUCTION AND SUMMARY

## CHAPTER 1

This Damage Assessment and Restoration Plan (DARP) has been prepared by state and federal natural resource Trustees to address the restoration of natural resources and resource services injured by the Texaco Pipeline Company Lake Barre oil spill on May 16, 1997 (the "incident"). It was developed following consideration of comments received during the public comment period on the Draft Damage Assessment and Restoration Plan/Environmental Assessment (DARP/EA). It represents the Trustees' final determination concerning the appropriate restoration actions necessary to make the environment and public whole for natural resource injuries and losses of service resulting from the incident. This DARP also served as an EA as defined under the National Environmental Policy Act (NEPA) 42 U.S.C. 4321 et seq., and addressed the potential impact of selected restoration actions on the quality of the physical, biological, and cultural environment. However, as described in Section 2.2.2, the proposed action had been analyzed in a previous EA, and received a finding of no significant impact (FONSI), satisfying NEPA requirements.

The Trustees and Texaco have considered the injuries resulting from this incident, evaluated restoration alternatives suggested by the public and local scientists and other interested parties, ranked the alternatives according to established criteria, and proposed a preferred restoration alternative. After consideration of comments received on the preferred alternative, the Trustees selected the preferred restoration alternative as the appropriate final restoration project. The Trustees believe that the process undertaken to evaluate injuries to natural resources and services and select the restoration alternative to make the public and the environment whole for losses resulting from this incident has been consistent with regulatory requirements.

### 1.1 OVERVIEW OF THE INCIDENT

At around 4:00 PM CDT on May 16, 1997, a release from a sixteen inch crude oil transmission pipeline was discovered by Texaco Pipeline Inc. (hereafter "Texaco") in Lake Barre, Louisiana. The release was caused by a 34" long gash in the pipeline, which had been buried five to eight feet below the sediment surface. The site of the pipeline rupture was at 29° 14.8' N latitude, 90° 29.3' W longitude, which is approximately 27 miles southeast of Houma, in Terrebonne Parish. Texaco estimated that approximately 6,561 barrels (275,562 gallons) of crude oil were discharged as a result of the pipeline rupture. Oil skimming and booming operations began on May 17, 1997 in an effort to control surface oil, remove oil from the environment, and protect sensitive estuarine and marsh ecosystems.

State and federal agency personnel along with Texaco responded, as part of the unified command to the spill and observed potential indications of biological injury from the effects of the incident. Extensive areas of marsh were observed to have been exposed to black oil or sheen, birds were observed to have been oiled, and dead shrimp were collected in a Louisiana Department of Wildlife and Fisheries trawl from Lake Barre. Small dead fish and invertebrates were observed in

provided benefits to recreational shrimpers and fishermen in addition to other criteria so as to provide some degree of compensation for the potential recreational loss.

### 1.3 PROPOSED RESTORATION ALTERNATIVES

Restoration actions under OPA are termed primary or compensatory. Primary restoration is any action taken to accelerate the return of injured natural resources and services to their baseline condition. Trustees may elect to rely on natural recovery rather than primary restoration actions in situations where feasible or cost-effective primary restoration actions are not available, or where the injured resources will recover relatively quickly without human intervention.

Compensatory restoration is any action taken to compensate for interim losses of natural resources and services pending recovery. The scale of the required compensatory restoration will depend both on the magnitude of initial resource injury and how quickly each resource and associated service returns to baseline. Primary restoration actions that speed resource recovery will reduce the requirement for compensatory restoration.

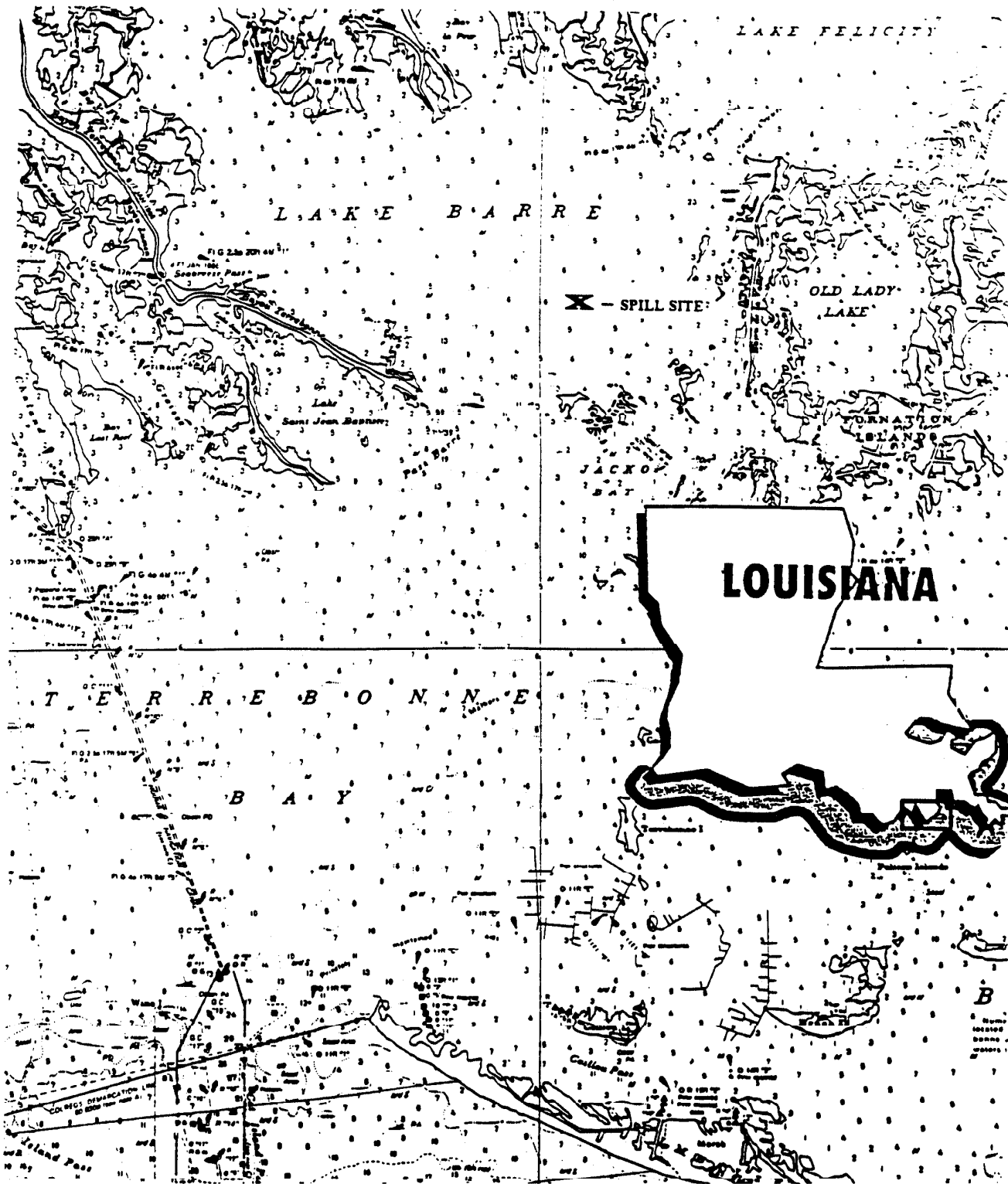
Based on observations made during the injury assessment studies, the Trustees determined that no active primary restoration actions were required to return injured natural resources and services to baseline (see Section 5.3.1). Therefore the natural recovery alternative was chosen for primary restoration. The Trustees evaluated more than 43 compensatory restoration alternatives with the potential to provide additional resources to compensate for the losses pending environmental recovery. As indicated in Exhibit 1-1 the Trustees propose compensatory restoration actions directed at marsh services, aquatic fauna, and birds.

<b>Exhibit 1-1</b>		
<b>SELECTED RESTORATION ALTERNATIVES</b>		
<b>Injured Resource/ Service</b>	<b>Primary Restoration</b>	<b>Compensatory Restoration</b>
Aquatic Fauna	Natural Recovery	Marsh enhancement
Birds	Natural Recovery	Marsh enhancement
Marsh habitat	Natural Recovery	Marsh enhancement
Human Use	Natural Recovery	Achieved through benefits to recreational fishing resulting from ecological restoration actions (marsh enhancement)

### 1.4 PLAN OF THIS DOCUMENT

The remainder of this document presents further information about the natural resource injury studies and the preferred restoration action for the Lake Barre incident that was selected after evaluation of the public comments received.

Figure 1. Location of Pipeline Break in Lake Barre, Louisiana.



acres of vegetated marsh was exposed to light oiling or sheen, and approximately 162 acres of vegetated marsh were exposed to heavy oiling.

## **2.2 AUTHORITY AND LEGAL REQUIREMENTS**

This DARP has been prepared jointly by the Louisiana Oil Spill Coordinator's Office (LOSCO), the Louisiana Department of Wildlife and Fisheries (LDWF), the Louisiana Department of Natural Resources (LDNR), the Louisiana Department of Environmental Quality (LDEQ), the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Department of the Interior (DOI) which is represented by the United States Fish and Wildlife Service (USFWS) (collectively, "the Trustees"). Each of these agencies is a designated natural resource Trustee under the Oil Pollution Act of 1990 (OPA), 33 U.S.C. Section 2706(b), and the National Contingency Plan, 40 CFR Section 300.600, for natural resources injured by the Lake Barre incident. As a designated Trustee, each agency is authorized to act on behalf of the public under state and/or federal law to assess and recover natural resource damages, and to plan and implement actions to restore natural resources and resource services injured or lost as the result of a discharge of oil.

### **2.2.1 Overview of OPA Requirements**

A natural resource damage assessment, as described under Section 1006 of OPA (33 U.S.C. Section 2706(c)) and the regulations for natural resource damage assessments under OPA at 15 CFR Part 990, consists of three phases: 1) Preassessment; 2) Restoration Planning; and 3) Restoration Implementation. The Trustees may initiate a damage assessment provided that an incident has occurred; the incident is not from a public vessel or an onshore facility subject to the Trans-Alaska Pipeline Authority Act; the incident is not permitted under federal, state or local law; and Trustee natural resources may have been injured as a result of the incident. Injury is defined as "an observable or measurable adverse change in a natural resource or impairment of a natural resource service" (15 CFR Section 990.30).

Based on early available information collected during the Preassessment Phase, Trustees make a preliminary determination whether natural resources or services have been injured and/or are threatened by ongoing injury. Through coordination with response agencies (e.g., the USCG), Trustees next determine whether response actions will eliminate injury or the threat of ongoing injury. If injuries are expected to continue, and feasible restoration alternatives exist to address such injuries, Trustees may proceed with the Restoration Planning Phase. Restoration planning also may be necessary if injuries are not expected to continue but are suspected to have resulted in interim losses of natural resources and services from the date of the incident until the date of recovery.

