APPENDIX B

ESSENTIAL FISH HABITAT ASSESSMENT

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1.0 INTRODUCTION

In 1976, the Magnuson-Stevens Act (MSA) was passed in order to promote fish conservation and management. The MSA granted the National Marine Fisheries Service (NOAA Fisheries) legislative authority for fisheries regulation in the United States within a jurisdictional area located between 3 miles to 200 miles offshore, depending on geographical location. NOAA Fisheries established eight regional fishery management councils, each responsible for the proper management and harvest of finfish and shellfish resources within their respective geographic regions. Fishery management councils have developed Fisheries Management Plans (FMP), which outline measures to ensure the proper management and harvest of the finfish and shellfish within these waters.

Recognizing that many marine fisheries are dependent on nearshore and estuarine environments for at least part of their life cycles, new habitat conservation provisions to the MSA (Public Law 94-265, as amended in 1996 and Public Law 104-297 as amended in 1998) were added, along with other goals, to promote more effective habitat management and protection of marine fisheries. The protection of the marine environments important to marine fisheries, referred to as essential fish habitat (EFH), is required in the review of projects conducted under federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S.C. 1802(10)).

Federal agencies that authorize, fund, or undertake activities that may adversely impact EFH must consult with the NOAA Fisheries. Although absolute criteria have not been established for conducting EFH consultations, NOAA Fisheries recommends consolidated EFH consultations with interagency coordination procedures required by other statutes, such as the National Environmental Policy Act (NEPA) and Endangered Species Act (ESA), in order to reduce duplication and improve efficiency. Generally, the EFH consultation process includes the following steps:

> **1) Notification** - The action agency should clearly state the process being used for EFH consultations (*e.g.*, incorporating EFH consultation into the Environmental Impact Statement (EIS) or Rivers and Harbors Act Section 10 permit).
>
> **2) EFH Assessment** - The action agency should prepare an EFH Assessment that includes both identification of affected EFH and an assessment of impacts. Specifically, the EFH should include: 1) a description of the proposed action; 2) an analysis of the effects (including cumulative effects) of the proposed action on EFH, the managed fish species, and major prey species; 3) the federal agency's views regarding the effects of the action on EFH; and 4) proposed mitigation, if applicable.

3) EFH Conservation Recommendations - After reviewing the EFH Assessment, NOAA Fisheries would provide recommendations to the action agency regarding measures that can be taken by that agency to conserve EFH.

4) Agency Response - The action agency must respond to NOAA Fisheries within 30 days of receiving NOAA Fisheries' recommendations to conserve EFH. The action agency may notify NOAA Fisheries that a full response to the conservation recommendations will be provided by a specified completion date agreeable to all parties. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH.

We[1] incorporate EFH consultations for the Ingleside Energy Center LNG Project with the interagency coordination procedures required under NEPA. For purposes of reviewing this Project under NEPA, the Federal Energy Regulatory Commission (FERC) is the lead federal agency. As such, the FERC requested that NOAA Fisheries consider an administrative draft the EIS as notification of initiation of EFH consultation. In its comments on the administrative draft EIS, NOAA Fisheries stated this method of consultation was acceptable[2].

NOAA Fisheries has agreed to be a cooperating agency for this project. In a letter dated June 3, 2004 to the Secretary of the Commission (Attachment B-1), NOAA Fisheries advised FERC that the proposed project site is adjacent to areas that have been identified as EFH. FERC and NOAA Fisheries staff participated in a coordination meeting on April 28, 2004. By letter dated January 7, 2005 NOAA Fisheries, Habitat Conservation Division, provided comments on the administrative draft of the EIS, and those comments were incorporated into the draft EIS and EFH Assessment. NOAA Fisheries reviewed the draft EIS and on April 12, 2005, NOAA Fisheries provided comments on the draft EIS and the EFH assessment, including a conservation recommendation. We have responded to those comments (see responses to A5 in Appendix H) and addressed NOAA Fisheries' EFH conservation recommendation in this EIS.

An assessment of potential effects of the Ingleside Energy Center LNG Project on EFH is included below.

2.0 FEDERALLY MANAGED SPECIES

Information regarding EFH was obtained through correspondence with NOAA Fisheries and from the Gulf of Mexico Fisheries Management Council (GMFMC).

The GMFMC (1998) reports that all estuarine systems of the Gulf of Mexico are considered essential habitat for fish managed by the GMFMC. Also, EFH includes all waters and substrates within the estuarine boundaries, including sub-tidal vegetation and adjacent tidal vegetation (GMFMC, 1998). In reviewing the Project location, NOAA Fisheries (2004) reported that designated EFH occurs in the Project area for various life stages of five species: postlarval,

[1] "We," "us," and "our" refer to the environmental staff of the FERC's Office of Energy Projects.

[2] The vertical line in the margin identifies text that has been modified in this final EIS and differs substantially form the corresponding text in the draft EIS.

juvenile, and adult red drum; adult and subadult Spanish mackerel; and juvenile and subadult white, brown, and pink shrimp. None of these managed stocks are endangered or threatened under the ESA. Although all waters and substrates within estuaries are considered EFH, the primary categories of EFH in the Project area for the species identified by NOAA Fisheries (2004) include estuarine water column, unvegetated mud and sand substrates, seagrass, and intertidal wetlands. Prey for managed fish species also comprise a critical component of EFH. Managed species and EFH categories used by these species are summarized in table 2-1.

A detailed description of life history characteristics and habitat preferences of each species, based primarily on the research referenced in Ingleside San Patricio's application to FERC, and our recent analysis of the Cheniere Corpus Christi LNG Project, is provided below. No field surveys were conducted to verify the presence or absence of these species in the Project area.

