

DRAFT

**DAMAGE ASSESSMENT AND RESTORATION PLAN AND
ENVIRONMENTAL ASSESSMENT FOR THE POINT
COMFORT/LAVACA BAY NPL SITE RECREATIONAL FISHING
SERVICE LOSSES**

PREPARED BY

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LIST OF ACRONYMS

AOC – Administrative Order on Consent
CEQ – Council on Environmental Quality
CERCLA – Comprehensive Environmental Response, Compensation and Liability Act
C.F.R. – Code of Federal Regulations
CMP – Coastal Management Program
CWA – Clean Water Act (also known as the Federal Water Pollution Control Act)
DARP/EA – Damage Assessment and Restoration Plan/Environmental Assessment
DOI – Department of the Interior
EPA – Environmental Protection Agency
TGLO – Texas General Land Office
MOA – Memorandum of Agreement
NCP – National Oil and Hazardous Substances Pollution Contingency Plan
NEPA – National Environmental Policy Act
NOAA – National Oceanic and Atmospheric Administration
NPL – National Priorities List
NRDA – Natural Resource Damage Assessment
PCO – Point Comfort Operations
RI/FS – Remedial Investigation/ Feasibility Study
RWC – Reasonable Worst Case
TDH – Texas Department of Health
TNRCC – Texas Natural Resource Conservation Commission
TPWD – Texas Parks and Wildlife Department
USFWS – United States Fish and Wildlife Service

INTRODUCTION AND SUMMARY

CHAPTER 1

This Draft Damage Assessment and Restoration Plan and Environmental Assessment (Draft DARP/EA) has been prepared by state and federal natural resource trustees to address recreational fishing services affected by releases of hazardous substances from the Alcoa Point Comfort/Lavaca Bay NPL Site ('Lavaca Bay Site' or 'Site'). The designated natural resource trustee agencies involved in the development of this document are the Texas Natural Resource Conservation Commission, the Texas General Land Office, the Texas Parks and Wildlife Department, the National Oceanic and Atmospheric Administration of the U.S. Department of Commerce, and the U.S. Fish and Wildlife Service on behalf of the U.S. Department of the Interior (collectively, 'the Trustees').

This Draft DARP/EA is intended to inform members of the public and to solicit their comments on the Trustees' assessment of recreational fishing service losses attributable to this Site and on the restoration actions which the Trustees are proposing be used to compensate for those losses. Comments received by the Trustees during the public comment period will be considered by the Trustees prior to finalizing the DARP/EA for recreational fishing service losses. A summary of comments received and the agencies' responses thereto will be included in the final DARP/EA for recreational fishing service losses. This Draft DARP/EA also serves as an Environmental Assessment pursuant to the National Environmental Policy Act (NEPA), 42 U.S.C. 4321 et seq., and regulations guiding its implementation at 40 C.F.R. Part 1500. Accordingly, this document addresses the purpose and need for the proposed restoration actions, the restoration alternatives considered, and the potential impact of restoration actions on the quality of the physical, biological, and cultural environment.

The restoration actions proposed herein are based on conceptual plans, not plans with full design details or implementation costs determined. Full design and costing of restoration actions will occur only after consideration of public comments on the restoration actions proposed and will be focused on the actions selected for implementation in the final DARP/EA. Public input at this stage, however, is essential to the selection of appropriate restoration actions to compensate for the recreational fishing service losses.

1.1 OVERVIEW OF THE SITE

Alcoa began operations at its Point Comfort, Texas facility (PCO) in 1948 on 3,000 acres of land on the eastern shore of Lavaca Bay. Between 1948 and the present, Alcoa has constructed and operated several types of manufacturing processes at this location, including alumina refining, aluminum smelting, carbon paste and briquette manufacturing, gas processing, and chlor-alkali processing.

The Site was added to the National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), on March 25,

1994 (59 Federal Register 8794, February 23, 1994). The listing was primarily based on levels of mercury found in several species of finfish and crabs in Lavaca Bay, a fisheries closure imposed by the Texas Department of Health (TDH) in 1988 due to mercury levels found in fish, and levels of mercury detected in bay sediments adjacent to the facility (Texas Department of Health, 1998). Alcoa, the State of Texas and the U.S. Environmental Protection Agency (EPA) signed an Administrative Order on Consent (AOC) under CERCLA in March 1994 for the conduct of a remedial investigation and feasibility study (RI/FS) for the Site.

The Trustees are responsible for evaluating potential injuries to natural resources and resource service losses resulting from releases of hazardous substances at the Site pursuant to Section 107(f) of CERCLA, the Federal Water Pollution Control Act, 33 U.S.C. Section 1251 et seq., (also known as the Clean Water Act or CWA) and other applicable Federal or State law, including Subpart G of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Sections 300.600 - 300.615, and regulations at 43 C.F.R. Part 11 which are applicable to natural resource damage assessments (NRDA) under CERCLA. The cost of actions appropriate to restore, replace or acquire resources or resource services equivalent to those lost is a primary basis for compensating the public for injuries to natural resources under these authorities.

The Trustees and Alcoa entered into a Memorandum of Agreement (MOA), effective January 14, 1997, which has allowed the evaluation of potential natural resource injuries and service losses attributable to the Site and restoration planning to address those losses to proceed on a focused and expedited basis. The goal of this process is to allow restoration actions, which will make the environment and public whole for resource injuries or losses that have occurred, to be identified and implemented in an expeditious and cost-effective manner.

1.2 STAGED APPROACH TO RESTORATION PLANNING

The Trustees have adopted a staged approach to restoration planning for this Site, consistent with 43 C.F.R. 11.32(a)(1)(iii). A staged approach allows restoration decisions for particular injury or loss categories to be made as soon as that injury or loss category can be quantified, based on available remedial and assessment information. This approach will allow the Trustees to seek implementation of restoration actions as quickly as possible following the quantification of specific resource injuries and/or service losses. Any resource injuries or losses that are dependent upon or residual to the choice of final remedy can be addressed in a final stage damage assessment and restoration plan. The staged approach may facilitate early implementation of many restoration actions. Where restoration actions can be expedited, restoration services (and public compensation credit) will begin to flow upon implementation, even before completion of the remedial process.

Consistent with this staged approach to restoration planning, the Trustees are focusing in this first Draft DARP/EA on the recreational fishing services affected by releases of hazardous substances attributable to the Lavaca Bay Site. The fisheries

closure imposed by TDH in 1988 due to mercury levels found in fish adversely affects recreational fishing near the PCO facility. To address recreational fishing service losses due to the closure, the Trustees have considered restoration actions that would increase or enhance recreational fishing opportunities in Lavaca Bay. The Trustees' assessment of recreational fishing service losses is described in Chapter 4. The restoration alternatives evaluated and the restoration actions preferred for use to compensate for those losses are presented in Chapter 5.

The Trustees will focus on ecological services lost or affected by releases at the Site and known impacts from early or planned remedial actions in the next Draft DARP/EA and, if necessary, develop a third and last Draft DARP/EA to address any injuries or service losses that result from future remedial actions selected for the Site.

1.3 RESTORATION UNDER CERCLA

In general, restoration actions for natural resource injuries and service losses under CERCLA can be termed as primary or compensatory restoration. Primary restoration is any action taken to enhance the return of injured natural resources and services to their baseline condition, i.e., the condition or level that would have existed had the release not occurred. Compensatory restoration actions compensate for resource injuries and service losses during the interim period, which is the period from the date of injury or loss until recovery to the baseline condition. The scale of restoration actions required to compensate for these interim losses will depend both on the extent and severity of the resource injuries and how quickly each resource and its services return to baseline.

In contrast, removal and remediation actions (termed 'response actions') are conducted by EPA or State response agencies and focus on controlling exposure to released hazardous substances, by removing, neutralizing or isolating them in order to protect human health and the environment from the threat of harm. Although response actions can reduce the need for restoration, the two types of actions are separate and distinct. 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, where remedial actions are sufficient to allow for the recovery of injured resources or where recovery can otherwise be expected to occur within a reasonable period of time without human intervention.

With respect to recreational fishing service losses in Lavaca Bay, it is only necessary for the Trustees to consider compensatory restoration. The baseline condition is represented by the recreational fishing use or access that would exist in the absence of the closure. Because the removal of the closure order is an objective of the remedial process, the Trustees expect actions undertaken within the remedial process will provide for the return of recreational fishing in Lavaca Bay to baseline service levels. Under these circumstances, further consideration of primary restoration alternatives for recreational fishing is not warranted. Therefore, in this Draft DARP/EA, the Trustees have focused

on restoration alternatives that will enhance recreational fishing opportunities in Lavaca Bay in order to compensate for the interim losses extending from 1988 (the initiation of the closure) until the date the closure is lifted, which is expected by 2010.

1.4 PLAN OF THIS DOCUMENT

The remainder of this document presents further information about the natural resource damage assessment underway with respect to recreational fishing services in Lavaca Bay and the restoration actions which the Trustees are proposing for use to compensate for recreational fishing service losses resulting from the closure.

- Chapter 2 briefly summarizes history of Site releases, the legal authorities and regulatory requirements of the Trustees, and the role of both Alcoa, the Responsible Party (RP), and the public in the damage assessment and restoration process.
- Chapter 3 describes the physical, biological, and cultural environment relevant to recreational fishing in Lavaca Bay, in accordance with NEPA (42 U.S.C. Section 4321, et seq.).
- Chapter 4 describes the method being used by the Trustees to assess recreational fishing service losses and the results of that assessment.
- Chapter 5 evaluates restoration options and identifies the restoration alternatives preferred for use to address the recreational fishing service losses outlined in Chapter 4.
- Appendix A is a list of the documents in the Administrative Record for the recreational fishing loss assessment as of the date of this Draft DARP/EA.
- Appendices B, C, D, E, F and G contain information related to the quantification of recreational fishing service losses and benefits.

1.5 LITERATURE CITED

Texas Department of Health. 1998. Fish advisories and bans, 1997. Texas Department of Health, Seafood Safety Division, Austin, Texas. 21 p.

PURPOSE OF AND NEED FOR RESTORATION

CHAPTER 2

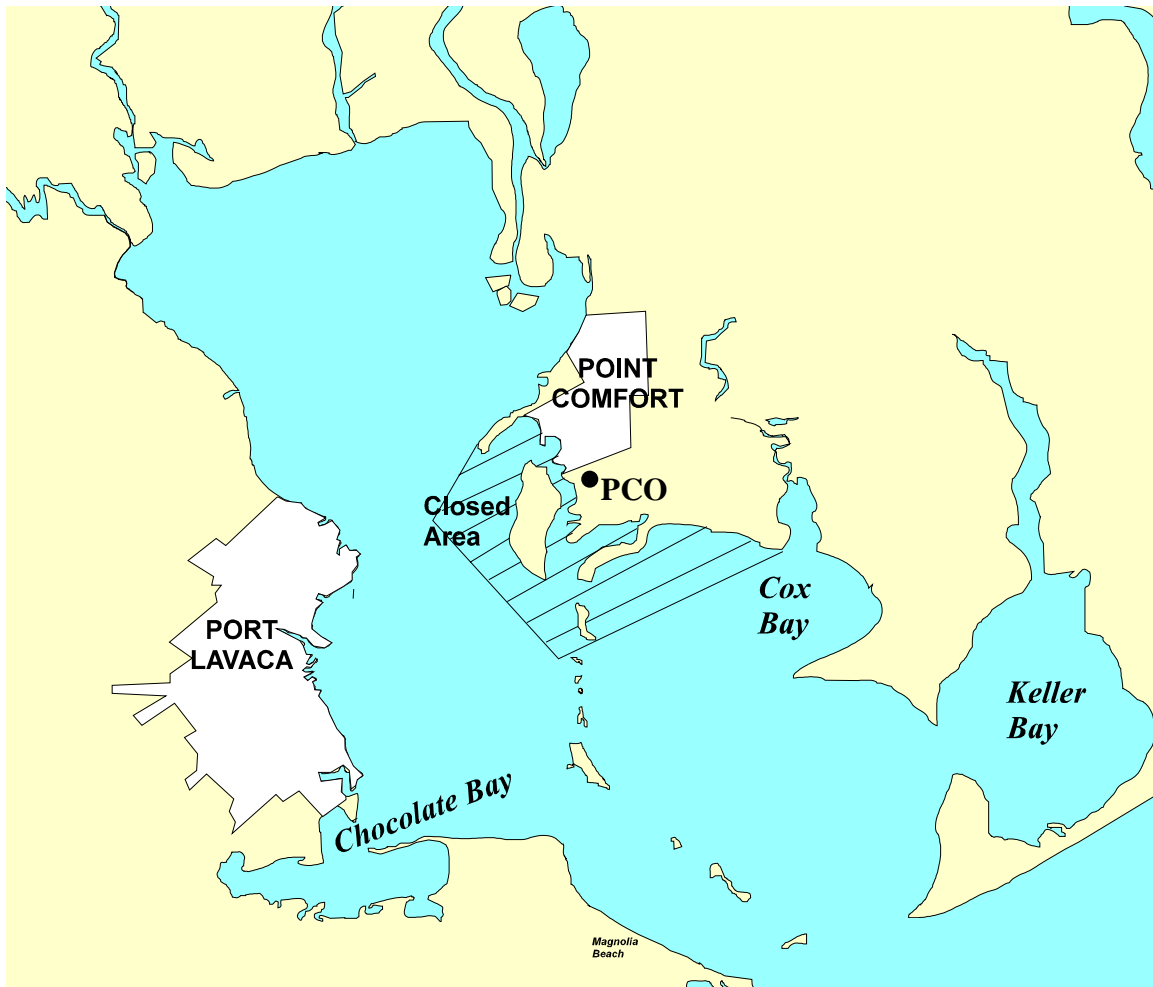
2.1 THE ALCOA POINT COMFORT/LAVACA BAY NPL SITE - SUMMARY OF RELEASE HISTORY

The Site is located in Point Comfort, Calhoun County, Texas and encompasses releases from Alcoa's PCO. The PCO facility has been in continuous service since 1948. The PCO began operation as an aluminum smelter. The smelting operation utilized alumina as the raw material and produced aluminum metal through an electrolytic process. Smelter construction began in 1948 and the unit operated until 1980. The alumina refining operation began in 1959 and continues to operate today. The alumina refining operation utilizes bauxite ore to produce alumina. Since the construction of the initial plotlines for the aluminum smelting plant, PCO has developed into an integrated complex of operations that currently include bauxite refining, an aluminum fluoride plant, and a carbon paste plant. Past operations conducted at the facility that have been dismantled and removed include the aluminum smelter, a cryolite plant, and a chlor-alkali processing unit.

The PCO facility currently comprises approximately 3,500 acres and is located adjacent to Lavaca Bay on the west and Cox Creek/Cox Lake on the east. The Dredge Island is an island in Lavaca Bay, west of the facility buildings, that is approximately 375 acres. It has been historically used for the disposal of dredge material, gypsum, and waste water from the chlor-alkali processing unit.