The purpose of the Restoration Planning Phase is to evaluate potential injuries to natural resources and services, and use that information to determine the need for and scale of restoration actions. Natural resources are defined as "land, fish, wildlife, biota, air, ground water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining

## COORDINATION WITH THE RESPONSIBLE PARTY

The OPA regulations require the Trustees to invite Responsible Parties to participate in the damage assessment process. Although the Responsible Party may contribute to the process in many ways, final authority to make determinations regarding injury and restoration rests solely with the Trustees.

Accordingly, the Trustees delivered a formal invitation pursuant to the OPA regulations for participation in the damage assessment, then in the preassessment phase, to Texaco on June 9, 1997. Texaco responded that it wished to participate in the cooperative process in a letter dated June 20, 1997. The designated technical representatives of Texaco participated actively in the damage assessment following the spill; they were involved in the design and implementation of many studies completed as part of this assessment. They also participated actively in Cooperative Assessment Groups (CAGs), which were created to design and interpret the studies and evaluate potential injuries. Coordination between the Trustees and Texaco helped reduce duplication of studies, increase the cost-effectiveness of the assessment process, increase sharing of information and experts, and is expected to decrease the likelihood of litigation. Input from Texaco was sought and considered, when provided, throughout the damage assessment process.

Subsequent to the incident, approximately one year into the cooperative assessment process, Equilon Pipeline Company LLC ("Equilon") succeeded to the liabilities of Texaco, through a merger. Therefore Equilon became the Responsible Party for this incident at that point in the process. To avoid confusion, however, "Texaco" is used throughout this document, rather than use "Texaco" sometimes and "Equilon" in others.

## PUBLIC PARTICIPATION

Public review of the Draft DARP/EA is an integral component of the restoration planning process. It is consistent with all state and federal laws and regulations that apply to the natural resource damage assessment process, including Section 1006 of OPA, the regulations for Natural Resource Damage Assessment under OPA (15 CFR Part 990), NEPA (42 USC Section 4371, et seq.) and the regulations implementing NEPA (40 CFR Part 1500, et seq.). Through the public review process, the Trustees seek public comment on the analyses used to define and quantify natural resource injuries and the methods being proposed to restore injured natural resources or replace lost resource services. The Draft DARP/EA provides the public with current information about the nature and extent of the natural resource injuries identified and restoration alternatives evaluated.

The Draft DARP/EA was made available for a 30-day federal public comment period beginning with the publication of a notice of its availability in the Federal Register on July 15, 1999. This comment period ended on August 16, 1999 (the first working day following the 30<sup>th</sup> day). A 10-day state public comment period began with the publication of a notice of its availability in the Louisiana Register on July 20, 1999, and ended on August 2, 1999. The availability of the Draft DARP/EA and the state and federal public comment periods was also published in the Houma Courier and Baton Rouge Advocate newspapers on July 19, 1999. All comments received during



in the Draft DARP/EA is selected. It will provide sufficient compensation to the public for injuries to, and loss of services from, resources affected by the incident plus will have additional benefits (not considered in the calculations) such as protection of existing marshes and infrastructure.

*ENTRIX, Texaco's contractor, made some minor suggestions to clarify language regarding flexibility in timing and design of planting, and of the monitoring program and performance criteria. They also suggested that anchors not be used to hold pots, due to possible hazards to wildlife that they could pose.*

The Trustees carefully evaluated these suggestions and accepted many of the clarifications. The Trustees recognize that the timing of planting will depend on several factors, including the availability of plants with the appropriate characteristics (e.g., acclimation to local climate and habitat conditions) and the weather conditions during the actual planting. The Trustees also recognize that the precise planting design followed will depend on the conditions that exist at the site following settling of the dredge material and the action of winter storms. One of Entrix's suggestions regarding timing was modified to include restrictions as to how close planting may occur to nesting wading and seabirds. The suggestion regarding anchors was also accepted.

The Trustees did not accept two suggestions regarding use of different plant material and size than that specified in the Draft DARP/EA. Regarding plant materials, it was thought that this is a reference to the use of other plant species. The use of plant species other than the two *Spartina* species for the initial planting is not approved since the primary plants affected by the spill were *Spartina*, and therefore they are more appropriate to restore the types of services lost. As discussed in Section 5.4.2.5.4, the use of different species may be considered as a corrective action measure, if necessary. The reference to plant size is thought to refer to use of multi-stem clumps. The use of multi-stem clumps of plants are thought to be less resistant to erosion than potted plants (Jim Holcombe, LDNR, pers. comm.), and the Trustees felt that it would be too risky to use clumps at a barrier island site. Although these two suggestions were not adopted, the Trustees feel that there is sufficient flexibility in the DARP to allow whatever minor modifications may be necessary, with the approval of the Trustees, to maximize the likelihood of the success of the project.

#### **2.4.2 Administrative Record**

The Trustees developed records documenting the information considered by the Trustees as they planned and implemented assessment activities and addressed restoration and compensation issues and decisions. These records have been compiled into an administrative record, which is now available for public review at the addresses given below. Although the record is still being added to, it presently contains the information that the Trustees relied upon to make the decisions described in the DARP. The administrative record facilitated public participation in the assessment process and will be available for use in future administrative or judicial review of Trustee actions to the extent provided by federal or state law. A list of those documents submitted to the administrative record through August 26, 1999 is attached as Appendix A to this document. Documents within the administrative record can be viewed at:

## AFFECTED ENVIRONMENT

## CHAPTER 3

This chapter presents a brief description of the physical and biological environment affected by the Lake Barre incident. The physical environment includes the marine waters of Lake Barre and associated coastal salt marsh, rookery island, oyster reef, and mudflat habitat. The biological environment includes a wide variety of fish, shellfish, birds and other organisms.

Lake Barre and its natural resources are part of the large Barataria-Terrebonne estuary system (BTES). Commercial fishing, aquaculture, recreational fishing, hunting, and wildlife viewing provide contributions to the economy of Terrebonne, Lafourche, Plaquemines, and Jefferson parishes within the BTES. The wetlands in the BTES also provide ecosystem services such as protection from wind and storm surge damage and wastewater treatment. These benefits depend on a healthy marine and coastal ecosystem in the BTES, including the Lake Barre region. The Barataria-Terrebonne Bay complex is included in the National Estuary Program (BTNEP).

### 3.1 PHYSICAL ENVIRONMENT

The state of Louisiana is located along the north-central coast of the Gulf of Mexico. Lake Barre is located along the northern edge of the BTES. The surrounding land is classified as Gulf Coast Marsh and was created as a series of overlapping delta lobes of the Mississippi River during the past 10,000 years. The climate of the area is humid subtropical with abundant precipitation. Rainfall in May and June averages 4.8 and 6.7 inches, respectively. Summers are hot and winters are mild, with mean monthly temperatures of about 82°F and 57°F, respectively. The area is subject to tropical storms and hurricanes.

Lake Barre is protected from the open Gulf of Mexico by a series of barrier islands to the south, including Isles Dernieres, Timbalier Island, and East Timbalier Island. The shoreline in the Lake Barre area is predominantly saltmarsh. The edges of some marsh areas are armored with oyster reefs. Organic and shell beaches are also present. The land in this area is subsiding, due to low influx of sediment, with land loss occurring so rapidly that 1995 maps were not easily used by response or assessment personnel for the May 16, 1997 spill. The subsidence and resultant erosion of marsh has resulted in a very complex shoreline with a number of small islands and isolated patches of saltmarsh remaining in front of the main current shoreline. Numerous bayous, cuts, and canals in the shoreline of Lake Barre allow exchange of water into interior portions of the marsh. Ponds are present in some areas of the marsh due to subsidence.

The site of the May 16, 1997 pipeline rupture is approximately 4.5 miles southeast of the nearest affected marsh island ("Big Island"), which is used by nesting birds, including terns. Water depth near the site of the release is around two meters, which is relatively constant in Lake Barre except near the shore where water depth is shallower and in channels where it is deeper. Oil from the ruptured pipeline spread out over open water, beach, reef, and marsh habitats. The area exposed

these species depend. The Louisiana Department of Wildlife and Fisheries' Natural Heritage Program also lists species that are of special concern to the state. Exhibit 3.1 at the end of this chapter provides a list of federal and state recognized endangered or threatened species reported to reside in or migrate through south coastal Louisiana ecosystems.

### 3.4 CULTURAL ENVIRONMENT AND HUMAN USE

Ever since the early 1600's when the explorer Pierre Le Moyne, Sieur d'Iberville discovered the region for France, the BTES has been recognized as an area with an abundance of fish and wildlife resources (see the BTNEP website: <http://www.epa.gov/nep/bt.htm>). The BTES, including the Lake Barre area, is directly used for commercial and recreational crabbing, trapping and hunting, and fishing, and is also used for wildlife viewing ("Economic Value Assessment of the Barataria-Terrebonne Estuarine System", published research report 26, The Barataria-Terrebonne National Estuary Program). As discussed above, many of the commercially and recreationally important fish and shellfish species are dependent during at least part of their life-history on the habitats within the BTES. Ecotourism (primarily bird and wildlife viewing and hunting and fishing) is increasingly important to the area. The wetlands in Lake Barre also serve as protection from storms and saltwater intrusion, protecting both human development and freshwater supplies.

<b>Exhibit 3.1</b>		
<b>FEDERAL AND STATE ENDANGERED OR THREATENED SPECIES IN SOUTH COASTAL LOUISIANA</b>		
<b>Common Name</b>	<b>Scientific Name</b>	<b>Status</b>
<b>MAMMALS</b>		
Louisiana Black Bear	<i>Ursus americanus luteolus</i>	Threatened
Florida Panther	<i>Felis concolor coryi</i>	Endangered
<b>REPTILES</b>		
Kemp's Ridley Sea Turtle	<i>Lepidochelys kempii</i>	Endangered
Hawksbill Sea Turtle	<i>Eretmochelys imbricata</i>	Endangered
Leatherback Sea Turtle	<i>Dermochelys coriacea</i>	Endangered
Loggerhead Sea Turtle	<i>Caretta caretta</i>	Threatened
Green Sea Turtle	<i>Chelonia mydas</i>	Threatened
<b>BIRDS</b>		
Eskimo Curlew	<i>Numenius borealis</i>	Endangered
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Threatened
Brown Pelican	<i>Pelecanus occidentalis</i>	Endangered
Piping Plover	<i>Charadrius melodus</i>	Threatened

#### **4.1.2 Bird Impacts**

Two oiled birds (a mottled duck and a tern) were found dead in the first week following the incident. Additionally, response personnel and Trustee representatives surveyed around ten percent of the spill affected area (Conzelmann, USFWS, pers. comm.) and observed at least 58 living, but oiled, birds in the days following the incident.