TABLE 2-1

Summary of EFH Categories Potentially Used by Specific Life Stages of Federally Managed Fish Species at the Proposed Ingleside Energy Center LNG Terminal Site

Species/Life Stage	EFH Categories at Proposed Terminal Site			
	Estuarine Water Column	Unvegetated Substrates	Seagrass	Intertidal Wetlands
Red Drum				
Postlarval	X			X
Juvenile	X			X
Adult	X			
Spanish Mackerel				
Subadult	X		X	X
Adult	X		X	X
White Shrimp				
Juvenile	X	X	X	X
Subadult	X	X	X	X
Brown Shrimp				
Juvenile	X	X	X	X
Subadult	X	X	X	X
Pink Shrimp				
Juvenile			X	
Subadult			X	

White Shrimp *(Litopenaeus setiferus)*

The white shrimp is one of the important penaeids along the Atlantic and Gulf of Mexico coasts. White shrimp are found in estuaries and out to depths of approximately 40 meters (m) offshore in the coastal waters extending from Florida to Texas and are most abundant in the central and western Gulf of Mexico. Non-spawning adult white shrimp inhabit offshore waters in the winter and move inshore in the spring. Spawning generally occurs offshore in water depths of less than 27 m from spring to late fall peaking during June and July. Eggs are demersal and share the same distribution as spawning adults. Larval white shrimp hatch within 12 hours of spawning

and begin to migrate through passes toward estuaries as they develop into postlarvae. Estuarine migration peaks between June and September.

Juvenile white shrimp are most abundant in turbid estuaries along the western coast of the Gulf of Mexico and, within these estuarine nurseries, reach their greatest densities in marsh edge habitats and in areas with submerged aquatic vegetation. However, juvenile white shrimp are also common in marsh ponds, channels, inner marshes, shallow subtidal areas and oyster reefs. In non-vegetated areas, postlarvae and juveniles inhabit mostly muddy substrates with large quantities of detritus (GMFMC, 1998). Subadult white shrimp move from the estuaries to coastal areas in late August and September.

Brown Shrimp *(Farfantepenaeus aztecus)*

Adult brown shrimp inhabit neritic waters (over the continental shelf from low tide to a depth of approximately 110 m) throughout the Gulf of Mexico, but are more abundant off the coasts of Texas, Louisiana, and Mississippi. Non-spawning adults prefer turbid waters to soft sediments (*i.e.*, mud and sand). In the spring and fall, adult brown shrimp move to slightly deeper water (46 to 91 m) to spawn. Brown shrimp eggs are demersal and usually hatch when temperatures are greater than 24°C. Larval brown shrimp are most abundant offshore but do occur in waters that range from 0 to 82 m deep. Postlarval brown shrimp migrate toward estuaries in the spring, typically reaching their destination between February and April. Late postlarval and juvenile brown shrimp are most abundant in shallow (<1 m) estuarine habitats in the spring and early summer but typically are present through the fall.

Juvenile brown shrimp reach their greatest abundances in turbid estuaries but tolerate waters with less suspended material. Within the estuarine environment, juvenile brown shrimp prefer marsh edges and areas with submerged vegetation, but occur throughout the vegetated and non-vegetated portions of the estuary and in the lower reaches of its tributaries. Subadults are most abundant in slightly deeper waters of 1 to 18 m and prefer sand, mud and shell substrates to the vegetated bottoms preferred by juveniles. As they develop, subadult brown shrimp continue to migrate toward deeper waters, eventually leaving the estuarine nurseries in mid-summer.

Pink Shrimp *(Farfantepenaeus duorarum)*

Adult pink shrimp typically inhabit offshore marine waters, where they reach their greatest densities over depths of 9 to 44 m (GMFMC, 1998). Adults prefer coarse sand and shell substrates with relatively little organic material (GMFMC, 1998). Spawning occurs offshore at depths between 4 and 48 m. Pink shrimp have demersal eggs that give rise to planktonic larvae.

Larvae migrate toward estuarine nursery areas in the spring and late fall (GMFMC, 1998). Upon reaching these nurseries, postlarval pink shrimp assume a benthic lifestyle, burrowing into the substrate during the day and foraging above the substrate at night. Juvenile pink shrimp inhabit nearly all U.S. estuaries in the Gulf of Mexico, but reach their greatest abundances in Florida where they prefer non-turbid waters with an abundance of seagrass, which provides cover and habitat for prey, and avoid marsh habitats (GMFMC, 1998). Postlarvel, juvenile and subadults also prefer coarse substrates, such as sand, shell and mud mixtures (GMFMC, 1998).

Red Drum *(Sciaenops ocellatus)*

The red drum occurs in a variety of habitats over different substrates throughout the Gulf of Mexico. Habitats range in depth from about 40 m offshore to very shallow in estuarine wetlands with substrates that include sand, mud and oyster reefs. Adult red drum are roving predators that opportunistically feed on a variety of invertebrate and vertebrate prey including crab, shrimp and other fishes. Spawning occurs from September through November over deeper waters protected from currents such as the mouths of bays and inlets, and on the Gulf of Mexico side of barriers islands. Eggs typically hatch between late summer and early fall in the open waters of the Gulf of Mexico and are subsequently transported on tides and currents into estuarine nursery areas.

Larval red drum are most abundant in estuaries from mid-August through late November. Within these estuarine nurseries, larvae, postlarvae, and juveniles prefer habitats protected form currents with submerged and emergent vegetation and muddy substrates, but also tolerate non-vegetated hard and soft-bottomed areas. Larval and postlarval red drum feed primarily on copepods whereas juveniles feed on a wide variety of small invertebrates. Juvenile red drum become most abundant in early winter. Much like the adult red drum, late juveniles utilize a wide variety of habitats. However, they still prefer protected waters and do not become abundant in open waters until mid-September to early October. Estuarine wetlands are very important to larval and juvenile red drum largely because these areas provide habitat for suitable prey species. Adult red drum use estuaries, but tend to spend more time offshore as they age (GMFMC, 1998).

