



BILLING CODE 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[RTID 0648-XA123]

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Construction of Two Liquefied Natural Gas Terminals, Texas

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; proposed incidental harassment authorizations; request for comments on proposed authorizations and possible renewals.

SUMMARY: NMFS has received requests from Rio Grande LNG, LLC (Rio Grande) and, separately, Annova LNG Common Infrastructure (Annova) for authorization to take marine mammals incidental to pile driving and removal associated with the construction of two separate LNG terminals in the Brownsville Ship Channel (BSC), Cameron County, Texas. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue two separate incidental harassment authorizations (IHAs; one to Rio Grande and one to Annova) to incidentally take marine mammals during the specified activities. NMFS is also requesting comments on possible one-year renewals that could be issued under certain circumstances and if all requirements are met, as described in *Request for Public Comments* at the end of this notice. NMFS will consider public comments prior to making any final decision on the issuance of the requested MMPA authorizations and agency responses will be summarized in the final notice of our decisions.

DATES: Comments and information must be received no later than [*insert date 30 days after date of publication in the FEDERAL REGISTER*].

ADDRESSES: Comments should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service.

Physical comments should be sent to 1315 East-West Highway, Silver Spring, MD 20910 and electronic comments should be sent to *ITP.Daly@noaa.gov*.

Instructions: NMFS is not responsible for comments sent by any other method, to any other address or individual, or received after the end of the comment period. Comments received electronically, including all attachments, must not exceed a 25-megabyte file size. Attachments to electronic comments will be accepted in Microsoft Word or Excel or Adobe PDF file formats only. All comments received are a part of the public record and will generally be posted online at <https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act> without change. All personal identifying information (*e.g.*, name, address) voluntarily submitted by the commenter may be publicly accessible. Do not submit confidential business information or otherwise sensitive or protected information.

FOR FURTHER INFORMATION CONTACT: Jaclyn Daly, Office of Protected Resources, NMFS, (301) 427-8401. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at:

<https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act>. In case of problems accessing these documents, please call the contact listed above.

SUPPLEMENTARY INFORMATION:

Background

The MMPA prohibits the “take” of marine mammals, with certain exceptions. Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) direct the Secretary of Commerce (as delegated to NMFS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed incidental take authorization may be provided to the public for review.

Authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for taking for subsistence uses (where relevant). Further, NMFS must prescribe the permissible methods of taking and other “means of effecting the least practicable adverse impact” on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stocks for taking for certain subsistence uses (referred to in shorthand as “mitigation”); and requirements pertaining to the mitigation, monitoring and reporting of the takings are set forth. The definitions of all applicable MMPA statutory terms cited above are included in the relevant sections below.

National Environmental Policy Act

To comply with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq.*) and NOAA Administrative Order (NAO) 216-6A, NMFS must review our proposed action (*i.e.*, the issuance of an incidental harassment authorization) with respect to potential impacts on the human environment.

These actions are consistent with categories of activities identified in Categorical Exclusion B4 (incidental harassment authorizations with no anticipated serious injury or mortality) of the Companion Manual for NOAA Administrative Order 216-6A, which do not individually or cumulatively have the potential for significant impacts on the quality of the human environment and for which we have not identified any extraordinary circumstances that would preclude this categorical exclusion. Accordingly, NMFS has preliminarily determined that the issuance of the proposed IHAs qualifies to be categorically excluded from further NEPA review.

We will review all comments submitted in response to this notice prior to concluding our NEPA process or making final decisions on the IHA requests.

Summary of Request

On August 20, 2019, NMFS received a request from Rio Grande for an IHA to take marine mammals incidental to pile driving associated with the construction of a LNG terminal in the BSC. Rio Grande submitted a revised application on November 21, 2019 that was deemed adequate and complete on December 19, 2019. Rio Grande's request is for take of a small number of three species of marine mammals, by Level B harassment only. Rio Grande, Annova and NMFS do not expect serious injury or mortality to result from these activities and, therefore, an IHA is appropriate.

Separately, on June 27, 2019, NMFS received a request from Annova for an IHA to take marine mammals incidental to pile driving associated with the construction of a LNG terminal in the BSC. Annova submitted a revised application on February 28, 2020 that was deemed adequate and complete on March 2, 2020. Annova's request is for take of a small number of three species of marine mammals, by Level B harassment only. Neither Annova nor NMFS

expects serious injury or mortality to result from this activity and, therefore, an IHA is appropriate.

Given the two projects and potential impacts are nearly identical in scope, the projects are located in the same waterway (the BSC), and the same species/stocks are potentially affected, we are utilizing this single **Federal Register** notice to notify the public of our proposed issuance of the two separate authorizations.

Description of Proposed Activity

Overview

Rio Grande and Annova are each proposing to construct an LNG terminal in the Brownsville Ship Channel, Texas. The purpose of each project is to construct and operate an LNG terminal for purposes of international export. The LNG terminals would be located across from each other on opposite banks of the BSC. Both projects require pile driving and removal. Rio Grande proposes to install 12 42-48-inch (in) piles and remove 5 small timber piles over 9 days. Annova proposes to install and remove 16 24-in temporary piles and install 4 96 impermanent breasting dolphin piles over 16 days. Due to the nature of the activities and potential presence of dolphins in the BSC, both applicants have requested authorization for the take of marine mammals incidental to pile driving and removal. Rio Grande's proposed IHA would be valid July 1, 2020 through June 30, 2021. Annova's proposed IHA would be valid March 1, 2021 through February 28, 2021.

Dates and Duration

Rio Grande has indicated pile driving activities could occur starting in July 1, 2020, but actual start dates will be based on receipt of all certifications, authorizations, and necessary permits. Rio Grande has indicated pile driving would be limited to daylight hours; however,

dredging may occur at any time. Pile driving and removal would occur for no more than 8 days (note the application states 12 days; however, the applicant clarified removal of the five timber navigation piles would occur in one day, not five).

Annova pile driving would occur beginning in 2021, contingent upon receipt of all certifications, authorizations, and necessary permits. Annova has requested the proposed IHA would be valid for one-year starting March 1, 2021. Annova has indicated pile driving would be limited to daylight hours; however, dredging may occur at any time. Pile driving and removal would occur for no more than 16 days.

Specific Geographic Region

The Laguna Madre system is a long (109 kilometers (km)) backwater bay separated from the Gulf of Mexico by Padre Island. The waters of Laguna Madre are approximately 439 square miles (mi²) and are hypersaline (saltier than typical sea water) due to the shallow water, limited freshwater inflow, and limited surface water exchange with the Gulf of Mexico (USACE 2014). It is subdivided into two lagoons referred to as the Upper Laguna Madre (approximately 40 mi long) and the Lower Laguna Madre (approximately 60 mi long). Substrate includes hard rock reefs, sand, mudflats, and extensive sea grass beds with an average depth of one meter (m), excluding dredged shipping channels that extend up to approximately 3.7 m in depth.

The BSC is located within the southernmost portion of Lower Laguna Madre. Both projects would be constructed in the BSC. The BSC is a man-made, marine navigation channel that connects to the Gulf of Mexico and forms the western terminus of the Gulf Intracoastal Waterway system. The BSC is a deep-draft navigation channel connecting the deepwater Port of Brownsville to the Gulf of Mexico via the Brazos Santiago Pass and is an established shipping corridor between the Texas mainland and South Padre Island. The BSC is approximately 12.8 m

(42 feet (ft)) deep and 27.4 km (17 miles (mi)) long. At the terminal sites, it is approximately 300 m wide. A turning basin located at the western terminus of the BSC is approximately 11 m (36 ft) deep and 365.8 m (1,200 ft) wide (Port of Brownsville 2019a).

The Rio Grande terminal site would be located on the northern shore of the BSC. The site is comprised of a shallow estuarine open water lagoon with estuarine emergent marsh and mudflats around its perimeter. The western boundary of the Terminal site is the Bahia Grande Channel, which was constructed in 2005 to connect the BSC and the Bahia Grande to restore tidal exchange to the Bahia Grande (USFWS 2015). As part of a comprehensive restoration plan, channels were constructed between the basins in the Bahia Grande system, and future plans include widening the Bahia Grande Channel from approximately 10.4 m (34 ft) to 76.3 m (250 ft) to increase tidal exchange via the BSC (Ocean Trust 2009; USFWS 2010).

The Annova terminal would be located opposite and slightly west of the Rio Grande terminal. The bank of the BSC at the site is non-vegetated; the channel is a poor habitat for seagrass due to disturbance from drawdowns and return surges associated with normal tidal movement and human-induced actions such as vessel traffic.

Fishing in the BSC is diverse. Anglers can reasonably expect to encounter snook, mangrove snapper, ladyfish, speckled trout, redfish, black drum, sheepshead, jack crevalle, lookdowns, etc. The shrimp fishery fleet docks at the terminus of the BSC and actively fishes the BSC. The vessels transit past both terminal sites inbound to the marina and dolphins have been observed following these shrimp boats, likely foraging on discarded bycatch (Ronje *et al.*, 2018, Piwetz and Whitehead, 2019).

Detailed Description of Specific Activity

Rio Grande

Rio Grande proposes to construct a natural gas liquefaction facility and liquefied natural gas (LNG) export terminal (Terminal) in Cameron County, Texas, along the north embankment of the Brownsville Ship Channel (BSC)(Figure 1). The purpose of the project is to develop, own, operate, and maintain a natural gas pipeline system to access natural gas from the Agua Dulce Hub and an LNG export facility in south Texas to export 24.5 million metric tons (27 million U.S. tons) per annum of natural gas that provides an additional source of firm, long-term, and competitively priced LNG to the global market.



Figure 1. Rio Grande LNG Terminal Location.

The terminal would be located on approximately 3.04 square kilometers (km²) (750.4 acres) of a 3.98-km² (984.2-acre) parcel of land along the northern shore of the BSC in Cameron County, Texas, approximately 16 km (9.8 statute miles) east of Brownsville and about 3.5 km (2.2 mi) west of Port Isabel (see Figure 1). The Terminal, which is currently expected to begin operations in late 2023, would have a minimum 20-year life span (which could be extended to a 50-year life span). It would receive natural gas via a proposed Pipeline System, which would connect the Terminal to the existing infrastructure near the natural gas Agua Dulce hub interconnection in Nueces County. All pipeline work is conducted on land and there are no potential impacts on marine mammals from this work; therefore, pipeline work will not be discussed further.

The terminal site includes the following major facilities: six liquefaction trains; four full-containment LNG storage tanks; docking facilities for two LNG vessels, turning basin, and material offloading facility (MOF); LNG truck loading facilities with four loading bays; and Pipeline System's Compressor Station 3, a metering site, and the interconnection to the Pipeline System. In-water pile driving associated with construction of the LNG Loading and Vessel Berthing Area, turning basin, MOF, and Tug Berth have the potential to harass marine mammals. Rio Grande would also remove existing navigation markers. We describe these construction activities below.

LNG Loading and Vessel Berthing Area

Two LNG vessel loading berths would be constructed along the south-central boundary of the Terminal to accommodate simultaneous loading of two LNG vessels (see Figure 2). The berths would be recessed into the Terminal property so that loading LNG vessels, separated by 76 m (250 ft), would not encroach on the navigable channel boundaries of the BSC. Construction

of the loading berths would require dredging to a depth of up to -14 m (43 ft plus 2 ft *allowable* overdepth) mean lower low water (MLLW) (-13-m [43 ft] plus -0.6 m [2 ft] of *allowable* overdepth). No pile driving in-water is associated with this part of the project.

Turning Basin

A 457.2-m (1,500-foot)-diameter turning basin would be constructed to the east of the LNG vessel loading berths to accommodate turning maneuvers of the LNG vessels calling on the Terminal. LNG vessels would be escorted into the BSC and turning basin via tug boats, rotated in the turning basin, and then placed adjacent to a loading berth with the bow facing downstream (*i.e.*, eastward). The turning basin would be partially recessed into the terminal site, but the area of the turning basin would encroach on the navigable channel of the BSC such that channel transit would be temporarily precluded until the LNG vessels were moored at the berth. As with the loading berths, the turning basin would be dredged to a depth of up to -13.1 m (-43 ft plus 2 ft *allowable* overdepth). The navigable channel is maintained at -12.8 m (-42 ft) MLLW and would be deepened to -15.8 m (-52 ft) plus 0.6 m (2 ft) *allowable* overdepth and an additional 0.6 m (2 ft) for advanced maintenance dredging. An in-water Private Aid to Navigation (PATON) consisting of two steel 48-in pipe piles would be installed just outside of the footprint of the turning basin.

MOF and Tug Basin

Rio Grandewould construct a MOF along the western extent of the Terminal site, adjacent to the BSC. The MOF would primarily be used during construction for marine delivery of bulk materials and larger or prefabricated equipment as an alternative to road transportation; however, it would be maintained for the life of the terminal for periodic delivery of bulk materials. The MOF, which would require a dredged depth of up to -7.6 m (-25 ft) MLLW plus

0.6 m (2 ft) advanced maintenance allowance, would be constructed of a steel sheet pile bulkhead on land. Fencing would be placed around the MOF to control access and separate it from the adjacent wetlands on the west side of the terminal site; access would be through the western LNG terminal entrance. The MOF would be capable of berthing two barges simultaneously. Rio Grande anticipates that 880 barges would deliver materials to the MOF during the first 5 years of construction, although deliveries would continue as needed for the remainder of construction and into operations. Bulk materials delivered to the MOF would include the crushed sand or stone necessary for concrete fabrication. Ten 42-in piles would be installed in-water at the tug berth to support construction.