From 1966 to 1970, the PCO facility discharged mercury-containing wastewater into Lavaca Bay from its chlor-alkali processing operations. Alcoa terminated the direct discharge of this wastewater into the bay in 1970 after the Texas Water Quality Board notified Alcoa of potential adverse environmental impacts associated with this discharge. In April 1988, the TDH issued a 'closure order' prohibiting the taking of finfish and crabs for consumption from a specific area of Lavaca Bay due to elevated mercury concentrations found in these species. This 'closed' area is shown in Figure 2-1. The Site was placed on the CERCLA's National Priority List in 1994. The listing was primarily based on levels of mercury found in several species of finfish and crabs in Lavaca Bay, the fisheries closure imposed by TDH in 1988, and levels of mercury detected in bay sediments in areas of the bay adjacent to the PCO facility. Alcoa, the State of Texas and the U.S. Environmental Protection Agency (EPA) signed an Administrative Order on Consent (AOC) under CERCLA in March 1994 for the conduct of a remedial investigation and feasibility study (RI/FS) for the Site. The remedial investigation undertaken for the Site demonstrated an ongoing release of mercury-contaminated groundwater from PCO into Lavaca Bay.

Figure 2.1 – Lavaca Bay



2.2 AUTHORITY AND LEGAL REQUIREMENTS

This Draft DARP/EA has been prepared jointly by the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce, the Texas Natural Resource Conservation Commission (TNRCC), the Texas General Land Office (TGLO), the Texas Parks and Wildlife Department (TPWD), and the U.S. Fish and Wildlife Service (USFWS) on behalf of the U.S. Department of the Interior (DOI) (collectively, 'the Trustees'). Each of these agencies is a designated natural resource trustee under Section 107(f) of CERCLA, Section 311 of the CWA, 33 U.S.C. Section 1321 and other applicable Federal or State law, including Subpart G of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Sections 300.600 - 300.615. As a designated Trustee, each agency is authorized to act on behalf of the public to assess and recover natural resource damages where natural resources and

resource services are injured, lost or destroyed as a result of releases of hazardous substances covered by CERCLA or the CWA.

2.2.1 Overview of CERCLA Assessment Procedures

Damages recovered by Trustees for natural resource injuries or service losses due to hazardous substances releases must be used to restore, replace or acquire natural resources or services equivalent to those lost. 42 U.S.C. 9607(f)(1). The costs of actions appropriate to restore, replace or acquire such resources or resource services (hereafter collectively referred to as ‘restoration’) are a preferred measure of natural resource damages under CERCLA and the CWA. CERCLA Section 107 indicates, however, that the measure of damages is not limited to the sums which can be used to restore or replace injured resources or services. 42 U.S.C. 9607(f)(1).

The DOI has developed regulations providing procedures for assessing natural resource damages under CERCLA and the CWA. These procedures are found at 43 C.F.R. Part 11 (1995), as amended (61 Fed. Reg. 20609, May 7, 1996) (hereafter, ‘the DOI regulations’). These regulations recognize ‘damages’ are to be based on the cost to restore injured resources, including interim lost resource services. Consistent with CERCLA Section 107, however, the DOI regulations also allow, at the discretion of the Trustees, ‘damages’ to include, for all or a portion of the interim service losses, the value (in monetary terms) of the loss to the public. 43 C.F.R. 11.80. Monetary values need not be determined where information and methods can be applied to identify and scale restoration actions directly.

The DOI regulations outline a phased approach¹ to the assessment of natural resource damages. Under the phased approach, the Trustees make an early determination, based on available information, as to whether natural resources have been or are likely to be injured by releases of hazardous substances, and whether such actual or potential injuries are sufficient to warrant an assessment of damages. Information considered by the Trustees at this early stage may include information collected during remedial investigations, existing injury studies, and other relevant studies or bodies of scientific work. The Trustees also consider the extent to which response actions will remedy present or future injuries to natural resources. Upon determining the appropriateness of further assessment action, the Trustees then proceed with actions to establish and quantify those injuries during the Assessment Plan phase. This phase focuses on planning and implementing methods for determining the nature and extent of any injuries to natural resources, including their baseline condition, recovery period, and any reduction in service levels pending recovery to baseline conditions. The Damage Determination phase is used to establish the appropriate compensation for the natural resource injuries identified and measured pursuant to the Assessment Plan. This phase contemplates development of a Restoration and Compensation Determination Plan as a basis for

¹ Different from the ‘staged’ approach for this case, which refers to the timing that the separate injury assessments are described and made public in damage assessment and restoration plans (see Section 1.2 for a description of the ‘staged’ approach in this case).

determining the amount of money to be sought from the potentially responsible party(s) as compensation for the assessed resource injuries and service losses. Damages determined in accordance with the final plan are presented to the potentially responsible party for payment at the conclusion of the assessment process. 43 C.F.R. 11.91. If not paid, they may be sought in litigation.

Under the expedited NRDA process underway in cooperation with Alcoa, the Trustees determined it to be preferable to use an assessment approach that directly facilitates the identification and scaling of restoration actions for all natural resource injuries and service losses. Where injury assessment and restoration planning components occur in parallel, assessment methods can be used which support the scaling or identification of restoration actions directly, rather than seeking to assess the dollar value of the service losses to the public. In this way, projects capable of restoring injured resources or lost services can be identified earlier in the assessment process. Further, in a cooperative assessment, this expedites the opportunity for restoration to occur as restoration actions selected by the Trustees can be implemented by the Responsible Party, under Trustee oversight. In addition to expediting the restoration of injured natural resources or services, this early focus on restoration planning can substantially reduce transaction costs. This restoration-based assessment approach is consistent with DOI regulations, which allows restoration planning to be included as part of the Assessment Plan phase where available data are sufficient to support their concurrent development. 43 C.F.R. 11.31.

Consistent with this expedited NRDA approach, this Draft DARP/EA describes both the injury assessment and proposed restoration plan for recreational fishing service losses. The goal of the injury assessment is to determine the effect of the 1988 closure on recreational fishing in Lavaca Bay, thus providing a factual basis for evaluating the need for, type of, and scale of restoration actions, including the extent to which considered restoration alternatives would provide recreational fishing service benefits comparable to assessed losses. The document incorporates and presents the plan for restoring recreational fishing services developed by the Trustees. It identifies and evaluates a reasonable range of restoration alternatives, identifies the preferred alternatives, and presents the proposed plan to the public for review and comment. The Trustees anticipate the proposed restoration actions will fully compensate for recreational fishing service losses due to the present closure, pending the anticipated recovery of this system and removal of the closure.

2.2.2 NEPA Compliance

To comply with NEPA and its implementing regulations, this Draft DARP/EA describes the purpose and need for action (Chapter 2), summarizes the current environmental setting (Chapter 3), identifies alternative restoration actions and assesses their applicability and environmental consequences (Chapter 5), and summarizes opportunities for public participation in the decision process (Section 2.4).

NOAA and DOI have reviewed this Draft DARP/EA for consistency with NEPA requirements, and the impact of the proposed restoration actions on the quality of the human environment. This review is contained in Chapter 7 of this Draft DARP/EA.

2.3 COORDINATION WITH RESPONSIBLE PARTIES

The DOI regulations require the Trustees to invite Responsible Parties to participate in the natural resource damage assessment process. 43 C.F.R. 11.32(a)(2)(iii). An RP may contribute to an assessment in many ways, however, the nature and extent of such participation is subject to substantial agency discretion and final authority to make determinations regarding injury and restoration rests solely with the Trustees. Coordination between the Trustees and the Responsible Parties can help avoid duplication of studies, increase the cost-effectiveness of the assessment process, facilitate the sharing of information and expertise, and decrease the likelihood of litigation. Input from the Responsible Parties is sought and considered, when provided, throughout the damage assessment process.

The Trustees' expedited assessment and restoration planning process for this Site has been aided and supported by Alcoa, pursuant to the cooperative planning process outlined in the January 1997 Trustees/ Alcoa MOA. The recreational fishing service losses assessed in this Draft DARP/EA, including the restoration plan outlined herein, are the product of this cooperative assessment process. Alcoa has committed to directly implementing restoration actions identified by the Trustees through this cooperative approach.

2.4 PUBLIC PARTICIPATION

2.4.1 Review of Draft Assessment and Restoration Plan

Public review of the Draft DARP/EA is an integral component of the assessment and restoration planning process. Through the public review process, the Trustees seek public comment on the analyses used to define and quantify natural resource injuries and service losses and the methods proposed to restore injured natural resources or replace lost resource services. This Draft DARP/EA provides the public with current information about the assessment of recreational fishing service losses and the restoration actions proposed to address those losses.

This Draft DARP/EA will be available to the public for a 30-day comment period. Comments received during the public comment period will be considered by the Trustees prior to finalizing the DARP/EA for recreational fishing service losses. A summary of comments received and the Trustees' responses thereto will be included in the final DARP/EA. Public review of the Draft DARP/EA is consistent with all state and federal laws and regulations that apply to the natural resource damage assessment process, including the DOI regulations, NEPA, and the regulations implementing NEPA at 40 C.F.R. Part 1500, et seq.

The deadline for submitting written comments on the Draft DARP/EA will be specified in one or more public notices issued by the Trustees to announce the document's availability for public review and comment. Additional opportunities for public review will be provided in the event that significant changes to the plan are required. Comments on this Draft DARP/EA should be submitted in writing to:

Tony Penn
NOAA, Damage Assessment Center
N/ORR33, SSMC4, Rm. 10218
1305 East West Highway
Silver Spring MD 20910
e-mail: tony.penn@noaa.gov

2.4.2 Availability of Administrative Record

The Trustees have maintained records documenting actions taken and information considered in developing the assessment of recreational fishing service losses and restoration plan outlined in this Draft DARP/EA. These records are compiled in an administrative record, which is available for public review at the addresses listed below. The administrative record facilitates public participation in the assessment process and is available for use in future administrative or judicial review of Trustee actions, to the extent permitted by federal or state law. A list of documents included in the administrative record to date for this Draft DARP/EA is provided in Appendix A. Additional information and documents will be included in the administrative record when completed or available, including any public comments received on this Draft DARP/EA, any additional Draft DARP/EAs that may be submitted for public review, the Final DARP/EA, and any further restoration planning documents.

Documents within the administrative record can be viewed in the offices of:

Richard Seiler
Texas Natural Resource Conservation Commission, MC142
12100 Park 35 Circle
Building D, Room 246
Austin, TX 78753
Tel. (512) 239-2523

Gladys Hunt – MFG, Inc.
Alcoa Information Center
320 E. Main
Port Lavaca, TX 77979
Tel. (361) 552-8839

Arrangements must be made in advance to review the record, or to obtain copies of documents in the record, by contacting the listed persons by letter or telephone.

AFFECTED ENVIRONMENT**CHAPTER 3**

This chapter describes the physical, biological, and cultural environment relevant to recreational fishing in Lavaca Bay, in accordance with NEPA. 40 U.S.C. 4321 et seq. Basic information on the Lavaca-Matagorda Bay system may be found in publications by Armstrong (1987), Ward and Armstrong (1980), and Weixelman and Dailey (1997). Unless otherwise noted, these publications are sources for much of the information presented in the following sections.

3.1 PHYSICAL ENVIRONMENT

Lavaca Bay is located in the Coastal Prairies province of the Gulf Coast Plain physiographic region in North America. Climate in the region is humid subtropical with hot summers. Annual precipitation in the vicinity of the Site is approximately 106 cm or 42 inches. The prevailing wind direction is southeast.

Lavaca Bay is part of the larger Matagorda Bay system, which also includes Carancahua, Turtle, and Tres Palacios Bays. The Lavaca Bay system consists of Lavaca Bay and several smaller bays such as Cox, Keller, and Chocolate Bays (see Figure 2-1). Located in Calhoun and Jackson Counties, the Lavaca Bay system covers an area of 155 square kilometers or 60 square miles (approximately 16,200 hectares or 40,000 acres). It is a shallow bay, with an average depth of 1.2 meters or 4 feet. The combination of wind-induced surface waves and fine sediment creates a high level of turbidity.

Lavaca Bay contains a variety of habitats including intertidal mudflat, fringe marsh, high marsh, oyster reef, and open water, which support a large array of plant and animal species. Submerged vegetation is generally absent from Lavaca Bay, but shoalgrass (*Halodule wrightii*) and wigeongrass (*Ruppia maritima*) have been found on the southern shoreline of Keller Bay (Adair et al., 1994). Important habitats for many species include perimeter salt marshes, oyster beds, and freshwater marshes found in upper Lavaca Bay, Cox Bay, and Chocolate Bay. Smooth cordgrass (*Spartina alterniflora*) is prevalent around the northern section of the Dredge Island and along parts of the shoreline in proximity to Alcoa. It also occurs in mixed stands with other marsh grasses in upper Lavaca Bay near the mouth of the Lavaca River, and in portions of Cox Cove and Keller Bay. Marsh-hay cordgrass (*Spartina patens*) is found in the upper reaches of Keller Bay. Other marsh plants, such as shoregrass (*Monanthochloe littoralis*), saltgrass (*Distichlis spicata*), black rush (*Juncus roemerianus*), saltwort (*Batis maritima*), and glassworts (*Salicornia* spp.) are found along the shores and inland reaches of upper Lavaca Bay.

3.2 BIOLOGICAL ENVIRONMENT

A wide variety of fish species are found in Lavaca Bay, the most abundant of which include Atlantic croaker (*Micropogonias undulatus*), spot (*Leiostomus xanthurus*),

bay anchovy (*Anchoa mitchilli*), hardhead catfish (*Arius felis*), gulf menhaden (*Brevoortia patronus*), striped mullet (*Mugil cephalus*), killifishes (*Fundulus* spp.), sheepshead minnow (*Cyprinodon variegatus*), and sand seatrout (*Cynoscion arenarius*). Less abundant fish species, some of which are also popular among recreational anglers, include gafftopsail catfish (*Bagre marinus*), spotted seatrout (*Cynoscion nebulosus*), sheepshead (*Archosargus probatocephalus*), black drum (*Pogonias cromis*), red drum (*Sciaenops ocellatus*), and southern flounder (*Paralichthys lethostigma*) (Campbell et al., 1991). Two state threatened fish species are seasonal or occasional visitors to the Lavaca-Matagorda Bay coastal ecosystem – they are the blue sucker (*Cycleptis elongatus*) and the river goby (*Awaous tajasica*) (Texas Parks and Wildlife Department, 1988; Texas Parks and Wildlife Department, 1997).

3.3 CULTURAL ENVIRONMENT

The Texas coast enjoys a rich history, dating back thousands of years. Archaeological remains indicate that Calhoun County was inhabited by the Karankawa people as early as 6000 B.C. (Hester, 1975). These people relied on some marine resources (oysters, roots of underwater plants) for sustenance but did not appear to travel beyond sight of land (Uecker and Kelly, 1979).

