hearings to solicit public comments on Joint Amendment with the Gulf and South Atlantic Council's to Address Electronic Reporting for Commercial Vessels participating in the coastal logbook program.

DATES: The public hearings will take place Monday, September 18, 2023 at 10 a.m., EDT and Tuesday, September 19, 2023 at 6 p.m., EDT and will conclude no later than 3 hours after the start time of each webinar. For specific dates and times, see **SUPPLEMENTARY INFORMATION.** Written public comments must be received on or before 5 p.m. EDT on October 17, 2023.

ADDRESSES: Please visit the Gulf Council website at *www.gulfcouncil.org* for meeting materials and webinar registration information. If you prefer to ''listen in'', you may access the log-on information by visiting our website at *www.gulfcouncil.org.*

Meeting addresses: The public hearings will be held virtual/webinars. For specific locations, see **SUPPLEMENTARY INFORMATION.**

Public comments: Comments may be submitted online through the Council's public portal by visiting *www.gulfcouncil.org* and clicking on ''CONTACT US''.

FOR FURTHER INFORMATION CONTACT: Emily Muehlstein; Public Information Officer*; emily.muehlstein@ gulfcouncil.org,* Gulf of Mexico Fishery Management Council; telephone: (813) 348–1630.

SUPPLEMENTARY INFORMATION: The original notice published in the **Federal Register** on July 31, 2023 (88 FR 49451). The hearings were scheduled for August 29th and 30th. The hearing dates had to be changed due to a hurricane.

The agenda for the following three webinar public hearings are as follows: Council and NOAA staff will begin with a presentation on the proposed management change addressed in the Amendment Addressing Electronic Reporting for Commercial Vessels. The Gulf and South Atlantic Councils are currently considering requiring federal commercial permit holders to submit commercial coastal logbooks electronically, rather than mailing paper logbooks. This amendment would impact commercial Reef Fish and Coastal Migratory Pelagic permit holders in the Gulf of Mexico and commercial Snapper/Grouper and Dolphin/Wahoo permit holders in the South Atlantic.

Staff and a Council member will be available to answer any questions, and the public will have the opportunity to provide testimony on the amendment and other related testimony at the end of each public hearing webinar.

Webinars:

Tuesday, September 18, 2023; webinar to begin at 10 a.m., EDT.

Wednesday, September 19, 2023; webinar to begin at 6 p.m., EDT.

Visit *www.gulfcouncil.org* website and click on the ''meetings'' tab for registration information. After registering, you will receive a confirmation email containing information about joining the webinar.

Authority: 16 U.S.C. 1801 *et seq.*

Dated: August 31, 2023.

Rey Israel Marquez,

Acting Deputy Director, Office of Sustainable Fisheries, National Marine Fisheries Service.

[FR Doc. 2023–19270 Filed 9–6–23; 8:45 am]

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[RTID 0648–XD182]

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Columbia East Lateral XPRESS Project

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

ACTION: Notice; proposed incidental harassment authorization; request for comments on proposed authorization and possible renewal.

SUMMARY: NMFS has received a request from TC Energy Columbia Gulf Transmission, LLC for authorization to take marine mammals incidental to the East Lateral XPRESS Project in Barataria Bay, Louisiana. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an incidental harassment authorization (IHA) to incidentally take marine mammals during the specified activities. NMFS is also requesting comments on a possible one-time, one-year renewal 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 authorization and agency responses will be summarized in the final notice of our decision.

DATES: Comments and information must be received no later than October 10, 2023.

ADDRESSES: Comments should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service and should be submitted via email to *ITP.StevenTucker@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, including all attachments, must not exceed a 25-megabyte file size. All comments received are a part of the public record and will generally be posted online at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-oil-and-gas* 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.

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/national/marine-mammal-protection/incidental-take-authorizations-oil-and-gas.* In case of problems accessing these documents, please call the contact listed below.

FOR FURTHER INFORMATION CONTACT: Steven Tucker, Office of Protected Resources, NMFS, (301) 427–8401.

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 proposed or, if the taking is limited to harassment, a notice of a proposed IHA is 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 IHA) with respect to potential impacts on the human environment.

This action is consistent with categories of activities identified in Categorical Exclusion B4 (IHAs 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 IHA 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 a final decision on the IHA request.