Removal of Existing Navigation Aids

RGLNG proposes to relocate one of the USCG fixed navigation aids in the BSC waterway. Pile driving would include in-water removal of five 12-in-diameter timber piles at the existing navigation aid location using a vibratory hammer. A double bubble curtain would be deployed during all vibratory hammer operations to reduce noise generated by the hammer. The new navigation aid would be installed on land near the shoreline. All five piles would be removed on the same day at a rate of one pile removed every 20 minutes.

In total, Rio Grande would install 12 piles associated with the marine facilities and remove five existing 12-in timber, navigation piles. (Table 1).

Table 1. In-Water Pile Driving and Removal Activities for Rio Grande.

Area	Pile Size/Type	Method	Source Level (dB) ¹			Piles per Day	Duration (days)	Total Piles
			SEL	RMS	Peak			
PATON at the LNG Berth	48-in (steel) ²	Vibratory	161.2	161.2	n/a	1	2	2
		Impact	179.7	191.6	205.5			
Removal of USCG	12-in (timber)	Vibratory	145.0 ³	145.0 ³	n/a	5 ⁵	1 ⁵	5

Navigation Aid								
Tug Berth	42-in (steel) ⁴	Vibratory	161.2	161.2	n/a	2	5	10
		Impact	179.7	191.6	205.5			
¹ Source levels presented here account for use of a bubble curtain; therefore, they represent a 7dB reduction from unattenuated source levels. ² 48-in pile source levels represent a -7 dB reduction from median values presented in Austin <i>et al</i> (168 dB rms (vibratory) and 198.6 dB rms and 186.6 dB SEL (diesel impact hammer). ³ The 145 dB SL represents a -7dB reduction from 152 dB; 152 dB represents the highest RMS value measured at 16 m during removal of timber piles at Port Townsend (Laughlin, 2011). ⁴ Rio Grande conservatively applied 48-in pile source levels measured at the Port of Alaska (Austin <i>et al.</i> 2016) to 42-in pile source level estimate. ⁵ Rio Grande's application indicates pile removal of the five 12-in timber piles would occur at a rate of one pile per day for five days. The applicant later clarified this was a mistake in interpreting the engineer's intent and that all five piles would be removed on the same day.								

Rock Armoring at the MOF

East of the MOF, channel embankments and the top slope of the shoreline (to a depth of -0.6 m [-2 ft] MLLW) would be graded to a 1:3 slope, stabilized with bedding stone overlain by geotextile fabric, and then covered with riprap (*i.e.*, rock armoring) (see Section 1.3.2 for further discussion of dredging activities). In the marine berths and turning basin, where vessel activity could erode the underwater channel slopes, the shoreline would be dredged to a 1:3 slope and stabilized with riprap to a depth of -13.1 m (-43 ft) MLLW. The rock armoring would extend to the top of the slope at elevation +1.8 m (+6 ft) North American Vertical Datum of 1988 and would tie in to the MOF bulkhead. The installation of rock armor does not generate in-water noise levels to the extent harassment is anticipated; therefore, this activity will not be discussed further.

Dredging

RGLNG would dredge the berthing areas and turning basin to a depth of -13.1 m (-43 ft) MLLW, with a -0.6 m (-2 foot) allowable over-dredge. The sides of the berthing areas and turning basin would be contoured at a 1:3 slope. The MOF would be excavated and dredged to a depth of -7.6 m (-25 ft) MLLW plus 0.6 m (2 ft) advanced maintenance allowance), to allow

barges and shallow-draft vessels to directly offload bulk materials at the Terminal site. RGLNG would install rock armoring to provide scour protection from propeller wash on the slope parallel to the shoreline. About 476,317.7 m³ (623,000 yd³) of material would be excavated along the shoreline and outside the federally maintained BSC by land-based equipment for the construction of the berthing areas, turning basin, and MOF. This material would be directly placed at the Terminal site for fill. An additional 29,817.6 m³ (39,000 yd³) of material would be dredged from the MOF using a mechanical dredge from the shoreline. Approximately 4.6 million m³ (6.1 million yd³) of material would be dredged from the berths and turning basin using water-based equipment. Material would be dredged using a hydraulic dredge and temporary pipeline and placed at a U.S. Army Corps of Engineers (USACE)-approved dredged-material-placement area. The placement area will be on the southern shoreline. Although the temporary dredge material pipeline will cross the BSC, it will be completely submerged and will rest on the bottom of the BSC while dredging activities take place. NMFS does not anticipate harassment to marine mammals from dredging nor is it likely the presence of the pipeline would be perceived as a barrier to dolphins. Therefore, harassment from dredging by Rio Grande is not anticipated or proposed to be authorized, and this activity is not discussed further.

Annova LNG

Annova is proposing to site, construct, and operate facilities necessary to liquefy and export natural gas along the south bank of the BSC (Figure 2). The purpose of the Project is to operate a mid-scale natural gas liquefaction facility along the South Texas Gulf Coast for exporting LNG to international markets via LNG carriers through United States and international waters. The terminal will include a new LNG export facility with a nameplate capacity of 6.0 million metric tons per annum (6.6 million U.S. tons) and a maximum output at optimal

operating conditions of 6.95 million metric tons (7.66 million U.S. tons) per year of LNG for export. The project site is located on a 2.96 km² (731-acre) property adjacent to the BSC on land owned by the Brownsville Navigation District (BND). The property, located at approximate mile marker 8.2 on the south bank of the BSC, has direct access to the Gulf of Mexico via the Brazos Santiago Pass.

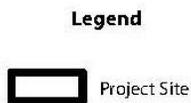
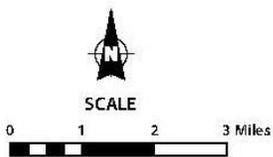


Figure 1
Project Location
Annova LNG Brownsville Project
Cameron County, Texas



Figure 2. Annova LNG Terminal Location.

Natural gas will be delivered to the facility via a third-party intrastate pipeline. The natural gas delivered to the site via the feed gas pipeline will be treated, liquefied, and stored on-site in two single-containment LNG storage tanks, each with a net capacity of approximately 160,000 cubic m (m³) (42.3 million gallons). The LNG will be pumped from the storage tanks to the marine facilities, where it will be loaded onto LNG carriers at the berthing dock using cryogenic piping.

The facilities for the Project include the following major components: gas pretreatment facilities; liquefaction facilities (six liquefaction trains and six approximately 72,000-horsepower electric motor-driven compressors); two LNG storage tanks; boil-off gas handling system; flare system; marine facilities; control, administration, and support buildings; an access road; fencing and barrier wall; and utilities (power, water, and communication). Similar to Rio Grande, in-water work with the potential to cause harassment to marine mammals includes construction of the marine facilities.

The marine facilities will include a 457 m (1,500-foot) diameter turning basin and widened channel approach areas to the turning basin (see Figure 2). LNG carriers will dock on the loading platform at the south side of the turning basin. The marine facilities include the following components: Loading platform and berth for one LNG carrier, including turning basin and access areas along the BSC; cryogenic pipelines and vapor return lines; aids to navigation; MOF, mooring and breasting dolphins; and tug berth area.

The proposed project involves installation and removal of 16 temporary 24-in diameter steel piles and installation of four 96-in diameter steel breasting dolphin piles (see Table 2). The 16 temporary steel piles will provide support during installation of the breasting dolphins (four temporary piles for each breasting dolphin). Each temporary pile will be installed using a

vibratory and impact hammer. Installation of the temporary piles will occur in stages, initially with a vibratory hammer followed by an impact hammer. Once installation of the breasting dolphin piles is complete, all temporary piles will be removed using a vibratory hammer.

Table 2. In-Water Pile Driving and Removal Scenarios for Annova.

Area	Pile Size/Type	Method	Source Level (dB) ¹			Piles per Day	Duration (days)	Total Piles
			SEL	RMS	Peak			
Breasting Dolphin (temporary)	24-in (steel)	Vibratory ¹	165.0	165.0	n/a	4	8 ³	16
		Impact ²	171.0	187.0	207.0			
Breasting Dolphins (permanent)	96-in (steel)	Vibratory ¹	170.0	170.0	n/a	0.5	8 ⁴	4
		Impact ²	188.0	198.0	213.0			

¹ Vibratory driving and removal source levels do not account for use of a bubble curtain. Source: Caltrans (2015), Table I.2-2.
² Impact driving source levels account for use of a bubble curtain (*i.e.*, -7 dB from unattenuated source level). Source: Caltrans (2015), Table I.2-1.
³ Includes four days for installation and four days for removal.
⁴ Four of the eight days include both vibratory and impact hammering; the remaining four days include impact hammering only.

Dredging

Annova LNG will dredge the marine berth using a hydraulic cutter dredge. The berth will be dredged to the final design depth of -13.7 m (-45 ft) mean lower low water, plus 0.9 m (3 ft) for advance maintenance and over depth, with side slopes at a ratio of 3:1 where sheet piling is not used. Material removed by land-based excavation will be used for on-site fill where possible or placed on the Project site to support landscaping and final grading. Annova LNG proposes to use the existing Dredged Material Placement Area (DMPA) 5A or 5B, located just west of the Project site, to dispose of dredged material not used as fill on-site. Dredged material will be moved to the DMPA through an approximately 2.6 km (1.6-mi)-long, floating dredged material pipeline that will be temporarily anchored along the south shore of the BSC. The dredged material pipeline will be marked with navigation lights and reflective signs and monitored to

ensure the safety of area traffic. Dredging for the marine berth is estimated to occur in two, 10-hour shifts, six days per week. Noise from dredging is not anticipated to harass marine mammals and the dredge material pipeline will not cross the BSC, avoiding potential impacts (*e.g.*, entrapment) to marine mammals. Therefore, dredging will not be discussed further.

Proposed mitigation, monitoring, and reporting measures for Annova are described in detail later in this document (please see *Proposed Mitigation* and *Proposed Monitoring and Reporting*).

Description of Marine Mammals in the Area of Specified Activities

Sections 3 and 4 of Rio Grande and Annova's applications summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history, of the potentially affected species. Additional information regarding population trends and threats may be found in NMFS's Stock Assessment Reports (SARs; <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments>) and more general information about these species (*e.g.*, physical and behavioral descriptions) may be found on NMFS's website (<https://www.fisheries.noaa.gov/find-species>).

Table 3 lists all species with expected potential for occurrence in the BSC and adjacent Laguna Madre and summarizes information related to the population or stock, including regulatory status under the MMPA and ESA and potential biological removal (PBR), where known. For taxonomy, we follow Committee on Taxonomy (2019). PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (as described in NMFS's SARs). While no mortality is

anticipated or authorized here, PBR and annual serious injury and mortality from anthropogenic sources are included here as gross indicators of the status of the species and other threats.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS’s stock abundance estimates for most species represent the total estimate of individuals within the geographic area, if known, that comprises that stock. For some species, this geographic area may extend beyond U.S. waters. All values presented in Table 3 are the most recent available at the time of publication and are available in the draft 2019 SARs (available online at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/draft-marine-mammal-stock-assessment-reports>).

Table 3. Marine Mammals Potentially Present In the Action Area.

Common name	Scientific name	Stock	ESA/MMPA status; Strategic (Y/N) ¹	Stock abundance (CV, N _{min} , most recent abundance survey) ²	PBR	Annual M/SI ³
Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Delphinidae						
Bottlenose dolphin	<i>Tursiops truncatus</i>	Laguna Madre	N, Y	unknown	UND	0.4
		Western Coastal GoM	N, N	20,161 (0.17, 17,491, 2012)	175	0.6
Atlantic spotted dolphin	<i>Stenella frontalis</i>	Northern GoM	N, N	37,611 (0.28, unk, 2004)	Undet.	42
Rough-toothed dolphin	<i>Steno bredanensis</i>	Northern GoM	N, N	624 (0.99, 311, 2009) ⁵	2.5	1.2 ⁶

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- 1 - Endangered Species Act (ESA) status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.
 - 2- NMFS marine mammal stock assessment reports online at: www.nmfs.noaa.gov/pr/sars/. CV is coefficient of variation; Nmin is the minimum estimate of stock abundance.
 - 3 - These values, found in NMFS's SARs, represent annual levels of human-caused mortality plus serious injury from all sources combined (*e.g.*, commercial fisheries, ship strike). Annual M/SI often cannot be determined precisely and is in some cases presented as a minimum value or range.
 - 4- The abundance estimate reported in the latest stock assessment report for common bottlenose dolphin Gulf of Mexico Bay, Sound, and Estuary stocks is 80 animals. However, this estimate is considered outdated as it is based on surveys from 1992–1993 (Blaylock and Hoggard 1994). Recent photo-identification surveys by Piwetz and Whitehead (2019) in Lower Laguna Madre identified 109 individuals; however, the authors note even this estimate is lower than a minimum population estimate.
 - 5- This abundance estimate is reported in the latest stock assessment report for rough-toothed dolphins in the Northern Gulf of Mexico stock (Hayes *et al.* 2018). This estimate is considered outdated (more than 8 years old) and is based on surveys from 2009 (Garrison 2016). It does not include continental shelf waters and does not correct for unobserved animals. Data combined from 1992–2009 resulted in an estimate of 4,853 (CV=0.19) (Roberts *et al.* 2016).
 - 6- Total human M/SI considers the mean annual M/SI from fishery observer related interactions from 2010-2014 and two stranded animals with signs of human-caused mortality (*i.e.*, 0.8 + 0.4).