European contact in this area was initiated by Rene-Robert Cavelier, Sieur de La Salle, who landed on the west shore of Lavaca Bay in 1685. The Spanish began populating Texas in the early 1700s. In 1831, Juan J. Linn, a member of the De Leon Colony, established Linnville, near the present-day town of Port Lavaca. German immigration to this part of Texas was prevalent during the 1800s. In 1844, the port town of Indianola was established as the eastern terminus of the Indianola Railroad, which later became part of the Southern Pacific system.

In 1863, federal troops captured Indianola, following the Battle of Matagorda Bay. The only Civil War battle actually fought in Calhoun County was on Christmas Eve in 1863 at Norris Bridge. This port town flourished until its destruction by two hurricanes (in 1875 and 1886). Although the town was re-built following the first hurricane, it was abandoned following the second storm.

Today the Lavaca Bay system supports significant amounts of recreational fishing. It is a popular spot for saltwater anglers, offering numerous fishing access points in Point Comfort, upper Lavaca Bay, Port Lavaca, Chocolate Bay, Magnolia Beach, and Keller Bay (see Figure 2.1). Sites at these locations differ from one another in terms of facilities, access, aesthetics, and available species of fish. The human activities at the sites are dependent upon the condition of the coastal and marine habitats.

A recently conducted survey provides information on how anglers fish, where they fish, and where the anglers come from. The survey was conducted as part of the RI/FS process to assess the human health risk associated with fish consumption due to the Lavaca Bay Site and to assess the recreational fishing component of natural resource damages (see Chapter 4). The survey was administered to a sample of anglers from the

population of anglers (those with fishing licenses) in Calhoun, Jackson, and Victoria counties, the three counties surrounding Lavaca Bay. Forty-seven percent of the sample was from Calhoun, 34 percent was from Victoria, and 19 percent was from Jackson. The number of surveys administered in each county were weighted by the number of anglers in each county.

Survey respondents provided information about their fishing trips in November, 1996. Of the fishing trips in that month, 55.8 percent of the sample took boat-mode trips, 25 percent of the sample took pier or shore based trips, and 19.2 percent of the sample took both boat and pier/shore trips. For the boat trips in the sample, 62 percent occurred outside Lavaca Bay. Alternative destinations included Matagorda Bay, Espiritu Santo Bay, and Carancahua Bay. Thirty-eight percent of boat trips occurred in Lavaca Bay and 7.9 percent of those trips were within the closure area in Lavaca Bay. Of the pier trips, 54 percent were outside Lavaca Bay. For the remaining trips within Lavaca Bay, 13 percent of the trips were within the closure area.

3.4 LITERATURE CITED

Adair, S. E., J. L. Moore and C. P. Onuf. 1994. Distribution and status of submerged vegetation in estuaries of the upper Texas coast. *Wetlands* 14: 110-121.

Armstrong, N. E. 1987. The ecology of open-bay bottoms of Texas: a community profile. U. S. Fish and Wildlife Service, Biological Report 85 (7.12), Washington, D.C. 104 p.

Campbell, R. P., C. Hons, and L. M. Green. 1991. Trends in finfish landings of sport-boat anglers in Texas marine waters, May 1974 - May 1990. Texas Parks and Wildlife Department, Management Data Series No. 75, Austin, Texas. 209 p.

Hester, T. R. 1975. Archaeological and historical resources in the San Antonio-Guadalupe River Basins: a preliminary statement. Center for Archaeological Research, The University of Texas at San Antonio, Regional Studies Report No. 1. 70 p.

Texas Parks and Wildlife Department. 1988. Endangered/threatened species data file, county lists. Texas Parks and Wildlife Department, Austin, Texas. 254 p.

Texas Parks and Wildlife Department. 1997. Texas threatened and endangered species. Texas Parks and Wildlife Department PWD-LF-W3000-017 (11-97), Austin, Texas. 4 p.

Uecker, H. and T. C. Kelly. 1979. A report on literature search and archaeological survey in the vicinity of Point Comfort, Calhoun County, Texas. Center for Archaeological Research, The University of Texas at San Antonio, Archaeological Survey Report No. 82. 11 p.

Ward, G. H. and N. E. Armstrong. 1980. Matagorda Bay, Texas: its hydrography, ecology and fishing resources. U. S. Fish and Wildlife Service, Biological Services Program, FWS/OBS- 81/52, Washington, D.C. 230 p.

Weixelman, M. G. and J. A. Dailey. 1997. Fishery survey of Chocolate Bay, Calhoun County, Texas. Texas Parks and Wildlife Department, Management Data Series No. 134, Austin, Texas. 50 p.

RECREATIONAL FISHING ASSESSMENT

CHAPTER 4

The goal of the injury assessment for recreational fishing is to determine the nature and extent of the recreational fishing service losses resulting from the onset of the 1988 closure until baseline service levels are anticipated to return (via removal of the closure) and to provide a technical basis for evaluating the need for, type of, and scale of restoration actions.

The assessment process being used by the Trustees is guided by the DOI regulations at 43 C.F.R. Part 11. The Trustees' strategy in this assessment, however, reflects two important innovations. First, the Trustees have pursued an assessment approach that is linked to the ongoing RI/FS for the Site. This linkage is advantageous because data and other information developed as part of the RI/FS process may also be useful in assessing natural resource injuries and service losses. Integration of RI/FS and NRDA processes, where appropriate, promotes data sharing, saves time and minimizes costs in the assessment process.

Second, as noted earlier in Section 2.2.1, the Trustees have elected to use an assessment approach that pursues in-kind compensation directly, rather than the dollar value of the service losses to the public. Under this approach, the focus is on quantifying the loss of natural resource services and identifying restoration projects that will return the same level, type, and quality of recreation services to the public. This approach – termed compensatory restoration scaling – is expressly provided for in regulations governing natural resource damage assessments under the Oil Pollution Act of 1990 developed by NOAA, found at 15 C.F.R. 990. Even though not yet commonly followed in assessments under CERCLA, this approach can be accommodated within the DOI regulations. The DOI regulations permit Trustees to use restoration as a basis for compensating for service losses and to include restoration planning in the Assessment Plan phase for that purpose.

As part of the cooperative assessment process underway for the Site, the Trustees and Alcoa have agreed to use a Reasonable Worst Case (RWC) strategy as a basis for assessing resource injuries and service losses. Under this strategy, the Trustees and Alcoa agreed to use existing and site-specific data (see below), as well as traditional modeling techniques in determining the nature and extent of recreational fishing service losses attributable to the closure. Moreover, the RWC strategy incorporates conservative assumptions in defining these losses, an approach that tends to increase the size or number, or maximize the quality, of restoration actions needed to provide for in-kind compensation of services. The RWC approach results in service loss estimates that, in the judgement of Trustees, will lead to restoration actions which would clearly be sufficient to compensate for recreational fishing service losses. Sufficient restoration is achievable sooner rather than later, and Alcoa saves money by avoiding costly, long term studies to refine or better define losses.

4.1 EVIDENCE OF INJURY

The DOI regulations indicate that the existence of a ban on fish consumption is evidence of injury to the resource. 43 C.F.R. 11.62(f). The TDH closure order is a consumption ban because this order prohibits anglers from keeping the fish they catch in the closed area. The lost use of or access to these fish for consumption may affect angler behavior, for example, because anglers may prefer to eat the fish they catch. If angler behavior is affected, then the closure has affected the recreational fishing services of resources in the closed area. Reductions in recreational fishing services in the closed area can be assessed by evaluating changes in the satisfaction that anglers derive from their fishing trips, also known as 'angler utility.' Angler utility serves as an index that can be used both to assess reductions in recreational fishing services and increases in such services based on the benefits of potential restoration actions.

4.2 METHODOLOGY FOR ESTIMATING SERVICE LOSSES AND RESTORATION BENEFITS

The objective of the RWC analysis for recreational fishing is to estimate the reduction in angler utility occurring as a result of the closure order that was put into effect in a portion of Lavaca Bay. The closure order can affect angler utility in three ways. First, in response to the closure order, anglers may choose to not go fishing. This decision means that the satisfaction associated with the trip is forgone. Second, anglers may choose to fish somewhere else that is less preferable. In this scenario, anglers experience a reduction in their utility because they derive the most satisfaction when fishing at their most preferred site. Finally, anglers may continue to fish in the closure area but not consume the fish. To the extent that being able to eat the fish that they catch provides utility to anglers, anglers who continue to fish in the closure area experience less utility than they would if the closure area were open. The RWC analysis is designed to estimate these types of losses in angler utility.

To estimate these losses, this assessment uses random utility models (see Adamowicz, Louviere, and Williams, 1994 and Adamowicz et al., 1997 as examples). These models are well-established in NRDA as an appropriate tool for measuring recreation losses (Hausman, Leonard, and McFadden, 1993; McFadden, 1995; Desvousges, Waters, and Train, 1996). Such models use observed site-choice behavior to estimate the probability that an individual angler will choose to visit a given recreation site, depending on the characteristics of that particular site and the characteristics of the other available substitute fishing sites. Fishing sites with more attractive characteristics provide more utility to anglers and thus have a higher probability of selection by anglers. These models also explicitly incorporate substitute fishing sites.

Most of the data used in this assessment were obtained through an angler survey. This survey was implemented by augmenting the questionnaire for the fish consumption study being conducted as part of the RI/FS process at the Site (Alcoa, 1998). The fish consumption study targeted recreational saltwater anglers and asked them detailed

questions about where they fished and the fish they caught and consumed. Adding questions appropriate to the assessment of recreational fishing service losses was a logical, cost-effective extension of the RI/FS process.

The survey was administered to almost 3,500 saltwater anglers residing in Calhoun, Jackson, and Victoria Counties. According to TPWD creel survey data, the Lavaca Bay system draws about 70 percent of its saltwater anglers from these three counties. There were approximately 13,000 fishing license holders in these three counties in 1994-1995. Of the three counties, about 50 percent of the anglers are from Calhoun County, 30 percent from Victoria County, and 20 percent from Jackson County. The sampling strategy employed in the study uses these same relative proportions. Almost 2,000 anglers participated in the survey. The respondents provided information about their fishing trips in November, 1996.²

Figure 4-1 depicts and provides a general description of the type of model used in this assessment.³ The first concept to understand about the model is that different fishing sites have different characteristics. Relevant site characteristics include whether or not the site has a boat ramp, whether or not the site has a lighted pier, which fish species are prevalent at the site, and how far it is from an angler's home. The site characteristics are observed (e.g., whether or not the site has a boat ramp) or derived based on survey information (e.g., distance to site from angler's home). The model determines angler satisfaction associated with any site based on that site's fishing characteristics.

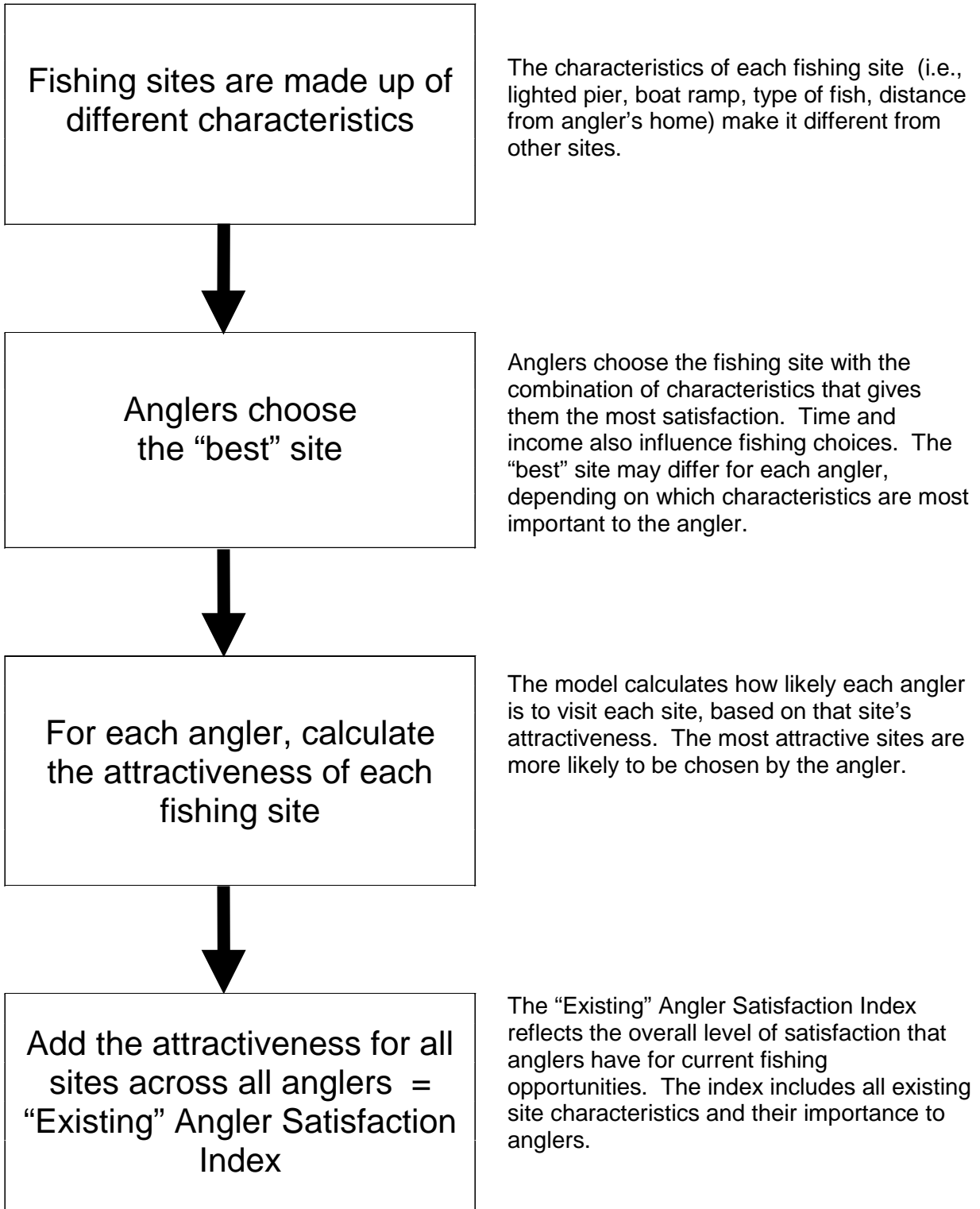
The concept that different fishing sites have different features is consistent with other types of consumer products and services. Different kinds of cars, for example, have different kinds of characteristics that distinguish them from one another. Consumer services, such as banking services, are also different in terms of fees, number of checks per month, minimum balance requirements, etc. Customer satisfaction with cars or banking services, then, is a function of the features of the car or service.