Summary of Request

On March 3, 2023, NMFS received a request from TC Energy/Columbia Gulf Transmission, LLC (Columbia Gulf) for an IHA to take marine mammals incidental to construction activities that include pile driving to install: (1) a point of delivery metering station (or, POD), and (2) a tie-in facility (or, TIF) in Barataria Bay. The project is intended to provide feed fuel for on-shore Liquefied Natural Gas (LNG) compressor stations. The application was deemed adequate and complete on June 5, 2023. Columbia Gulf's request is for take of bottlenose dolphin (*Tursiops truncatus,* Barataria Bay Estuarine System stock or, BBES) by Level B harassment only. Neither Columbia Gulf nor NMFS expects serious injury or mortality to result from this activity and, therefore, an IHA is appropriate.

Description of Proposed Activity

Overview

Columbia Gulf Transmission, LLC, a wholly-owned subsidiary of TC Energy Corporation, proposes to construct two new compressor stations, a new meter station, approximately 8 miles (13 kilometers) of new 30-inch diameter natural gas pipeline lateral, two new mainline valves, a tie-in facility, launcher and receiver facilities, and other auxiliary appurtenant facilities all located in St. Mary, Lafourche, Jefferson, and Plaquemines parishes, Louisiana (collectively referred to as ''Project''). A summary of all construction activities necessary to complete the all elements of the project are shown in Table 1.

TABLE 1—ALL ELEMENTS OF THE PROJECT. BOLDED ELEMENTS INCLUDE IN-WATER ACTIVITIES THAT MAY RESULT IN THE TAKE OF MARINE MAMMALS

Facility	Parish	Pipeline milepost location	Description
Pipeline Facilities			
30-inch Pipeline Lateral	Jefferson	0.00–2.47	Install approximately 13.1 kilometers (8.14) miles of new 30-inch-diameter pipeline lateral.
	Plaquemines	2.47–8.14	
Aboveground Facilities			
Centerville Compressor Station.	St. Mary	[a] 66.50, [b] 66.70, [c] 67.00	Construct a new gas-fired compressor station with a 23,470 hp compressor unit, which will interconnect with Columbia Gulf's existing EL–100, EL–200, and EL–300 pipelines.
Golden Meadow Compressor Station.	Lafourche	[c] 149.50	Construct a new gas-fired compressor station with a 23,470 hp compressor unit, which will interconnect with Columbia Gulf's existing EL–300 pipeline.
Point of Delivery Meter Station.	**Plaquemines**	**8.14**	**Construct one point of delivery meter station at the terminus of the new 30-inch pipeline lateral on an existing platform shared with Venture Global Gator Express, LLC. A 30-inch pig receiver will also be installed at the POD Meter Station.**
Tie-in Facility	**Jefferson**	**0.00**	**Install a new tie-in facility situated on a new platform at the intersection of the new 30-inch pipeline and Columbia Gulf's existing EL–300 pipeline. A 30-inch pig launcher will also be Installed at the Tie-in Facility.**
Valves and Other Ancillary Facilities.	Jefferson	0.00, [c] 1.71	Install one new 30-inch mainline valve assembly on the new 30-inch pipeline lateral and one new 24- inch mainline valve assembly Columbia Gulf's existing EL–300 pipeline. Both mainline valve assemblies will be situated on the new Tie-in Facility platform.

[a] Milepost is associated with Columbia Gulf's existing EL–100 pipeline.
[b] Milepost is associated with Columbia Gulf's existing EL–200 pipeline.
[c] Milepost is associated with Columbia Gulf's existing EL–300 pipeline.

The work necessary to complete construction of the project would temporarily impact 2.79 acres, permanently alter .02 acres and include in-water activity that may result in take of marine mammals in Barataria Bay. Specifically, in order to provide fuel supply services to onshore LNG compressor stations, Columbia Gulf proposes pile driving to construct a new Point of Delivery Meter Station on an existing platform and a new Tie-in

Facility at the terminus a new 30-inch lateral pipeline. Project activities include installation, by impact hammer, of 20 18-inch concrete piles and 104 36-inch spun cast piles. The new POD Meter Station will include the installation of three 16-inch meter runs and related facilities. The new POD Meter Station will be constructed at the site of an existing platform, and construction will require the installation of four new 18-inch square concrete piles to protect a 30-inch- diameter riser. Pipelines will be installed by jetting and dredging with displaced sediment precipitating back to the substrate or being side-cast adjacent to the trench, respectively.

The new Tie-in Facility will be situated on a new 180 foot (55 meter) long by 80 foot (24.3 meter) wide platform supported by 104 36-inch-diameter spun cast and 4 18-inch-diameter concrete piles. Two 24-inch-diameter and one 30-inch-diameter risers will be protected by 12 a8-inch diameter concrete piles. The Tie-in Facility would include a boat landing measuring 10 foot (3 meter) long by 10 foot (3 meter) wide, that will be used for maintenance and servicing of the platform.