Spanish Mackerel *(Scomberomorus maculatus)*

The Spanish mackerel is a coastal pelagic fish that typically occurs in waters up to 75 m deep in coastal areas throughout the Gulf of Mexico (GMFMC, 1998). Adults are most prevalent in coastal waters, but will inhabit estuarine areas, especially those with higher salinity, during seasonal migrations (GMFMC, 1998), and in pursuit of prey. They are, however, considered rare and occur infrequently in Gulf of Mexico estuaries (GMFMC, 1998). Important spawning areas are located in waters over the inner continental shelf of northeastern and north-central Gulf of Mexico, where spawning occurs from May through September.

Eggs are pelagic, occurring in waters over the inner continental shelf of the northern Gulf of Mexico with depths of greater than 50 m during the spring and summer. Larvae are common from May to October in these same offshore areas over depths ranging from nine to 84 m, but are most common in waters less than 50 m deep. Estuaries and coastal waters serve as year-round nurseries for juvenile Spanish mackerel.

EFH Species Distribution in Corpus Christi Bay

NOAA's Estuarine Living Marine Resources (ELMR) Program has developed synoptic species distribution and relative abundance data for fishes and macroinvertebrates in the Gulf of Mexico. Relative abundance ranking was performed based on a variety of data include surveys, gray literature, peer review literature, and reviews by academic and government fisheries experts. Five categories of abundance were developed, including, not present, rare, common, abundant, and highly abundant.

Results of this evaluation are available in tabular form on the ELMR website (http://galveston.ssp.nmfs.gov/efh/elrm.html). The abundance data is further broken down into lifestages, salinity seasons, months, and locale. A summary of the Corpus Christi Bay estuary EFH species lifestage and seasonal abundance information for the species and lifestages identified in the June 3, 2004, NOAA Fisheries letter is provided in table 2-2.

EFH distribution maps showing the seasonal breakdown of relative abundance for the adult and juvenile stages for each of the species with EFH potentially occurring in the Project area in Nueces and San Patricio Counties, Texas can be obtained from the NOAA Fisheries Galveston Laboratory web site

(http://galveston.ssp.nmfs.gov/research/fisheryecology/EFH/Relative/estuaries/index.html).

TABLE 2-2

Summary of Corpus Christi Bay EFH Information
Nueces and San Patricio Counties, Texas

Species b/	Life stage c/	Relative Abundance a/			
		Low Salinity (April-June)	Increasing Salinity (July)	High Salinity (Aug-Oct)	Decreasing Salinity (Nov-Mar)
White Shrimp (*Litopenaeus setiferus*)	A	Common	Not present	Abundant	Abundant
	J	Common	Abundant	Abundant	Common
Brown Shrimp (*Farfantepenaeus aztecus*)	A	Rare	Rare	Rare	Not present
	J	Common	Common	Common	Common
Pink Shrimp (*Farfantepenaeus duorarum*)	A	Not present	Not present	Not present	Not present
	J	Common	Rare	Common	Common
Red Drum (*Sciaenops ocellatus*)	A	Common	Common	Common	Common
	J	Common	Common	Common	Common
Spanish Mackerel (*Scomberomorus maculates*)	A	Common	Common	Common	Rare
	J	Rare	Rare	Rare	Not present

Source: GMFMC, 2003
a/ Seasonal relative abundances provided by GMFMC (EFH maps). Determined as the highest monthly relative abundance value in the ELMR database for that salinity season.
b/ Species for which EFH maps are provided by the GMFMC.
c/ Life stages for which EFH is mapped include adults (A) and juveniles (J).

Spawning and larval development of the penaeid shrimp occur in the Gulf of Mexico. They have similar life history stages, are estuarine-dependent and vary seasonally in abundance. Adult white shrimp begin to appear in Corpus Christi Bay with a major peak of abundance beginning in August during the high salinity season extending through the end of March, are common in the spring as salinity decreases and begin to migrate back to the sea during June when bay salinities begin to increase. Juveniles are common in the bay during decreasing and low salinities from November to June becoming abundant from July to October. Brown shrimp utilize the same nursery grounds as the white shrimp during the growth period from the postlarval stage to the adult stage. Adult brown shrimp distribution from April to October is rare and they are not present in the bay between March and November. The juvenile shrimp population is highly

abundant in the upper portion of Nueces Bay from April to June and commonly found in the entire Corpus Christi Bay system throughout the year. For the pink shrimp, adults are not present whereas juveniles commonly occur almost year-round except during July when they are rarely present in the bay.

Adult and juvenile forms of red drum are common throughout the year. Adult Spanish mackerel are common throughout the year except the November through March period of decreasing salinity when they are rarely present in Corpus Christi Bay. Conversely, the juvenile Spanish mackerel do not occur in Corpus Christi Bay during the November through March period and only rarely occur during the time between April and October.

Due to their life history strategies, there is a temporal component to the probability of occurrence of most shellfish and finfish species (table 2-2). Most estuarine species spawn offshore and move inshore to take advantage of rich estuarine waters while they develop before emigrating offshore as adults. Seagrass and coastal marsh habitats typically serve as nursery areas for juvenile penaeid shrimp and red drum, therefore these species are likely to occur in these habitats during the early phase of their life cycle. Red drum inhabit estuaries throughout their life cycle but exhibit less affinity towards vegetated areas as they age and therefore have a moderate probability of occurrence in all Project area habitat types. Other species, such as the Spanish mackerel, utilize estuaries opportunistically in pursuit of prey mainly as adults.

3.0 POTENTIAL EFFECTS ON EFH

Based on comparisons of habitat preferences as described above and the aforementioned characteristics of the major habitat types, open bay habitat and seagrass habitat near the proposed LNG terminal site could potentially function as EFH for the following species: adult and juvenile brown shrimp, pink shrimp, white shrimp, red drum, and Spanish mackerel. Of these, adult brown shrimp, pink shrimp, and Spanish mackerel are considered rare or not present in Corpus Christi Bay (GMFMC, 2003) and therefore are not likely to occur in the vicinity of the proposed Project.