All species that could potentially occur in the proposed project areas are included in Table 3. As described below, three species (with four managed stocks) temporally and spatially co-occur with the activity to the degree that take is reasonably likely to occur, and we have proposed authorizing it.

In addition, the West Indian manatee (*Trichechus manatus manatus*) may be found in the Laguna Madre. However, manatees are managed by the U.S. Fish and Wildlife Service and are not considered further in this document.

Bottlenose Dolphins

Bottlenose dolphins are found throughout the world in both offshore and coastal waters, including harbors, bays, gulfs, and estuaries, as well as nearshore coastal waters, deeper waters over the continental shelf, and even far offshore in the open ocean. Bottlenose dolphins may travel alone or in groups, and the groups continually break apart and reform. Their travel is characterized by persistent movement in a consistent direction. They use breeding, playing,

aggression, and gentle body contact (such as rubbing) as ways to have social interactions with one another. Bottlenose dolphins can thrive in many environments and feed on a variety of prey, such as fish, squid, and crustaceans (*e.g.*, crabs and shrimp). They use different techniques to pursue and capture prey, searching for food individually or cooperatively. For example, they can work to bring fish together into groups (herding). They then take turns charging through the schools to feed. They may also trap schools of fish against sand bars and seawalls. They also use passive listening and/or high frequency echolocation to locate prey.

The Gulf of Mexico hosts 36 stocks of bottlenose dolphins, as designated for management purposes by NMFS: 1 offshore stock, 1 continental shelf stock, 3 coastal stocks, and 31 Northern Gulf of Mexico Bay, Sound, and Estuary (BSE) stocks, seven of which occur in Texas (Waring *et al.* 2016; Hayes *et al.* 2019). Distinguishing between individuals of each coastal and BSE stock is difficult as members of these stocks have nearly identical physical characteristics and often have overlapping range boundaries. Coastal and estuarine stocks can partially overlap in their ranges, with estuarine dolphins observed in coastal waters and coastal dolphins observed in estuarine waters (*e.g.*, Bassos-Hull *et al.* 2013; Laska *et al.* 2011; Maze and Würsig 1999). The two stocks that may be present in the ensonified area are the Laguna Madre BSE stock and western Gulf of Mexico coastal stock.

Laguna Madre Stock

Bottlenose dolphins are found throughout the Laguna Madre estuary. The abundance of the entire Laguna Madre stock is considered “unknown” for management purposes. In August of 2016, the Marine Mammal Stranding Network conducted boat-based surveys to search for an injured entangled dolphin reported in the extreme southern portion of lower Laguna Madre (Ronje *et al.*, 2018). Over the course of the 4 days of surveys, 46 dolphin group sightings were

recorded, estimated at 60 individuals. In 2018 and 2019, Piwetz and Whitehead (2019) conducted 5 surveys covering 365.4 km in the southern portion of the lower Laguna Madre to better understand dolphin distribution and abundance. Dolphin sightings were consistent along the BSC until the industrial section (Figure 3), beginning around the Brownsville Fishing Harbor, spanning approximately 6.5 km to the west where the channel ultimately terminates. Dolphins were observed in the Brazos Santiago Pass, several of which travelled to the end of the pass around the Boca Chica Jetty, where waters are turbulent and dolphins have been observed foraging. In the lower Laguna Madre, north of the Queen Isabella Causeway, dolphins were concentrated around the deeper waters of the Gulf Intracoastal Waterway (GIWW). Overall, 33 groups of dolphins were recorded. Calves (n=15) were present in 33 percent (n=11) of the total group sightings and comprised 10 percent (n = 15) of the total number of dolphins sighted. Preliminary photo-ID analysis includes 109 individuals, 95 of which are considered distinct or marginally distinct based on dorsal fin nicks and notches. These surveys only covered the southern portion of the lower Laguna Madre, a small portion of the stock's home range. As expected, the nonasymptotic nature of the discovery curve (accumulation curve) indicates that the sampling effort has not yet identified all, or even most, of the individuals that use this region. Of the distinct or marginally distinct individuals, 42 percent (n = 28) were sighted on more than one survey day and 6 percent (n = 6) were observed in both the winter and summer seasons, suggesting at least some degree of site fidelity. In summary, the preliminary results presented in Piwetz and Whitehead (2019) show that bottlenose dolphins use the lower Laguna Madre area, primarily deeper channels and passes, present day use is likely greater than the outdated SAR abundance estimate, and a number of individuals show some degree of site fidelity.

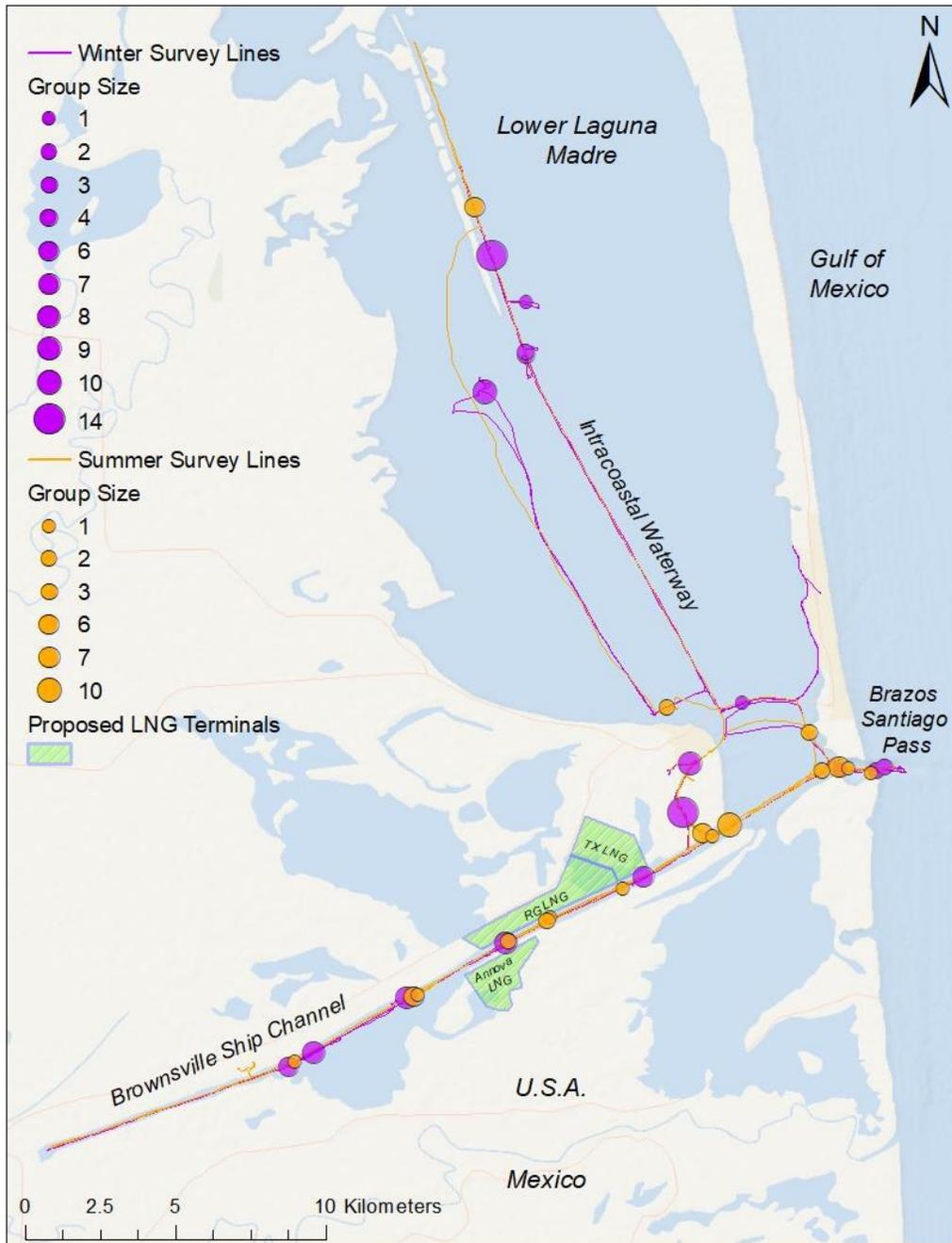


Figure 3. Initial sighting locations of bottlenose dolphin groups in the lower Laguna Madre region during photo-identification surveys in December 2018 and August 2019 (as presented in Piwetz and Whitehead, 2019).

Observed behavioral states included slow travel, fast travel, probable feed, feed (several observations of fish in mouth), mill, and social. The small sample size precluded robust statistical analysis; however, the current trend indicates that foraging and socializing may occur more within the BSC than other sub-areas of the lower Laguna Madre (Piwetz and Whitehead, 2019).

Within the BSC, commercial fishing trawlers may play a role in the occurrence of coastal bottlenose dolphins within the BSC, with coastal dolphins following trawlers into the estuary. Interaction with the shrimp fishery is a common occurrence on the Atlantic and Gulf coasts (*e.g.*, Siegal et al. 2015; Greenman and McFee, 2014). During the summer, Piwetz and Whitehead (2019) observed five of 33 groups of dolphins following shrimp trawlers and foraging on discarded bycatch either behind the trawler or directly off the stern. Ronje (2016) noted dolphins inside the BSC were usually observed slowly travelling, often in the direction of tidal movement or behind shrimp trawlers during the morning hours and that dolphins were observed as far as the Brownsville Fishing Harbor, where a number of commercial fisheries vessels were docked. Given the BSC is a dead-end channel, in-bound dolphins traveling past the proposed terminals would also have to pass the terminals as they leave the BSC.

Dolphins in Laguna Madre are subject to several anthropogenic stressors. Dolphin tourism vessels and commercial fishing charters were observed pursuing groups of dolphins in the region (Ronje *et al.*, 2018). Dolphins often follow shrimp trawlers, feeding on discarded catch, a behavior, which can increase gear interaction risk. The BSC and GIWW is dredged by the U.S. Army Corps of Engineers. In addition to potential threats from vessel and fishing activities, the BSC is a busy industrial port that exports hazardous materials such as chemical and petroleum products. There are no records of major oil spills in LM in the recent past. However,

given that ships and barges regularly use the GIWW and the ports in LM, as well as the presence of pipelines and wells, smaller spills have occurred via leaks or minor collisions or accidents (Sharma *et al.*, 1997). For example, in 2009 an oil slick formed around Port Isabel and tar balls washed up on beaches, with no known source of an oil spill (Brownsville Herald, 2009).

Western Gulf of Mexico Coastal Stock

During aerial surveys in 2011 and 2012, the abundance estimates for the Gulf of Mexico western coastal stock of bottlenose dolphins were based upon tracklines and sightings in waters from the shoreline to the 20-m isobath and between the Texas-Mexico border and the Mississippi River Delta. This stock's boundaries abut other bottlenose dolphin stocks, namely the Northern Coastal Stock, Continental Shelf Stock and several bay, sound and estuary stocks in Texas and Louisiana, and while individuals from different stocks may occasionally overlap, it is not thought that significant mixing or interbreeding occurs between them.

Bottlenose dolphins are known to become entangled in, or ingest recreational and commercial fishing gear (Wells and Scott 1994; Gorzelany 1998; Wells *et al.* 1998; Wells *et al.* 2008), and some are struck by vessels (Wells and Scott 1997; Wells *et al.* 2008). Since 1990, there have been 14 bottlenose dolphin die-offs or Unusual Mortality Events (UMEs) in the northern Gulf of Mexico, and 7 of these have occurred within the boundaries of the Western Coastal Stock and may have affected the stock. Sources of these UMEs include morbillivirus, low salinity, the *Deepwater Horizon* oil spill, and harmful algal blooms (Hayes *et al.*, 2015).

Total U.S. fishery-related mortality and serious injury for this stock is not known, but at a minimum is greater than 10 percent of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. The status of this stock

relative to OSP in the Gulf of Mexico EEZ is unknown. There are insufficient data to determine the population trends for this stock.

Atlantic Spotted Dolphins

Estimates of immigration rates between the western North Atlantic shelf population and the Gulf of Mexico stock were less than 1 percent per year (Viricel and Rosel 2014), which is well below the 10 percent per year threshold for demographic independence (Hastings 1993), thereby supporting separate stocks for Gulf of Mexico and western North Atlantic shelf populations. In the Gulf of Mexico, Atlantic spotted dolphins occur primarily from continental shelf waters 10-200m deep to slope waters <500m deep and are present year-round. However, it has been suggested that this species may move inshore seasonally during spring, but data supporting this hypothesis are limited (Caldwell and Caldwell 1966; Fritts *et al.* 1983). Viricel and Rosel (2014) also found support for two demographically independent populations within the northern Gulf of Mexico. One population primarily occupied shelf waters from the Texas-Mexico border eastward to Cape San Blas, Florida while the second population was concentrated over the Florida shelf in the eastern Gulf of Mexico and stretched westward to the Florida panhandle. However, NMFS identifies one stock in the project area: the Northern Gulf of Mexico stock.