Faced with all these different choices of fishing sites, the angler chooses the 'best' site, which is the second box shown in Figure 4-1. Which site is best depends on what characteristics are most important to each angler and how he or she is willing to trade off different characteristics. For example, being close to a site might be more

² Because the model is constructed based on trip information in November of 1996, the model quantifies losses and benefits for November, 1996. If November is a typical or representative month, then about 1/12, or 8.3 percent, of annual trips should be during November. Texas Parks and Wildlife Department creel data indicate that November is a representative month for 1996. According to the creel data, 7 percent of the anglers taking trips in Matagorda Bay (which includes Lavaca Bay) in 1996 took them in November. So, November is representative of 1996 and the model captures the benefits and losses for all of 1996. Section 4.4 describes how service losses are addressed in previous and later years.

³ See Alcoa, 1998 for a full report on the methodology and results of the recreational fishing assessment.

Figure 4.1: General Model



important to Angler A than the kind of fish he is likely to catch. Angler B, on the other hand, may be willing to drive farther to fish where sea trout are numerous.

The fact that anglers trade off different features of a fishing site is also consistent with how consumers make decisions about other goods and services. Returning to the car example, most consumers would agree that leather seats are nice. However, because they cost more, some consumers trade the leather seats for a lower price or for a bigger engine. When buying a car, each consumer weighs the different facets of different cars and makes the decision that is best for him or for her. The same is true for fishing sites. Each angler looks at the different choices and chooses the site that provides him or her with the most satisfaction, subject to his/her budget constraint.

Since the angler survey requested information regarding past fishing experiences, survey data provide the actual fishing-site choices made by anglers from the three-county area. Based on the choices that each angler actually made, the model calculates an attractiveness index for each angler for each site, which is the third box shown in Figure 4-1. In calculating this index, the model takes into account each angler's preferences about different site characteristics and the different fishing sites available to anglers. Selected sites are more attractive and rate higher on the index.

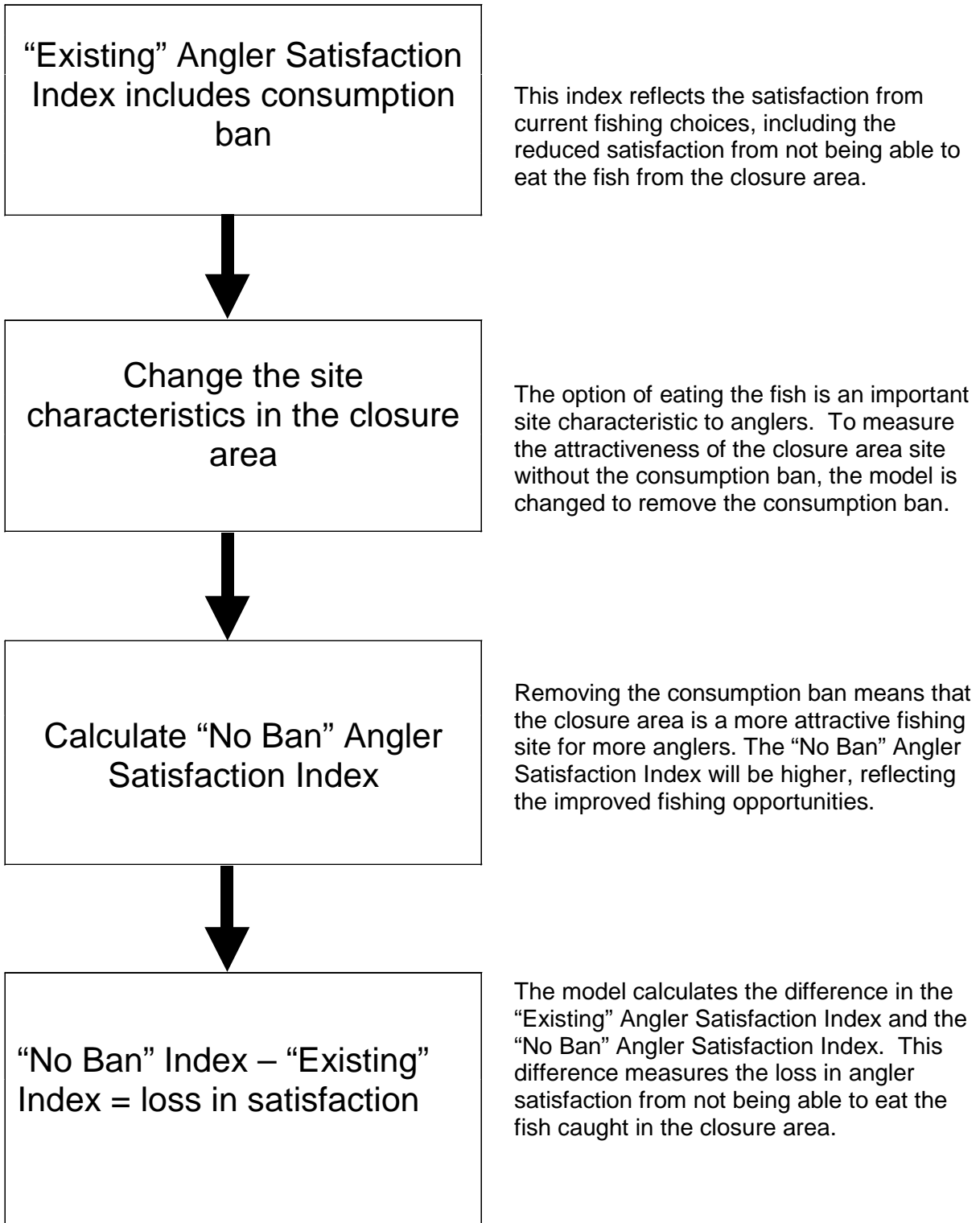
For example, suppose that Angler A, who does not like to drive far to fish, has two fishing sites within 5 miles of his house. These sites would rate higher on Angler A's attractiveness index than any other sites. Angler B, on the other hand, places a premium on sites where she is likely to catch many sea trout. However, the best sites with sea trout are more than 15 miles from Angler B's house. Even so, on Angler B's attractiveness index, these more distant sites would rate higher than any other closer site.

The fourth box in Figure 4-1 explains that the attractiveness scores for each site for each angler are summed. This sum gives us an overall measure of angler satisfaction with the current fishing opportunities. This measure of angler satisfaction reflects the actual choices that anglers make and reveals what characteristics are important to each angler.

Figure 4-2 shows how the general model is used to estimate losses in angler utility associated with the closure area. The first box is the same as the last box on Figure 4-1, which is the existing angler satisfaction index. Because this satisfaction index reflects the current fishing sites that anglers have available to them, it includes the reduced satisfaction from not being able to eat the fish from the closure area. Being able to eat fish caught during fishing trips is important to some anglers, so the consumption ban reduces overall angler satisfaction.

The second box in Figure 4-2 is the crux of estimating losses in angler utility. To determine how much angler satisfaction has been reduced as a result of the closure order, that site characteristic (i.e., whether or not anglers can eat the fish from that area) is altered in the model by removing the consumption ban. This change permits the

Figure 4.2: Effect of Consumption Ban



assessment of the attractiveness of the closure area without the consumption ban. Thus, this model is like any other model because it predicts how something (in this case, angler satisfaction) would change if the model inputs were different.

As the third box in Figure 4-2 indicates, the model then recalculates the satisfaction index without the consumption ban. As a result, the closure area is more attractive to anglers. For some anglers, the attractiveness of the closure area increases, so the overall level of angler satisfaction increases. This 'no ban' satisfaction index is larger than the existing satisfaction index.

No angler will be worse off by removing the consumption ban, but some may not be better off. Whether or not a specific angler is better off depends on what fishing site characteristics are important to him or to her. For example, anglers who are farther from the closure area and who consider distance an important characteristic will not be made much better off. Even without the consumption ban, these anglers are unlikely to fish in the closure area because it is so far away. However, anglers who live close to the closure area and rate distance as an important characteristic will be better off. The satisfaction index will increase for these anglers, increasing the overall index.

Returning to Figure 4-2, the last box explains that angler utility losses are estimated by subtracting the existing satisfaction index (i.e., the level of angler satisfaction with the consumption ban in place) from the no-ban satisfaction index. This subtraction reveals how much more satisfaction there would be if the consumption ban were removed. In other words, it reveals how much loss in angler satisfaction has occurred as a result of the consumption ban.

The same models that are used to estimate losses in angler utility are also used to estimate gains in angler utility based on possible restoration actions. Anglers choose their fishing sites based on the different characteristics and are assumed to select the site that provides them with the most utility. To estimate gains in utility, specific enhancements to existing sites or the creation of new sites are incorporated into the calculation of angler utility. For example, suppose that a restoration alternative would add a fishing pier to a locale that currently has no pier. To estimate the gains associated with this restoration alternative, angler utility is re-calculated, adding another fishing pier to the set of fishing opportunities. Angler utility increases with the addition of this new pier because anglers now have more choices when selecting a fishing site. The specific increase depends on the overall attractiveness of the characteristics for the new site across the population of potential anglers.

4.3 MODEL SELECTION

A random utility model was developed based on the general method described in Section 4.2. A model was constructed based on the survey data to estimate the losses due to the closure and the benefits from different restoration actions. Actually, two models

were developed in order to assess impacts by two fishing modes – boat and pier. To ensure robustness of the model results, sensitivity analyses were conducted.⁴

Separate models were developed for boat anglers and for pier/shore anglers because boat and pier/shore anglers, based on the survey data, appear to have somewhat different preferences. The decision to develop separate models is also consistent with the RWC approach. Because about 20 percent of the surveyed anglers participate in both boat fishing and pier/shore fishing, segregating these models could overestimate losses. This could occur because separate models do not allow anglers to substitute boat fishing opportunities for pier fishing opportunities, or vice versa.

The initial recreational fishing models and analyses were subjected to peer review. Three peer reviewers, i.e. independent academic experts otherwise not involved in the case, were jointly selected by Alcoa and the Trustees. The peer reviewers were asked to comment on all aspects of the assessment methodology, including the modeling work. Review of the modeling work was particularly important as the models formed the basis of the recreational fishing assessment.

The peer reviewers provided a variety of comments (Adamowicz, 1998; Parsons, 1998; and Smith, 1998). Some questions and recommendations did not affect the foundation of the analysis. However, other comments raised questions about the modeling work, itself. Along with these comments, the peer reviewers suggested alternative modeling approaches be considered.

In response to the peer reviewer comments, additional analysis (MacNair and Lutz, 1999) was conducted. Part of this work provided additional information on the angler survey and the survey results. Most importantly, in response to the peer reviewer comments, additional sensitivity analyses of the models were conducted. That is, alternative model formulations were developed to assess their impacts on the modeling results. After the additional modeling effort, there were thirteen models, with associated outcomes, for each fishing mode.

The Trustees considered the additional modeling work and how best to use the models in assessing recreational fishing impacts. For each fishing mode, the results across each of the thirteen models all fell within a narrow range. In other words, for each mode, all estimates of the losses due to the closure and of the benefits from a particular restoration action were similar. The Trustees believed that actual losses as well as the restoration requirement needed to compensate for those losses fell within the ranges defined by the array of models. However, the Trustees were uncertain which of the thirteen models was most appropriate for the boat and pier mode assessments. Rather than trying to determine the ‘right’ model, the Trustees elected to base the restoration scaling on the models that led to the largest restoration requirement. This choice was

⁴ Sensitivity analysis is a mechanism whereby alternative models are developed which incorporate different model assumptions. In this case, alternative models were investigated to ensure changes in model assumptions did not significantly change model results.

conservative, accounting for the uncertainty associated with the model choice in a manner that assured the public would be sufficiently compensated for their losses. The models selected for use to quantify the recreational fishing service losses and determine the scale of compensatory restoration required are those labeled number VII in Tables 3 and 4 of MacNair and Lutz (1999).

4.4 LOSSES DUE TO THE CLOSURE AND BENEFITS OF RESTORATION

The model results describe the loss in utility for a typical trip in 1996. To fully compensate for losses, the model results must be ‘aggregated’ to account for losses over time. Because the TDH issued the closure order in 1988, recreational fishing service losses began in 1988. Losses will continue into the future. It is expected that the closure will remain in effect and losses will continue through 2010. Alcoa has already removed some of the most highly contaminated sediments and has acted (or is currently acting) to control mercury sources to prevent future contamination of the bay. Additional response actions are possible as part of a final remedy decision for the Site. Lavaca Bay hydrologic models, developed as part of the RI/FS, suggest additional burial of contaminated surficial sediments will occur in some areas through natural processes and, taking into account response actions taken to date, likely provide for fish tissue levels low enough to permit removal of the closure by 2010. That projection would be strengthened by any additional actions undertaken as part of the final remedy.⁵

To aggregate losses, a discount factor is applied to the model results. Discounting is a standard economic technique that recognizes that people prefer to use or consume goods and services in the present rather than postpone their use or consumption to some future time. Specifically, people must be offered additional compensation before they are willing to postpone use or consumption. Interest-bearing savings accounts are based on this principle. In order to get people to save money (i.e., forgo present use or consumption), banks pay customers an additional amount of money in the form of interest. The same principle applies when discounting to incorporate differences in timing for the losses and for the gains associated with the restoration projects.

Thus, to compensate for past losses in utility, anglers must experience more utility from their future fishing opportunities than they lost in the past. The discount factor determines how much more utility is sufficient. For this analysis, the Trustees use a 3 percent real discount rate. This rate is consistent with DOI policy and with economic theory (Freeman, 1993; Lind, 1982).⁶ The results of the quantification of the pier and

⁵ Even if the objectives are not achieved by 2010, the preferred restoration projects identified in Chapter 5 will offset losses due to a closure until 2030. Chapter 5 and Appendices F and G contain further information.

⁶ For further discussion of discounting and justification of the 3 percent discount rate, see NOAA (1999).

boat-mode losses due to the fishing closure, as described in this chapter, are found in Appendix B and C.

The discounted utility losses are then compared to the discounted utility gains associated with a number of restoration alternatives or a combination of restoration alternatives. This comparison is the restoration ‘scaling’ as it determines whether any given restoration alternative or any given combination of restoration alternatives provides anglers with gains in utility that are sufficient to offset the losses.

Chapter 5 describes the restoration alternatives that the Trustees considered in their evaluation of potential projects and identifies the restoration type and scale necessary to compensate for recreational fishing service losses.

4.5 LITERATURE CITED

Adamowicz, W. 1998. Review Comments on “Technical Memorandum on Lavaca Bay Recreational Fishing Assessment.”

Adamowicz, W., J. Louviere, and M. Williams. 1994. “Combining Revealed and Stated Preference Methods for Valuing Environmental Amenities.” *Journal of Environmental Economics and Management* 26: 271–292.

Adamowicz, Wiktor, Joffre Swait, Peter Boxall, Jordan Louviere, and Michael Williams. 1997. “Perceptions versus Objective Measures of Environmental Quality in Combined Revealed and Stated Preference Models of Environmental Valuation.” *Journal of Environmental Economics and Management* 32(1):65–84.