Coastal marsh habitat and tidal flat habitat near the proposed LNG terminal site could potentially function as EFH during periods of inundation for the following species: adult and juvenile brown shrimp, pink shrimp, white shrimp, red drum and Spanish mackerel. Of these, adult brown shrimp, pink shrimp, and Spanish mackerel are considered rare or not present in Corpus Christi Bay (GMFMC, 2003) and therefore are not likely to occur in the vicinity of the proposed Project.

In addition to being designated as EFH, the tidally influenced wetlands, seagrass, mud and sand substrates and shallow water habitats in the Project area provide nursery, foraging and refuge habitats that support various recreationally and economically important marine fishery species such as spotted seatrout (*Cynoscion nebulosus*), flounder (*Paralichthys spp*.), Atlantic croaker (*Micropogonias undulatus*), black drum (*Pogonias cromis*), Gulf menhaden (*Brevoortia patronus*), striped mullet (*Mugil cephalus*) and blue crab (*Callinectes sapidus*). Such estuarine-dependent species serve as prey for other fisheries managed by GMFMC (*e.g.*, red drum, mackerels, snappers and groupers) and highly migratory species managed by NOAA Fisheries (*e.g.*, billfishes and sharks).

Ingleside San Patricio proposes to use a cutter head suction dredging system to remove approximately about 3,084,700 cubic yards of material that include layers of natural stiff to hard clays interbedded with medium dense to very dense clayey silty and clayey sands. Of this amount, about 1,719,400 cubic yards of material would be removed for the LNG ship berth and 1,365,300 cubic yards of material would be dredged for the maneuvering area. In addition, about 550,300 cubic yards of material would be dredged as part of the removal of Occidental Chemical's existing loading dock (see section 2.10.1 of this EIS). During the dredging operation, potential effects on water quality could include temporary increased turbidity surrounding the hydraulic cutterhead of the dredge as well as around the mixing zone where the water from the dredging activities reenters the bay. Disturbance of bottom sediments during dredging can significantly increase turbidity and down-current deposition of re-suspended sediments. Very high levels of turbidity can result in the physical impairment of estuarine species (*e.g.*, turbidity induced clogged gills resulting in suffocation, or abrasion of sensitive epithelial tissue). Dredging with a hydraulic cutterhead dredge generally creates less turbidity than other types of dredges (*i.e.*, mechanical bucket or hopper dredges). With a cutterhead dredge, the cutter speed can be adjusted to match the sediment properties, thus minimizing turbidity. Herbich and Brahme (1984) discuss the mechanism of turbidity generation around the cutterhead, and based on model studies reported that turbidity at the cutterhead moved horizontally in all directions but its vertical movement was very limited.

Ward (1997) describes the tidal flushing in Corpus Christi Bay as a restricted flow, tidal regime switching from a semi-diurnal to diurnal. The tides are wind dominated which results in relatively higher tides in summer and spring with lower tides in winter and fall because of the prevailing wind. Because of the change in the width to depth ratio of the La Quinta Channel, overall currents would be expected to be relatively low, particularly at or near the bottom where dredging would occur.

As discussed in section 2.4.1.2 of this EIS, Ingleside San Patricio's preferred dredge material placement area (DMPA) would be at Alcoa's bauxite residue tailing ponds. Alcoa's tailing ponds are 119, 385, and 188 acres in size, and were formerly used for the disposal and permanent storage of bauxite residue and related waste from refining activities at the Sherwin Alumina Company plant. Should unforeseen circumstances arise that preclude the use of Alcoa's tailing ponds, Ingleside San Patricio has identified the Port of Corpus Christi Authority's (PCCA) DMPA No. 13 as an alternative. However, use of DMPA No. 13 would not proceed without a determination from the PCCA and the U.S. Army Corp of Engineers (COE) that adequate capacity exists at this location to accommodate the maintenance work required in Corpus Christi Bay and dredged material from other area projects. The PCCA's DMPA is located about 800 feet west of the LNG terminal site and consists of a 600-acre spoil bank that was created by dredged material from other area projects. Dredged material return water would be addressed in Ingleside San Patricio's Section 401 permit.

Based on the general hydraulic characteristics of the site and the proposed depth of dredging, most of the sediment that would become suspended during the dredging process is expected to be short term and the water quality would return to background levels a short distance from the point of disturbance. The sediments that would be dredged consist of mostly consolidated clays. The dredged material slurry would be pumped into the PCCA's DMPA No. 13 or Alcoa's tailing ponds via submerged disposal lines, about 1.1 and 3.8-miles-long, respectively. The amount and

location of sediment that would settle out depends on the amount of sediment suspended, ambient water currents and particle size. Ingleside San Patricio performed a standard engineering analysis, using the mathematical model DREDGE, to assess the potential impact on water column quality and seagrass beds as a result of a turbidity plume created by dredging operations. The analysis results indicate that the concentration of a turbidity plume would be less than 20 milligram per liter (mg/L) at all locations, with the highest concentrations occurring in the immediate vicinity of the dredge, and decreasing rapidly with distance downcurrent. Based on the correlation between turbidity and suspended sediment concentration, the turbidity plume would not exceed the threshold value of 30 nephelometric turbidity units (NTU), a screening value indicative of water column impact.

A Stokes settling velocity analysis was conducted to evaluate the potential for sediments to settle out of the water column and the potential impacts on adjacent seagrass beds. The analysis results indicate that the particles resuspended during dredging operations are not likely to significantly impact the seagrass beds along the La Quinta Channel since the fine silt and clay particles would be washed out of the channel prior to settling out of the water column. Impacts to EFH due to water quality impacts from dredging are therefore expected to be short term and minimal, and turbidity control methods are not expected to be required.

Entrainment of aquatic organisms by dredging machinery can impact EFH species directly, or indirectly through the removal of prey species (*e.g.*, benthic invertebrates) or food species (*e.g.*, macroalgae), disrupting energy flow and biotic interactions. Entrainment of benthic organisms during the dredging of the proposed berthing and maneuvering areas is expected, however, entrainment would not be extensive enough to have a significant impact on the fishery resources of Corpus Christi Bay. In addition, benthic organisms typically have rapid re-colonization rates that would limit impacts to the biota of these areas due to entrainment to short-term impacts.