#### **4.1.3 Marsh Habitat Impacts**

Approximately 4,327 acres of marsh were exposed to oil (including sheen) from the pipeline rupture. In small areas of the exposed marsh, oil streamers collected and resulted in a near total loss of above-ground biomass. In the vast majority of the marsh, the exposure to oil had less dramatic consequences, resulting in a partial loss of marsh services. The oil caused stress to the marsh plants, resulting in an increase in chlorosis and potential reductions in primary productivity. The habitat value of the oiled marsh was also reduced. Some other marsh services were also potentially affected, such as reductions in remineralization processes.

#### **4.1.4 Human Use Impacts**

The incident affected human use service in the Lake Barre area. Under OPA, the Trustees are responsible for evaluating and obtaining compensation for public (but not private) lost human use. The Louisiana Department of Health and Hospitals issued a precautionary closure of oyster harvesting in the affected area on May 19, 1997 to alleviate public health and seafood quality concerns. The closure, which affected private commercial and not public interests, was lifted on August 1, 1997. During the early stages of the cleanup, public access to the area was limited by cleanup activities, including boom placement across access points to the area. In the judgment of the Trustees, the effect of the incident on recreational uses of Lake Barre was relatively limited in duration and magnitude. Recreational use of the area is believed to have returned to baseline levels shortly after the response actions ended. Therefore, no specific actions were required for recreational use to return to baseline conditions, allowing natural recovery to be the preferred alternative for primary restoration for this injury category. Additionally, there are numerous nearby substitute sites for fishing and shrimping that were not directly affected by the incident. Thus, there was little potential for significant interim loss and, therefore, it did not warrant further evaluation. Instead the Trustees considered benefits to recreational uses as an additional criterion in determining preferred restoration alternatives for other injury categories.

### **4.2 ASSESSMENT STRATEGY**

The goal of injury assessment under OPA is to determine the nature and extent of injuries to natural resources and services, thus providing a technical basis for evaluating the need for, type of, and scale of restoration actions. The assessment process occurs in two stages: injury determination and injury quantification.

relative to baseline, and therefore forms the basis for scaling restoration actions. Baseline refers to the condition that the resource would have maintained but for the effects of the incident.

<b>Exhibit 4-1</b>	
<b>LAKE BARRE OIL SPILL: ASSESSMENT METHODS FOR POTENTIAL RESOURCE AND SERVICE INJURIES</b>	
<b>Potential Injuries Assessed</b>	<b>Injury Assessment Method(s)</b>
1. Aquatic Fauna	Preliminary estimates developed independently by Trustees and Texaco using a combination of field data, modeling of oil fate and transport, and literature toxicity information.
2. Birds	Preliminary estimates developed independently by Trustees and Texaco. Trustees used a combination of field data and modeling of oil fate and transport; Texaco used observations made during the response effort.
3. Marsh Function	Trustees and Texaco cooperatively performed a field study designed to obtain data allowing use of a Habitat Equivalency Analysis. Input parameters for the model were jointly developed based on the field observations.
4. Human Use	Trustees determined that no specific assessment was warranted.

### 4.3 SUMMARY OF INJURIES

A summary of injury assessment results is provided in Exhibit 4-2 and described in the following sections.

<b>Exhibit 4-2</b>	
<b>LAKE BARRE OIL SPILL: SUMMARY OF INJURY ASSESSMENT RESULTS</b>	
<b>INJURED RESOURCE/SERVICE</b>	<b>INJURY QUANTIFICATION</b>
1. Aquatic Fauna	The Trustees estimate that approximately 7,465 kg of fish, crabs, and shrimp were lost as a result of this incident; Texaco estimates that less than 500 kg of fish, crabs, and shrimp were lost.
2. Birds	The Trustees estimate that approximately 333 birds were killed as a result of this incident; Texaco estimates that less than 100 birds were killed.
3. Marsh Function	Trustees and Texaco cooperatively performed a field study designed to obtain data allowing use of a Habitat Equivalency Analysis. Input parameters for the model were jointly developed based on the field observations. The injury is estimated to represent 75.6 discounted service acre-years of lost marsh ecological service flows.
4. Human Use	Trustees determined that no specific assessment was warranted.

#### 4.3.1 Summary of Assessment Methods

Injury quantification for aquatic fauna and bird resources begins with developing an estimate of the number of animals killed. Possible sublethal injuries to populations also are considered if the

## 4.4 INJURIES TO SPECIFIC RESOURCES

The following sections of this chapter describe the results of the injury determination and quantification efforts for the incident that were conducted subsequent to the preassessment phase. Potential injuries are organized into four categories: aquatic fauna, birds, marsh, and human use (recreation).

### 4.4.1 Aquatic Fauna

#### 4.4.1.1 Determination of Injury

The Lake Barre area is known to be used by aquatic fauna, including blue crabs, shrimp, and other invertebrates, and numerous species of fish. The LDWF has conducted trawl sampling in this area for many years, which documents this use. Oil from the incident was documented to cover thousands of acres of surface waters. Water samples collected near the time of the spill indicate that polycyclic aromatic hydrocarbons (PAHs) were present in the water column for a short period of time in the vicinity of the pipeline break at levels known to be toxic to aquatic organisms in laboratory tests. Additionally, possible injury from the incident is evidenced by the collection of some dead shrimp in a trawl taken by LDWF, and dead juvenile crabs in a crab pot. A few dead forage fish were also observed shortly following the spill.

#### 4.4.1.2 Injury Quantification Strategy

The Trustees and Texaco did not agree on a common method to quantify aquatic injuries. However, both parties agreed that the cost of conducting a large field study to investigate aquatic faunal injuries was not warranted, given the specific circumstances of this incident. A field effort designed to quantify injuries to fish, shellfish, and other aquatic organisms would be very expensive, and the natural variability that exists in the plankton of the Gulf of Mexico region would have made it difficult to detect the magnitude of injuries that the Trustees believed were present. Although some aquatic mortalities were observed, as noted above, there were not any dramatic fish kills or strandings of large numbers of organisms as sometimes occurs following releases of petroleum products (e.g., *Exxon Valdez* oil spill, *North Cape* oil spill, and others). Given the visual evidence suggesting that the magnitude of injury to aquatic organisms was relatively small, the Trustees decided to use a modeling approach.

The Trustees decided to develop a site-specific modeling approach, using some algorithms from the Natural Resource Damage Assessment Model for Coastal and Marine Habitats (Version 2.4, April 1996), some new algorithms to account for the specific circumstances of the incident, and some new data for habitats and aquatic fauna. The habitat data was developed from aerial photography taken after the incident, and the aquatic fauna data was provided by LDWF and derived from their long-term sampling efforts in the Lake Barre area. A preliminary model run was performed using two different estimates for the release volume: 5,000 BBL and 7,000 BBL. These input parameters for volume were chosen since the size of the release had been estimated to lie between these figures (the final release estimate was 6,561 BBL). Extrapolating from the results of the modeling effort suggest that approximately 7,465 kg of fish, decapods, and other

bird species composition and abundance data used in the model was from the Natural Resource Damage Assessment Model for Coastal and Marine Habitats (Version 2.4, April 1996) for species present in Lake Barre in spring. A preliminary model run was performed using two different estimates for the release volume: 5,000 BBL and 7,000 BBL. These input parameters for volume were chosen since the size of the release had been estimated to lie between these figures (the final release estimate was 6,561 BBL). The Trustees' model estimated that 333 birds were lost as a result of the incident from impacts due to oil released from the pipeline break (Kern, 1999). These figures include the estimated direct mortality that the model predicts for the first week of the spill. In this model, birds that are "oiled" in the model run by contact with the slick are assumed to have been killed. This is a conservative assumption in that it is possible that some of the oiled birds did not die. The Trustees believe, however, that a significant proportion of the birds that were exposed to oil likely died. It is not unexpected that only a small proportion of expected bird mortalities were found, since dead birds can be subject to predation, sinking, or could have been hidden in the thick marsh vegetation.

This injury category, as evaluated by the Trustees' modeling approach, estimates the bird injury that the Trustees believe resulted from death due to exposure to surface slicks that were present in the early days following the incident. It does not estimate the potential reduction in bird production that resulted from reductions in marsh service flows supporting birds. Losses due to a reduction in marsh services supporting birds are accounted for in the assessment of injury to marsh. In the judgment of the Trustees, assessing direct mortality of birds in the first few days of the incident and considering longer-term indirect injury to birds through reduction in marsh services to birds does not result in significant double-counting of bird injuries, under the specific circumstances of this incident.

Although the Trustees and Texaco disagreed on the magnitude of estimated bird losses, they agreed to move forward with selecting an appropriate restoration option and scaling the amount of restoration needed to compensate for these losses. The selection of the preferred restoration option and the scaling approach is discussed in Chapter 5. The Trustees' did not finalize the model using the final release estimate, 6,561 BBL, since an agreement on restoration was reached that, in the judgment of the Trustees, was clearly sufficient to provide adequate compensation for this injury. Therefore, there was no need for the Trustees to incur the additional expense of further modeling efforts.

#### **4.4.3 Marsh**

##### **4.4.3.1 Determination of Injury**

The trajectory of the oil into the marsh and the extent of oiling were documented on a frequent basis during the initial response using overflights and on-water surveys. Overflights occurred on at least a daily basis from May 17, 1997 through May 28, 1997. Trustees participated in surveys and field observations in May, June, July, and October 1997, and June 1998. It is estimated that approximately 4,165 acres of marsh were exposed to light oiling (including sheen) and 162 acres of marsh were exposed to heavy oiling. In limited areas, oil streamers hit the shoreline and oil accumulated on the sediment

3. *Heavy oiling with slow to moderate recovery*: Approximately 8.1 acres of marsh were exposed to heavier oiling than the first two categories, with a higher degree of service reduction and slower recovery. These areas were estimated to have suffered an initial service loss of 75%. During the July 1997 site visit, there were indications of some recovery of services, with service losses estimated at 65%. In October 1997 and June 1998 there were substantial signs of recovery, but service losses in June 1998 were estimated to be at 20%. The CAG estimates that recovery from the June 1998 estimate of 20% service losses to full recovery will occur within two years following the incident. The estimated interim loss of marsh services in this category is 4.6 acre-years with no primary restoration actions other than natural recovery.
4. *Heavy Oiling with slow recovery*: Approximately 0.28 acres of marsh were exposed to very heavy oiling, with the above-ground vegetation killed and slight signs of recovery in June 1998. Minimal marsh service flows were believed to be coming from these limited areas, with service flows gradually improving toward baseline service provision. Given the limited areal extent of this category, the CAG decided that it was not cost-effective to continue the field study to monitor the gradual recovery for such a small area. The Trustees and Texaco agreed to conservatively assume that full recovery for these 0.28 acres would not occur until 20 years following the incident for the purpose of calculating compensatory restoration needs, although the Trustees believe recovery will occur more quickly. As discussed in the following chapter, primary restoration actions to speed recovery to baseline was considered but ultimately rejected by the Trustees as not being necessary. The interim loss of marsh services in this category is estimated to be 2.6 acre-years with no primary restoration actions other than natural recovery.