Alcoa, 1998. Draft Report on Finfish/Shellfish Consumption Study. Alcoa (Point Comfort) / Lavaca Bay Superfund Site. Volume B7b: Bay System Investigation, Phase 2. January.

Alcoa, 1998. Technical Memorandum on Lavaca Bay Recreational Fishing Assessment.

Federal Register, 1996. 61(4):453, January 5.

Freeman, A. Myrick, III. 1993. *The Measurement of Environmental and Resource Values: Theory and Methods*. Washington, DC: Resources for the Future.

Desvousges, William H., Steven M. Waters, and Kenneth E. Train. 1996. *Supplemental Report on Potential Economic Losses with Recreation Services in the Upper Clark Fork River Basin*. Submitted to United States District Court, District of Montana, Helena Division. State of Montana v. Atlantic Richfield Company. No. CV-83-317-HLN-PGH. February 1.

Hausman, Jerry A., Gregory K. Leonard, and Daniel McFadden. 1993. "Assessing Use Values Losses Caused by Natural Resource Injury." In *Contingent Valuation: A Critical Assessment*, J.A. Hausman, ed. Amsterdam: Elsevier Science Publishers, BV (North-Holland).

Lind, Robert C. 1982. "A Primer on the Major Issues." In *Discounting for Time and Risk in Energy Policy*. Lind et al., eds. Baltimore: John Hopkins University Press.

MacNair, Doug and Janet Lutz. 1999. Lavaca Bay Technical Memorandum.

McFadden, Daniel L. 1995. *Expert Report of Daniel L. McFadden*. Submitted to United States District Court, District of Montana, Helena Division in the matter of *State of Montana v. Atlantic Richfield Company*, CV-83-317-HLN-PGH.

NOAA, 1999. Discounting and the Treatment of Uncertainty in Natural Resource Damage Assessment, Technical Paper 99-1. National Oceanic and Atmospheric Administration, Damage Assessment and Restoration Program.
Website location: <http://www.darp.noaa.gov/darporg/publicat.htm>.

Parsons, George R. 1998. Comments on the "Technical Memorandum on Lavaca Bay Recreational Fishing Assessment."

Smith, V. Kerry. 1998. Comments on the Technical Report on the Lavaca Bay Recreational Fishing Assessment.

5.1 RESTORATION STRATEGY

The goal of restoration is to make the environment and public whole for the injury to fishery resources and services losses resulting from the recreational fishing closure. In developing the restoration plan to address those losses, the Trustees sought to identify and evaluate restoration alternatives that would provide recreational fishing services equivalent to those lost as a result of the TDH closure order. The recreational fishing service losses were quantified as pier/shore mode angling losses and boat mode angling losses. Likewise, restoration alternatives were identified and evaluated by their ability to provide pier/shore mode services and boat mode services.

Restoration actions are generally 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 undertaken to restore the injured natural resources and/or services to baseline condition, is considered 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. Primary restoration actions that require human intervention are appropriate when injured resources will not recover, or will recover slowly, and when 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. In planning for such restoration, the Trustees should consider alternatives that would provide services of the same type and quality, and of value comparable to those lost. The scale of compensatory restoration is dependent on both the initial size of the injury and how quickly each resource and/or service will return to baseline. Primary restoration actions that speed the recovery of resources, including the services they provide, reduce the requirement for compensatory restoration.

With respect to the recreational fishing service losses in Lavaca Bay, the baseline condition is the removal of the closure order. The removal of the closure order is an objective of the remedial process. The Trustees believe, based on actions taken to date or still possible as part of any final decision on remedy, that the remedial process will be sufficient to allow the closure to be removed (and for recreational fishing services to return to baseline), by 2010. In this instance, further consideration of primary restoration alternatives by the Trustees as part of a natural resource damage assessment process is viewed as unnecessary as remediation actions functionally equate to primary restoration of Site-related resource injuries or losses. Accordingly, this Draft DARP/EA, focuses only on restoration alternatives which would appropriately enhance recreational fishing opportunities in Lavaca Bay in order to compensate for the interim loss of recreational

fishing services, from the time the closure was implemented until its anticipated removal.⁷

This chapter describes the different types and locations of fishing restoration projects considered by the Trustees and the process used to evaluate and identify the preferred restoration alternatives for recreational fishing. The chapter is organized as follows. Section 5.2 discusses general restoration alternatives; Section 5.3 describes the potential types of restoration projects and their locations; and Section 5.4 presents the Trustees' evaluation of the alternatives and identifies the restoration actions which are preferred for use to compensate for recreational fishing services losses assessed in this plan.

5.2 GENERAL RESTORATION ALTERNATIVES

Under the legal and policy frameworks applicable to NRDA, the use of on-site, in-kind restoration actions are favored, wherever possible, to ensure the most direct relationship between resource injuries or service losses and the benefits of restoration actions. Consistent with this focus, the goal of restoration for recreational fishing service losses is to increase or enhance fishing opportunities in Lavaca Bay near the site of those losses, i.e., the closed area. Restoration alternatives were identified for consideration based on this restoration goal.

The Trustees considered several alternative approaches to providing recreational fishing opportunities and identified improving fishing access as the preferred approach. Increasing catch rates was considered as a means of providing fishing opportunities but the effect of possible restoration actions on catch rates was not measurable based on existing information, so that the benefits of restoration in increasing catch rates could not be quantified. Therefore, in developing restoration project alternatives, the Trustees focused on identifying and evaluating restoration projects and project sites that would improve fishing access, by mode, as a means of providing recreational fishing services comparable to those lost.

The Trustees also evaluated the 'no-action' alternative, as required by NEPA. Under this alternative, the Trustees take no direct action to restore injured natural resources or to compensate for lost services pending resource recovery. As noted in Section 5.1, in this instance the Trustees expect that the remedial process will be sufficient to allow removal of the fishing closure (i.e., recovery to baseline). Notable recreational service losses due to the closure, however, have and will occur in the interim period as discussed in Chapter 4. Under laws applicable to public natural resource damage claims, the Trustees are responsible for seeking compensation for such interim

⁷ Under the staged approach to restoration planning described in Section 1.2, the Trustees' determination regarding the necessity of further primary restoration planning for the recreational fishing services losses can be revisited after the final remedy for the Site is selected and addressed, if needed, in any final stage restoration plan that may be developed.

losses where losses are significant and where feasible, cost-effective alternatives are available for use to define restoration-based compensation. Because the interim service losses associated with the closure would go uncompensated, the Trustees have determined that the 'no action' alternative will not satisfy compensatory restoration objectives and rejected it on that basis.

The Trustees identified suitable projects to improve fishing access using two sources of information. The first source of information is public input. The Trustees actively solicited suggestions and comments from the public about the types of restoration projects that the public would see as beneficial to recreational fishing in the affected area during public meetings in Port Lavaca in February and November 1998.⁸ The second source of information is the recreational fishing models, which identify site characteristics that positively affect angler utility. These models rely on extensive information provided by the angler survey in the three county area. Although some of these site characteristics cannot be addressed by restoration projects, many can be changed and these changes represent potentially suitable restoration projects. For example, the survey data indicate that boat ramps with the capacity to accommodate large boats are better than ramps that only accommodate small boats. This is a characteristic of a boat ramp that can be changed as a restoration action. On the other hand, the survey data indicate that the view of an industrial plant during a fishing experience is worse than a fishing experience without an industrial plant in view. However, the characteristic of an industrial plant in view at a fishing site cannot feasibly be changed through a restoration action.

5.2.1 Types of Restoration Projects

The combination of public input and the recreational fishing models yielded the following list of potential restoration projects:

- Increasing fishing access, either by creating new launch facilities or by constructing new fishing piers;
- Improving existing launch facilities to accommodate larger boats;
- Increasing the number of launch lanes at existing launch facilities;
- Adding lights to fishing piers; and

⁸ Some of the projects proposed by the public are inconsistent with improving recreational fishing in Lavaca Bay. For example, some commenters proposed nature trails and inland fishing farms. Under the applicable federal statutes, the Trustees are required to give preference to restoration alternatives that provide the same type and quality of recreation services as the services that are lost before considering alternatives that provide dissimilar services. Since there are alternatives that provide similar services, the projects that provide dissimilar services were not evaluated further.

- Adding parking at access points.

The next section of this Draft DARP/EA lists of locations where fishing restoration projects of these types could be implemented.

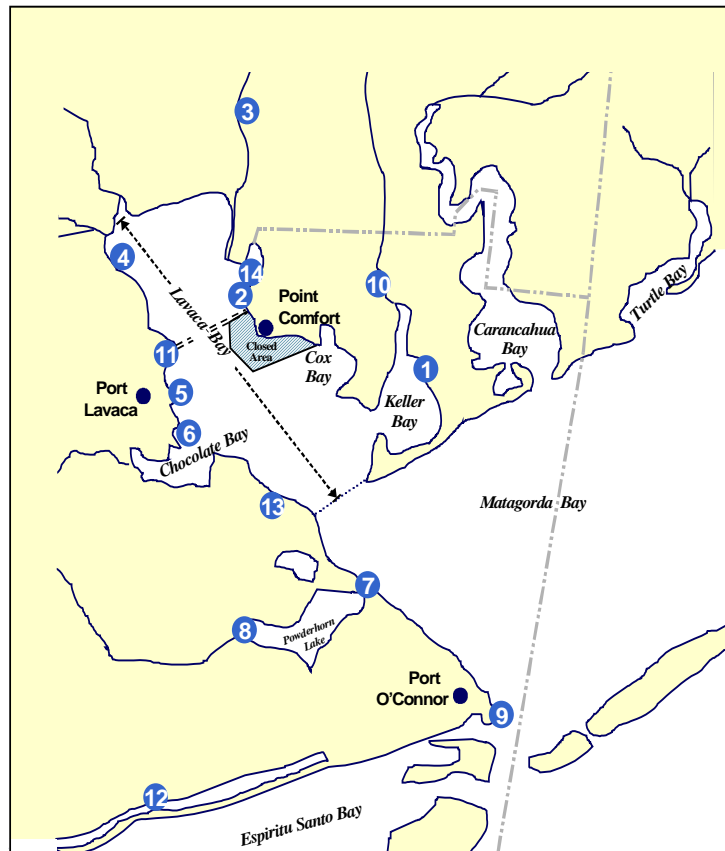
5.2.2 Geographic Locations for Restoration Projects

In addition to evaluating the different types of restoration projects, the Trustees have also evaluated different geographic locations for these projects. Both public input and the recreational fishing models provided information on which the list of possible locations was based. None of the locations are in the closure area or in areas of other known contamination. The locations are shown on Figure 5-1. The combination of all possible project locations and project types results in several dozen possible restoration alternatives.

Figure 5.1

Potential Locations for Recreational Fishing Projects

- ① Olivia
- ② Bean Property
- ③ Lolita
- ④ Six-Mile Park
- ⑤ Port Lavaca Bayfront
- ⑥ Harbor of Refuge
- ⑦ Indianola
- ⑧ Powderhorn Lake
- ⑨ Port O'Connor
- ⑩ Keller Creek
- ⑪ Lighthouse Beach
- ⑫ Fulghum Launch
- ⑬ Magnolia Beach
- ⑭ Point Comfort



5.3 EVALUATION OF ALTERNATIVES

To evaluate the different restoration alternatives, the Trustees rely on a set of criteria or standards. The criteria used in this plan are based on guidance provided by the DOI regulations. 43 C.F.R. 11.81-82. The criteria also reflect additional guidance found in the regulations developed by NOAA for restoration planning under OPA.⁹ 15 C.F.R. 990.54. From the range of restoration alternatives, the Trustees identify preferred compensatory restoration alternatives based on the following criteria:¹⁰

- The extent to which each alternative is expected to meet restoration goals and objectives in compensating for interim losses;
- The likelihood of success of each 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.

In addition to the foregoing criteria, the Trustees also consider proximity to the Site as an important factor. The majority of the potentially affected anglers live within the three-county area, with nearly half of them residing in Calhoun County. Thus, restoration projects designed to compensate for the losses these anglers experienced must be located within the same general vicinity as the Site. Projects implemented within the Site, however, have the potential to be less effective in meeting restoration goals as their utility will continue to be adversely affected by the mercury that remains in the sediments until system recovery. Thus, projects within or immediately bordering the closure area are less attractive.

⁹ Although OPA is not directly applicable to NRDA for this Site, OPA and CERCLA have a common goal, i.e. the restoration of injured resources or services. Because the OPA regulations more directly outline planning appropriate to support restoration-based compensation decisions, the Trustees considered these regulations a useful reference in implementing restoration-based compensation planning in this CERCLA context.

¹⁰ The cost to carry out the alternative is often also an appropriate criterion for evaluating restoration alternatives. When two or more restoration actions provide the same or a similar level of benefits, this criterion supports selection of the least costly alternative. The criterion is inapplicable where no two projects provide comparable benefits, are not equally preferable based on other criteria, or where the costs of such alternatives are comparable (or potential cost differences negligible). Consideration of the costs of the boat ramp and pier projects in this Draft DARP/EA was not viewed as necessary to the identification of the preferred restoration alternatives as the ramp and pier projects represent similar cost alternatives.

Further, the Trustees considered an even distribution of the projects around the closure area, if there were to be multiple projects, to be an important factor in evaluating alternatives. In other words, if a number of projects were necessary to compensate for the interim losses, the Trustees decided it would be important to locate the projects in a number of communities near the closure area and not all in one community or location in order to ensure that as much of the population affected by the closure benefits from the preferred restoration projects.

The Trustees also considered the level of support for a project from local communities when identifying preferred restoration alternatives. The Trustees recognize the importance of public participation in the restoration planning process, and the acceptance of selected projects in the community. All else equal, alternatives that complement or are compatible with other community development plans and goals are considered more favorably.¹¹

In evaluating restoration alternatives, the Trustees first focused on possible locations for restoration projects. After narrowing the list of possible locations, the Trustees then evaluated specific projects that could be implemented at the preferred locations.

5.3.1 Evaluation of Possible Locations

The Trustees used proximity to the Site as a first-tier screening factor. More proximate locations are more likely to be successful in restoring lost fishing services, which is consistent with the legal and policy frameworks applicable to NRDA. Fulghum Launch, and Colomo Creek/Powderhorn Lake were screened out as restoration sites due to their relatively distant locations from the closure area. However, Port O'Connor, which is also a relatively distant location, was retained for further evaluation because it is such a popular fishing destination.