Dredging can also result in the chemical impairment of the water column due to the suspension of contaminated sediments. The Final Environmental Impact Statement for the Corpus Christi Ship Channel Improvement Project (COE, 2003) reported the results of sediments that were sampled and analyzed for organic and metallic chemicals. In the COE's Final EIS, the results were compared to the Effects Range Low (ERL), which are used by NOAA as screening levels for assessing sediment quality. These are conservative concentration levels used to identify sediment that may require additional evaluations before decisions on disposal or beneficial re-use are made. The levels are considered the lowest concentrations where effects on the marine ecology have been observed.

Ingleside San Patricio sampled six locations from the maneuvering basin and Occidental Chemical's existing loading dock and tested the materials for total organic carbon, metals, polycyclic aromatic hydrocarbons, volatile organic compounds, pesticides, and polycyclic biphenyls. The results of the analyses revealed that few compounds were detected and did not exceed regulatory limits set by the state.

In 1985 samples from the La Quinta Channel, arsenic ranged from 12 to 15 milligram per kilogram (mg/kg) in all six samples, which is above the ERL of 8.2 mg/kg. Six samples were taken from the same stations in 1990 and again in 2000, and all metals were below the ERL levels. The samples taken in 1985 were analyzed for PCBs and pesticides and all detections

were below ERL levels. The samples taken in 1990 and 2000 were analyzed for PCBs, pesticides, and PAHs, and all detections were below ERL levels. The COE concluded that, overall, there is no indication of current water quality problems in the La Quinta Channel reach, or problems that would result from dredging to extend the La Quinta Channel (COE, 2003).

Approximately 45 acres would be affected by the proposed project dredging. Of the 45 acres, approximately 40 acres is currently shallow open water habitat that would be deepened to -43 feet MSL. The proposed project would therefore permanently alter this habitat, changing it from shallow water to deep water. Impact on EFH species would depend on the species use of deeper water habitats. Many of the species that occupy shallow-water habitats may also inhabit the deeper water habitats that currently exist in the adjacent La Quinta Channel sometime during their life cycle. Many species reside or migrate through both inshore and offshore areas at different stages of their lives and during different seasons throughout the year.

About 0.54 acre of submerged aquatic seagrass beds, 1.36 acres of coastal marsh, and 3.08 acres of tidal flat habitats would be permanently converted to open water habitat. In addition, about 0.53 acres of seagrass beds would permanently converted to open water as part of the relocation of Occidental Chemical's existing loading dock (see section 2.10.1 of this EIS). The existing EFH functions of the 5.51 acres of seagrass beds, coastal marsh, and tidal flat habitats associated with the LNG terminal and with the dock relocation, would be lost. These habitats are valuable habitat types relative to fish and EFH as they provide a food rich environment for productive foraging and refuge to juveniles and prey species from predators. Alteration of these habitats can cause a reduction or loss of juvenile or prey species' rearing habitats and an alteration in the timing of life history stages. See additional discussion in sections 4.4 and 4.5 of the EIS. While the existing functions of the permanently impacted seagrass, coastal marsh, and tidal flat would be lost, this area would function as open water habitat (EFH for adult and juvenile brown shrimp, pink shrimp, white shrimp, red drum and Spanish mackerel). In addition to the measures required by our Procedures, Ingleside San Patricio would minimize impacts to wetlands through adherence to permit conditions contained in the COE's Section 404 permit and the state's Section 401 permit. The permanent conversion of wetlands as a result of the proposed dredging would require compensatory mitigation to comply with the COE's Section 404(b)(1) guidelines. As discussed in section 4.4.1 of this EIS, Ingleside San Patricio has consulted with the COE, U.S. Environmental Protection Agency (EPA), U.S. Fish and Wildlife Service (FWS), Texas Parks and Wildlife Department (TPWD), Texas General Land Office (TGLO), NOAA Fisheries, and the Coastal Bends Bays and Estuaries Program (CBBEP) office regarding the development of a mitigation plan that would compensate for impacts to aquatic resources. Based on agency consultations, Ingleside San Patricio developed a Draft Wetland Mitigation Plan that was filed with the Commission on May 18, 2005.

In addition to impacts from dredging during construction of the Project, sound pressure waves produced during pile driving activities to construct the marine terminal may result in impacts on nearby fish species with EFH designations and their prey. Although the effects of pile driving are poorly studied and there appears to be substantial variation in a species' response to sound, intense sound pressure waves can change fish behavior or injure/kill fish through rupturing swim bladders or causing internal hemorrhaging. The intensity of the sound pressure levels produced during pile driving depends on a variety of factors including, but not limited to, the type and size of the pile, the firmness of the substrate into which the pile is being driven, the depth of water,

and the type and size of the pile-driving hammer. The degree to which an individual fish exposed to sound waves would be affected is dependent upon variables such as the peak sound pressure level and frequency as well as the species, size, and condition of a fish (*e.g.*, small fish are more prone to injury by intense sound waves than are larger fish of the same species). Depending on the specific conditions at the site, pile driving activities could generate underwater sound levels great enough to injure some fish or cause them to be more susceptible to predation.

In a review of studies documenting fish kills associated with pile driving, NOAA Fisheries (2003) reported that all have occurred during use of an impact hammer on hollow steel piles. Ingleside San Patricio has not yet identified the type of hammer that would be used to drive piles during construction of the marine terminal. However, it seems likely that construction noise and activities would cause many fish to avoid the area where the most intense sound levels would be generated. Through informal consultation with NOAA Fisheries, Protected Resources Division, pile driving was identified as having the potential to affect federally listed sea turtles. To avoid the possibility of harm to sea turtles, as well as marine mammals, we have included a recommendation in section 4.6.1.3 of this EIS that Ingleside San Patricio utilize measures to reduce sound transmission into the water or perform monitoring to ensure no listed species are present in the zone of potential impact during pile driving activities.