These activities would be supported by eight vessels using existing public barge channels and waterways during an estimated 16 barge trips per week. Because vessels will be in transit, exposure to ship noise will be temporary, relatively brief and will occur in a predictable manner, producing sound at a relatively low level and consistent with use of the waterway and other activity in the area. In order to reduce the number barge transits during construction, Columbia Gulf intends to station one or more barges onsite for hoteling of personnel.

Dates and Duration

Columbia Gulf proposes to start construction in January, 2024 in order to meet a planned in-service date of April, 2025. Pile driving within Barataria Bay is anticipated to occur within a 3 month period from January, 2025 to March, 2025. Pile driving activity will be intermittent, conducted in accordance with project phasing requirements, and as such will not be continuous throughout the 3-month period. Pile driving activities would take place from 7 a.m. to 7 p.m. (adjusted as appropriate to conduct work during daylight hours), and could occur on any day of the week for about 25 days (five piles per day).

Specific Geographic Region

Barataria Bay is a shallow estuarine system, and is categorized as an open bay habitat with a mean depth of approximately 2.0 meters (U.S. Environmental Protection Agency, 1999; Conner and Day, 1987). Archival data collected at NOAA's St. Mary's Point station indicate a mean tidal range of 0.97 feet, with Mean High-High Water reference elevation of .47′ and Mean Low-Low Water reference elevation of −2.32. The bay has two fronting barrier islands (Grand Isle and Grand Terre) that separate it from the rest of the Gulf of Mexico and that also inhibit underwater sound transmission from portions of the Bay to the coastal waters of the Gulf of Mexico.

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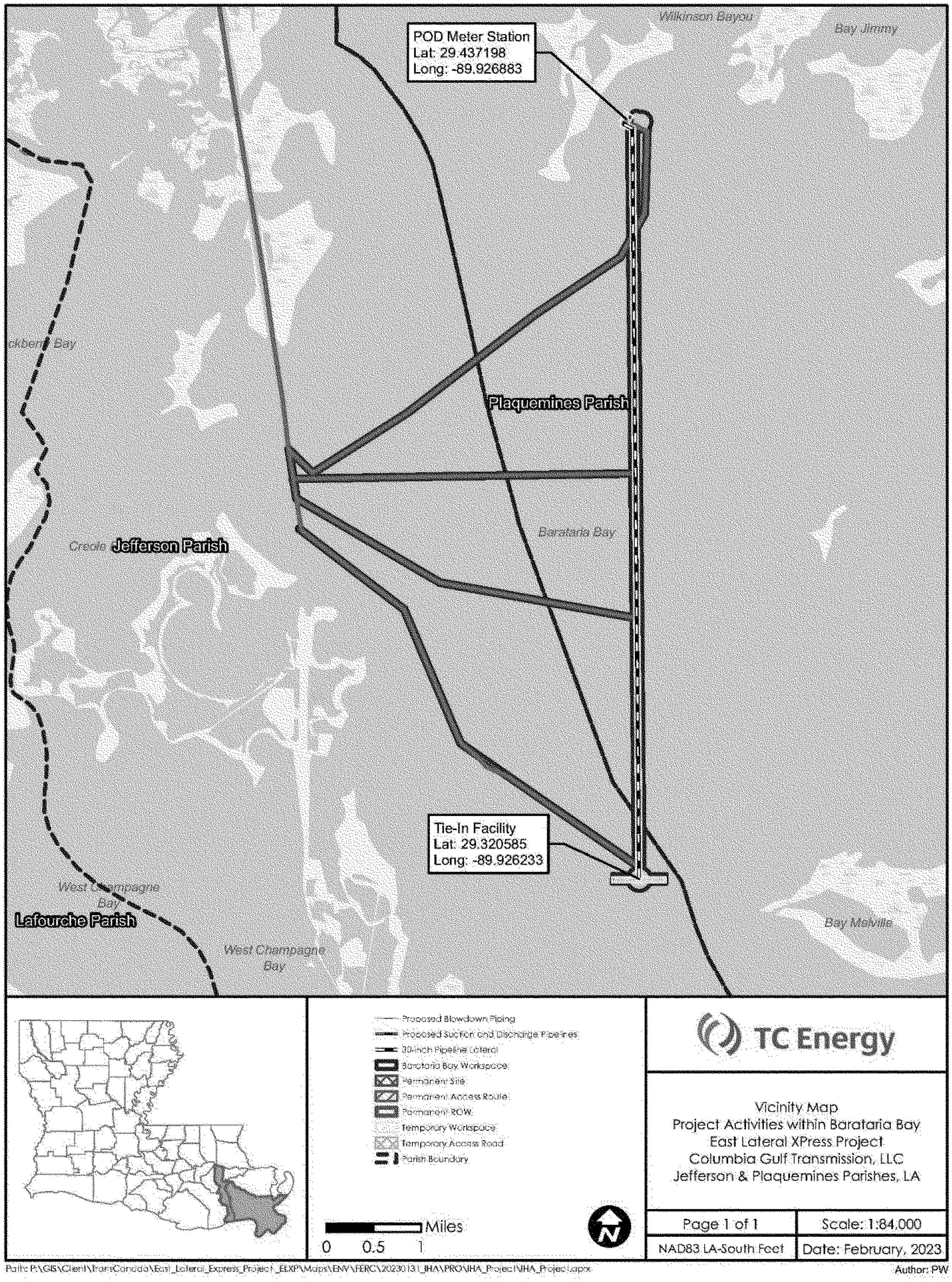