About half of the remaining locations were screened out for other reasons. Two of the locations, Indianola and Keller Creek, are privately held, and the owners are not interested in selling. In addition, the Keller Creek location is so close to the Olivia location that a project at Olivia would improve access to essentially the same fishing waters. The Harbor of Refuge is within two miles of the Port Lavaca Bayfront and already has a boat ramp. Since the Bayfront offers more opportunities for projects, it was selected in lieu of the Harbor of Refuge. The Bean property is adjacent to Point Comfort, but contains dilapidated buildings and industrial debris. A considerable effort and potential cost would be required before public access could be allowed. Therefore, Point Comfort was retained over Bean. A pending unresolved construction issue hampers use

¹¹ Throughout the entire evaluation process, the Trustees have sought to ensure that preferred restoration alternatives would also comply with all relevant laws, be consistent with all government policies, and not endanger public health or safety.

of the Lolita site. Proposed highway construction at the location could delay a restoration project.

The sites for potential projects that remained after this initial screening were the Port Lavaca Bayfront, Six-Mile Park, Magnolia Beach, Olivia, Point Comfort, Port O'Connor and Lighthouse Beach.

5.3.2 Potential Site and Project Descriptions

The next phase of the screening process focuses on evaluating specific potential projects at the remaining locations. Each of the remaining locations was visited by representatives of Alcoa and Trustees to assess the existing quality and type of facilities. In addition, county and port commissioners, city officials, local fishermen, and guides provided information and ideas. Proposed additions or enhancements at each remaining location are site-specific and depend on the quality and type of facilities already in place and the feasibility of action at each location to increase or enhance recreational fishing opportunities. Table 5-1 displays the specific projects considered for each of the remaining locations.

Table 5-1. Specific Projects at Remaining Locations

| Location | Add or enhance boat ramp | Add or enhance pier | Add or enhance parking |
|----------------------|---------------------------------|----------------------------|-------------------------------|
| Port Lavaca Bayfront | X | X | X |
| Six-Mile Park | X | X | |
| Magnolia Beach | | X | X |
| Olivia | | X | |
| Point Comfort | | X | X |
| Port O'Connor | | X | X |
| Lighthouse Beach | X | | |

Each of the projects listed in the table is discussed in the following paragraphs. Where piers are part of the project mix, the proposal is generally for a 300 foot lighted fishing pier. The boat ramp and parking projects are specific to each project site.

Port Lavaca Bayfront

The Port Lavaca Bayfront area is currently being enhanced as a public recreation area. There is a master plan for the area that includes a new pier, and a new boat ramp and parking area; these projects have yet to be funded. The plan originally located the ramp and parking on a peninsula of land south of the Marina. This property is privately held and the owners are not willing to sell. The community's desire to have a ramp and

parking could be realized if a location north of the Marina on public property is selected. A navigational channel for the Marina area already exists and is being maintained.

Six-Mile Park

Six-Mile Park currently contains a boat ramp, sheltered picnic area, playground, and parking area. The property is also an access point for wade fishing. The boat ramp is highly utilized, and during periods of heavy use, boaters have been observed launching from an auxiliary ramp that is in need of improvement. The proposed ramp project is to improve this auxiliary ramp and associated bulkhead such that the ramp can be maintained and utilized under most tidal conditions. The proposed pier project is the addition of a new pier. A pier at this site has potential since the area is known as a good fishing location and the pier would be supported by other existing facilities.

Magnolia Beach

Magnolia Beach has a boat ramp, a public beach, and a park with shelters, camper sites, and restroom facilities. The site is relatively more removed – as compared to other sites – from the closure area. The boat ramp does not have adequate parking to accommodate current use; therefore, an expanded parking area has been proposed. Since the existing parking is so limited, a project to expand parking should ease traffic and draw additional anglers to the site. The pier project is a proposal for a new pier. A lighted fishing pier could be supported by the existing facilities. Private piers in this general area are known as good fishing locations.

Olivia

At Olivia, Hatteras Park includes a new boat ramp, sheltered picnic area, playground, and parking area. The proposed project is a new fishing pier. A lighted pier could be supported by the existing facilities. The area is known for good fishing, but relative to other sites the location is more remote from the closure area. The boat ramp has begun to silt in, and it is configured such that mechanical dredging from the shore would be difficult. The proposed fishing jetty/pier project would provide access for the county's equipment, allowing the existing boat ramp to be maintained more easily.

Point Comfort

Point Comfort's park includes a boat ramp, sheltered picnic area, playground, and parking area. The proposal is for a new fishing pier. A lighted pier could be supported by the existing facilities. The best location for a pier would be on a peninsula adjacent to the boat ramp. The addition of some paved access and parking would also be attractive enhancements.

Port O'Connor

Port O'Connor has an existing fishing pier at King Fisher Beach and multiple boat ramp facilities around the area. The existing pier is in need of major improvements and a jetty project to help protect the public beach needs completion. The proposed fishing jetty/pier project could replace the existing pier and complete the beach protection project. Parking at the public boat ramp is inadequate to support periods of heavy use, so a project to provide more parking space is proposed.

Lighthouse Beach

Facilities at Lighthouse Beach include a boat ramp, picnic areas, and a pier. The potential for boat ramp improvements is limited. The channel that services the existing boat ramp needs maintenance and dredging. The boat ramp could be improved in order to provide access at low tides, which is currently limited.

5.3.3 Pier Project Evaluation

As noted previously, recreational fishing service losses were quantified separately for pier and boat mode anglers. Restoration projects to provide compensation for the losses, then, had to be evaluated by each fishing mode. The restoration projects were grouped and evaluated by their ability to provide restoration benefit to compensate for pier mode or boat mode fishing service losses.

Table 5.2 shows the pier project locations and their initial evaluation based on a number of criteria. The first three criteria are from the regulations; the last three are specific factors the Trustees considered: close proximity (to the affected area), consistency with community development goals, and competition with other sites. Locations that met an individual criterion received a plus. Locations that did not meet a criterion received a minus. If there was no strong rationale for determining that the location either met or did not meet the criterion, it was left blank. For the competition criterion, locations received a plus if they did not present any anticipated direct competition with other sites.

Evaluation of the pier project locations indicates that all the locations except the Port Lavaca Bayfront are good fishing locations and are expected to achieve success in providing fishing opportunities. The potential to achieve success at the Bayfront is uncertain. While a Bayfront pier may be a good winter fishery, it is not expected to be a good year-round fishery, due in part to a significant level of boat traffic at the site. Since all the pier projects would co-occur with other facilities, e.g., parks, picnic areas, or beaches, the piers would also be expected to provide additional benefits to non-angling users. The Point Comfort site benefits public health and safety by providing a close substitute site that is outside the closure area. In other words, this substitute site may be close enough to the site to draw anglers away from the closure area. A replacement pier for the existing pier at Port O'Connor would also promote public safety as the current pier

Table 5-2. Pier Projects at Remaining Locations

| Location | Likelihood of success | Additional benefits | Affects public health & safety | Close proximity | Consistent with Community development goals | Competition with sites | Total |
|----------------------|------------------------------|----------------------------|---|------------------------|--|-------------------------------|--------------|
| Point Comfort | + | + | + | + | | | 4 |
| Six-Mile Park | + | + | | | | + | 3 |
| Port Lavaca Bayfront | | + | | + | + | | 3 |
| Port O'Connor | + | + | + | - | | + | 3 |
| Magnolia Beach | + | + | | - | | + | 2 |
| Olivia | + | + | | - | | + | 2 |

Table 5-3. Ramp Projects at Remaining Locations

| Location | Modeled Sufficient Compensation | Likelihood of success | Additional benefits | Affects public health & safety | Close proximity | Consistent with Community development goals | Total |
|----------------------|--|------------------------------|----------------------------|---|------------------------|--|--------------|
| Port Lavaca Bayfront | + | + | + | + | + | + | 6 |
| Lighthouse Beach | - | | | | + | | 0 |
| Six-Mile Park | - | + | | | | | 0 |
| Magnolia Beach | - | + | | | - | | -1 |
| Port O'Connor | - | | | + | - | | -1 |

is unstable. With respect to the project location being near the closure area, the Bayfront and Point Comfort locations meet the criterion; Magnolia Beach, Olivia, and Port O'Connor do not. Because the Bayfront had a master plan for development including a pier project, only a pier project there was judged to be consistent with identified community development goals. Projects at Six-Mile, Port O'Connor, Magnolia, and Olivia were judged to be isolated enough that they would not compete with other existing pier locations.

The pier projects were also evaluated according to whether the project or combination of projects were sufficient to compensate for the losses and whether the projects (combined with the boat mode project) were distributed in locations around the closure area and not all in one location. With respect to whether restoration benefits would compensate for the losses, any combination of two projects from among Bayfront, Six-Mile, and Point Comfort is sufficient to compensate for the losses. No one of these projects can provide enough restoration benefit alone, but any two can.¹² Port O'Connor in combination with one of these projects does not provide sufficient compensation. For Port O'Connor to be included in the mix of locations two additional sites would require piers, which is not cost efficient. The desire for a distribution of projects (projects including piers and boat ramps) was used to select two pier locations. However, before selecting two pier locations, it is necessary to identify the appropriate boat mode project location(s).

5.3.4 Boat Ramp Project Evaluation

The boat mode project locations and the criteria used to evaluate the locations are listed in Table 5.3. Again, locations that met the individual criterion received a plus; those that did not meet the criterion received a minus. If there was no strong rationale for determining that the location either met or did not meet the criterion, it was left blank

Evaluating boat ramp construction options to compensate for boat fishing service losses indicates that only the Bayfront site would provide enough restoration benefit to compensate for the losses. No other one project or combination of projects provides enough benefit to offset recreational losses associated with boat mode fishing.¹³ The uncertainty about the Port O'Connor site to achieve success is attributed to the inability to identify property for the parking area. A boat ramp at Lighthouse Beach may not achieve success because it is difficult to access the ramp from the water during low tide (and potentially also at high tide, if sedimentation continues). The added benefit of the project at the Bayfront location is that in addition to directly serving recreational anglers, the ramp will also provide service to an adjacent marina. Boat ramp projects at the Bayfront and Port O'Connor sites would both benefit public health and safety, as emergency, rescue and/or oil spill response boats would be able to use these locations, where they recently could not or may have had difficulty. The Bayfront and Lighthouse Beach projects would be located near the area of the closure; Magnolia Beach and Port O'Connor do not meet that criterion. Because the Bayfront had a master plan for development incorporating a boat mode project, only a project there was judged to be consistent with identified community development goals.

¹² See Appendix D for the benefit quantification of piers at Point Comfort and Six-Mile.

¹³ See Appendix E for the benefits of the boat ramp at the Bayfront.

The results of project evaluation in Table 5.3 indicate that the Bayfront site is the best location for a boat mode project, in this case a boat ramp.

5.3.5 Environmental and Socio-Economic Impact

Although the restoration project alternatives considered present some differences in meeting restoration planning criteria, as noted in sections 5.3.3 and 5.3.4, the alternatives considered in this plan all have a potential to affect the human environment in similar ways. At any of the potential locations, the construction of fishing piers, boat ramps or parking improvements would involve the temporary use of equipment, such as trucks or other machinery, which could increase noise, dust, and traffic in the immediate project vicinity for a short time. All project alternatives considered would occur in areas that have some existing facilities, e.g., parking lots and/or boat ramps at the proposed pier project locations. Because these sites have already been developed, further displacement of ecological habitats either would not occur or would be minimal (such as the minimal displacement or disturbance of submerged sediments from placement of support pilings). Minimization of any adverse ecological affects is also assured through project design and permitting processes. None of the potential projects has the potential to affect any historical resources, as no resources of this nature are located in the vicinity of any of the project sites.

In the long term, construction of fishing piers, boat ramps or parking improvements will facilitate access to Lavaca Bay for recreational fishing. As a result, projects at any location would be expected to experience increased use by recreational anglers and boaters. The construction or improvement of such facilities will be sufficient to accommodate these traffic increases. Where existing facilities are presently inadequate to support traffic during periods of heavy use, projects considered would be expected to alleviate those conditions.

These projects will facilitate access to fisheries resources. This is consistent with state and federal management objectives for fishery species targeted by recreational anglers in Lavaca Bay. Increasing fishing access in this area, however, is not expected to diminish or degrade these fish stocks or even lead to localized overfishing. Modeling analyses outlined in this plan do not indicate fishing trips will increase; rather, the projects will increase the options existing anglers will have for accessing and enjoying the fishing resources in this area. Communities in the counties surrounding Lavaca Bay are not experiencing rapid or uncontrolled growth, so the angler population utilizing this area is relatively stable. If such projects did result in any increase in trips or catches, the increases and, therefore, the potential to negatively impact fish stocks, would likely be minimal. Further, any such increases will be offset by restoration alternatives being considered in this assessment to compensate for ecological injuries. Although to be addressed in a subsequent Draft DARP/EA, all of the types of restoration actions under consideration would increase or enhance the habitats in Lavaca Bay which support fishery resources in this system.

All of the project alternatives considered would also potentially benefit non-anglers by providing or enhancing opportunities for other recreational activities, such as boating, walking, picnicking, and birdwatching. In addition, any of the project alternatives would also help support existing property values and fishing-related commercial activities.

Long term benefits associated with any of the project alternatives would outweigh any potential for negative affects on the environment, which are expected to be minimal. None of the project alternatives considered in Sections 5.3.2, 5.3.3, and 5.3.4 are believed to have any significant differences relative to potential ecological or socioeconomic impacts and none of the potential impacts, whether considered independently or cumulative, would be significant.

5.3.6 Preferred Restoration Alternatives

With the identification of a boat ramp at the Bayfront site as preferred compensation for recreational fishing service losses associated with the boat mode, it becomes possible to identify the pier project locations preferred to compensate for the pier mode losses. The selection of two pier projects from among the three locations – Bayfront, Six-Mile, and Point Comfort – was based on ensuring an equal distribution of projects (combined with the boat mode project) in the vicinity of the affected area. Since the boat mode project is at the Bayfront, the Trustees selected the pier projects at the Six-Mile and Point Comfort sites to achieve the balanced distribution of projects.

Fishing piers at Point Comfort and Six-Mile are the preferred restoration projects to compensate the public for pier-mode recreational fishing service losses. To compensate for boat-mode losses, a boat ramp at the Bayfront is the preferred restoration alternative. While the projects have not been designed in complete detail, there is information on the nature of the restoration projects. After this Draft DARP/EA has been reviewed by the public and finalized, the Trustees will seek implementation of the final restoration project selections by Alcoa. Final engineering details will be developed to support implementation by Alcoa or, if necessary, as a basis for determining final restoration costs.¹⁴

5.3.6.1 Pier Projects

The pier at Six-Mile is proposed for Six-Mile Park at Park Road. A lighted pier will be constructed off the promenade; it will span a minimum of 300 linear feet and will be 8 feet wide. The pier will be located so as to minimize interference with boat ramp traffic while maximizing access to better fishing spots. The initial design for the pier includes handrails and lighting, both flood and area lighting.

A pier is also proposed for Point Comfort's park. A lighted pier will be constructed off of the peninsula west of the existing boat ramp. The plan for the pier at Point Comfort mimics the specifications of the pier at Six-Mile. Again, the pier will be designed to maximize access to better fishing spots, however, its location will not interfere with the boat ramp. In addition to the pier, the project would include construction of a paved access road and a parking area with roughly twenty spaces.