The commercial fisheries that interact, or that potentially could interact, with this stock in the Gulf of Mexico are the pelagic longline fishery and the Southeastern U.S. Atlantic/Gulf of Mexico shrimp trawl fishery. No ongoing habitat threats are provided in the SAR with the exception of ongoing health impacts from the 2010 Deepwater Horizon oil spill.

Rough-Toothed Dolphins

Rough-toothed dolphins occur in oceanic and to a lesser extent continental shelf waters in the northern Gulf of Mexico (*i.e.*, U.S. Gulf of Mexico) (Figure 1; Fulling *et al.* 2003; Mullin and Fulling 2004; Maze-Foley and Mullin 2006). Although there are only a few records from Gulf of Mexico waters beyond U.S. boundaries (*e.g.*, Jefferson and Schiro 1997, Ortega Ortiz 2002), rough-toothed dolphins almost certainly occur throughout the oceanic Gulf of Mexico (Jefferson *et al.* 2008), which is also composed of waters belonging to Mexico and Cuba where there is currently little information on cetacean species abundance and distribution. This is a transboundary stock and the abundance estimates are for U.S. waters only.

The estimated mean annual fishery-related mortality and serious injury for this stock during 2010–2014 was 0.8 rough-toothed dolphins due to interactions with the pelagic longline fishery (Hayes *et al.*, 2018). This stock was also affected by the Deepwater Horizon oil spill.

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Current data indicate that not all marine mammal species have equal hearing capabilities (*e.g.*, Richardson *et al.*, 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.* (2007) recommended that marine mammals be divided into functional hearing groups based on directly measured or estimated hearing ranges on the basis of available behavioral response data, audiograms derived using auditory evoked potential techniques, anatomical modeling, and other data. Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e.*, low-frequency cetaceans). Subsequently, NMFS (2018) described generalized hearing ranges for these marine mammal

hearing groups. Generalized hearing ranges were chosen based on the approximately 65 decibel (dB) threshold from the normalized composite audiograms, with the exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al.* (2007) retained. Marine mammal hearing groups and their associated hearing ranges are provided in Table 4.

Table 4. Marine Mammal Hearing Groups (NMFS, 2018).

Hearing Group	Generalized Hearing Range*
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 35 kHz
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz
High-frequency (HF) cetaceans (true porpoises, <i>Kogia</i> , river dolphins, cephalorhynchid, <i>Lagenorhynchus cruciger</i> & <i>L. australis</i>)	275 Hz to 160 kHz
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 39 kHz
* Represents the generalized hearing range for the entire group as a composite (<i>i.e.</i> , all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall <i>et al.</i> 2007) and PW pinniped (approximation).	

For more detail concerning these groups and associated frequency ranges, please see NMFS (2018) for a review of available information. Three marine mammal species (all mid-frequency cetaceans) have the reasonable potential to co-occur with the proposed pile driving and removal activities.

Potential Effects of Specified Activities on Marine Mammals and their Habitat

This section includes a summary and discussion of the ways that components of the specified activity may impact marine mammals and their habitat. The *Estimated Take by Incidental Harassment* section later in this document includes a quantitative analysis of the

number of individuals that are expected to be taken by this activity. The *Negligible Impact Analysis and Determination* section considers the content of this section, the *Estimated Take by Incidental Harassment* section, and the *Proposed Mitigation* section, to draw conclusions regarding the likely impacts of these activities on the reproductive success or survivorship of individuals and how those impacts on individuals are likely to impact marine mammal species or stocks.

In-water construction activities associated with the project would include impact pile driving, vibratory pile driving, and dredging. The sounds produced by these activities fall into one of two general sound types: impulsive and non-impulsive. Impulsive sounds (*e.g.*, explosions, gunshots, sonic booms, impact pile driving) are typically transient, brief (less than 1 second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay (ANSI 1986; NIOSH 1998; ANSI 2005; NMFS 2018). Non-impulsive sounds (*e.g.* aircraft, vessels, machinery operations such as drilling or dredging, vibratory pile driving, and active sonar systems) can be broadband, narrowband or tonal, brief or prolonged (continuous or intermittent), and typically do not have the high peak sound pressure with rapid rise/decay time that impulsive sounds do (ANSI 1995; NIOSH 1998; NMFS 2018). The distinction between these two sound types is important because they have differing potential to cause physical effects, particularly with regard to hearing (*e.g.*, Ward 1997 in Southall *et al.* 2007).

Two types of pile hammers would be used on this project: impact and vibratory. Impact hammers operate by repeatedly dropping a heavy piston onto a pile to drive the pile into the substrate. Sound generated by impact hammers is characterized by rapid rise times and high peak levels, a potentially injurious combination (Hastings and Popper 2005). Vibratory hammers install piles by vibrating them and allowing the weight of the hammer to push the pile into the

sediment. Vibratory hammers produce significantly less sound than impact hammers and the nature of the noise (*i.e.*, no sharp rise times) reduce the probability and severity of marine mammal auditory injury (Nedwell and Edwards 2002; Carlson *et al.* 2005).

The potential impacts of Rio Grande and Annova's proposed activities on marine mammals would be caused by acoustic stressors. Any non-auditory injury from potential non-acoustic stressors such as vessel movement and rock armoring is *de minimis* due to the nature of the work (*e.g.*, barges are stationary) and the proposed mitigation for any vessels (*e.g.*, tugs) to slow in the presence of marine mammals or, for Rio Grande, delay placement of rock armoring if marine mammals approach within 10 m. Therefore, here we focus on acoustic stressors resulting from both projects: pile installation and removal and dredging.

Acoustic Impacts

In general, animals exposed to natural or anthropogenic sound may experience physical and psychological effects, ranging in magnitude from none to severe (Southall *et al.* 2007). Exposure to in-water construction noise has the potential to result in auditory threshold shifts and behavioral reactions (*e.g.*, avoidance, temporary cessation of foraging and vocalizing, changes in dive behavior) and/or lead to non-observable physiological responses such as an increase in stress hormones ((Richardson *et al.*, 1995; Gordon *et al.*, 2004; Nowacek *et al.*, 2007; Southall *et al.*, 2007; Gotz *et al.*, 2009). Additional noise in a marine mammal's habitat can mask acoustic cues used by marine mammals to carry out daily functions such as communication and predator and prey detection. The effects of elevated noise exposure are dependent on several factors, including, but not limited to, sound type (*e.g.*, impulsive vs. non-impulsive), the species, age and sex class (*e.g.*, adult male vs. mom with calf), duration of exposure, the distance between the pile

and the animal, received levels, behavior at time of exposure, and previous history with exposure (Wartzok *et al.* 2004; Southall *et al.* 2007).

Richardson *et al.* (1995) described zones of increasing intensity of effect that might be expected to occur, in relation to distance from a source and assuming that the signal is within an animal's hearing range. First is the area within which the acoustic signal would be audible (potentially perceived) to the animal, but not strong enough to elicit any overt behavioral or physiological response. The next zone corresponds with the area where the signal is audible to the animal and of sufficient intensity to elicit behavioral or physiological responsiveness. Third is a zone within which, for signals of high intensity, the received level is sufficient to potentially cause discomfort or tissue damage to auditory or other systems. Overlaying these zones to a certain extent is the area within which masking (*i.e.*, when a sound interferes with or masks the ability of an animal to detect a signal of interest that is above the absolute hearing threshold) may occur; the masking zone may be highly variable in size. Below we discuss three categories of potential acoustic-driven effects on marine mammals : 1) physical auditory effects (threshold shifts), 2) behavioral effects and 3) potential impacts on marine mammal habitat.

Auditory Effects - NMFS defines a noise-induced threshold shift (TS) as a change, usually an increase, in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS 2018). The amount of threshold shift is customarily expressed in dB. A TS can be permanent or temporary. As described in NMFS (2018), there are numerous factors to consider when examining the consequence of TS, including, but not limited to, the signal temporal pattern (*e.g.*, impulsive or non-impulsive), likelihood an individual would be exposed for a long enough duration or to a high enough level to induce a TS, the magnitude of the TS, time to recovery (seconds to minutes

or hours to days), the frequency range of the exposure (*i.e.*, spectral content), the hearing and vocalization frequency range of the exposed species relative to the signal's frequency spectrum (*i.e.*, how animal uses sound within the frequency band of the signal; *e.g.*, Kastelein *et al.* 2014b), and the overlap between the animal and the source (*e.g.*, spatial, temporal, and spectral).

Permanent Threshold Shift (PTS) - NMFS defines PTS as a permanent, irreversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS 2018). Available data from humans and other terrestrial mammals indicate that a 40 dB threshold shift approximates PTS onset (see Ward *et al.* 1958, 1959; Ward 1960; Kryter *et al.* 1966; Miller 1974; Ahroon *et al.* 1996; Henderson *et al.* 2008). PTS levels for marine mammals are estimates, as with the exception of a single study unintentionally inducing PTS in a harbor seal (Kastak *et al.* 2008), there are no empirical data measuring PTS in marine mammals largely due to the fact that, for various ethical reasons, experiments involving anthropogenic noise exposure at levels inducing PTS are not typically pursued or authorized (NMFS 2018).

Temporary Threshold Shift (TTS) - A temporary, reversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS 2018). Based on data from cetacean TTS measurements (see Southall *et al.* 2007), a TTS of 6 dB is considered the minimum threshold shift clearly larger than any day-to-day or session-to-session variation in a subject's normal hearing ability (Schlundt *et al.* 2000; Finneran *et al.* 2000, 2002). As described in Finneran (2016), marine mammal studies have shown the amount of TTS increases with cumulative sound exposure level (SELcum) in an accelerating fashion: At low exposures with lower SELcum, the amount of TTS is typically small and the growth curves have shallow slopes. At exposures with higher higher

SELcum, the growth curves become steeper and approach linear relationships with the noise SEL.

Depending on the degree (elevation of threshold in dB), duration (*i.e.*, recovery time), and frequency range of TTS, and the context in which it is experienced, TTS can have effects on marine mammals ranging from discountable to serious (similar to those discussed in auditory masking, below). For example, a marine mammal may be able to readily compensate for a brief, relatively small amount of TTS in a non-critical frequency range that takes place during a time when the animal is traveling through the open ocean, where ambient noise is lower and there are not as many competing sounds present. Alternatively, a larger amount and longer duration of TTS sustained during time when communication is critical for successful mother/calf interactions could have more serious impacts. We note that reduced hearing sensitivity as a simple function of aging has been observed in marine mammals, as well as humans and other taxa (Southall *et al.* 2007), so we can infer that strategies exist for coping with this condition to some degree, though likely not without cost.

Currently, TTS data only exist for four species of cetaceans (bottlenose dolphin, beluga whale (*Delphinapterus leucas*), harbor porpoise (*Phocoena phocoena*), and Yangtze finless porpoise (*Neophocoena asiaeorientalis*)) and five species of pinnipeds exposed to a limited number of sound sources (*i.e.*, mostly tones and octave-band noise) in laboratory settings (Finneran 2015). However, the existing marine mammal TTS data come from a limited number of individuals within these species. No data are available on noise-induced hearing loss for mysticetes. For summaries of data on TTS in marine mammals or for further discussion of TTS onset thresholds, please see Southall *et al.* (2007), Finneran and Jenkins (2012), Finneran (2015), and Table 5 in NMFS (2018).

Installing piles requires a combination of impact pile driving and vibratory pile driving while removing piles involves only a vibratory hammer. For the projects considered in the proposed IHAs, these activities would not occur at the same time, a limited number of piles would be installed and removed per day, and there would likely be pauses in activities such that noise from pile operations is not continuous. Given these considerations, and that any dolphins are likely moving through the action area and not remaining for extended periods of time, the potential for PTS is *de minimis* (and we are not proposing to authorize any Level A harassment take) and the potential for TTS is low.

Behavioral Effects - Behavioral disturbance may include a variety of effects, including subtle changes in behavior (*e.g.*, minor or brief avoidance of an area or changes in vocalizations), more conspicuous changes in similar behavioral activities, and more sustained and/or potentially severe reactions, such as displacement from or abandonment of high-quality habitat. Disturbance may result in changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); avoidance of areas where sound sources are located. Behavioral responses to sound are highly variable and context-specific and any reactions depend on numerous intrinsic and extrinsic factors (*e.g.*, species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day), as well as the interplay between factors (*e.g.*, Richardson *et al.* 1995; Wartzok *et al.* 2003; Southall *et al.* 2007; Weilgart 2007; Archer *et al.* 2010). Behavioral reactions can vary not only among individuals but also within an individual, depending on previous experience with a sound source, context, and numerous other factors (Ellison *et al.* 2012), and can vary depending on characteristics

associated with the sound source (*e.g.*, whether it is moving or stationary, number of sources, distance from the source). Please see Appendices B-C of Southall *et al.* (2007) for a review of studies involving marine mammal behavioral responses to sound. In general, if a marine mammal responds to a stimulus by changing its behavior (*e.g.*, through relatively minor changes in locomotion direction/speed or vocalization behavior), the response may or may not constitute taking at the individual level, and is unlikely to affect the stock or the species as a whole.