Ship and boat traffic associated with construction and operation of the project would also generate underwater sounds. Although vessel sounds would not generally be of the intensity produced from driving steel piles, project vessels (LNG carrier ships, tugs, construction barges) operating in the La Quinta Channel could result in sounds that illicit responses in fish. Most research suggests that fish exhibit avoidance behavior in response to engine noise (ICES, 1995). At the same time, research conclusions tend to suggest that since the effects are transient (*i.e.*, once the ship passes, behavior returns to normal), then the long-term effects on populations are negligible (Stocker, 2001).

Operation of the Project may result in impacts on aquatic organisms as a result of ballast water intake by ships calling on the LNG terminal. The LNG vessels would be fully loaded with LNG when arriving at the terminal and no ballast would be on board the vessels. No ballast would be discharged into the Bay, therefore there should be no impact to EFH or managed species as a result of discharge of ballast water. Nevertheless, it is expected that any LNG carrier calling at the Ingleside Energy Center LNG terminal would be in full compliance with the domestic requirements for ballast water management as specified in the National Invasive Species Act of 1996 (NISA, 1996) and international standards that were adopted on February 13, 2004. We believe that the introduction of attached invasive species via ship hulls would not likely significantly alter the local biotic community.

Once at the terminal each vessel would discharge its entire cargo to LNG storage tanks on shore. While the vessel is discharging its LNG cargo, it would be taking on seawater ballast to maintain a constant draft at the berth. Aquatic species in the immediate vicinity of the ship berths could therefore be impacted by entrainment during ballast water intake.

<u>Cumulative Impacts</u>

Cumulative impact results when impact associated with a proposed project is superimposed on or added to impact associated with past, present, or reasonably foreseeable future projects within

the area affected by the proposed Project. Although the individual impacts of the separate projects might be minor, the additive effects from all the projects could be significant.

Existing environmental conditions in the Project area reflect extensive changes based on past projects and activities. For example, substantial impacts have occurred and continue to occur because of water quality degradation from point and non-point source pollution along the La Quinta Channel and Corpus Christi Bay (cited in Tunnel *et al.*, 1996). Residential, commercial, and industrial developments may be directly impacting EFH by dredging or by affecting the watershed. Point source discharges from industry, combined with septic tank leachates, stormwater runoff, and oil and chemical spills contribute to lower water quality and degraded fishery habitats (cited in Tunnel *et al.*, 1996).

This final EIS provides a detailed environmental analysis of the effects of construction and operation of the Ingleside Energy Center LNG Terminal Project and our recommendations to mitigate environmental impact. Construction of the Project would adversely affect surface water quality and biological resources associated with the La Quinta Channel. Specific Project activities such as dredging, dredge disposal, and upland clearing/grading could result in a variety of impacts related to aquatic resources that include:

- increased water turbidity and resuspension of sediments;
- loss of wetland or upland vegetation;
- disturbance to benthic substrates; and
- potential spills of hazardous substances.

Although mitigation would lessen these impacts, gradual and cumulative impacts that could result from the construction and operation of the proposed Project and other projects in the area and within the near future would result in some unavoidable adverse effects on the existing environment. For example, future projects such as the Ingleside Energy Center LNG Terminal Project, the Vista del Sol LNG Terminal Project, the Cheniere Corpus Christi LNG Project, the Corpus Christi Ship Channel Improvement Project, the La Quinta Gateway Container Terminal, the Kiewit Offshore Services, and the GBS LNG Project graving dock/fabrication sites would cumulatively contribute to about 32.5 acres of impacts on submerged aquatic vegetation. However, Pulich *et al.* (1997) estimated that the Nueces Estuary contains about 20,403 acres of seagrass habitat. In addition, Ingleside San Patricio is coordinating a mitigation plan for these impacts that would ensure no net loss of this resource. Additional discussions of cumulative impacts that are relevant to the EFH Assessment are included in section 4.13.

4.0 CONSERVATION MEASURES

Ingleside San Patricio has attempted to avoid or minimize impact on coastal resources, including EFH, by identifying a site for the proposed LNG terminal that is adjacent to an existing deep water shipping channel, a site with existing industrial activity or history of industrial activity, and a site that would minimize impact on coastal wetlands. Because the proposed site is immediately adjacent to the existing La Quinta Channel, the need for dredging would be limited to that required for the terminal maneuvering basin, berth and relocation of Occidental Chemical's existing loading dock. No dredging would be required to widen or deepen any portion of the shipping channel that would be used to access the proposed terminal site.

Unavoidable adverse impacts on coastal habitats as a result of the proposed Project are described above. To mitigate for unavoidable impact on wetlands, Ingleside San Patricio would comply with the COE's Section 404(b)(1) guidelines that restrict discharges of dredge or fill material where a less environmentally damaging alternative exists.

As part of its review of the project, the COE will evaluate whether practicable alternatives have been taken to avoid wetland impacts to the maximum extent possible. Ingleside San Patricio must also demonstrate that it has taken appropriate and practicable steps to minimize wetland impacts. The permanent conversion of wetlands as a result of the proposed dredging would require compensatory mitigation to comply with the COE's Section 404(b)(1) guidelines. Ingleside San Patricio initiated consultation with the COE, EPA, FWS, TPWD, NOAA Fisheries, TGLO, and the CBBEP regarding the development of a mitigation plan that would compensate for impacts to aquatic resources directly within the Project area as well as potential impacts to aquatic resources adjacent to the Project area. Mitigation options included enhancement of degraded wetlands or restoration of historic wetlands, wetland creation, or wetland preservation. On March 30, 2005, Ingleside San Patricio met with the FWS, TPWD, COE, and FERC to review wetland mitigation proposals. Based on previous consultations and agency feedback received at the March 30, 2005 meeting, Ingleside San Patricio developed a draft wetland mitigation plan that was filed with the Commission on May 18, 2005 (see appendix E).