Figure 1. Map of Project Area and Proposed Features

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Barataria Bay is bordered by tidal salt marshes and is connected to a series of passes (*i.e.,* Caminada Pass, Barataria Pass, Pass Abel, and Quatre Bayou Pass) which, in turn, provide hydrologic connection to the waters of the Gulf of Mexico (NMFS, 2023a; Conner and Day, 1987). To the east, Barataria Bay is bounded by levees surrounding the Mississippi River and to the west it is bordered by Bayou Lafourche (Birdsong, 2004). The waters of Barataria Bay are turbid with lower salinity level (including the presence of freshwater lakes) in northern reaches. Higher salinity levels prevail in the southern portion of the bay due to tidally influenced exchange with Gulf coastal waters (NMFS, 2023a). As a result, measured salinity concentrations in

Barataria Bay can vary ranging from 6 to 22 parts per trillion, depending on the sampling location.

Detailed Description of the Specified Activity

Columbia Gulf proposes to construct a POD Meter Station on an existing platform along with the new receiver at the terminus of a new 30-inch pipeline lateral within Barataria Bay. The new POD Meter Station requires installation of three 16-inch meter runs and related facilities. The new POD Meter Station is proposed for construction on an existing platform, and requires the installation of four 18-inch square concrete piles in order to protect a 30-inch-diameter riser.

In addition to shore side construction and installation of the POD meter station, Columbia Gulf proposes to construct a new Tie-in Facility at the intersection of the new 30-inch pipeline lateral and Columbia Gulf's existing EL–300 pipeline. With the exception of a portion of two new 24-inch-diameter risers and one new 30-inch-diameter riser which will be underwater, the Tie-in Facility will be constructed on a new 180 foot (55 meter) long by 80 foot (24.3 meter) wide platform supported by 104 36-inch-diameter spun cast and 4 18-inch-diameter concrete piles. Twelve 18-inch-diameter concrete piles will be installed to protect the 2 24-inch-diameter and 1 30-inch-diameter risers. The new platform will also be equipped with a boat landing, which will measure 10 feet (3 meters) long by 10 feet (3 meters) wide and will enable maintenance activities during operation of the Project.

Of the activities described in the application, noise from pile-driving is the only activity expected to result in level B harassment of bottlenose dolphins, and the implications of pile driving are discussed in greater detail below. The Piles and method of installation are presented in Table 2, below.

TABLE 2—PROPOSED PILE DRIVING ACTIVITIES

Location	Number of piles	Proposed pile diameter/type	Proxy pile for calculations	Impact strikes per pile	Piles per day	Strikes per day	Days of installation
Tie-in Facility	104	36″ Spun Cast Concrete Piles.	36″ Concrete (round, hollow).	4,800	5	24,000	24
Tie-in Facility	16	18″ Concrete (round).					
Point of Delivery Platform.	4	18″ Concrete (square).					1
Total	120						25

Proposed mitigation, monitoring, and reporting measures 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 the application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history of the Barataria Bay Estuarine Stock (BBES) of bottlenose dolphins. NMFS fully considered all of this information, including relevant citations which may be included here, and we refer the reader to these materials instead of reprinting the information. Additional information regarding population estimates and potential threats for the Barataria Bay Estuarine System stock of bottlenose dolphins, can be found in NMFS' Stock Assessment Reports (SARs; *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*) and more information about this species in general (*e.g.,* physical and behavioral descriptions) may be found on NMFS' website (*https://www.fisheries.noaa.gov/find-species*).