This injury quantification approach attempts to take into account reductions in the entire flow of marsh services. It is intended to account for a reduction in bird production that resulted from reductions in marsh service flows supporting birds. Likewise, it is intended to account for a reduction in aquatic faunal production from reductions in marsh service flows supporting fish, shrimp, crabs, and other aquatic fauna. It is also intended to capture the loss of other marsh services. It is the judgment of the Trustees that accounting for reductions in marsh services with this approach does not result in significant double-counting of the bird and aquatic faunal injuries, under the specific circumstances of this incident.

This injury approach treats injury to marsh sediments as part of the overall loss of marsh services. That is, the effect of the oiling on the sediments was considered during the development of the estimates for loss of overall marsh services. Since affected sediments were virtually all in or adjacent to marsh, no separate injury assessment and restoration evaluation was performed for intertidal sediment injury. Chemistry results of subtidal sediment samples indicate that no significant injury occurred to this habitat. It is the judgment of the Trustees that consideration of intertidal sediment injury as part of the overall assessment of marsh injury was the most efficient approach to use under the specific circumstances of this incident.



**5.1 RESTORATION STRATEGY**

The goal of restoration under the Oil Pollution Act of 1990 (OPA) is to make the environment and public whole for injuries to natural resources and services resulting from the Lake Barre incident. Restoration actions under OPA are termed primary or compensatory.

Primary restoration is any action taken to accelerate the return of injured natural resources and services to their baseline condition. Natural recovery, in which no human intervention is taken to directly restore the injured natural resources and/or services to baseline conditions, is considered as a primary restoration alternative. Natural recovery is the appropriate restoration alternative in situations where feasible or cost-effective primary restoration actions are not available, or where the injured resources will recover relatively quickly without human intervention. Actual primary restoration actions (as opposed to natural recovery) are appropriate in situations where injured resources will not recover, or will recover slowly, without taking steps to bring about or speed recovery, and where feasible and cost-effective methods exist to assist recovery to baseline.

Compensatory restoration is any action taken to compensate for interim losses of natural resources and/or services pending recovery to baseline. The scale of the required compensatory restoration is dependent on both the initial size of the injury and how quickly each resource and/or service returns to baseline. Primary restoration actions that speed recovery will reduce the requirement for compensatory restoration.

To plan restoration for injuries resulting from the Lake Barre incident, the Trustees first consider possible primary restoration actions for each injury and determine whether primary restoration can and should be implemented. The Trustees then consider the type and scale of compensatory restoration that can best compensate for lost resources and/or services during the recovery period.

Restoration alternatives must be scaled to ensure that their size appropriately reflects the magnitude of injuries resulting from the incident. Where feasible, the Trustees employ a resource-to-resource scaling methodology. Under this approach, the Trustees determine the scale of restoration actions that will provide natural resources and/or services of the same type and quality and of comparable value to those lost. Here, equivalency is obtained between the resources and/or services lost and those to be provided through restoration.

If a reasonable range of alternatives providing natural resources and/or services of the same type and quality and comparable value to those lost cannot be identified, other compensatory restoration actions may be considered. These other compensatory restoration actions must, in the judgment of the Trustees, provide services of comparable type and quality as those lost. When restoration provides resources or services not of comparable value as those injured, the Trustees

Another suggestion was that Texaco should fund long-term monitoring to assess the impact of oil on deltaic marshes, or fund experimentation with planting various species of plants, site characteristics, planting techniques, and mechanical structures to contribute to the state of knowledge concerning these topics. The Trustees and Texaco jointly conducted a field assessment in the impacted marsh, sufficient to be able to develop estimates of injury to the marsh. Further assessment studies beyond that required for injury quantification are not justified within the OPA regulations. Basic research in marsh planting techniques as a restoration alternative is similarly not consistent with regulations since it will not replace the injured natural resources and services to the public.

Another restoration suggestion, trying to reduce erosion of existing marsh in the Lake Barre area by plantings done in critical areas and by plugging breaches and tidal cuts, was considered by the Trustees. The experts consulted by the Trustees, including those attending the February 13, 1998 meeting, told the Trustees that loss of marsh was occurring in this area due to two phenomena. The first is the subsidence that is causing the loss of marsh from the interior, with ponding occurring as the water depth becomes too deep for marsh vegetation. Plugging of interior cuts and breaches would have little affect on the rate of subsidence. The Trustees were told that the only way to slow subsidence would be to pump large volumes of sediment out onto the marsh, which would be very expensive and would have the potential to cause injury to existing resources during the implementation. There is also the practical problem of where to obtain the large amounts of sediment that would be required.

The other cause of marsh loss is erosion along the edge of the marsh, primarily along the southern shoreline. Reducing erosion through shoreline armoring and plugging exterior cuts was one of the restoration options considered as a viable alternative. It was screened as an alternative, but ultimately rejected both because of cost required to reduce erosion sufficiently to compensate for losses and because of the potential for impacting oyster leases during implementation. Movement of equipment in the area could cause impacts to oyster leases in the area, which was a concern expressed by oystermen participating in the two public meetings. With respect to the suggestion of reducing erosion through planting in critical areas, the Trustees and Texaco did not observe any locations where they believed that vegetation could be established to reduce shoreline erosion and where it would remain for a sufficient period of time to justify this approach. The CAG did not receive additional input as to appropriate areas for planting despite attempts to get this information.

As shown in Exhibit 5-1, most of the general restoration alternatives considered are for compensatory restoration. This is because the assessment studies have shown that resources and resource services impacted by the incident are, in the judgment of the Trustees, recovering to baseline conditions within an acceptably short time period. Therefore there was little need to consider active primary restoration alternatives. The only injured resource that is expected to take longer than two or three years to recover is the 0.28 acres of most heavily impacted marsh. Marsh replanting was considered as a primary restoration alternative for this small area but, as discussed in Section 5.3.1, the Trustees decided that it was not cost-effective to undertake actions to speed recovery for such a small area.

- The extent to which each alternative will prevent future injury as a result of the incident, and avoid collateral injury as a result of implementing the alternative;
- The extent to which each alternative benefits more than one natural resource and/or service; and
- The effect of each alternative on public health and safety.

The regulations leave it up to the Trustees to consider how to prioritize the criteria, and allow additional criteria to be used. The key criterion for the Trustees is the second in the list, since it is the criterion that most clearly indicates whether the goal of making the public whole from losses resulting from the incident are met. The Trustees have, as indicated previously, also considered as an additional criterion the extent to which the restoration alternative will provide benefits to recreational uses (fishing and wildlife viewing).

Based on a thorough evaluation of a number of factors, including the criteria listed above, the Trustees selected preferred restoration alternatives for primary and compensatory restoration of injured natural resources and/or services (highlighted in Exhibit 5-1). Information supporting the Trustees' selection of restoration alternatives is provided throughout the remainder of this chapter. In compliance with OPA, the restoration alternatives were finalized following public review and comment on the Draft DARP/EA, with the preferred alternatives identified in the Draft DARP/EA being selected since there were no comments received that identified errors in the Trustees' screening or scaling approaches.

### **5.3.1 Primary Restoration**

Based on field indications of recovery, the Trustees and Texaco jointly determined that most of the impacted marsh only suffered a partial loss of services and expect that the areas will recover within 4 to 24 months of the incident. A small area, 0.28 acres, is expected to take much longer to recover. However, the Trustees determined that primary restoration actions to aid in the recovery of the marsh habitat were neither necessary nor cost-effective due to the very limited size of the slowly recovering area. Therefore, the No Action/Natural Recovery option is selected as the primary restoration alternative for this resource.

In addition, based on the magnitude of the estimated injury and site conditions, the Trustees determined that no additional actions were necessary to aid in the recovery of aquatic fauna, birds, or recreational resources. Therefore, the No Action/Natural Recovery option is selected as the primary restoration alternative for these resources. After determining the appropriate primary restoration alternative, the Trustees proceeded to determine the type and size of compensatory restoration to account for interim losses to injured resources and/or services (marsh, birds, aquatic fauna), which is addressed below.

alternatives for compensatory restoration: creation/restoration of oyster beds and marsh restoration (i.e., creation, enhancement, or protection).

Creation of an oyster bed by depositing cultch would increase habitat for oysters and other animals that require a hard surface for attachment. A created oyster reef would serve as a substrate for increased secondary productivity, and would provide habitat and/or feeding areas for some fish. Oyster reef construction could benefit recreational use by creating a new fishing location where fishes may aggregate. However, construction of an oyster reef would reduce the amount of area available for shrimping, and would have the potential to interfere with trawls. It would adversely impact the area of benthic habitat on which it would be constructed. Additionally, although oyster reef construction is technically feasible, there are no unleased waterbottoms within the area that have the appropriate salinity to support an oyster reef. Any cultch planting in the area would need to be on privately leased waterbottoms, not in the public realm, and therefore the Trustees could not guarantee that the oyster reef would provide the ecological services to the public since it would potentially be subject to harvest by private leaseholders.

Salt marshes are widely recognized as providing a suite of critical services for aquatic life. Marshes serve as spawning and nursery areas for many species of juvenile fish and shellfish, export detritus (energy source for the aquatic food web) into the estuary, and can increase water quality by filtering sediments and other pollutants from the water column. In addition, marsh habitat provides many collateral benefits such as storm surge protection and habitat for birds and mammals. As already discussed, marsh creation will benefit recreational use of the area by increasing production of important recreational species and their prey items. Marsh restoration, creation, and/or protection can be successfully and cost-effectively implemented. The rapid loss of coastal marshes in Louisiana due to subsidence and erosion is a serious threat to the ecology and economy of Louisiana and efforts to increase the amount of marsh through creation projects and functioning of existing marsh through enhancement projects are widely supported throughout the state. In addition, marsh restoration is consistent with state and federal policies concerning wetlands and essential fish habitat.

The Trustees decided that, for this incident, restoration in the form of creation, enhancement, or protection of marsh habitat is more consistent with the restoration selection criteria as compensation for aquatic faunal injuries than is oyster reef creation. Therefore, marsh restoration was identified as the preferred alternative as the compensatory restoration action for aquatic faunal injuries in the Draft DARP/EA, and selected as the alternative after consideration of all comments received.

### **5.3.2.3 Birds**

The Trustees feel that technically feasible and cost-effective alternatives exist to compensate for interim losses to birds. Thus, the Trustees determined that the No Compensation alternative was not appropriate compensatory restoration for this injury and considered three other alternatives for compensatory restoration: actions that would create, enhance, or protect bird nesting sites, oyster reef creation, and marsh restoration.

years for bird losses. For the 7,000 BBL model run, the estimated lost salt marsh equivalent was approximately 4.17 acre-years of lost marsh production for aquatic losses and approximately 27.65 acre-years for bird losses. Thus, the total estimated salt marsh equivalent for aquatic and bird losses was between 30.20 and 31.82 acre-years of marsh production.