¹⁴ A full restoration costs determination by the Trustees is unnecessary where an RP agrees to implement restoration actions.

5.3.6.2 Boat Project

The preferred restoration alternative to address boat mode fishing service losses is a boat ramp at the Bayfront site. A two-lane boat ramp, 14 feet wide for each lane, capable of accommodating large boats, 25 feet or longer, will be constructed on the promenade adjacent to the existing marina. Three walkways associated with the boat ramp – one down each side and one between the lanes – are also planned; the walkways will be 100 feet long and 4 feet wide. The project would include a new parking area with approximately twenty spaces for boat trailers.

The Trustees expect the boat and pier projects to meet restoration objectives. There is some uncertainty about the assumptions that determine the recreational fishing service losses and the benefits from the preferred restoration alternatives. Of primary importance is uncertainty about the time the closure will be lifted and the lifespan of the restoration projects. However, the Trustees have factored that uncertainty into their analysis and even with the uncertainty, the Trustees expect that the public will be fully compensated for the fishing service losses.

With respect to the lifespan of the restoration projects, the Trustees assumed the projects would exist and serve the recreational anglers for 30 years. Therefore, the Trustees will increase the likelihood of achieving 30-year project lifespans by designing and constructing the projects appropriately.

Although, the fishing closure is expected to be lifted by 2010, the pier projects at Point Comfort and Six-Mile and the boat ramp at the Bayfront, based on the modeling work and construction design, are still likely to provide sufficient restoration benefit to compensate for losses to 2030.¹⁵

¹⁵ Appendices F and G show the net benefits of the pier and boat ramp projects, respectively, should the fisheries closure remain in place until 2030.

COMPLIANCE WITH OTHER KEY STATUTES, REGULATIONS, AND POLICIES
CHAPTER 6

Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), 42 U.S.C. 9601 *et seq.*

CERCLA is the principle statute applicable to sites contaminated with hazardous substances. The statute establishes liability for site cleanup, prescribes a procedure for identifying and ranking contaminated sites, provides funding for site cleanups, establishes cleanup procedures that provide protection for humans and the environment, establishes liability for the injury to, destruction of or loss of natural resources caused by releases of hazardous substances and provides for the restoration of injured natural resources through provisions administered by designated natural resource trustees.

CERCLA provides a framework for conducting sound natural resource damage assessments that achieve restoration of natural resources or resource services. The process emphasizes both public involvement and participation by the Responsible Party(ies). For the Point Comfort/Lavaca Bay NPL Site, CERCLA is a primary statute supporting the assessment and restoration planning process which has been undertaken by the Trustees. This Draft DARP/EA is consistent with all applicable CERCLA provisions.

National Environmental Policy Act (NEPA), 42 U.S.C. 4321, *et seq.*, 40 C.F.R. Parts 1500-1508

In considering and identifying restoration actions proposed herein, the Draft DARP/EA for recreational fishing service losses integrates the elements of an Environmental Assessment (EA) in accordance with NEPA. This Draft DARP/EA, however, only proposes the restoration actions which the Trustees believe are appropriate to compensate the public for interim recreational fishing service losses. After finalizing the selection of restoration actions, the Trustees will supplement the information and analyses necessary to support implementation of selected restoration actions, as may be appropriate to make findings required by NEPA. Public input at this stage, however, is essential to the Trustees' final decision on appropriate restoration actions to compensate for the recreational fishing service losses.

Federal Water Pollution Control Act (also referred to as the Clean Water Act (CWA)), 33 U.S.C. 1251, *et seq.*

The Clean Water Act (CWA) Section 311 is also a source of authority for seeking natural resource damages at this Site. Like CERCLA, NRDA claims under the CWA are also appropriately based on appropriate restoration actions and are addressed under the DOI regulations.

Section 404 of the law authorizes a permit program for the disposal of dredged or fill material into navigable waters. The Army Corps of Engineers (Corps) administers the program. In general, restoration projects, which move significant amounts of material into or out of waters or wetlands – for example, hydrologic restoration of marshes – require 404 permits. A CWA

Section 404 permit will be obtained, if required, in implementing any restoration actions selected in the Final DARP/EA.

Coastal Zone Management Act (CZMA), 16 U.S.C. 1451, *et seq.*, 15 C.F.R. 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. Under Section 1456 of CZMA, restoration actions undertaken or authorized by federal agencies are required to comply, to the maximum extent practicable, with the enforceable policies of a state's federally approved Coastal Zone Management Program. NOAA and DOI have reviewed this Draft DARP/EA for consistency with the Texas Coastal Zone Management Plan and believe the restoration actions proposed herein are consistent with that plan. NOAA and DOI are submitting this determination to appropriate state agencies for review, as required under this Act.

Endangered Species Act (ESA), 16 U.S.C. 1531, *et seq.*, 50 C.F.R. 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 USFWS 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 restoration actions described in this Draft DARP/EA are not expected to adversely impact any species identified as threatened or endangered under the ESA, however, prior to implementation of any restoration action, the Trustees will initiate consultation with the appropriate agencies pursuant to the ESA in order to ensure that the restoration actions undertaken under this plan are in accordance with all applicable provisions of the ESA.

Fish and Wildlife Conservation Act, 16 U.S.C. 2901 *et seq.*

The proposed restoration projects will neither encourage nor discourage the conservation of non-game fish and wildlife.

Fish and Wildlife Coordination Act, (FWCA), 16 U.S.C. 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 the process of complying with Section 404 of the Clean Water Act, NEPA, or other federal permit license or review requirements. Upon finalization of the restoration projects, the Trustees will initiate consultation with the USFWS, the National Marine Fisheries Service, and state wildlife agencies pursuant to this statute.

Magnuson Fishery Conservation and Management Act, 16 U.S.C. 1801 *et seq.*

The Magnuson Fishery Conservation and Management Act provides for the conservation and management of the Nation's fishery resources within the Exclusive Economic Zone (from the seaward boundary of every state to 200 miles from that baseline). The management goal is to achieve and maintain the optimum yield from each fishery. The proposed restoration projects will not adversely impact Essential Fish Habitat (EFH).

Marine Mammal Protection Act, 16 U.S.C. 1361, *et seq.*

The Marine Mammal Protection Act provides for long-term management and research programs for marine mammals. It places a moratorium on the taking and importing of marine mammals and marine mammal products, with limited exceptions. The Department of Commerce is responsible for whales, porpoises, seals, and sea lions. The Department of the Interior is responsible for all other marine mammals. The proposed restoration projects will not have an adverse effect on marine mammals.

Migratory Bird Conservation Act, 126 U.S.C. 715 *et seq.*

The proposed restoration projects will have no adverse effect on migratory birds.

Archeological Resources Protection Act, 16 U.S.C. 470, *et seq.*

The Texas State Historical Preservation Officer will be consulted after finalization of restoration projects and prior to implementation to ensure that there are no known cultural resources in the project area and no known sites or properties listed on or eligible for listing on the National Register of Historic Places.

Rivers and Harbors Act of 1899, 33 U.S.C. 403, *et seq.*, Section 10

The Rivers and Harbors Act regulates development and use of the nation's navigable waterways. Section 10 of the Act prohibits unauthorized obstruction or alteration of navigable waters and vests the Corps with authority to regulate discharges of fill and other materials into such waters. Restoration actions that 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. Any permits under this Act, if required, will be obtained prior to implementing any restoration actions selected in the Final DARP/EA.

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

A Draft 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 proposed restoration activities will not adversely effect wetlands or the services they provide.

Executive Order Number 12898 – Environmental Justice

On February 11, 1994, President Clinton issued Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. This Executive Order requires each federal agency to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low income populations. EPA and the Council on Environmental Quality (CEQ) have emphasized the importance of incorporating environmental justice review in the analyses conducted by federal agencies under NEPA and of developing mitigation measures that avoid disproportionate environmental effects on minority and low-income populations. The Trustees have concluded that there are no low income or ethnic minority communities that would be adversely affected by the preferred restoration projects.

Executive Order Number 12962 (60 FR 30769) – Recreational Fisheries

The proposed restoration projects will not adversely effect recreational fisheries and the services they provide.

FINDING OF NO SIGNIFICANT IMPACT

CHAPTER 7

Having reviewed the attached environmental assessment and the available information relative to the proposed actions in Lavaca Bay, Texas, I have determined that there will be no significant environmental impacts from the proposed actions. Accordingly, preparation of an environmental impact statement on these issues is not required by Section 102 (2) (c) of the National Environmental Policy Act or its implementing regulations.

_____ Date _____

Penelope D. Dalton
Assistant Administrator for Fisheries
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
U. S. Department of Commerce

_____ Date _____

Nancy M. Kaufman
Regional Director, Region 2
Fish and Wildlife Service
U. S. Department of the Interior

TRUSTEE COUNCIL SIGNATURES

CHAPTER 8

In accordance with the Memorandum of Agreement among the National Oceanic and Atmospheric Administration of the U. S. Department of Commerce, the Fish and Wildlife Service of the U. S. Department of the Interior, the Texas Natural Resources Conservation Commission, the Texas Parks and Wildlife Department, and the Texas General Land Office, executed January 14, 1997, the following designated members of the 'Lavaca Bay Natural Resources Trustee Council' indicate by signature below their agreement to adopt, in its entirety, this Lavaca Bay Damage Assessment and Restoration Plan / Environmental Assessment.

The date of final approval for this document shall be the date of the final Trustee Representative's signature.

For NOAA _____ Date _____
Ron Gouguet
Coastal Resource Coordinator – Region 6
Office of Response and Restoration
1445 Ross Avenue, Dallas, TX 75202

For FWS _____ Date _____
Tom Schultz
Ecologist, Division of Environmental Contaminants
U.S. Fish and Wildlife Service, c/o TAMU-CC, Campus Box 338
6300 Ocean Drive, Corpus Christi, TX 78412

For TNRCC _____ Date _____
Richard Seiler
Natural Resource Trustee Delegate
Texas Natural Resource Conservation Commission, MC142
P.O. Box 13087, Austin, TX 78711-3087

For TPWD _____ Date _____
David R. Sager, Ph.D.
Director, Freshwater Conservation Branch
Resource Protection Division, Texas Parks and Wildlife Department
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For TGLO _____ Date _____
Diane Hyatt
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CHAPTER 9

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| Aluminum Company of America (Alcoa) | Kirk Gribben Kevin McKnight Ronald Weddell Lori McShea |

Appendix A – Administrative Record Documents

Filing Structure and Documents for Lavaca Bay

Classification # Classification Name

1. ADMINISTRATIVE RECORD INDEX
2. TRUSTEE/RESPONSIBLE PARTY AGREEMENTS
 - 2.01 Funding Agreements
 - 1 Funding Agreement 2/16/96
Document ID 1657
 - 2 Funding Agreement (DOI/ALCOA) 2/16/96
Document ID 1655
 - 2.02 Memorandum of Agreement (MOA)
 - 1 Memorandum of Agreement 1/14/97
Document ID 1658
 - 2.02.1 Attachments to MOA
 - 1 MOA Attachment 97-01 9/3/97
Document ID 1654
 - 2 MOA Attachment 98-01 3/9/98
Document ID 1669
 - 2.02.1.1 Annual Funding Actions
 - 1 Stephanie W. Fluke, to Ron Weddell, 4/25/97, Letter on Funds Request -- 1997
Document ID 1653
 - 2 Stephanie W. Fluke, to Ron Weddell, 1/12/98, Letter on Funds Request -- 1998
Document ID 1652
 - 3 Stephanie W. Fluke, to Ron Weddell, 1/19/98, Letter on Funds Request --1998
Document ID 1651
 - 4 Stephanie W. Fluke, to Ron Weddell, 1/21/99, Letter on Funds Request -- 1999
Document ID 1670
3. INJURY ASSESSMENT PHASE
 - 3.01 Injury Matrices
 - 3.02 Benthos (Soft Bottom)
 - 3.03 Birds
 - 3.04 Fish/Shellfish
 - 3.05 Groundwater/Water Column
 - 3.06 Marsh
 - 3.07 Oyster Reef
 - 3.08 Terrestrial Habitats (including High Marsh)
 - 3.09 Lost Recreational Use
 - 3.09.1 Technical Reports
 - 1 Recreational Fishing Assessment Technical Memorandum. Trustees and Alcoa, (11/30/99), 230
Document ID 1664

Classification # Classification Name

- 3.09.2 **Technical Comments**
 - 1 Tony Penn, to Bill Desvousges, 2/8/99, Memorandum on Follow-up Dissussion of Peer Reviewer Comments
Document ID 1659
 - 2 Doug MacNair, Janet Lutz, to Ron Gouguet, Tony Penn, David Chapman, Don Pitts, Ron Weddell, Kirk Gribben, 2/22/99, Letter on Technical Memorandum
Document ID 1663

- 3.09.3 **Peer Review**
 - 1 Adamowicz Peer Review Comments. Vic Adamowicz, (Department of Rural Economy, University of Alberta)(12/29/98), 18
Document ID 1662
 - 2 Parsons Peer Review. George R. Parsons, (9/2/99), 9
Document ID 1661
 - 3 V. Kerry Smith, to David J. Chapman, Douglas MacNair, 12/30/98, Letter on Smith Peer Review Comments
Document ID 1660

- 4. **ASSESSMENT/RESTORATION PLAN DEVELOPMENT - Lost Recreational Use**
- 4.01 **Public participation - Restoration Scoping**
 - 1 Port Lavaca Bayfront Masterplan. BRW, Inc., G & W Engineering, Gignac & Associates, (1/1/96), 61
Document ID 1656

- 4.01.1 **Notices**
 - 1 Public Meeting Announcment -- 17 February 1998. Alcoa and Trustees, (2/1/98), 3
Document ID 1650
 - 2 Public Meeting Announcment -- 5 November 1998. Alcoa and Trustees, (11/1/98),
Document ID 1641

- 4.01.2 **Meetings**
 - 1 Public Meeting Summary -- 17 February 1998. Ronald Weddell, (3/1/98), 13
Document ID 1649
 - 2 Public Meeting Summary -- 5 November 1998. Kristy Mathews, (11/9/98), 2
Document ID 1640