In its draft plan, Ingleside San Patricio proposes to provide funding for the purchase of two tracts of land (Tract Nos. 2 and 3) totaling 32.83 acres from the Portland Harbors Corporation. The two tracts of land are located adjacent to Nueces Bay near the City of Portland and are comprised of coastal emergent marsh and tidal sand and mud flat areas. Based on preliminary surveys, Ingleside San Patricio estimates that about 8.0 acres of smooth cordgrass, 18 acres of mixed coastal vegetation, 5.0 to 6.0 acres of nonvegetated areas (tidal sand and mud flat), and 3.0 to 5.0 acres of seagrass beds exist within Tract Nos. 2 and 3. Significant development has occurred on private property adjacent to the tracts; however, no development has occurred on Tract Nos. 2 and 3. Ownership of the land would be maintained by a government entity or conservation organization/land trust with restrictive covenants to assure wetland preservation.

Ingleside San Patricio would conduct detailed surveys at Tract Nos. 2 and 3 to determine property boundaries and the amount of wetland habitats that exist on-site. Ingleside San Patricio expects that the mitigation exchange rate would exceed the 1:1 ratio for coastal wetlands and tidal flats and proposes out-of-kind mitigation for seagrass impacts. Although mitigation for seagrasses would not be in-kind it would provide a net ecosystem benefit by placing the two tracts into a conservation easement program. Placing restrictive covenants on Tract Nos. 2 and 3 for preservation would assure that no further loss of wetlands would occur in this area.

As stated in NOAA Fisheries letter dated June 3, 2004, Section 305(b)(4)(A) of the MSA requires that NOAA Fisheries provide EFH Conservation Recommendations for any federal agency action that may result in adverse impacts to EFH. As a cooperating agency NOAA Fisheries reviewed an administrative draft of this EIS and EFH Assessment and in a letter to FERC dated January 7, 2004, stated that the documents adequately describe EFH and dependent fishery resources and the potential adverse Project impacts affecting EFH. NOAA Fisheries recommended that final action on the proposed Project should require the applicants to offset adverse Project impacts to EFH by developing and implementing a wetlands and submerged aquatic vegetation mitigation plan that will adequately compensate for lost functions and values

to approximately 5.51 acres of EFH (4.98 acres associated with the LNG terminal and 0.53 acre associated with the dock relocation). NOAA Fisheries reviewed the draft EIS and EFH Assessment and restated its EFH conservation recommendation in a letter to FERC dated April 12, 2005, adding that the mitigation plan should be fully implemented and deemed successful prior to initiation of operation of the LNG facility.

To ensure the conservation of EFH and associated fishery resources, we have recommended that Ingleside San Patricio continue its consultation with the COE, EPA, FWS, TPWD, TGLO, the CBBEP, and NOAA Fisheries to develop a Final Wetland Mitigation Plan to compensate for vegetated wetlands and submerged aquatic vegetation lost as a result of project construction and operation and file its final plan with the Secretary for review and written approval by the Director of OEP, before we would allow construction of the Project to go forward. In addition, we have recommended that Ingleside San Patricio conduct post-construction surveys of seagrass beds adjacent to the areas that would be dredged and file a report that compares the results of the pre- and post-construction seagrass surveys with the Secretary within 90 days of completing dredging and dredge material placement. If secondary impacts to these areas are observed, we have recommended that Ingleside San Patricio consult with resource and regulatory agencies to develop additional mitigation measures as necessary. We believe our recommendation is consistent with NOAA Fisheries Conservation Recommendation.

5.0 CONCLUSIONS OF THE EFH ASSESSMENT

Construction and operation of the proposed Project would have temporary and long-term effects on EFH. In general, temporary impacts are not expected to be significant considering the proposed dredging method and the localized effect of the actions compared to the area of Corpus Christi Bay that would be unaffected. Dredging of the proposed maneuvering area and berth would temporarily affect EFH by disturbing bottom sediments and increasing turbidity in the vicinity of dredging activity, which can have adverse physiological affects on finfish and shellfish species. Hydraulic dredging would also directly affect some benthic species that would be entrained during dredging. However, considering the nature of the sediments that would be dredged and the use of hydraulic cutterhead dredging and the temporary nature of the dredging, these impacts should not be significant.

Impacts to EFH from the deposition of sediments re-suspended by dredging activities are expected to be minimal. Considering the hydraulic characteristics of the site and the depth of excavation, the particles that would be resuspended as a result of dredging would wash out of the channel before settling. If particles are suspended higher in the water column, or in deeper water, the settling time and distance would be greater. Field studies of cutterhead dredges indicated that elevated turbidity is limited to the lower portion of the water column and turbidity levels are at background within several hundred feet of the cutterhead dredging operation. Because of the design of the channel, suspended sediments would be washed out of the channel prior to settling out of the water column.

With the exception of areas of seagrass, dredging of open bay habitats is not expected to result in a significant alteration of habitat structure, as the area of the bay near the LNG terminal site generally lacks habitat structure/cover. Also, considering the re-colonization rates of potentially affected benthic species and the relatively limited area affected by dredging, these losses would

not be extensive enough to have a significant impact on the fishery resources of Corpus Christi Bay.

The primary impact on EFH would be the permanent loss of approximately 5.51 acres of seagrass, coastal marsh, and tidal flat (4.98 acres associated with the LNG terminal and 0.53 acre of seagrass beds associated with the dock relocation). These habitats provide valuable habitat for EFH managed species as they provide a food-rich environment for foraging, and refuge for juveniles and prey species utilized by EFH species. To compensate for this permanent loss of habitat, Ingleside San Patricio would implement wetland mitigation designed to avoid a net loss of wetlands as necessary to comply with the COE's Section 404(b)(1) guidelines. During June and July, 2004 Ingleside San Patricio filed with the COE its wetlands delineation reports for the pipeline route and LNG terminal. Ingleside San Patricio submitted a Section 404/10 Individual Permit application to the COE on November 9, 2004. As discussed above, we have recommended that the Final Wetland Mitigation Plan be filed with the Secretary for review and written approval by the Director of OEP, before we would allow construction of the Project to go forward. It will be implemented in association with the COE's Section 404/10 individual permitting process. With this mitigation, we do not believe construction or operation impacts on EFH would have a substantial adverse effect on managed fisheries in the area.