Since each acre of marsh that is created will provide services such as primary production for a number of years, the number of acres that need to be created is less than the number of acre-years of marsh production presented above. These calculations are presented in Penn (1999). The Trustees estimated that the amount of marsh needed to be created in order to compensate for the aquatic fauna and bird losses lies between 3.18 and 3.35 acres. These values assume that the created marsh provide services for 25 years (assuming constant erosion beginning 3 years after creation).

As discussed in Chapter 4, Texaco did not agree with the method used by the Trustees to estimate aquatic faunal or bird losses nor with Trustee estimates of losses for these resources. Texaco also did not agree with the method used by the Trustees to translate aquatic faunal and bird losses into units of marsh production. However, Texaco offered four acres of marsh creation, or the ecological equivalent, as compensation for faunal injuries (both birds and aquatic organisms). The Trustees did not finalize or verify any model runs including runs using the final release estimate of 6,561 BBL, since the Texaco offer was clearly adequate as compensation for even a 7,000 BBL release.

#### **5.3.2.5 Human Use**

The No Action alternative is appropriate for compensatory restoration of recreational losses due to the small, anticipated magnitude of those losses. As discussed previously in Sections 1.2 and 4.4.4.1, the Trustees determined that, under the regulations and for the specific circumstances of this incident, the cost of conducting assessment studies to evaluate such a small potential injury was unjustified. However, the Trustees considered benefits to recreational uses as an additional criterion in determining the selected restoration alternative so as to provide some degree of compensation for potential recreational losses.

### **5.4 EVALUATION OF MARSH RESTORATION ALTERNATIVES**

The Trustees selected marsh restoration in the form of creation, protection, or enhancement as the preferred compensatory restoration project for all natural resource injuries. Since marsh restoration is a broad category that could include many types of actions and sites, the Trustees completed the second step of the selection process: the development of a range of project-specific marsh restoration alternatives and selection of a preferred alternative from this list. The selection process for these marsh restoration alternatives is described in greater detail below.

First, the Trustees compiled an initial comprehensive list of possible alternatives. The Trustees then conducted two "screenings" which narrowed the list to five alternatives. These five alternatives were then ranked in order of preference. For each screening and the ranking, two or more criteria, including the criteria listed in the OPA regulations, were applied to the list of alternatives. Section 5.4.1 describes the selection process. Sections 5.4.2 through 5.4.4 provide

Twenty alternatives that did not meet one or both of the proposed criteria were removed from the list (Exhibit 5-3). Ten of the projects were dropped due to the lack of a strong similarity in attributes to the injuries from the Incident. Of these ten, nine of them were dropped due to the fact that the project would benefit freshwater resources, and the incident impacted estuarine and marine resources. The Christmas Tree Sediment Fence project was eliminated based on a low nexus to the injured resources. This project is designed to trap sediments, which might eventually lead to marsh development, but this possibility was judged by the Trustees as too remote to be considered further. The remaining projects that were dropped during this first screen were dropped due to location. They were judged as being located too far away from the area impacted by the incident to serve as appropriate locations for compensating the members of the public that were most affected.

#### 5.4.1.3 Second Tier Screening

After the first tier screening was completed, the Trustees and Texaco collected additional, detailed information (e.g., project design, project status) on the remaining 23 alternatives. Once this information was assembled, a second set of screening criteria was applied and the list was narrowed to three alternatives: East Timbalier Island, Upper Bayou LaCache, and Raccoon Island. The Raccoon Island location was retained as an alternative, despite the lack of complete information at the time the secondary screen was conducted, due to its status as the most important rookery island off the Louisiana coast for brown pelicans, a threatened species in Louisiana. Although no brown pelicans were reported as being oiled or found dead, the results of the Trustee model suggests that some brown pelicans might have been killed. The Trustees therefore gave special consideration to this alternative, which would not have been the case in the absence of its importance to brown pelicans. The second tier screening criteria are described below, and the application of these criteria is shown in Exhibit 5-4.

*Project Status* - This criterion referred to the stage of the project. Projects that had already been completed, projects that were deauthorized under CWPPRA, and projects already fully funded from other sources were not considered for further evaluation.

*Site Ownership* - This criterion considered whether the site was publicly or privately owned and for private property, whether the landowner would agree to an appropriate conservation easement to ensure that the project would continue to provide benefits to the public far enough into the future to adequately fulfill compensation requirements.

*Likelihood of Success of Each Alternative (Technical Feasibility)* - This criterion considered whether a restoration project could be successfully implemented given currently available technology and expertise. Technically feasible alternatives were those that used proven methods, had a high rate of success as documented in the literature, and were well enough understood to characterize resulting natural resource service gains. This criterion also considered project and site-specific factors that may influence project success.

#	Project Name	Project Type	Method of Implementation	Source
13	Isles Dernieres (Whiskey Island) Planting Project	Marsh Enhancement	Planting or Supplemental Planting at TE-27/PTE-15bi	Trustees
14	Whiskey Island Restoration Project (TE-27/PTE-15bi)	Marsh Enhancement	Structure/Fill with Dredged Material and Plant	CWPPRA
15	Raccoon Island Project (TE-DWF)	Marsh Creation	Fill with Dredged Material and Plant	Trustees
16	Poseiden Pipeline Mitigation Project	Marsh Enhancement	Water Control Structure/Other?	Trustees
17	Penchant Sub-Basin Drainage Project	Marsh Enhancement	Hydrologic Modifications	BTNEP <sup>3</sup>
18	Penchant Basin Natural Resources Plan, Increment 1 (TE-34/PTE-26i)	Marsh Enhancement/ Protection	Hydrologic Modifications	CWPPRA
19	Lake Boudreaux Wetland Project (TE-7)	Marsh Enhancement/ Protection	Hydrologic Modifications	BTNEP
20	Lake Boudreaux Basin Freshwater Introduction and Hydrologic Management Project (Alternative B) (TE-32/TE-7f)	Marsh Enhancement/ Protection	Hydrologic Modifications	CWPPRA
21	L'Ours Ridge Restoration Project	Marsh Enhancement/ Protection	Plug Cuts/Canals	BTNEP
22	Central Basin Tidal Drag Project	Marsh Enhancement?	Hydrologic Modifications	BTNEP
23	GIWW to Clovelly Project	Marsh Enhancement?	Hydrologic Modifications	BTNEP
24	Little Lake Oil and Gas Project	Marsh Enhancement?	Hydrologic Modifications	BTNEP
25	Salt Water Barrier or Lock in Houma Navigation Channel	Marsh Enhancement/ Protection	Hydrologic Modifications	BTNEP
26	Avoca Island Lake Marsh Restoration Project	Marsh Creation	Sediment and Freshwater	BTNEP

#	Project Name	Project Type	Method of Implementation	Source
39	Point Au Fer Canal Plugs Project (TE-22/PTE-22/24)	Marsh Enhancement/Protection	Plug Cuts/Canals, Shoreline Armoring	CWPPRA
40	Red Mud Demonstration Project (XTE-43)	Marsh Creation	Fill with Dredged Material and Plant	CWPPRA
41	Bay Chaland Planting Project	Marsh Enhancement	Planting	Trustees
42	West Belle Pass Headland Restoration Project (TE-23/PTE-27)	Marsh Creation/Enhancement/Protection	Fill with Dredged Material, Plug Cuts/Canals, Shoreline Armoring, Water Control Structures	Trustees
43	Houma Wastewater Facility Diversion Project	Marsh Enhancement	Wastewater Diversion	BTNEP

<sup>1</sup> Selected alternative is in bold

<sup>2</sup> Coastal Wetlands Planning, Protection & Restoration Act Comprehensive Plan

<sup>3</sup> Barataria-Terrebonne National Estuary Program Comprehensive and Management Plan



#	Project Name	Strong Similarity In Attributes?	Strong Proximity To Affected Area?	Insufficient Information To Screen?	Project Eliminated From Further Evaluation?
	<b>Introduction and Hydrologic Management Project (Alternative B) (TE-32/TE-7f)</b>				
21	L'Ours Ridge Restoration Project	*	No	No	Yes
22	Central Basin Tidal Drag Project	*	No	No	Yes
23	GIWW to Clovelly Project	*	No	No	Yes
24	Little Lake Oil and Gas Project	*	No	No	Yes
25	<b>Salt Water Barrier or Lock in Houma Navigation Channel</b>	?	Yes	Yes	No
26	Avoca Island Lake Marsh Restoration Project	No	No	No	Yes
27	Avoca Island Project (TE-35/CW-5i)	No	No	No	Yes
28	<b>Empire Waterway and Belle Pass Project</b>	Yes	Yes	No	No
29	<b>Falgout Canal Demonstration Project (TE-17)</b>	Yes	Yes	No	No
30	Lake Salvador Shoreline Protection Demonstration Project	No	No	No	Yes
31	Barataria Bay Waterway Shore Protection (west side) Project	*	No	No	Yes
32	Floatant Marsh Fencing Demonstration Project (TE-31/XTE-54b)	No	No	No	Yes
33	<b>Lower Bayou LaCache Hydrologic Restoration Project (TE-19)</b>	Yes	Yes	No	No
34	<b>Timbalier Island Demonstration Planting Project (TE-18)</b>	Yes	Yes	No	No
35	Bonnet Carre Freshwater Diversion Project	No	No	No	Yes
36	Dayou Lafourche Siphon Diversion Project (BA-25/PBA-20)	No	No	No	Yes
37	Brady Canal Hydrologic Restoration Project (TE-28/PTE-26b)	No	Yes	No	Yes
38	Lake Chapeau Sediment Input and Hydrologic Restoration Project (TE-26/PTE-23/26a/33)	Yes	No	No	Yes
39	Point Au Fer Canal Plugs Project (TE-22/PTE-22/24)	Yes	No	No	Yes
40	Red Mud Demonstration Project (XTE-43)	*	No	No	Yes

*Public Health, Safety, and Welfare* - This criterion evaluated the potential for a given restoration project to negatively impact public health, safety, and welfare.

Eleven of the projects surviving the first tier screen were eliminated in the second tier screen because funding had already been secured for the project, or the project had already been implemented. These projects are: East Timbalier Island Sediment Restoration (Phase one and two); Isle Dernieres Planting Project (East Island, Trinity Island, and Whiskey Island); Wine Island Eastward Expansion Project; Whiskey Island Restoration Project; Lake Boudreaux Basin Freshwater Introduction and Hydrologic Management; Falgout Canal Demonstration Project; Timbalier Island Demonstration Planting Project; and West Belle Pass Headland Restoration Project. Another six projects were eliminated primarily based on project status either because the project has been deauthorized or there is no current intent to implement the project (Salt Water Barrier in Houma Navigation Canal; Empire Waterway and Belle Pass Project; Lower Bayou LaCache Hydrologic Restoration Project), or the project has not been developed beyond the conceptual stage (Poseiden Pipeline Mitigation Project; Lake Boudreaux Wetland Project; Bay Chalant Planting Project). As previously mentioned, the Raccoon Island Project remained under consideration, despite its status (conceptual stage), because of its special status as the most important rookery island for brown pelicans in Louisiana.