Classification # Classification Name

- 4.01.3 Public Comments
 - 1 Public Feed Backforms. The Public, (2/17/99), 34
Document ID 1648
 - 2 C. Elaine Giessel, to Peter Sheridan, 2/18/98, Letter on Public Comment
Document ID 1646
 - 3 Thomas J. Blazek, to Dr. Pete Sheridan, 2/19/98, Letter on Public Comment
Document ID 1642
 - 4 Gary Cunningham, to Dr. Pete Sheridan, 2/23/98, Letter on Public Comment
Document ID 1644
 - 5 Jack P. Traylor, to Peter Sheridan, 2/24/98, Letter on Public Comment
Document ID 1643
 - 6 Leroy Belk, to Dr. Pete Sheridan, 3/1/98, Letter on Public Comment
Document ID 1647
 - 7 J.C. Melcher, Jr., to Dr. Pete Sheridan, 3/1/98, Letter on Public Comment
Document ID 1645
 - 8 Leroy Belk, to Dr. Pete Sheridan, 5/11/98, Letter on Public Comment
Document ID 1667
 - 9 Thomas J. Blazek, to Dr. Peter F. Sheridan, 9/21/98, Letter on Public Comment
Document ID 1665
 - 10 Patricia H. Suter, to Dr. Peter Sheridan, 10/19/98, Letter on Public Comment
Document ID 1666
 - 11 Ted Dodson, to Dr. Pete F. Sheridan, 11/8/98, Letter on Public Comment
Document ID 1639
 - 12 Linda Reese, to Dr. Sheridan, 11/30/98, Letter on Public Comment
Document ID 1638
 - 13 Thomas Blazek, to Dr. Peter F. Sheridan, 12/18/98, Letter on Public Comment
Document ID 1637
- 4.02 Draft Assessment/Restoration Plan
 - 4.02.1 Notice of Availability
 - 4.02.2 Public Comments
- 4.03 Final Assessment/Restoration Plan
 - 4.03.1 Notice of Availability
- 4.04 NEPA Compliance Documents
- 4.05 Coastal Zone Consistency Determination
- 5. ASSESSMENT/RESTORATION PLAN DEVELOPMENT - Ecological Injuries/Service Losses
- 6. ASSESSMENT/RESTORATION PLAN DEVELOPMENT - Resource Injuries/Service Losses Residual to Final ROD

Appendix B – Quantification of Pier-Mode Recreational Fishing Service Losses

| Parameters | |
|--|--------|
| Closure Implemented | 1988 |
| Utility Index with Closure | 5.1766 |
| Utility Index at Baseline | 5.4673 |
| Duration of Closure in Years (through 10 years after remedy in 2000) | 23 |
| Discount Rate | 3% |
| Base Year | 1999 |

| Year | Raw Utility Loss | Discounted Utility Loss |
|---|------------------|-------------------------|
| 1987 | 0 | 0.0000 |
| 1988 | 0.2907 | 0.4024 |
| 1989 | 0.2907 | 0.3907 |
| 1990 | 0.2907 | 0.3793 |
| 1991 | 0.2907 | 0.3683 |
| 1992 | 0.2907 | 0.3575 |
| 1993 | 0.2907 | 0.3471 |
| 1994 | 0.2907 | 0.3370 |
| 1995 | 0.2907 | 0.3272 |
| 1996 | 0.2907 | 0.3177 |
| 1997 | 0.2907 | 0.3084 |
| 1998 | 0.2907 | 0.2994 |
| 1999 | 0.2907 | 0.2907 |
| 2000 | 0 | 0.0000 |
| 2001 | 0 | 0.0000 |
| 2002 | 0 | 0.0000 |
| 2003 | 0 | 0.0000 |
| 2004 | 0 | 0.0000 |
| 2005 | 0 | 0.0000 |
| 2006 | 0 | 0.0000 |
| 2007 | 0 | 0.0000 |
| 2008 | 0 | 0.0000 |
| 2009 | 0 | 0.0000 |
| 2010 | 0 | 0.0000 |
| 2011 | 0 | 0.0000 |
| | | |
| Sum of Discounted Utility Losses | | 4.1256 |

The restoration projects are expected to provide benefits starting in 2000. While the closure is still in place through 2010, there is no net loss from 2000 - 2010 because of the function of restoration projects.

Appendix C – Quantification of Boat-Mode Recreational Fishing Service Losses

| Parameters | |
|--|--------|
| Closure Implemented | 1988 |
| Utility Index with Closure | 7.3062 |
| Utility Index at Baseline | 7.4087 |
| Duration of Closure in Years (through 10 years after remedy in 2000) | 23 |
| Discount Rate | 3% |
| Base Year | 1999 |

| Year | Raw Utility Loss | Discounted Utility Loss |
|---|------------------|-------------------------|
| 1987 | 0 | 0.0000 |
| 1988 | 0.1025 | 0.1419 |
| 1989 | 0.1025 | 0.1378 |
| 1990 | 0.1025 | 0.1337 |
| 1991 | 0.1025 | 0.1298 |
| 1992 | 0.1025 | 0.1261 |
| 1993 | 0.1025 | 0.1224 |
| 1994 | 0.1025 | 0.1188 |
| 1995 | 0.1025 | 0.1154 |
| 1996 | 0.1025 | 0.1120 |
| 1997 | 0.1025 | 0.1087 |
| 1998 | 0.1025 | 0.1056 |
| 1999 | 0.1025 | 0.1025 |
| 2000 | 0 | 0.0000 |
| 2001 | 0 | 0.0000 |
| 2002 | 0 | 0.0000 |
| 2003 | 0 | 0.0000 |
| 2004 | 0 | 0.0000 |
| 2005 | 0 | 0.0000 |
| 2006 | 0 | 0.0000 |
| 2007 | 0 | 0.0000 |
| 2008 | 0 | 0.0000 |
| 2009 | 0 | 0.0000 |
| 2010 | 0 | 0.0000 |
| 2011 | 0 | 0.0000 |
| | | |
| | | |
| Sum of Discounted Utility Losses | | 1.4547 |

The restoration projects are expected to provide benefits starting in 2000. While the closure is still in place through 2010, there is no net loss from 2000 - 2010 because of the function of restoration projects.

Appendix D – Benefit of Piers at Point Comfort and Six-Mile

| Parameters | |
|---|----------------|
| Restoration Implemented | 2000 |
| Utility Index with Restoration and Closure | 5.6848 |
| Utility Index at Baseline | 5.4673 |
| Utility Index with Restoration only Closure lifted | 5.8674 2010 |
| Lifespan of project | 30 |
| Discount Rate | 3% |
| Base Year | 1999 |

| Year | Raw Utility Benefit | Discounted Utility Benefit |
|--|---------------------|----------------------------|
| 1999 | 0 | 0.0000 |
| 2000 | 0.2175 | 0.2112 |
| 2001 | 0.2175 | 0.2050 |
| 2002 | 0.2175 | 0.1990 |
| 2003 | 0.2175 | 0.1932 |
| 2004 | 0.2175 | 0.1876 |
| 2005 | 0.2175 | 0.1822 |
| 2006 | 0.2175 | 0.1768 |
| 2007 | 0.2175 | 0.1717 |
| 2008 | 0.2175 | 0.1667 |
| 2009 | 0.2175 | 0.1618 |
| 2010 | 0.2175 | 0.1571 |
| 2011 | 0.4001 | 0.2806 |
| 2012 | 0.4001 | 0.2724 |
| 2013 | 0.4001 | 0.2645 |
| 2014 | 0.4001 | 0.2568 |
| 2015 | 0.4001 | 0.2493 |
| 2016 | 0.4001 | 0.2421 |
| 2017 | 0.4001 | 0.2350 |
| 2018 | 0.4001 | 0.2282 |
| 2019 | 0.4001 | 0.2215 |
| 2020 | 0.4001 | 0.2151 |
| 2021 | 0.4001 | 0.2088 |
| 2022 | 0.4001 | 0.2027 |
| 2023 | 0.4001 | 0.1968 |
| 2024 | 0.4001 | 0.1911 |
| 2025 | 0.4001 | 0.1855 |
| 2026 | 0.4001 | 0.1801 |
| 2027 | 0.4001 | 0.1749 |
| 2028 | 0.4001 | 0.1698 |
| 2029 | 0.4001 | 0.1648 |
| 2030 | 0 | 0.0000 |
| Sum of Discounted Utility Gains | | 6.1526 |

From 2000 - 2010, the benefit of the projects is net of the losses that occur due to the closure that is still in effect.

Appendix E – Benefit of Boat Ramp Project at Bayfront

| Parameters | |
|---|--------|
| Restoration Implemented | 2000 |
| Utility Index with Restoration and Closure | 7.5986 |
| Utility Index at Baseline | 7.4087 |
| Utility Index with Restoration only Closure lifted | 7.716 |
| | 2010 |
| Lifespan of project | 30 |
| Discount Rate | 3% |
| Base Year | 1999 |

| Year | Raw Utility Benefit | Discounted Utility Benefit |
|--|---------------------|----------------------------|
| 1999 | 0 | 0.0000 |
| 2000 | 0.1899 | 0.1844 |
| 2001 | 0.1899 | 0.1790 |
| 2002 | 0.1899 | 0.1738 |
| 2003 | 0.1899 | 0.1687 |
| 2004 | 0.1899 | 0.1638 |
| 2005 | 0.1899 | 0.1590 |
| 2006 | 0.1899 | 0.1544 |
| 2007 | 0.1899 | 0.1499 |
| 2008 | 0.1899 | 0.1455 |
| 2009 | 0.1899 | 0.1413 |
| 2010 | 0.1899 | 0.1372 |
| 2011 | 0.3073 | 0.2155 |
| 2012 | 0.3073 | 0.2093 |
| 2013 | 0.3073 | 0.2032 |
| 2014 | 0.3073 | 0.1972 |
| 2015 | 0.3073 | 0.1915 |
| 2016 | 0.3073 | 0.1859 |
| 2017 | 0.3073 | 0.1805 |
| 2018 | 0.3073 | 0.1752 |
| 2019 | 0.3073 | 0.1701 |
| 2020 | 0.3073 | 0.1652 |
| 2021 | 0.3073 | 0.1604 |
| 2022 | 0.3073 | 0.1557 |
| 2023 | 0.3073 | 0.1512 |
| 2024 | 0.3073 | 0.1468 |
| 2025 | 0.3073 | 0.1425 |
| 2026 | 0.3073 | 0.1383 |
| 2027 | 0.3073 | 0.1343 |
| 2028 | 0.3073 | 0.1304 |
| 2029 | 0.3073 | 0.1266 |
| 2030 | 0 | 0.0000 |
| Sum of Discounted Utility Gains | | 4.9370 |

From 2000 - 2010, the benefit of the projects is net of the losses that occur due to the closure that is still in effect.

Appendix F – Benefit of Piers at Point Comfort and Six-Mile (Assuming Loss until 2030)

| Parameters | |
|---|----------------|
| Restoration Implemented | 2000 |
| Utility Index with Restoration and Closure | 5.6848 |
| Utility Index at Baseline | 5.4673 |
| Utility Index with Restoration only Closure lifted | 5.8674 2030 |
| Lifespan of project | 30 |
| Discount Rate | 3% |
| Base Year | 1999 |

| Year | Raw Utility Benefit | Discounted Utility Benefit |
|--|---------------------|----------------------------|
| 1999 | 0 | 0.0000 |
| 2000 | 0.2175 | 0.2112 |
| 2001 | 0.2175 | 0.2050 |
| 2002 | 0.2175 | 0.1990 |
| 2003 | 0.2175 | 0.1932 |
| 2004 | 0.2175 | 0.1876 |
| 2005 | 0.2175 | 0.1822 |
| 2006 | 0.2175 | 0.1768 |
| 2007 | 0.2175 | 0.1717 |
| 2008 | 0.2175 | 0.1667 |
| 2009 | 0.2175 | 0.1618 |
| 2010 | 0.2175 | 0.1571 |
| 2011 | 0.2175 | 0.1526 |
| 2012 | 0.2175 | 0.1481 |
| 2013 | 0.2175 | 0.1438 |
| 2014 | 0.2175 | 0.1396 |
| 2015 | 0.2175 | 0.1355 |
| 2016 | 0.2175 | 0.1316 |
| 2017 | 0.2175 | 0.1278 |
| 2018 | 0.2175 | 0.1240 |
| 2019 | 0.2175 | 0.1204 |
| 2020 | 0.2175 | 0.1169 |
| 2021 | 0.2175 | 0.1135 |
| 2022 | 0.2175 | 0.1102 |
| 2023 | 0.2175 | 0.1070 |
| 2024 | 0.2175 | 0.1039 |
| 2025 | 0.2175 | 0.1009 |
| 2026 | 0.2175 | 0.0979 |
| 2027 | 0.2175 | 0.0951 |
| 2028 | 0.2175 | 0.0923 |
| 2029 | 0.2175 | 0.0896 |
| 2030 | 0 | 0.0000 |
| Sum of Discounted Utility Gains | | 4.2631 |

From 2000 - 2029, the benefit of the projects is net of the losses that occur due to the closure that is still in effect.

Appendix G – Benefit of Boat Ramp Project at Bayfront (Assuming Loss until 2030)

| Parameters | |
|---|--------|
| Restoration Implemented | 2000 |
| Utility Index with Restoration and Closure | 7.5986 |
| Utility Index at Baseline | 7.4087 |
| Utility Index with Restoration only Closure lifted | 7.716 |
| | 2030 |
| Lifespan of project | 30 |
| Discount Rate | 3% |
| Base Year | 1999 |

| Year | Raw Utility Benefit | Discounted Utility Benefit |
|--|---------------------|----------------------------|
| 1999 | 0 | 0.0000 |
| 2000 | 0.1899 | 0.1844 |
| 2001 | 0.1899 | 0.1790 |
| 2002 | 0.1899 | 0.1738 |
| 2003 | 0.1899 | 0.1687 |
| 2004 | 0.1899 | 0.1638 |
| 2005 | 0.1899 | 0.1590 |
| 2006 | 0.1899 | 0.1544 |
| 2007 | 0.1899 | 0.1499 |
| 2008 | 0.1899 | 0.1455 |
| 2009 | 0.1899 | 0.1413 |
| 2010 | 0.1899 | 0.1372 |
| 2011 | 0.1899 | 0.1332 |
| 2012 | 0.1899 | 0.1293 |
| 2013 | 0.1899 | 0.1255 |
| 2014 | 0.1899 | 0.1219 |
| 2015 | 0.1899 | 0.1183 |
| 2016 | 0.1899 | 0.1149 |
| 2017 | 0.1899 | 0.1115 |
| 2018 | 0.1899 | 0.1083 |
| 2019 | 0.1899 | 0.1051 |
| 2020 | 0.1899 | 0.1021 |
| 2021 | 0.1899 | 0.0991 |
| 2022 | 0.1899 | 0.0962 |
| 2023 | 0.1899 | 0.0934 |
| 2024 | 0.1899 | 0.0907 |
| 2025 | 0.1899 | 0.0881 |
| 2026 | 0.1899 | 0.0855 |
| 2027 | 0.1899 | 0.0830 |
| 2028 | 0.1899 | 0.0806 |
| 2029 | 0.1899 | 0.0782 |
| 2030 | 0 | 0.0000 |
| Sum of Discounted Utility Gains | | 3.7221 |

From 2000 - 2029, the benefit of the projects is net of the losses that occur due to the closure that is still in effect.