6.0 REFERENCES

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ATTACHMENT B-1

Letter from the National Marine Fisheries Service (NOAA Fisheries) Habitat Conservation Division to the Federal Energy Regulatory Commission.
Essential Fish Habitat Designation
Federally Managed Species

June 3, 2004

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ORIGINAL

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
9721 Executive Center Drive N.
St. Petersburg, Florida 33702

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OFFICE OF THE
SECRETARY

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FEDERAL ENERGY REGULATORY COMMISSION

June 3, 2004

Magalie R. Salas, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E., Room 1A
Washington, D.C. 20426

Dear Secretary Salas:

The National Marine Fisheries Service (NOAA Fisheries) has reviewed the "NOTICE OF INTENT TO PREPARE ENVIRONMENTAL IMPACT STATEMENTS FOR THE PROPOSED **VISTA DEL SOL LNG TERMINAL AND PIPELINE PROJECT** AND THE **INGLESIDE ENERGY CENTER LNG TERMINAL AND PIPELINE PROJECT**, REQUEST FOR COMMENTS ON ENVIRONMENTAL ISSUES, AND NOTICE OF PUBLIC SCOPING MEETING" (Docket No. PF04-9-000) dated May 13, 2004. Ingleside Energy Center LLC and San Patricio Pipeline LLC, both subsidiaries of Occidental Chemical, propose to construct a liquified natural gas (LNG) import terminal and storage facility, and associated pipelines, adjacent to the LaQuinta Ship Channel in Corpus Christi Bay near Ingleside, Texas.

The proposed project site includes and is adjacent to areas identified as essential fish habitat (EFH) for postlarval, juvenile, and adult red drum (*Sciaenops ocellatus*), adult and subadult Spanish mackerel (*Scomberomorus maculatus*), and juvenile and subadult white (*Litopenaeus setiferus*), brown shrimp (*Farfantepenaeus aztecus*) and pink shrimp (*Farfantepenaeus duorarum*). The estuarine water column, unvegetated benthic habitats, seagrasses and intertidal wetlands are categories of EFH that could be impacted by dredging and construction for the proposed ship berthing area. The designations by the Gulf of Mexico Fishery Management Council (GMFMC) in its EFH amendment, as approved by NOAA Fisheries, were specified consistent with the requirements of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (P.L. 104-297) and implementing regulations. As the proposed facility may adversely affect EFH and associated managed species, the Federal Energy Regulatory Commission (FERC) will be required to prepare an EFH Assessment (see 50 CFR 600.920(e)) and consult with NOAA Fisheries prior to any final federal action on the proposed LNG project. The GMFMC also is provided an opportunity for comment on EFH-related issues under provisions of the Magnuson-Stevens Act.

In our previous coordination with the applicant's representatives, we were informed that the proposed project will involve the dredging of a ship berth adjacent to the LaQuinta Channel. An undetermined acreage of shallow water, shoreline wetlands, and patchy seagrass would be impacted by the proposed dredging. Therefore the environmental impact statement should address the probable impacts of the selected plan on EFH and dependent fishery resources,

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alternative siting and layout plans considered, and measures to avoid, minimize and mitigate all unavoidable impacts to NOAA-trust resources. Additional scoping information needs are outlined in the enclosure.

Finally, the project area may be within the known distribution limits of Federally listed threatened species that are under purview of NOAA Fisheries. In accordance with the Endangered Species Act of 1973, as amended, it is the responsibility of FERC to identify actions that may affect endangered or threatened species or their habitat. Determinations involving species under NOAA Fisheries' jurisdiction should be reported to our Protected Resources Division (PRD) at the letterhead address. If it is determined that the activities may adversely affect any species listed as endangered or threatened and under PRD purview, then formal consultation must be initiated.

Thank you for the opportunity to provide comments on environmental issues concerning the proposed permitting of the Ingleside Energy Center LNG Terminal and Pipeline Project. If we may be of further assistance, please contact Mr. Rusty Swafford in our Galveston, Texas, facility at (409) 766-3699. For information concerning threatened and endangered species please contact Mr. David Bernhart of our PRD at (727) 570-5312.

Sincerely,

Rusty Swafford

for Miles M. Croom
Assistant Regional Administrator
Habitat Conservation Division

cc: PRD
SER 42
SER 43
SER 44

Enclosure

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INFORMATION REQUIREMENTS FOR NOAA REVIEW OF INGLESIDE ENERGY CENTER LNG TERMINAL AND PIPELINE PROJECT, DOCKET NO. PF04-9-000

General project details:

1. **Project Location**
   a. Associated state, county, city
   b. Habitat types impacted
   c. Surrounding features (natural, created, other industry, etc.)
   d. Alternate sites
      i. Location of less-damaging sites (particularly important if proposed terminal to be sited in a wetland, estuarine pass, or shallow water)
      ii. Justification for not siting terminal in less-damaging location

2. **Project Features**
   a. Type of terminal structure
   b. Associated pipelines
      i. Size
      ii. Location
      iii. Installation procedures
      iv. Associated wetlands impacts
      v. Restoration/monitoring protocols
      vi. Wetlands impact mitigation plan
      vii. Monitoring and reporting requirements
   c. Overall project footprint
   d. Construction and/or installation procedures
   e. Maintenance dredging requirements and long term dredged material disposal plan
   f. Regasification system
   g. Terminal operation schedule (i.e., number of days per year LNG expected to be regasified at terminal)

3. **Essential fish habitat (EFH)**
   a. Description of EFH to be impacted
   b. Description of life stages of managed species to be impacted
   c. Proposed measures to avoid and minimize EFH impact
   d. Proposed EFH mitigation measures

4. **Cumulative Impacts (past, present and reasonably foreseeable future)**
   a. Other LNGs
   b. Other industry (e.g., petroleum, fishing, power generation, etc.)