The Lake Barre Shoreline Armoring Project had a number of problems that caused it to be eliminated from further consideration. Although the experts consulted during the meeting on February 13, 1998 told the Trustees that such a project should reduce shoreline erosion, a very long barrier would have to be created in order to reduce erosion sufficiently to provide sufficient compensation for the injuries resulting from the incident. This would mean that the cost would be prohibitively high. There were also concerns expressed about the technical feasibility of construction of such a barrier in an area that is experiencing a high rate of subsidence. One of the major concerns was the potential impacts to oyster leases and subtidal benthic communities during the implementation of the project. Implementation of this project would require the use of deep draft barges in shallow water, probably requiring channels to be dredged to allow access. Given the concerns expressed to the Trustees at both public meetings conducted in 1997 about the potential impacts to oyster leases from implementing restoration in the area, as well as the other concerns identified above, this project was eliminated.

The Lake Pelto/Isles Dernieres New Cut Project was eliminated based on the estimated cost of the project (\$4-6 million). The benefits that would be derived from implementation of this project cannot justify this high expense, given the availability of other projects at significantly lower cost that would provide appropriate compensation to the public from the injuries to natural resources and services caused by the incident.

The Bayou Terrebonne Natural Levee Restoration Project was eliminated based on a number of concerns, but primarily on the cost. The first phase of the project is anticipated to cost \$7.9 million, and the second phase \$13.6 million. As with the Lake Pelto/Isles Dernieres New Cut Project, this is too costly to be a restoration alternative for this incident given the availability of other, more cost-effective projects that are sufficient to meet compensation needs.

Project Name	Project Status	Site Ownership	Technical Feasibility	Logistical Considerations	Cost Effectiveness	Avoids Additional Injury	Multiple Benefits	Social and Political Considerations	Public Health, Safety, and Welfare
Falgout Canal Demonstration Project (TE-17)	X								
Lower Bayou LaCache Hydrologic Restoration Project (TE-19)	X								
Timbalier Island Demonstration Planting Project (TE-18)	X								
Bay Chalard Planting Project	X								
West Belle Pass Headland Restoration Project (PTE-27)	X								

"X" denotes the project failed one or more criteria  
Projects remaining after this screening are in bold

**Exhibit 5-5  
Ranking of Preferred Restoration Alternatives**

Criterion	Upper Bayou LaCache Restoration Project	Raccoon Island Marsh Creation	Raccoon Island Segmented Breakwaters	Raccoon Island Stone Jetty/Groin	East Timbalier Island Planting Project
Site Location	+	+	+	+	-
Site Ownership	-	+	+	+	+
Similarity in Attributes to Injured Habitat	+	+	-	-	+
Project Stage	+	-	-	-	+
Project Timing	-	-	-	-	+
Recreational/Public Use Benefits	-	+	+	+	+

**Exhibit 5-6  
Explanation of Assigned Ranking**

Criterion	Explanation of Assigned Ranking	Project Given a "-" Ranking if:
Site Location	Project site within Terrebonne Parish	Project site outside of Terrebonne Parish
Site Ownership	Project implemented on public land or with appropriate conservation easements	Project located on private land without conservation easements arranged
Similarity in Attributes to Injured Habitat	Project will create or enhance brackish or salt marsh	Project is non-habitat based or will create other habitats
Project Stage	Detailed designs, studies, permitting, etc. have been completed	Project is in conceptual stage only; detailed designs or studies have not been completed
Project Timing	Project will not be subject to delays in implementation due to design issues, studies, permitting, landowner agreements, etc.	Project may be subject to delays in implementation due to design issues, studies, permitting, landowner agreements, etc.
Recreational/Public Use Benefits	Project will permit public access for recreational use opportunities	Project will not permit public access for recreational use opportunities

mangrove (*Avicennia germinans*) is also distributed across a large portion of the island (USDOC, 1993). In 1993, the total land area of East Timbalier Island was estimated as approximately 400 acres (GOTECH, 1998).

East Timbalier Island is part of a deteriorating barrier island system. The island is currently experiencing high rates of subsidence and shoreline erosion primarily due to an inadequate supply of sediments, high rates of relative sea level rise, and the impacts from periodic cold fronts, storms, and hurricanes (McBride and Byrnes, 1997). In 1992, Hurricane Andrew caused extensive breaching and erosion on East Timbalier Island resulting in a 25% decrease in the island's landmass. Breaching of the island and back levee was most extensive where the island was narrow or its width locally reduced as a result of bayside embayments. The recent extension of existing jetties at Belle Pass has also accelerated shoreline erosion by reducing the amount of new sediment supplied to East Timbalier. According to McBride et al. (1991), the island is currently experiencing average shoreline retreat rates of approximately 76 feet per year. The highest rates of loss are occurring in the island's central region (GOTECH, 1998).

Efforts to protect and restore East Timbalier Island have been ongoing since the mid-1960's and have included the construction of a bayside dirt levee, a gulfside rock revetment, and most recently, the creation of approximately 22 acres of smooth cordgrass marsh on dredge materials. A more detailed account of previous shoreline protection and restoration measures on the island is provided in GOTECH (1998). Without additional restoration efforts, however, it has been predicted that the island will disappear in as soon as three (Reed, 1995) to 25 (van Beek, 1993) years.

Current efforts by the National Oceanographic and Atmospheric Administration (NOAA) and the Louisiana Department of Natural Resources's Coastal Restoration Division to preserve the island are focused on creating approximately 250 acres of marsh and dune habitat as part of the East Timbalier Island Sediment Restoration Project. Dredge materials from Timbalier Bay will be placed in shallow water areas where the island was breached by Hurricane Andrew and where the island is narrow to increase its width (primarily in the central and eastern portion of the island). A rock revetment will be constructed on the gulfside where shoreline breakwaters have deteriorated, and dune habitat established northward of the revetment and gulf beach. The revetment and dunes will provide additional shoreline stabilization by reducing the frequency and magnitude of future washover events. Construction began on this project in April, 1999. It is projected that placement and consolidation of the dredge material will be completed in early September, 1999. CWPPRA has funds for placement of the spoil material and the construction of the rock revetment, but has no funding available for planting salt marsh vegetation. Planting of the marsh platform is conservatively anticipated to increase the lifespan of the project by over 33 percent.

The restoration project selected for the Lake Barre incident consists of planting salt marsh vegetation on the newly-deposited dredge materials on East Timbalier Island. Marsh vegetation (smooth cordgrass [*Spartina alterniflora*] and marshhay cordgrass [*Spartina patens*]) will be planted on 18.6 acres of the approximately 170-acre marsh platform. Plants will be installed in strips consisting of multiple rows. Strips will be oriented parallel to the shoreline and will be separated by unplanted areas. Strips will serve as a source of seed, as well as vegetative material (rhizomes) for colonization of unplanted areas within the marsh platform. The general planting

means that Texaco will be required to produce more marsh (through direct planting and vegetative spread) on the marsh platform on East Timbalier Island than they would have had to plant on a typical marsh creation project.

#### 5.4.2.3 Restoration Scaling Approach

The scaling approach used to determine the extent of resource restoration required as compensation for natural resource injuries is based on Habitat Equivalency Analysis (HEA). HEA begins with the injury assessment and an identification of the habitat-specific resource services that were lost due to the incident. A "debit" is specified for the lost services for each type of resource habitat. The debit equals the loss in service-acre-years from the injury to the habitat, as a result of the incident, in present-value terms. For each debit, the scale of a compensatory restoration project is determined by calculating the credit, per acre, that the restoration project will generate over its lifespan. This credit is the present value of the ecological services provided by the project. Then, the size of the compensating project is calculated so as to equate the total credit to the debit. Both the debit and per-acre credit are measured by service-acre-years, as discussed in Section 4.3.1.

This scaling procedure is summarized by the following equation:

$$\text{Debit} = (\text{Credit per acre from restoration project}) \times (\text{Acres of restoration project})$$

The first component is the debit for the injured resource services. The second component is the credit per acre from implementing the restoration project. The credit is based on a set of input parameters to the HEA model. Given the debit, and the credit per acre for restoration, it is a simple task to solve the equation for the acres of the restoration project needed to equal the debit.

##### 5.4.2.3.1 HEA Debit

The debit is composed of two parts. The first part corresponds to the reduction in the full set of marsh services from oiled marsh, including faunal support services. This part of the debit corresponds to the marsh injuries described in Chapter 4. The second part of the debit corresponds to the direct aquatic faunal and bird injuries described in Chapter 4, translated into marsh services, required to restore direct faunal losses. Indirect injuries to fauna due to losses in marsh services to fauna are included in the marsh debit. The debit and scale of restoration needed to compensate for these two injury categories have been determined separately.

Regarding the full marsh services, based on the marsh injury studies, as described in section 4.3.2, the marsh injury debit is 75.6 discounted service acre years (DSAYs).

The Trustees and Texaco did not agree on the faunal debit. Texaco offered four acres of marsh creation as compensation, and the Trustees independently confirmed that the faunal debit could be compensated for via four acres of marsh creation. Because the selected restoration project on East Timbalier Island is one of marsh enhancement rather than marsh creation, there is a need to translate the credit that would be generated by four acres of marsh creation into an amount of

The scaling model and the parameters used are discussed in detail in the technical scaling memorandum (Tomasi and Penn, 1999) that is available in the administrative record. Based on all the considerations discussed above, the required area to plant in strips to compensate for the faunal debit is 3.7 acres. The required area to compensate for the marsh debit is 14.9 acres. Therefore, the total area to be planted is 18.6 acres. The total area enhanced (either planted in strips or more rapidly colonized because of the strips) is computed as 58.0 acres.

#### 5.4.2.4 Probability of Success

Planting salt marsh vegetation on dredge materials is a feasible and proven technique with well-developed methodologies and well-documented results. This technique has been used successfully at a number of sites along the Gulf coast including Grand Isle, and Wine, Raccoon, and East Islands. For the East Timbalier Island Planting project to be successful, it is important that smooth cordgrass and marshhay cordgrass are planted within the appropriate elevational range. The optimal elevational range for each of these species will be determined by measuring the elevational range of healthy and robust populations of smooth cordgrass and marshhay cordgrass in existing natural marshes on the island.

Several additional measures will be taken to improve the likelihood of project success. Plants will be contract-grown in Louisiana by a Louisiana licensed nursery grower. Most of the specified plants will be container-grown (potted). Bare-root plugs will also be used. Container-grown plants have well-developed root systems that have superior drought resistance. Smooth cordgrass pots and plugs will be *Spartina alterniflora* cv. *Vermillion*, a cultivated variety that is resistant to infection by the fungus *Rhizoctonia solani*. *Rhizoctonia* infections are prevalent in native stands of smooth cordgrass along the Gulf coast. Pots and plugs will also be acclimated to the local climate and habitat conditions found on East Timbalier Island for at least 90 days prior to installation. Planting will not be conducted during stormy weather or prior to predicted storms to avoid plant loss.