Habituation can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok *et al.*, 2003). Animals are most likely to habituate to sounds that are predictable and unvarying. It is important to note that habituation is appropriately considered as a "progressive reduction in response to stimuli that are perceived as neither aversive nor beneficial," rather than as, more generally, moderation in response to human disturbance (Bejder *et al.*, 2009). The opposite process is sensitization, when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure.

As noted above, behavioral state may affect the type of response. For example, animals that are resting may show greater behavioral change in response to disturbing sound levels than animals that are highly motivated to remain in an area for feeding (Richardson *et al.*, 1995; NRC, 2003; Wartzok *et al.*, 2003). Controlled experiments with captive marine mammals have showed pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway *et al.*, 1997; Finneran *et al.*, 2003). Observed responses of wild marine mammals to loud pulsed sound sources (typically seismic airguns or acoustic harassment devices) have been varied but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds 2002; see also Richardson *et al.*, 1995; Nowacek *et al.*, 2007).

Available studies show wide variation in response to underwater sound; therefore, it is difficult to predict specifically how any given sound in a particular instance might affect marine mammals perceiving the signal. If a marine mammal reacts briefly to an underwater sound by changing its behavior temporarily (*e.g.*, ceases foraging, moving a small distance away from the source), the impacts of the change are unlikely to be significant to the individual, *let alone* the stock or population. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (*e.g.*, Lusseau and Bejder 2007; Weilgart 2007; NRC 2005). There are broad categories of potential marine mammal responses to anthropogenic noise, which we describe in greater detail here, that include alteration of dive behavior, alteration of foraging behavior, effects to breathing, interference with or alteration of vocalization, avoidance, and flight.

Changes in dive behavior can vary widely, and may consist of increased or decreased dive times and surface intervals as well as changes in the rates of ascent and descent during a dive (*e.g.*, Frankel and Clark 2000; Costa *et al.*, 2003; Ng and Leung 2003; Nowacek *et al.*, 2004; Goldbogen *et al.*, 2013a,b). Variations in dive behavior may reflect interruptions in biologically significant activities (*e.g.*, foraging) or they may be of little biological significance. The impact of an alteration to dive behavior resulting from an acoustic exposure depends on what the animal is doing at the time of the exposure and the type and magnitude of the response. Due to the very shallow water depths in the BSC, we do not anticipate dolphins would alter dive behavior. They may; however, remain submerged for longer periods of time as they avoid the area.

Disruption of feeding behavior can be difficult to correlate with anthropogenic sound exposure, so it is usually inferred by observed displacement from known foraging areas, the

appearance of secondary indicators (*e.g.*, bubble nets or sediment plumes), or changes in dive behavior. As for other types of behavioral response, the frequency, duration, and temporal pattern of signal presentation, as well as differences in species sensitivity, are likely contributing factors to differences in response in any given circumstance (*e.g.*, Croll *et al.* 2001; Nowacek *et al.* 2004; Madsen *et al.* 2006; Yazvenko *et al.* 2007). A determination of whether foraging disruptions incur fitness consequences would require information on or estimates of the energetic requirements of the affected individuals and the relationship between prey availability, foraging effort and success, and the life history stage of the animal. Due to the narrowness of the BSC, noise from pile operations does not propagate to the degree it would in the more open waters of the Laguna Madre; therefore, the potential area for foraging disruption is very small compared to available foraging habitat.

Variations in respiration naturally vary with different behaviors and alterations to breathing rate as a function of acoustic exposure can be expected to co-occur with other behavioral reactions, such as a flight response or an alteration in diving. However, respiration rates in and of themselves may be representative of annoyance or an acute stress response. Various studies have shown that respiration rates may either be unaffected or could increase, depending on the species and signal characteristics, again highlighting the importance in understanding species differences in the tolerance of underwater noise when determining the potential for impacts resulting from anthropogenic sound exposure (*e.g.*, Kastelein *et al.*, 2001, 2005b, 2006; Gailey *et al.*, 2007).

Marine mammals vocalize for different purposes and across multiple modes, such as whistling, echolocation click production, calling, and singing. Changes in vocalization behavior in response to anthropogenic noise can occur for any of these modes and may result from a need

to compete with an increase in background noise or may reflect increased vigilance or a startle response. For example, in the presence of potentially masking signals, humpback whales and killer whales have been observed to increase the length of their songs (Miller *et al.*, 2000; Fristrup *et al.*, 2003; Foote *et al.*, 2004), while right whales (*Eubalaena glacialis*) have been observed to shift the frequency content of their calls upward while reducing the rate of calling in areas of increased anthropogenic noise (Parks *et al.*, 2007b). In some cases, animals may cease sound production during production of aversive signals (Bowles *et al.*, 1994).

Avoidance is the displacement of an individual from an area or migration path as a result of the presence of a sound or other stressors, and is one of the most obvious manifestations of disturbance in marine mammals (Richardson *et al.*, 1995). For example, gray whales (*Eschrichtius robustus*) are known to change direction – deflecting from customary migratory paths – in order to avoid noise from seismic surveys (Malme *et al.*, 1984). Avoidance may be short-term, with animals returning to the area once the noise has ceased (*e.g.*, Bowles *et al.*, 1994; Goold 1996; Stone *et al.*, 2000; Morton and Symonds, 2002; Gailey *et al.*, 2007). Longer-term displacement is possible, however, which may lead to changes in abundance or distribution patterns of the affected species in the affected region if habituation to the presence of the sound does not occur (*e.g.*, Blackwell *et al.*, 2004; Bejder *et al.*, 2006; Teilmann *et al.*, 2006). Given that other acoustic stressors are already present within the BSC and dolphins continue to utilize the BSC, it is unlikely dolphins would avoid the BSC in response to relatively brief pile driving noise during LNG terminal construction.

A flight response is a dramatic change in normal movement to a directed and rapid movement away from the perceived location of a sound source. The flight response differs from other avoidance responses in the intensity of the response (*e.g.*, directed movement, rate of

travel). Relatively little information on flight responses of marine mammals to anthropogenic signals exist, although observations of flight responses to the presence of predators have occurred (Connor and Heithaus 1996). The result of a flight response could range from brief, temporary exertion and displacement from the area where the signal provokes flight to, in extreme cases, marine mammal strandings (Evans and England 2001). However, it should be noted that response to a perceived predator does not necessarily invoke flight (Ford and Reeves 2008), and whether individuals are solitary or in groups may influence the response.

Behavioral disturbance can also impact marine mammals in more subtle ways. Increased vigilance may result in costs related to diversion of focus and attention (*i.e.*, when a response consists of increased vigilance, it may come at the cost of decreased attention to other critical behaviors such as foraging or resting). These effects have generally not been demonstrated for marine mammals, but studies involving fish and terrestrial animals have shown that increased vigilance may substantially reduce feeding rates (*e.g.*, Beauchamp and Livoreil 1997; Fritz *et al.*, 2002; Purser and Radford 2011). In addition, chronic disturbance can cause population declines through reduction of fitness (*e.g.*, decline in body condition) and subsequent reduction in reproductive success, survival, or both (*e.g.*, Harrington and Veitch, 1992; Daan *et al.*, 1996; Bradshaw *et al.*, 1998). However, Ridgway *et al.* (2006) reported that increased vigilance in bottlenose dolphins exposed to sound over a five-day period did not cause any sleep deprivation or stress effects.

Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (24-hour cycle). Disruption of such functions resulting from reactions to stressors such as sound exposure are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall *et al.*, 2007). Consequently, a behavioral response lasting less

than one day and not recurring on subsequent days is not considered particularly severe unless it could directly affect reproduction or survival (Southall *et al.*, 2007). Note that there is a difference between multi-day substantive behavioral reactions and multi-day anthropogenic activities. For example, just because an activity lasts for multiple days does not necessarily mean that individual animals are either exposed to activity-related stressors for multiple days or, further, exposed in a manner resulting in sustained multi-day substantive behavioral responses.

Stress responses – An animal’s perception of a threat may be sufficient to trigger stress responses consisting of some combination of behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune responses (*e.g.*, Seyle 1950; Moberg 2000). In many cases, an animal’s first and sometimes most economical (in terms of energetic costs) response is behavioral avoidance of the potential stressor. Autonomic nervous system responses to stress typically involve changes in heart rate, blood pressure, and gastrointestinal activity. These responses have a relatively short duration and may or may not have a significant long-term effect on an animal’s fitness.

Neuroendocrine stress responses often involve the hypothalamus-pituitary-adrenal system. Virtually all neuroendocrine functions that are affected by stress – including immune competence, reproduction, metabolism, and behavior – are regulated by pituitary hormones. Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction, altered metabolism, reduced immune competence, and behavioral disturbance (*e.g.*, Moberg 1987; Blecha 2000). Increases in the circulation of glucocorticoids are also equated with stress (Romano *et al.*, 2004).

The primary distinction between stress (which is adaptive and does not normally place an animal at risk) and “distress” is the cost of the response. During a stress response, an animal uses

glycogen stores that can be quickly replenished once the stress is alleviated. In such circumstances, the cost of the stress response would not pose serious fitness consequences. However, when an animal does not have sufficient energy reserves to satisfy the energetic costs of a stress response, energy resources must be diverted from other functions. This state of distress will last until the animal replenishes its energetic reserves sufficient to restore normal function.

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well-studied through controlled experiments and for both laboratory and free-ranging animals (*e.g.*, Holberton *et al.*, 1996; Hood *et al.*, 1998; Jessop *et al.*, 2003; Krausman *et al.*, 2004; Lankford *et al.*, 2005). Stress responses due to exposure to anthropogenic sounds or other stressors and their effects on marine mammals have also been reviewed (Fair and Becker 2000; Romano *et al.*, 2002b) and, more rarely, studied in wild populations (*e.g.*, Romano *et al.*, 2002a). For example, Rolland *et al.* (2012) found that noise reduction from reduced ship traffic in the Bay of Fundy was associated with decreased stress in North Atlantic right whales. These and other studies lead to a reasonable expectation that some marine mammals will experience physiological stress responses upon exposure to acoustic stressors and that it is possible that some of these would be classified as “distress.” In addition, any animal experiencing TTS would likely also experience stress responses (NRC, 2003).

Masking - Sound can disrupt behavior through masking, or interfering with, an animal’s ability to detect, recognize, or discriminate between acoustic signals of interest (*e.g.*, those used for intraspecific communication and social interactions, prey detection, predator avoidance, navigation) (Richardson *et al.* 1995). Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher intensity, and

may occur whether the sound is natural (*e.g.*, snapping shrimp, wind, waves, precipitation) or anthropogenic (*e.g.*, pile driving, shipping, sonar, seismic exploration) in origin. The ability of a noise source to mask biologically important sounds depends on the characteristics of both the noise source and the signal of interest (*e.g.*, signal-to-noise ratio, temporal variability, direction), in relation to each other and to an animal's hearing abilities (*e.g.*, sensitivity, frequency range, critical ratios, frequency discrimination, directional discrimination, age or TTS hearing loss), and existing ambient noise and propagation conditions.

Masking of natural sounds can result when human activities produce high levels of background sound at frequencies important to marine mammals. Conversely, if the background level of underwater sound is high (*e.g.* on a day with strong wind and high waves), an anthropogenic sound source would not be detectable as far away as would be possible under quieter conditions and would itself be masked. The BSC hosts numerous recreational and commercial vessels; therefore, background sound levels in the BSC are already elevated above ambient by these activities.

The frequency range of the potentially masking sound is important in determining any potential behavioral impacts. For example, low-frequency signals may have less effect on high-frequency echolocation sounds produced by odontocetes but are more likely to affect detection of mysticete communication calls and other potentially important natural sounds such as those produced by surf and some prey species. The masking of communication signals by anthropogenic noise may be considered as a reduction in the communication space of animals (*e.g.*, Clark *et al.*, 2009) and may result in energetic or other costs as animals change their vocalization behavior (*e.g.*, Miller *et al.*, 2000; Foote *et al.*, 2004; Parks *et al.*, 2007b; Di Iorio and Clark 2009; Holt *et al.*, 2009). Masking can be reduced in situations where the signal and

noise come from different directions (Richardson *et al.*, 1995), through amplitude modulation of the signal, or through other compensatory behaviors (Houser and Moore 2014). Masking can be tested directly in captive species (*e.g.*, Erbe 2008), but in wild populations it must be either modeled or inferred from evidence of masking compensation. There are few studies addressing real-world masking sounds likely to be experienced by marine mammals in the wild (*e.g.*, Branstetter *et al.*, 2013).

Masking affects both senders and receivers of acoustic signals and can potentially have long-term chronic effects on marine mammals at the population level as well as at the individual level. Low-frequency ambient sound levels have increased by as much as 20 dB (more than three times in terms of SPL) in the world's ocean from pre-industrial periods, with most of the increase from distant commercial shipping (Hildebrand 2009). All anthropogenic sound sources, but especially chronic and lower-frequency signals (*e.g.*, from vessel traffic), contribute to sustained elevated ambient sound levels, thus intensifying masking.