After elevations on the marsh platform have been determined, based on the configuration of the completed platform following settling of the dredge material and the reworking of this material by winter storms, Texaco will submit a detailed planting design for Trustees approval. The Trustees will carefully monitor plant handling and installation to ensure that the guidelines are being followed. All plant materials will be inspected to ensure that they are healthy and vigorous and will be protected during mobilization from drying and physical damage. Planting will occur in spring through early summer (to be concluded by July 31) to allow growers adequate time to grow and harden the plants prior to planting. Container-grown plants will be treated with a slow-release fertilizer at the time of planting. Other measures are under consideration for inclusion in the project design to increase the likelihood of success, including dune planting or the installation of sediment fence along the dunes to prevent the smothering of marsh plants by wind-borne sand. Replanting may occur if a significant number of the plants die within the first 60-days.

#### **5.4.2.5.4**      *Corrective Actions*

In the event that the performance standards are not achieved at the 60-day or 3-year monitoring, or if the interim monitoring suggests unsatisfactory project progress, corrective actions may be implemented by Texaco. Corrective actions may include, but are not limited to, the following:

- Allowing additional time for site to develop (no action);
- Replanting/seeding same species in same area;
- Replanting/seeding same species in different areas;
- Replanting/seeding different species;
- Sand fencing or other stabilizing structures; and
- Applying additional fertilizer.

#### **5.4.2.5.5**      *Reporting*

Texaco will prepare and submit monitoring reports to the Trustees after the 60-day monitoring event and following each annual monitoring event. Monitoring reports will contain the results of all annual monitoring events that will be presented in a cumulative fashion. Following receipt of the monitoring reports and based on observations made in the field, the Trustees will coordinate with Texaco regarding the performance of the project, including any need to perform corrective actions.

#### **5.4.2.6**      **Environmental and Socioeconomic Impacts**

Planting marsh vegetation on East Timbalier Island is not expected to have any significant adverse environmental or economic impacts. Any impacts to existing habitats from project implementation are expected to be temporary. [Impacts to subtidal sediments by placement of dredge material are due to the CWPPRA project and not due to planting- but even these impacts were judged to be insignificant relative to the benefits of restoring the island (GOTECH, 1998)]. Plantings may be conducted during the bird nesting season only while maintaining a minimum distance of 100 meters from nesting wading birds and 200 meters from nesting seabirds. Typically only the latter are expected on East Timbalier Island. If any nest sites are found within the project area, they will be mapped and flagged prior to planting to limit disturbance. Four threatened and endangered bird species were identified in an Environmental Assessment of East Timbalier Island as occurring in the vicinity of the project area: piping plover, brown pelican, least tern, and bald eagle (GOTECH, 1998). None of these species are known to nest on East Timbalier Island and therefore should not be impacted by the project.



bird watching, hunting, and nature study. For these reasons, the Trustees have determined that, compared to all other potential restoration alternatives investigated, marsh enhancement at East Timbalier Island best fits the OPA restoration selection criteria. This alternative best addresses the injuries to marsh habitat, aquatic fauna, and birds from the Lake Barre incident and was therefore the preferred alternative identified in the Draft DARP/EA and the selected alternative in this Final DARP.

Another important benefit of marsh enhancement at East Timbalier Island is sediment stabilization. Planted vegetation will stabilize newly deposited dredge materials by binding sediments with an extensive system of roots and rhizomes, dampening wave and current velocities during overwash events, and increase sedimentation through trapping wind-borne sediments. Although East Timbalier Island will still be susceptible to subsidence, erosion, and the impacts of storms and hurricanes, stabilizing sediments by planting vegetation will prolong the life expectancy of the island. Protection and stabilization of barrier islands is of particular importance to the Lake Barre Trustees because of scientific concern over the deterioration of Louisiana's barrier islands and strong public support for barrier island restoration projects. In fact, barrier island restoration is a key component of Louisiana's coastal restoration program (van Heerden and DeRouen, 1997). Additionally, restoration and maintenance of the Timbalier and Isle Dernieres barrier island chains is a strategic goal of the Coast 2050 project (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority, 1998), a project that was developed with federal, state, and local agency, as well as community input.

The loss of Louisiana's barrier island system would have significant environmental and economic consequences. Barrier islands serve as the last defense for inland areas, protecting them against the destructive forces of hurricanes, storm surges, and saltwater intrusion (van Heerden and DeRouen, 1997). If the barrier island system were lost, inland bays and estuaries would be converted to less productive open water areas which would likely result in the diminishment of Louisiana's recreational and commercial fishing industries (GOTECH, 1998; van Heerden and DeRouen, 1997). Increased exposure of inland coastal areas to the physical influence of the open waters of the Gulf of Mexico would threaten navigational waterways, shipping routes, artificial levees, and other infrastructure (van Heerden and DeRouen, 1997).

The Lake Barre incident occurred in Terrebonne Parish, and the Trustees considered the benefits to Terrebonne Parish in all restoration alternatives considered. Although East Timbalier Island lies in Lafourche Parish, just east of the Terrebonne Parish boundary, it provides protection for inland marshes and coastal communities in the Terrebonne/Timbalier Bay system of both parishes. Over the past century, East Timbalier Island has endured several direct hits from hurricanes and tropical storms (GOTECH, 1998). East Timbalier Island also protects about 400 oil and gas wells (Miller, 1994) and numerous pipelines (GOTECH, 1998) in Timbalier Bay. These wells and pipelines were not designed to withstand open ocean conditions and exposure to these conditions would increase the risk of a major oil spill. Therefore, stabilization of the barrier islands will help reduce the chance of future oil spill incidents.

secured. Coordinating with landowners could cause delays in project implementation or possibly result in the cancellation of the project. In addition, it is difficult to establish the connection between the benefits of berm construction and the direct replacement of lost ecological services. This difficulty in establishing, and therefore quantifying, the benefits of this project would make it difficult for the Trustees to determine if the benefits would provide adequate compensation. Furthermore, because the site is privately owned and access is limited, there will likely be little or no direct recreational opportunities for the public.

Finally, Upper Bayou LaCache is an active marsh management project. The Tidewater District operates existing water control structures and pump stations in accordance with an approved Army Corps of Engineer's Operations and Maintenance Plan. The Trustees are concerned that site management goals may not necessarily coincide with NRDA restoration goals. For these reasons, the Upper Bayou LaCache project is not a preferred restoration alternative.

#### **5.4.4 Non-Preferred Alternative: Raccoon Island Restoration Projects**

##### **5.4.4.1 Site Description**

Raccoon Island is a 114-acre barrier island located in Caillou Bay in southwestern Terrebonne Parish. It is the western most island of the Isles Dernieres barrier island chain which extends from Raccoon Point to the west to Wine Island Pass to the east. Raccoon Island has been designated as part of the Terrebonne Barrier Islands Refuge along with Whiskey and Wine Islands. The island is owned by the State of Louisiana and managed by the LDWF. Raccoon Island is rapidly eroding. In 1992, Hurricane Andrew destroyed large portions of the island.

Restoration has been ongoing since the LDWF assumed management of the island in 1992. In 1993, dredged materials were used to plug breaches and create marsh and dune habitat. More recently, eight offshore, segmented breakwaters were installed along the eastern end of the island to reduce wave energy and trap longshore sediments. Three restoration projects are currently proposed for Raccoon Island: marsh creation, installation of additional breakwaters, and construction of a jetty.

##### **5.4.4.2 Salt Marsh Creation on Raccoon Island**

###### **5.4.4.2.1 *Project Description***

Salt marsh would be created using dredged materials from a borrow area north of the island in Caillou Bay. Dredge materials would be used to create either a series of elevated lobes extending from the northern shoreline into the bay or placed on top of and behind the sand spit on the western end of the island. Following placement and consolidation of materials, the area would be planted with both salt marsh vegetation and mangroves.

displacing the existing flora and fauna that depend on that type of habitat and replacing them with ones that rely upon a hard substrate. The environmental benefits of breakwaters include perching sites for birds, attachment sites for aquatic macroinvertebrates, and a source of cover and food for fish. In addition, by attracting fish, the breakwaters would provide increased recreational opportunities for local anglers.

#### **5.4.4.3.3      *Evaluation***

Extending breakwaters along the Gulf and/or bayside of Raccoon island will slow beach erosion by reducing wave energy and enhancing net sediment deposition, as well as protect the island during severe weather conditions. The existing breakwaters are used as sites for recreational fishing, and increasing the number of breakwaters would increase fishing opportunities for the public. Furthermore, there is strong public support for barrier island projects.

To date, however, the project has not advanced beyond the conceptual design stage. There have been no detailed engineering surveys to determine project feasibility. The success of the existing breakwater project is still being evaluated and the Trustees consider the use of breakwaters for habitat restoration to be too experimental at this point in time to justify its selection over the preferred alternative. Additional studies may cause delays in project implementation or reveal the project to be infeasible or not cost-effective. In addition, scaling this project to determine the appropriate number of breakwaters would be difficult. Although the breakwaters will protect existing beach, mangrove, and marsh habitats, it is difficult to establish the connection between the benefits of breakwater construction and the direct replacement of lost services. For these reasons, the Trustees have determined that breakwater construction is not a preferred project.

#### **5.4.4.4      *Jetty at Raccoon Island***

##### **5.4.4.4.1      *Project Description***

This project would construct a rock jetty at the western end of Raccoon Island at Raccoon Point. The jetty would extend 650-800 feet into the Gulf of Mexico. The purpose of the jetty would be to trap and retain sediments within the island system and build up the western end of the island. The jetty would be similar in design to the rock breakwaters, although oriented perpendicularly to the axis of the island rather than parallel.

##### **5.4.4.4.2      *Environmental and Socioeconomic Impacts***

Jetty construction would substantially alter the bottom characteristics of the offshore environment. The jetty most likely would be located on a sandy, featureless bottom, thereby displacing the existing flora and fauna that depend on that type of habitat and replacing them with ones that rely upon a hard substrate. The environmental benefits of a jetty include a perching site for birds, attachment sites for aquatic macroinvertebrates, and a source of cover and food for fish. In addition, by attracting fish, the jetty would provide increased recreational opportunities for local anglers.

this project from a broad range of general and site-specific alternatives that included marsh creation, enhancement, and protection alternatives.

The selected project will, in the judgment of the Trustees, provide more than sufficient compensation to make the public and the environment whole for injuries resulting from the Lake Barre incident. Although comments were received objecting to the project based solely on its location outside of Terrebonne Parish, as discussed in Section 2.4.1, there were no comments received that challenged the Trustees' evaluation of alternatives based on the screening criteria. The amount of planting to be implemented under this alternative was determined through calculations based solely on the benefits of the planting and subsequent vegetative spread on East Timbalier Island itself. This is sufficient to directly compensate for the injuries to marsh function, and loss of birds and aquatic fauna. No public comments were received that disputed the adequacy of the scale of the restoration project. Although the available information suggests that there was little lost recreational use associated with this incident there will be benefits to recreational fishing and wildlife viewing through the increased fish and bird populations that the newly created habitat will support. Therefore the chosen alternative will, in the judgment of the Trustees, provide adequate compensation for the limited public lost human use associated with this incident.

There are additional benefits to this project that are not considered in the calculation of how much planting is required. The longevity of East Timbalier Island will be increased through stabilization of the dredged material and the capture of sediments by the planting. This will, in turn, decrease the rate of loss of interior marsh in the Lake Barre area since storm surge and wave heights are reduced by the presence of barrier islands. It will also serve to protect coastal communities in Terrebonne Parish as well as the oil and gas infrastructure that are not designed for open gulf conditions. Considering these additional benefits for which Texaco has not received credit in the scaling calculations, the Trustees are confident that this restoration alternative provides more than sufficient compensation for injuries resulting from this incident.

Pulsipher, A., D. Tootle, and R. Pincomb, 1998. Economic and social consequences of the oil spill in Lake Barre, Louisiana. OCS Study MMS 998-00-\_\_\_. Prepared by the Center for Energy Studies, Louisiana State University, Baton Rouge, LA. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, La. 32 pp.

Reed, D.J., Ed. 1995. Status and historical trends of hydrologic modification, reduction in sediment availability, and habitat loss/modification in the Barataria and Terrebonne system. BTNEP Publ. No. 20, Barataria-Terrebonne National Estuary Program, Thibodeaux, Louisiana, 338 p. plus appendices.

Ritchie, W., K.A. Westphal, R.A. McBride, and S. Penland. 1995. Coastal sand dunes of Louisiana: the Bayou Lafourche barrier shoreline. Coastal Geology Technical Report No. 9. Louisiana State University, Louisiana Geological Survey and University of Aberdeen. 200 p.

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van Beek, J. L. 1993. Erosion and life expectancy of East Timbalier Island, Lafourche Parish, Louisiana. Prepared for Greenhill Petroleum Corporation. Prepared by Coastal Environments, Inc., Baton Rouge, Louisiana. 19 p.

van Beek, J. L., and K. Debusschere. 1994. Evaluation of Restoration Approaches for East Timbalier Island, Louisiana. Prepared for the National Marine Fisheries Service, the National Oceanic and Atmospheric Administration, and the U.S. Department of Commerce. Prepared by Coastal Environments, Inc., Baton Rouge, Louisiana. April, 1994.

van Heerden, I.L. and K DeRouen, Jr. 1997. Implementing a barrier island and barrier shoreline restoration program - the state of Louisiana's perspective. Journal of Coastal Research. 13(3): 679-685.

## Appendix A Administrative Record Index (through August 26, 1999)

Number	Date	Description of Contents
1	5-16-97	DEQ spill report
2	5-19-97	USCG POLREPS
3	5-19-97	Unified Command Center spill report
4	5-19-97	Spill notification to Governor Mike Foster
5	5-19-97	Notification of Closure of Molluscan Shellfish Waters
6	5-21-97	USCG POLREPS
7	5-23-97	Preliminary results from the Texaco Pipeline spill samples
8	5-30-97	USCG POLREPS
9	6-6-97	Biological sampling near oil spill site
10	6-9-97	LOSCO inviting Texaco to participate in cooperative NRDA assessment
11	6-19-97	Meeting with Entrix and ES <sup>2</sup> (for Texaco) and Trustees 6-17-97
12	6-20-97	Notice of Intent to Perform a NRDA
13	6-24-97	1) Tri-State Bird Rescue and Research, Inc., Final Bird Species List 2) Estimated Bird Mortalities/Oilings 3) Tri-State Bird Rescue and Research, Inc., Final Report
14	7-10-97	Lake Barre oil spill public meeting-report
15	7-11-97	July 1 meeting with FINA representatives
16	7-23-97	Follow-up of requests from 6-14-97 meeting
17	8-97	Texaco agreeing to fund NRDA preassessment phase costs
18	8-15-97	NOAA "HOTLINE" chronological spill reports of incident
19	10-24-97	Publishing of a notice of public meeting in Houma Courier
20	10-22-98	Marsh Assessment Study Plan Eugene Island Pipeline Incident
21	10-22-98	Data Summary Section for Inclusion in Pre-Assessment Screen Report
22	2-12-98	Notes on L. Barre Coordination Meeting of 2-12-98
23	5-18-98	Notification of Property Access
24	6-24-98	Draft Marsh Injury Assessment Workbook
25	6-9-97	Summary of CAG meeting
	6-24,25-97	Summary of CAG meeting and activities
	9-21-97	Summary of CAG meeting and activities
	11-10,11-97	Summary of CAG meetings
	12-8-97	Summary of conference call
	2-19-98	Correction of summary CAG meeting
	4-24-98	Summary of conference call
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	7 28,29-98	Summary of CAG meetings
	9-3-98	Summary of conference call
	11-5-98	Summary of CAG meeting
	1-20-99	Summary of CAG meeting
	4-19,20-99	Summary of CAG meeting
	4-29-99	Summary of conference call

	7-2-99	Letter from Michael Robichaux (Louisiana State Senator) to Jack Caldwell (Secretary of DNR)
	7-2-99	Letter from Judith Gibson (Tidelands Seafood Co. Inc.) to Roland Guidry (LOSCO)
	7-7-99	Letter from John Siracusa (Louisiana State Senator) to Jack Caldwell (Secretary of DNR)
	7-12-99	Letter from Sam Hamilton (DOI/USFWS) to John Kern (NOAA)
	7-21-99	Letter from Ray B. Boudreaux, Jr. (Terrebonne Parish Council Chairman) to Warren P. Lorentz (LOSCO)
	7-23-99	Letter from Judith Gibson (Tidelands Seafood Co. Inc.) to Warren P. Lorentz (LOSCO)
	7-23-99	5 response letters from Jack Caldwell (Secretary of DNR) to Paul Labat (Terrebonne Parish Council Clerk), Michael Robichaux (Louisiana State Senator), Hunt Downer (Speaker of the House of Representatives), John Siracusa (Louisiana State Senator), and Reggie Dupre Jr. (Louisiana State Representative)
	7-28-99	Letter from Matthew B. Sevier (TPCG CZM Manager) to Oil Spill Coordinator
	7-28-99	Letter from Barry P. Bonvillain (Terrebonne Parish President) to Warren P. Lorentz (LOSCO)
	8-13-99	Letter from Gary Harmon (ENTRIX) to Warren P. Lorentz (LOSCO)
	8-16-99	Response letter from Terry Ryder (Governor Mike Foster's Deputy Chief of Staff) to Paul Labat (Terrebonne Parish Council Clerk). Attachment: Letter from Dr. Karolien Debusschere (LOSCO) to Governor Mike Foster
49	7-9-99	Meeting minutes from 6-21-99 Terrebonne Parish Council meeting
50	8-26-97	Entrix list of Action Items from 8-21-97 CAG meeting to LOSCO
51	8-12-98	Preliminary list of Restoration options, screening criteria
52	8-24-98	Proposed HEA debit curves for marsh injury
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**Additional Material**

<u>Letter</u>	<u>Date</u>	<u>Description of Contents</u>
A	5-17-23-97	Color Oblique Aerial Photographs
B	10-2-97	Color Infrared Aerial Photography of Lake Barre Spill
C	5-10-98	Color Infrared Aerial Photography of Lake Barre Spill
D	4-26-99	Literature Review
E	7-22,24-97	Field Efforts filmed by Entrix (VCR tape)
F	10-7,8-97	Field Efforts filmed by Entrix (VCR tape)
G	6-97-10-98	John Kern's (NOAA) Field Log Book
	5-97-10-98	John Kern's (NOAA) Photographs and Photolog

vests the Corps with authority to regulate discharges of fill and other materials into such waters. Restoration actions that require Section 404 Clean Water Act permits are likely also to require permits under Section 10 of the Rivers and Harbors Act. However, a single permit usually serves for both. Therefore, the Trustees can ensure compliance with the Rivers and Harbors Act through the same mechanism.

#### **Coastal Zone Management Act (CZMA), 16 USC 1451, *et seq.*, 15 CFR 923**

The goal of the CZMA is to preserve, protect, develop and, where possible, restore and enhance the nation's coastal resources. The federal government provides grants to states with federally-approved coastal management programs. Section 1456 of the CZMA requires that any federal action inside or outside of the coastal zone that affects any land or water use or natural resources of the coastal zone shall be consistent, to the maximum extent practicable, with the enforceable policies of approved state management programs. It states that no federal license or permit may be granted without giving the state the opportunity to concur that the project is consistent with the state's coastal policies. The regulations outline the consistency procedures. The selected restoration project will be consistent with the Louisiana CZMA program.

#### **Endangered Species Act (ESA), 16 USC 1531, *et seq.*, 50 CFR Parts 17, 222, 224**

The ESA directs all federal agencies to conserve endangered and threatened species and their habitats and encourages such agencies to utilize their authorities to further these purposes. Under the Act, the Department of Commerce through NOAA and the Department of the Interior through the US&FWS publish lists of endangered and threatened species. Section 7 of the Act requires that federal agencies consult with these departments to minimize the effects of federal actions on endangered and threatened species. The selected restoration project is expected to have no adverse impacts on threatened or endangered species and is expected to develop habitat enhancements beneficial to supporting ecosystems for threatened and endangered species, including, but not limited to brown pelicans and piping plovers. Consultation has been completed for the CWPPRA East Timbalier Island Restoration Project (GOTECH, 1998).

#### **Fish and Wildlife Conservation Act, 16 USC 2901, *et seq.***

The selected restoration project will encourage the conservation of non-game fish and wildlife.

#### **Fish and Wildlife Coordination Act (FWCA), 16 USC 661, *et seq.***

The FWCA requires that federal agencies consult with the U.S. Fish and Wildlife Services, the National Marine Fisheries Service, and state wildlife agencies for activities that affect, control, or modify waters of any stream or bodies of water, in order to minimize the adverse impacts of such actions on fish and wildlife resources and habitat. This consultation is generally incorporated into



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

**Executive Order Number 11514 (34 FR 8693) - Protection and Enhancement of Environmental Quality**

An Environmental Assessment has been prepared and environmental coordination is taking place as required by NEPA.

**Executive Order Number 11990 (42 FR 26961) - Protection of Wetlands**

The selected restoration project will help ensure the protection of wetlands and the services they provide.

**Executive Order Number 12962 (60 FR 30769) - Recreational Fisheries**

The selected restoration project will help ensure the protection of recreational fisheries and the services they provide.