The biological significance of many of the behavioral effects is difficult to predict, especially if the detected disturbances appear minor. Consequences of behavioral modification could be biologically significant if the change affects growth, survival, or reproduction. Example significant behavioral modifications that could potentially lead to effects on growth, survival, or reproduction include:

- Drastic changes in diving/surfacing patterns (such as those thought to cause beaked whale stranding due to exposure to military mid-frequency tactical sonar);
- Longer-term habitat abandonment due to loss of desirable acoustic environment; and
- Longer-term cessation of feeding or social interaction.

We do not expect dolphins exposed to pile driving noise to respond in the intense manners described above. Pile driving and removal associated with projects is very brief (about couple hours (at most) per day for 8 to 20 non continuous days and the area of ensonification to sound levels above NMFS harassment thresholds is very small (1 to 5 km²). While we anticipate marine mammals to behaviorally react to pile driving noise, such as avoiding the area, increasing swim speeds and ceasing behavior such as socializing and foraging, we expect dolphins would return to pre-exposure behavior shortly after exiting the ensonified zone. As these individual-level effects are low, we do not anticipate that harassment to any individual would lead to adverse impacts on a given marine mammal stock's annual rates of recruitment or survival.

Marine Mammal Habitat Effects

The area likely impacted by the projects is relatively small compared to the available habitat for all impacted species and stocks, and does not include any ESA-designated critical habitat. There are no known foraging hotspots or other bottom structure of significant biological importance to marine mammals in the BSC. Therefore, the main impact issue associated with the proposed activities would be temporarily elevated sound levels and the associated direct effects on marine mammals, as discussed previously in this document. The primary potential acoustic impacts to marine mammal habitat are associated with elevated sound levels produced by vibratory and impact pile driving and removal in the area.

In-water pile driving activities would also cause short-term effects on water quality due to increased turbidity. Any increases in turbidity and suspended sediments would be temporary, localized, and minimal. In general, turbidity associated with pile installation is localized to a few meters from the pile.

Potential avoidance by dolphin prey (*e.g.*, fish, shrimp) of the immediate area is also possible. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution (summarized in Popper and Hastings 2009). Hastings and Popper (2005) reviewed several studies that suggest fish may relocate to avoid certain areas of sound energy. Additional studies have documented physical and behavioral effects of pile driving on fish, although several are based on studies in support of large, multiyear bridge construction projects (*e.g.*, Scholik and Yan 2001, 2002; Popper and Hastings 2009). Sound pulses at received levels of 160 dB may cause subtle changes in fish behavior. The SPLs associated with pile driving may cause noticeable changes in behavior (Pearson *et al.* 1992; Skalski *et al.* 1992). SPLs of sufficient strength have been known to cause injury to fish and fish mortality (summarized in Popper *et al.* 2014).

The use of a double bubble curtain by both applicants during impact pile driving will greatly reduce the potential for fish injury or mortality. Therefore, we anticipate impacts to prey will be primarily behavioral in nature. The exact duration of fish avoidance of this area after pile driving is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated. Any behavioral avoidance by fish of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity.

The duration of the construction activities is relatively short. Rio Grande and Annova pile driving and removal activities would occur for 8 and 20 non-consecutive days, respectively. Impacts to habitat and prey are expected to be minimal based on the use of a double bubble curtain during all impact driving and short duration of activities. Further, the BSC (a man-made canal) is a very small portion of marine mammal habitat within Laguna Madre.

Permanent impacts to marine mammal habitat will be limited to the presence of the terminal post-construction. Rio Grande's terminal would be located along the existing shoreline; however, Annova's terminal would be located in currently what is uplands. Therefore, the area of marine mammal habitat will actually be increased in size due to dredging out of these uplands. However, the quality of this expanded habitat is likely poor due to the industrialized nature of the project.

In its Final Environmental Impact Statement for both the Rio Grande and Annova terminals, the Federal Energy Regulatory Commission (FERC) included an Essential Fish Habitat (EFH) Assessment. EFH is present within the BSC. On February 15, 2019, and February 5, 2019, NMFS' Habitat Conservation Division concurred with FERC that the construction of the Rio Grande and Annova LNG terminals, respectively, would result in temporary, limited impacts to EFH. NMFS had no conservation recommendations for FERC on either project.

Estimated Take

This section provides an estimate of the number of incidental takes proposed for authorization through these IHAs, which will inform both NMFS' consideration of "small numbers" and the negligible impact determination.

Harassment is the only type of take expected to result from these activities. Except with respect to certain activities not pertinent here, section 3(18) of the MMPA defines "harassment" as any act of pursuit, torment, or annoyance, which (i) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of

behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

Authorized takes would be by Level B harassment only, in the form of disruption of behavioral patterns for individual marine mammals resulting from exposure to pile driving and removal. Based on the nature of the activity and the anticipated effectiveness of the mitigation measures (*i.e.*, shutdowns) – discussed in detail below in Proposed Mitigation section, Level A harassment is neither anticipated nor proposed to be authorized. Given the scope of work considered, no mortality or serious injury is anticipated or proposed to be authorized for this activity. The projects do have the potential to cause Level B (behavioral) harassment of dolphins within the BSC. Below we describe how the Level B harassment take is estimated.

Generally speaking, we estimate take by considering: (1) acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be behaviorally harassed or incur some degree of permanent hearing impairment; (2) the area or volume of water that will be ensonified above these levels in a day; (3) the density or occurrence of marine mammals within these ensonified areas; and, (4) the number of days of activities. We note that while these basic factors can contribute to a basic calculation to provide an initial prediction of takes, additional information that can qualitatively inform take estimates is also sometimes available (*e.g.*, previous monitoring results or average group size). Below, we describe the factors considered here in more detail and present the proposed take estimate.

Acoustic Thresholds

Using the best available science, NMFS has developed acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be

reasonably expected to be behaviorally harassed (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment).

Level B Harassment for non-explosive sources – Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors related to the source (*e.g.*, frequency, predictability, duty cycle), the environment (*e.g.*, bathymetry), and the receiving animals (hearing, motivation, experience, demography, behavioral context) and can be difficult to predict (Southall *et al.*, 2007, Ellison *et al.*, 2012). Based on what the available science indicates and the practical need to use a threshold based on a factor that is both predictable and measurable for most activities, NMFS uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS predicts that marine mammals are likely to be behaviorally harassed in a manner we consider Level B harassment when exposed to underwater anthropogenic noise above received levels of 120 dB re 1 μ Pa (rms) for continuous (*e.g.*, vibratory pile-driving, drilling) and above 160 dB re 1 μ Pa (rms) for intermittent (*e.g.*, impact pile driving) sources.

Both Rio Grande and Annova’s activities include the use of continuous (vibratory pile driving and removal) and intermittent (impact pile driving) sound sources; therefore, the 120 and 160 dB re: 1 μ Pa (rms) are applicable.

Level A harassment for non-explosive sources - NMFS’ Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) (Technical Guidance, 2018) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive). Both Rio

Grande and Annova proposed activities include the use of impulsive (impact pile driving) and non-impulsive (vibratory pile driving and removal) sources.

These thresholds are provided in the Table 5. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2018 Technical Guidance, which may be accessed at <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance>.

Table 5. Thresholds identifying the onset of Permanent Threshold Shift.

Hearing Group	PTS Onset Acoustic Thresholds* (Received Level)	
	Impulsive	Non-impulsive
Low-Frequency (LF) Cetaceans	Cell 1 $L_{pk,flat}$: 219 dB $L_{E,LF,24h}$: 183 dB	Cell 2 $L_{E,LF,24h}$: 199 dB
Mid-Frequency (MF) Cetaceans	Cell 3 $L_{pk,flat}$: 230 dB $L_{E,MF,24h}$: 185 dB	Cell 4 $L_{E,MF,24h}$: 198 dB
High-Frequency (HF) Cetaceans	Cell 5 $L_{pk,flat}$: 202 dB $L_{E,HF,24h}$: 155 dB	Cell 6 $L_{E,HF,24h}$: 173 dB
Phocid Pinnipeds (PW) (Underwater)	Cell 7 $L_{pk,flat}$: 218 dB $L_{E,PW,24h}$: 185 dB	Cell 8 $L_{E,PW,24h}$: 201 dB
Otariid Pinnipeds (OW) (Underwater)	Cell 9 $L_{pk,flat}$: 232 dB $L_{E,OW,24h}$: 203 dB	Cell 10 $L_{E,OW,24h}$: 219 dB

* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.

Note: Peak sound pressure (L_{pk}) has a reference value of 1 μ Pa, and cumulative sound exposure level (L_E) has a reference value of 1 μ Pa²s. In this Table, thresholds are abbreviated to reflect American National Standards Institute standards (ANSI 2013). However, peak sound pressure is defined by ANSI as incorporating frequency weighting, which is not the intent for this Technical Guidance. Hence, the subscript “flat” is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (*i.e.*, varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate

the conditions under which these acoustic thresholds will be exceeded.

Ensonified Area

Here, we describe operational and environmental parameters of the activity that will feed into identifying the area ensonified above the acoustic thresholds, which include source levels and transmission loss coefficient.

When the NMFS Technical Guidance (2016) was published, in recognition of the fact that ensonified area/volume could be more technically challenging to predict because of the duration component in the new thresholds, we developed a User Spreadsheet that includes tools to help predict a simple isopleth that can be used in conjunction with marine mammal density or occurrence to help predict takes. We note that because of some of the assumptions included in the methods used for these tools, we anticipate that isopleths produced are typically going to be overestimates of some degree, which may result in some degree of overestimate of Level A harassment take. However, these tools offer the best way to predict appropriate isopleths when more sophisticated 3D modeling methods are not available, and NMFS continues to develop ways to quantitatively refine these tools, and will qualitatively address the output where appropriate. For stationary sources such as pile driving, NMFS User Spreadsheet predicts the distance at which, if a marine mammal remained at that distance the whole duration of the activity, it would incur PTS. Inputs used in the User Spreadsheet to calculate Level A

harassment threshold isopleths for impact and vibratory pile driving are presented in Table 6 and 7, respectively.

Table 6. Inputs into NMFS PTS User Spreadsheet for Impact Pile Driving.

Input Parameters	Rio Grande	Annova	
Spreadsheet Tab Used	E.1) Impact pile driving		
Source Level (SELS-s)	179.7	171	188
Source Level (SPLpk)	205.5	200	213
Weighting Factor Adjustment (kHz)	2		
Number of piles per day	1 (48-in), 2 (42-in)	4	0.5
Number of strikes per pile	400	675	2,700
Propagation (xLogR)	15		
Distance of source level measurement (m)	10		

Table 7. Inputs into NMFS PTS User Spreadsheet for Vibratory Pile Driving.

Input Parameters	Rio Grande		Annova	
	12-in piles	48-in and 42-in	24-in	96-in
Source Level (RMS SPL) ¹	145	161.2	165	170
Number of piles per day	5	1 (48-in), 2 (42-in)	4	0.5
Duration to drive or remove a single pile (minutes)	20 ²	24	10 (install), 45 (remove) ³	20
Propagation (xLogR)	15			
Distance from source level measurement (m)	16	10	10	10

¹ Source levels account for a -7db bubble curtain reduction from unattenuated source levels.

² We note Rio Grande's application indicated it would take 480 minutes to remove each 12-in pile and 1 pile would be removed per day. Upon request from NMFS, the applicant later clarified this time reflected the removal of all five piles, including when the hammer would not be operating. The actual hammer operation time per pile is 20 minutes and all 5 piles would be removed in a single day.

³ We note Annova's application indicated it would take 60 minutes to remove each 24-in pile but the applicant later clarified this included time when the hammer would not be operating and that actual hammer time would be, at most, 45 minutes.

The results of the User Spreadsheet are presented in Table 8. These distances represent the distance at which a dolphin would have to remain for the entire duration considered in the calculation and may be unrealistic (*e.g.*, NMFS does not anticipate a dolphin would remain at 18

m for the entire time it takes to install two 42-in piles with an impact hammer). In all cases, the peak Level A harassment threshold is not reached. For these reasons, the potential for Level A harassment take from all pile driving and removal is very small. However, for these proposed IHAs, the applicants have proposed shutdown zones greater than or equal to the outputs of the User Spreadsheet to further ensure the potential for all Level A harassment take is avoided.

Table 8. Level A Harassment Isoleths and Corresponding Ensonified Areas.

Pile Type	Hammer Type	Level A Isoleth (m)	Level A Area (km²)
Rio Grande			
42-in	Vibratory	0.5	< 0.01
	Impact	18.4	< 0.01
48-in-diameter steel tube piles	Vibratory	0.3	< 0.01
	Impact	11.6	< 0.01
12-in-diameter timber piles ²	Vibratory	0.1	< 0.01
Annova			
24-in	Vibratory	0.3 (install) 0.9 (remove)	< 0.01
	Impact	10.9	< 0.01
92-in	Vibratory	1.2	< 0.01
	Impact	93.5	0.04

To estimate the area ensonified to the Level B harassment thresholds, a basic calculation that incorporated the source levels provided in Table 9 and a practical spreading loss model was used to estimate distances to the respective intermittent (160 dB rms) and continuous (120 dB rms) thresholds. However, the width of the BSC is relatively narrow (approximately 300 m wide); therefore, the Level B harassment areas were clipped to account for land. Table 9 provides the calculated Level B harassment isopleths and area accounting for land.

Table 9. Level B Harassment Distances and Areas for Rio Grande and Annova.

Hammer Type	Pile Size (source level dB rms)	Isoleth distance (m)	Level B harassment area (km²)¹
Rio Grande			
Impact	42- and 48-in	1,278	1.06
Vibratory	42- and 48-in	5,580	4.85

	12-in	743	0.62
Annova			
Impact	24-in (187)	631	0.56
	96-in (198)	3,415	1.0 ²
Vibratory	24-in (165)	10,000	1.0 ²
	96-in (170)	21,544	1.0 ²
¹ Ensonified areas are truncated by land. See Figures 4-6 in both Rio Grande and Annova's applications. ² Although radii to Level B harassment isopleths are similar between applications, Annova's pile driving will take place setback from the shoreline inside a berthing area (currently on land but will be dug out- see Figures 4-6 in Annova's application) versus Rio Grande's pile driving which will be conducted along the current shoreline. The nature of the work creates much smaller ensonified areas for Annova.			

Take Calculation and Estimation

The abundance, distribution and density of marine mammals in Laguna Madre is poorly understood. Therefore, while the harassment areas described above are important for planning mitigation (*e.g.*, shutdown to avoid Level A harassment) and monitoring, they are not part of the take estimate calculations. For both applicants, we have considered other quantitative information (*e.g.*, group size and sighting rates) as well as behavior to estimate take.

Bottlenose Dolphins

For bottlenose dolphins, both applicants first estimated density in the Laguna Madre using the number of individuals reported in Piwetz and Whitehead (2019), which was 109 dolphins. We note this is not an abundance estimate of the Laguna Madre stock as Piwetz and Whitehead (2019) conducted the surveys in a limited area of the lower Laguna Madre and the authors note the non-asymptotic nature of the [photo-identification] discovery curve (accumulation curve) indicates that the sampling effort has not yet identified all, or even most, of the individuals that use this region. Regardless, both applicants used habitat data layers from Finkbeiner *et al.* (2009) to estimate the area of the Laguna Madre, removing the layers that were not dolphin habitat (*e.g.*, land, emergent marsh, and mangroves), which resulted in a 1,938 km² area. Separately, they estimated the area of the BSC at 27 km², for a total area of 1,965 km².

Using these inputs, both applicants calculated a density of 0.055 dolphins/km² (109/1,965=0.055). NMFS believes this approach is an underestimate since the surveys in Piwetz and Whitehead (2019) were confined to the lower Laguna Madre. Therefore, we applied the 109 animals to the survey area in the study. The report did not provide the survey area (only the combined area covered for all five days) but a rudimentary GIS exercise yielded an approximate survey area of 140 km². This results in a density of 0.76 dolphins/km².

When considering a density-based approach to calculate potential take, NMFS typically recommends the following equation: *density x area x pile driving days*. Using this equation and the NMFS-derived survey area of 140 km², the resulting total take estimate for Rio Grande is approximately 29 ((0.76 dolphins/km² x 4.85 km² x 7 days) + (0.76 dolphins/km² x 0.62 km² x 1 day) and approximately 12 for Annova (0.76 dolphins/km² x 1.0 km x 16 days).

While these calculations would be appropriate for more open water areas, the results are not realistic for the context of these projects. First, dolphins travel up and down the BSC therefore the potential for them to be exposed to pile driving noise is somewhat independent of the harassment zone sizes as all zones cross the entire width of the channel they are likely to travel into these zones on any given day (*i.e.*, that all dolphins traveling the BSC will eventually pass the terminal sites and therefore have equal chances for exposure). Second, Rio Grande is conducting less work on fewer days than Annova. Given the likely daily occurrence for dolphins to be within the BSC, it is unrealistic to assume Rio Grande has the potential to have more than double the instances of take than Annova. For this reason, NMFS determined the resulting take based on density is not realistic and has instead estimated take based on sighting rates which considers an important parameter - the number of hours of pile driving.

To derive a more realistic take estimate, NMFS considered the Piwetz and Whitehead (2019) data and the amount of pile driving proposed by each applicant. Piwetz and Whitehead (2019) observed 109 dolphins over 26.72 hours of survey effort, resulting in an average of 4.1 dolphins/hour. Rio Grande anticipates installing 12 piles and removing 5 piles over approximately 11.3 hours. Given the number of dolphins/hour, this results in a total take estimate of 46 (4.1 dolphins per hour x 11.3 hours). Annova anticipates installing 20 piles and removing 16 of those 20 piles over approximately 15 hours. Given the number of dolphins/hour, this results in a total take estimate of 62 takes (4.1 dolphins per hour x 15 hours). This amount of take more closely reflects the potential for both applicants to harass animals and allows for an adequate amount of take when considering another important parameter- group size. The average expected group size of dolphins in the BSC is 4.5 dolphins (Piwetz and Whitehead, 2019). The proposed amount of bottlenose dolphin take for Rio Grande and Annova is presented in Table 10 and 11, respectively.

Rough-toothed and Atlantic Spotted Dolphins

It is unlikely that rough-toothed dolphins or Atlantic spotted dolphins will occur in the BSC as these species typically inhabit coastal and offshore waters. We note that neither of these species were observed during opportunistic and planned surveys in 2016 through 2019 (Ronje *et al.*, 2018; Piwetz and Whitehead 2019). However, because there is a small risk that these animals may be exposed to project-related noise if they do enter the BSC during pile driving (*e.g.*, a stranding event or other abnormal behavior), both Rio Grande and Annova have each requested take equating to the average group size of these species (Maze-Foley and Mullin 2006). These mean group sizes are 14 rough-toothed dolphins and 26 Atlantic spotted dolphins (Table 10 and 11).

Table 10. Proposed Take for Rio Grande.

Species	Stock	Level B Harassment Take
Bottlenose dolphin	Laguna Madre	46
	Western Gulf of Mexico Coastal	
Rough-toothed dolphin	N. Gulf of Mexico	14
Atlantic spotted dolphin	N. Gulf of Mexico	26

Table 11. Proposed Take for Annova.

Species	Stock	Level B Harassment Take
Bottlenose dolphin	Laguna Madre	62
	Western Gulf of Mexico Coastal	
Rough-toothed dolphin	N. Gulf of Mexico	14
Atlantic spotted dolphin	N. Gulf of Mexico	26

Proposed Mitigation

In order to issue an IHA under Section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to the activity, and other means of effecting the least practicable impact on the species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stock for taking for certain subsistence uses (latter not applicable for this action). NMFS regulations require applicants for incidental take authorizations to include information about the availability and feasibility (economic and technological) of equipment, methods, and manner of conducting the activity or other means of effecting the least practicable adverse impact upon the affected species or stocks and their habitat (50 CFR 216.104(a)(11)).

In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, as well as subsistence uses where applicable, we carefully consider two primary factors:

(1) the manner in which, and the degree to which, the successful implementation of the measure(s) is expected to reduce impacts to marine mammals, marine mammal species or stocks, and their habitat. This considers the nature of the potential adverse impact being mitigated (likelihood, scope, range). It further considers the likelihood that the measure will be effective if implemented (probability of accomplishing the mitigating result if implemented as planned), the likelihood of effective implementation (probability implemented as planned), and;

(2) the practicability of the measures for applicant implementation, which may consider such things as cost, impact on operations, and, in the case of a military readiness activity, personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

Both Rio Grande and Annova have proposed similar mitigation measures to ensure the least practicable adverse impact on marine mammals. Because dolphins are present within the Laguna Madre year-round, we are not proposing any in-water work windows.

Each IHA would contain the following mitigation measures:

For in-water construction, heavy machinery activities other than pile driving (*e.g.*, use of barge-mounted excavators, or dredging), if a marine mammal comes within 10 m, Rio Grande and Annova must cease operations and reduce vessel speed to the minimum level required to maintain steerage and safe working conditions. This measure is designed to prevent physical injury from in-water equipment.

Rio Grande and Annova are required to conduct briefings for construction supervisors and crews, the monitoring team, and staff prior to the start of all pile driving activity, and when new personnel join the work, in order to explain responsibilities, communication procedures, the marine mammal monitoring protocol, and operational procedures.

Two protected species observers (PSOs) must be stationed on land, barge, boat, or dock with full view of the shutdown zones (Table 12) and with direct view of the opposite shoreline to observe for marine mammals within the Level B harassment zone. If a marine mammal is observed within or approaching the shutdown zone, the PSOs will call for a shutdown.

Table 12. Shutdown Zones.

Applicant	Pile	Shutdown Zone
Rio Grande	All piles	20 m
Annova	24-in	20 m
	96-in	100 m

Marine mammal monitoring must take place from 30 minutes prior to initiation of pile driving activity through 30 minutes post-completion of pile driving activity. Pile driving may commence when observers have declared the shutdown zone clear of marine mammals. In the event of a delay or shutdown of activity resulting from marine mammals in the shutdown zone (Table 12), their behavior must be monitored and documented until they leave of their own volition, at which point the activity may begin or they have not been re-sighted within 15 minutes.

If a marine mammal is entering or is observed within an established shutdown zone (Table 12), pile driving must be halted or delayed. Pile driving may not commence or resume until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone or 15 minutes have passed without subsequent detections.

Should environmental conditions deteriorate such that marine mammals within the entire shutdown zone would not be visible (*e.g.*, fog, heavy rain), pile driving and removal must be delayed until the PSO is confident marine mammals within the shutdown zone could be detected.

Rio Grande and Annova must use soft start techniques when impact pile driving. Soft start requires contractors to provide an initial set of strikes at reduced energy, followed by a thirty-second waiting period, then two subsequent reduced energy strike sets. A soft start must be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of thirty minutes or longer.

Rio Grande and Annova are required to employ a double bubble curtain during all impact pile driving and operate it in a manner consistent with the following performance standards: the bubble curtain must distribute air bubbles around 100 percent of the piling perimeter for the full depth of the water column; the lowest bubble ring must be in contact with the mudline for the full circumference of the ring, and the weights attached to the bottom ring shall ensure 100 percent mudline contact. No parts of the ring or other objects shall prevent full mudline contact; and air flow to the bubblers must be balanced around the circumference of the pile. Rio Grande also proposed operating a double bubble curtain during all vibratory pile driving and removal and we have accounted for its ability to attenuate noise in our analysis. Therefore, Rio Grande must also operate this double bubble curtain during vibratory driving and removal.

If a species for which authorization has not been granted, or a species for which authorization has been granted but the authorized takes are met, is observed approaching or within the monitoring zone (Table 9), pile driving and removal activities must shut down immediately using delay and shut-down procedures. Activities must not resume until the animal has been confirmed to have left the area or 15 minutes has elapsed without a subsequent sighting.

In the case that 75 percent of the authorized take is met and two or more piles are left to be installed to complete the project, Rio Grande and Annova would implement additional monitoring and mitigation to ensure the authorized take is not exceeded. If this trigger is met, an additional PSO would be positioned at the western edge of the Level B harassment zone.

Based on our evaluation of the applicants' proposed measures, NMFS has preliminarily determined that the proposed mitigation measures provide the means effecting the least practicable impact on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Proposed Monitoring and Reporting

In order to issue an IHA for an activity, Section 101(a)(5)(D) of the MMPA states that NMFS must set forth requirements pertaining to the monitoring and reporting of such taking. The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the proposed action area. Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should contribute to improved understanding of one or more of the following:

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.*, presence, abundance, distribution, density);
- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of:

(1) action or environment (*e.g.*, source characterization, propagation, ambient noise); (2) affected species (*e.g.*, life history, dive patterns); (3) co-occurrence of marine mammal species with the action; or (4) biological or behavioral context of exposure (*e.g.*, age, calving or feeding areas);

- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;
- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;
- Effects on marine mammal habitat (*e.g.*, marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and
- Mitigation and monitoring effectiveness.

Marine mammal monitoring before, during, and after pile driving and removal must be conducted by NMFS-approved PSOs who are independent and have a degree in biological sciences or related training/field experience. NMFS considers the following qualifications when reviewing potential PSO's *Curriculum Vitae* (CV): ability to conduct field observations and collect data according to assigned protocols, experience or training in the field identification of marine mammals, including the identification of behaviors, sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations, writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times when in-water construction activities were conducted; dates, times, and reason for implementation of mitigation (or why mitigation was not implemented when required); and marine mammal behavior, and ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine

mammals observed in the area as necessary. Rio Grande and Annova must submit PSO CVs for approval by NMFS prior to the onset of pile driving.

Each IHA holder must submit a draft report on all marine mammal monitoring conducted under their IHA within ninety calendar days of the completion of marine mammal monitoring. A final report must be prepared and submitted within thirty days following resolution of comments on the draft report from NMFS.

The marine mammal report must contain information related to construction activities, weather conditions, the number of marine mammals observed, by species, relative to the pile location (*e.g.*, distance and bearing), description of any marine mammal behavior patterns during observation, including direction of travel and estimated time spent within the Level A harassment and Level B harassment zones during pile driving and removal, if pile driving or removal was occurring at time of sighting, age and sex class, if possible, of all marine mammals observed, PSO locations during marine mammal monitoring, detailed information about any implementation of any mitigation triggered (*e.g.*, shutdowns and delays), a description of specific actions that ensued, and resulting behavior of the animal, if any, an extrapolation of the estimated takes by Level B harassment based on the number of observed exposures within the Level B harassment zone and the percentage of the Level B harassment zone that was not visible. Rio Grande and Annova must also submit all PSO datasheets and/or raw sighting data to NMFS.

In the event that personnel involved in the construction activities discover an injured or dead marine mammal, the IHA-holder must immediately cease the specified activities and report the incident to NMFS and the Southeast Marine Mammal Stranding Network. If the death or injury was clearly caused by the specified activity, the IHA-holder must immediately cease the specified activities until NMFS is able to review the circumstances of the incident and determine

what, if any, additional measures are appropriate to ensure compliance with the terms of the IHA. The IHA-holder must not resume their activities until notified by NMFS. Reporting information must include information about the event, species, animal condition and behavior, and if possible, photographs.

Negligible Impact Analysis and Determination

NMFS has defined negligible impact as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.*, population-level effects). An estimate of the number of takes alone is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be “taken” through harassment, NMFS considers other factors, such as the likely nature of any responses (*e.g.*, intensity, duration), the context of any responses (*e.g.*, critical reproductive time or location, migration), as well as effects on habitat, and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS’s implementing regulations (54 FR 40338; September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the environmental baseline (*e.g.*, as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

To avoid repetition, our analysis below applies to the issuance of an IHA to Rio Grande and, separately, issuance of an IHA to Annova, as both projects include construction of an LNG terminal in the same area of the BSC.

Pile driving activities associated with both projects, as outlined previously, have the potential to disturb or displace marine mammals. Specifically, the specified activities may result in take, in the form of Level B harassment (behavioral disturbance) incidental to underwater sounds generated from pile driving. Harassment could occur if dolphins are present in relatively close proximity (1-5 km²) to pile driving and removal.

No Level A harassment, serious injury or mortality is anticipated given the nature of the activities and measures designed to avoid the potential of injury (*e.g.*, PTS) to marine mammals. The potential for these outcomes is minimized through the construction method and the implementation of the planned mitigation measures. Rio Grande and Annova would utilize a double bubble curtain during all impact pile driving while Rio Grande has also committed to using the double bubble curtain during vibratory driving and removal. Specifically, vibratory and impact hammers will be the primary methods of installation. Piles will first be installed using vibratory pile driving. Vibratory pile driving produces lower SPLs than impact pile driving. The rise time of the sound produced by vibratory pile driving is slower, reducing the probability and severity of injury. Impact pile driving produces short, sharp pulses with higher peak levels and much sharper rise time to reach those peaks. When impact pile driving is used, implementation of soft start and shutdown zones significantly reduces any possibility of injury. Given sufficient “notice” through use of soft starts (for impact driving), marine mammals are expected to move away from a sound source; thereby, lowering received sound levels.

The proposed activities by Rio Grande and Annova are localized and of relatively short duration (8 and 16 days, respectively). The project area is also very limited in scope spatially (confined to a small area of the BSC). Localized (confined to the BSC) and short-term noise exposures produced by project activities may cause short-term behavioral modifications in dolphins. Surveys in the lower Laguna Madre indicate dolphin behavior is generally dominated by socializing, traveling (often in the direction of tidal movement), and foraging (Ronje *et al.*, 2018; Piwetz and Whitehead, 2019). Dolphins were also observed foraging behind active commercial shrimp trawlers in the BSC as far as the Brownsville Fishing Harbor (Ronje *et al.* 2018). During another survey, commercial fishing trawlers were observed actively operating and 31 percent (n = 5) of groups were observed foraging behind trawlers or directly off the stern taking advantage of discarded bycatch (Piwetz and Whitehead, 2019).

Another Texas waterway similar to the BSC, the Galveston Ship Channel, has been a hot spot for dolphin research in Texas. Dolphins regularly use the GSC to forage (57 percent of observed behavioral states) and socialize (27 percent), and for traveling (5 percent) (Piwetz, 2019). The author found when boats were present, the proportion of time dolphins spent socializing and foraging was significantly less than expected by chance. Swimming speeds increased significantly in the presence of small recreational boats, dolphin-watching tour boats, shrimp trawlers, and when tour boats and shrimp trawlers were both present. We would expect animals in the BSC to respond similarly (*e.g.*, decreased foraging and socializing) to pile driving. However, the activities considered in these IHAs (pile driving) would be stationary in nature and no vessels would be actively approaching dolphins nor would dolphins likely be attracted to pile driving as they are to shrimp trawls.

In general, effects on individuals that are taken by Level B harassment will likely be limited to temporary reactions such as avoidance, increased swimming speeds, and decreased socializing and foraging behaviors. We would anticipate swim speeds would increase as dolphins move closer to the pile driving location (similar to how they react to vessels); however, this would move them quickly past the terminal and pre-pile driving exposure behavior would likely return quickly. Foraging and socializing behaviors may cease; however, these behaviors would also resume shortly thereafter. Level B harassment will be reduced to the level of least practicable adverse impact through use of mitigation measures described herein.

The project also is not expected to have significant adverse effects on affected marine mammal habitat. Marine mammal habitat quality within the BSC varies. There is little development along the shoreline until the Brownsville Fishing Harbor, located approximately 8 km west of the project sites, when the BCS becomes commercial/industrial. Dolphin habitat in the BSC would be temporarily, indirectly impacted during the brief duration of pile driving for both projects. Direct impacts to dolphin habitat would not occur during Annova's construction as the site is currently uplands. For Rio Grande, direct impacts to foraging habitat would be minimal and temporary in nature during pile driving, primarily consisting of increased turbidity. Dredging would permanently deepen the channel at the Rio Grande terminal location; however, the entire BSC is a man-made canal that is dredged. The activities may cause some fish to leave the area of disturbance, thus temporarily impacting marine mammal foraging opportunities in a limited portion of the foraging range. However, because of the short duration of the activities, the relatively small area of the habitat that may be affected, the impacts to marine mammal habitat are not expected to cause significant or long-term negative consequences.

In summary and as described above, the following factors primarily support our preliminary determination that the impacts resulting from the proposed activities are not expected to adversely affect the species or stock through effects on annual rates of recruitment or survival:

- No Level A harassment, mortality is anticipated or authorized.
- The anticipated incidents of Level B harassment consist of, at worst, temporary modifications in behavior that would not result in fitness impacts to individuals;
- The specified activity and ensonification area is very small (1-5 km²) relative to the overall habitat ranges of all species and does not include habitat areas of special significance; and
- The presumed efficacy of the proposed mitigation measures in reducing the effects of the specified activity to the level of least practicable adverse impact.
- The impacts to marine mammal habitat would be temporary in nature, primarily increased turbidity and noise.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the proposed monitoring and mitigation measures, NMFS preliminarily finds that the total marine mammal take from Rio Grande's specified activities and, separately, Annova's specified activities, will have a negligible impact on all affected marine mammal species or stocks.

Small Numbers

As noted above, only small numbers of incidental take may be authorized under Sections 101(a)(5)(A) and (D) of the MMPA for specified activities other than military readiness activities. The MMPA does not define small numbers and so, in practice, where estimated

numbers are available, NMFS compares the number of individuals taken to the most appropriate estimation of abundance of the relevant species or stock in our determination of whether an authorization is limited to small numbers of marine mammals. When the predicted number of individuals to be taken is fewer than one third of the species or stock abundance, the take is considered to be of small numbers. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

For coastal stocks (bottlenose, Atlantic spotted, and rough-toothed dolphins) the amount of proposed take is less than one percent of the population. There is no population estimate available for the Laguna Madre stock of bottlenose dolphins. Two studies investigating dolphins in Lower Laguna Madre yielded approximately 60 in 2016 (Ronje *et al.*, 2018) and 109 individuals in 2018 and 2019 (Piwetz and Whitehead, 2019). However, these surveys were very limited in space with respect to the stock range and the numbers reflect identified individuals. More specifically, Ronje *et al.* 2018 limited their survey to the extreme lower portion of Lower Laguna Madre while Piwetz and Whitehead (2019) acknowledge the non-asymptotic nature of the discovery curve (accumulation curve) indicates that the sampling effort has not yet identified all, or even most, of the individuals that use this region (presumably referring to lower Laguna Madre). The entire Laguna Madre stock range include upper and lower Laguna Madre.

To estimate potential abundance, we looked for comparative ecosystems to estimate potential population size and trends in abundance estimates for other Gulf of Mexico BSE stocks. The Indian River Lagoon (IRL) in Florida is similar in configuration and length to Laguna Madre but is approximately half the size (539 km² versus 1137km²). Similar to Laguna Madre, there are no recent stock estimates for the IRL; however, seasonal aerial surveys spanning the IRL from 2002 and 2003 yielded a range of 362 (CV =0.29) to 1316 (CV=0.24)

with an overall mean abundance of 662 dolphins (Hayes *et al.*, 2016). For those Gulf of Mexico BSEs that have been more intensively studied in recent years, the trend demonstrates these BSEs support much larger stocks of bottlenose dolphins than previously believed. For example, the abundance estimates for the Barataria Bay, Mobile Bay, and Mississippi Sound stocks based on older data were estimated at 138, 122, and 901 animals, respectively (Hayes *et al.* 2017). More recent surveys and analysis now estimate those stocks at 2,306, 1,393, and 3,046 dolphins, respectively. For these reasons, it is reasonable to assume the entire Laguna Madre similarly supports several hundred to thousand animals.

Finally, dolphins within the BSC have been documented as following the tides and shrimp trawls making their way back to the fleet docks which are located west of the terminal sites (Ronje *et al.* 2018). Because the BSC is a dead-end canal, dolphins traveling past the terminal sites in a westward direction must re-transit past the terminal sites to exit the BSC. This is likely to occur on the same day given the tides. While it is not possible to determine if pile driving would be occurring as animals are transiting both west and east of the terminal sites on any given day, it is possible some animals may be exposed to pile driving on more than one occasion on any given day (*e.g.*, if pile driving is occurring in the morning and then several hours later, after a tide change). Therefore, the number of individual dolphins actually harassed may be less than the amount of take proposed to be authorized.

In summary, surveys in Laguna Madre have been limited to lower Laguna Madre and the authors acknowledge the limitations of their studies for purposes of estimating stock size, the IRL (a lagoon similar in configuration and proximity to ocean waters as the BSC but approximately half the surface water area) supports hundreds to over 1,000 animals, and trends of older stock estimates compared to more recent data for other Gulf of Mexico BSE stocks. For

these reasons, it is likely the Laguna Madre stock estimate is, at minimum, several hundred animals. Further, the number of individuals taken may be less than the amount of take authorized. Therefore, for the Laguna Madre stock of bottlenose dolphins, we find that the total taking may reasonably be expected to represent less than one-third of the total likely population abundance.

Based on the analysis contained herein of the proposed activity (including the proposed mitigation and monitoring measures) and the anticipated take of marine mammals, NMFS preliminarily finds that small numbers of marine mammals relative to the population size of the affected species or stocks may be taken incidental to Rio Grande's proposed activities and, separately, incidental to Annova's proposed activities.

Endangered Species Act (ESA)

No incidental take of ESA-listed species is proposed for authorization or expected to result from this activity. Therefore, NMFS has determined that formal consultation under section 7 of the ESA is not required for this action.

Proposed Authorization

As a result of these preliminary determinations, NMFS proposes to issue IHAs to both Rio Grande and Annova authorizing the take, by Level B harassment only, of small numbers of marine mammals provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. A draft of the proposed IHAs can be found at <https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act>.

Request for Public Comments

We request comment on our analyses, the proposed authorizations, and any other aspect of this Notice of Proposed IHA for the proposed projects. We also request at this time comment on the potential Renewal of the proposed IHAs as described in the paragraph below. Please include with your comments any supporting data or literature citations to help inform decisions on the request for these IHAs or subsequent Renewal IHAs.

On a case-by-case basis, NMFS may issue a one-year Renewal IHA following notice to the public providing an additional 15 days for public comments when (1) up to another year of identical or nearly identical, or nearly identical, activities as described in the Specified Activities section of this notice is planned or (2) the activities as described in the Specified Activities section of this notice would not be completed by the time the IHA expires and a Renewal would allow for completion of the activities beyond that described in the Dates and Duration section of this notice, provided all of the following conditions are met:

- A request for renewal is received no later than 60 days prior to the needed Renewal IHA effective date (recognizing that the Renewal IHA expiration date cannot extend beyond one year from expiration of the initial IHA);
- The request for renewal must include the following:
 - (1) An explanation that the activities to be conducted under the requested Renewal IHA are identical to the activities analyzed under the initial IHA, are a subset of the activities, or include changes so minor (*e.g.*, reduction in pile size) that the changes do not affect the previous analyses, mitigation and monitoring requirements, or take estimates (with the exception of reducing the type or amount of take);

(2) A preliminary monitoring report showing the results of the required monitoring to date and an explanation showing that the monitoring results do not indicate impacts of a scale or nature not previously analyzed or authorized; and

- Upon review of the request for Renewal, the status of the affected species or stocks, and any other pertinent information, NMFS determines that there are no more than minor changes in the activities, the mitigation and monitoring measures will remain the same and appropriate, and the findings in the initial IHA remain valid.

Dated: May 1, 2020.

Donna S. Wieting,
Director, Office of Protected Resources,
National Marine Fisheries Service.

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