Take of BBES bottlenose dolphins may occur incidental to the specified activities described in the request for authorization. Information related to the population or stock, including regulatory status under the MMPA and Endangered Species Act (ESA) and potential biological removal (PBR), where known is provided in Table 3. 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' SARs). While no serious injury or mortality is anticipated or proposed to be authorized here, PBR and annual serious injury and mortality from anthropogenic sources are included here as gross indicators of the status of the species or stocks and other threats.

The BBES abundance estimate presented in this document represents the estimated total number of individuals within study and survey areas in Barataria Bay. BBES are one of several estuarine stocks fringing the northern Gulf of Mexico, and Barataria Bay is considered a Biologically Important Area year-round for the Small and Resident Population. In addition to Barataria Bay itself, individual BBES dolphins may be found in Caminada Bay, Bay Coquette, and Gulf coastal waters extending 1 kilometer (km) from the shoreline (NMFS, 2023a).

The BBES stock was first designated in 1995 and is regarded as distinct from populations in adjacent Gulf coastal waters based on genetics, reproductive seasonality and direct observations. BBES bottlenose dolphins are present throughout Bay year-round including in the vicinity of the proposed construction site. Accordingly, when estimating take and weighing potential impacts, BBES dolphin abundance, density and distribution is presumed to be consistent throughout the construction period. No additional assumptions or qualitative adjustments were made based on seasonality. The values presented in Table 2 are the most recent available at the time of publication (including the draft 2022 SARs) and are available online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments.*

TABLE 3—MARINE MAMMALS LIKELY IMPACTED BY THE SPECIFIED ACTIVITIES

Common name	Scientific name	Stock	ESA/MMPA status; strategic (Y/N) [2]	Stock abundance (CV, N_{min}, most recent abundance survey) [3]	PBR	Annual M/SI [4]
Family Delphinidae						
Bottlenose Dolphin	*Tursiops truncatus*	Barataria Bay Estuarine Stock	Y—Strategic	2,071	18	160

[1] Information on the classification of marine mammal species can be found on the web page for The Society for Marine Mammalogy's Committee on Taxonomy (*https://marinemammalscience.org/science-and-publications/list-marine-mammal-species-subspecies/*; Committee on Taxonomy (2022).

[2] 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.

[3] NMFS marine mammal stock assessment reports online at: *www.nmfs.noaa.gov/pr/sars/*. CV is coefficient of variation; N_{min} is the minimum estimate of stock abundance.

[4] 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, vessel strike). Annual M/SI often cannot be determined precisely and is in some cases presented as a minimum value or range. A CV associated with estimated mortality due to commercial fisheries is presented in some cases.

As described above, animals from the BBES stock of bottlenose dolphins temporarily and spatially co-occur with the activity to the degree that take is reasonably likely to occur. While other marine mammal species may occur in offshore waters of the Gulf of Mexico, the characteristics of Barataria Bay make transits or sustained presence in the area affected by the specified activity exceedingly unlikely and as a result take is not expected to occur. Given take of other marine mammal species is not expected, they are not discussed further.

The BBES stock has been affected by three declared unusual mortality events, all of which are now closed. The first spanned January through May of 1990 (in which 344 individuals became stranded), the second from March 2010 to July 2014 (which included stranding before, during, and after the Deepwater Horizon (DWH) oil spill), and the third from February to November of 2019 and was found to be a result of freshwater discharge from rivers (NMFS, 2023a).

Research conducted after the DWH oil spill found that the BBES dolphins suffered a wide range of effects, including impaired reproduction, respiratory illness, other diseases, and death. These and other physiological and environmental challenges that followed the spill impacted individual animals' ability to thrive and diminished the health of the stock. In Barataria Bay alone, it is estimated that 45 percent of the common bottlenose dolphin population was lost following the spill (Schwacke *et al.,* 2021).

NMFS regards BBES dolphins to be a strategic stock. Insufficient data exists to assess population trends for the stock. However, impacts examined in the course of past Unusual Mortality Events, including impacts from the DWH oil spill and changes in habitat characteristics, coupled with an estimated PBR rate greater than 10 percent support the Service's finding that the stock is strategic.

LeBreque et al. (2015) identified a small and resident population Biologically Important Area for bottlenose dolphins in the Caminada Bay and Southwest Barataria Bay area, indicating that the range of this small population is limited to this area.

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. 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, 2019) recommended that marine mammals be divided into hearing groups based on directly measured (behavioral or auditory evoked potential techniques) or estimated hearing ranges (behavioral response data, anatomical modeling, *etc.*). 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	275 Hz to 160 kHz.
(true porpoises, *Kogia,* river dolphins, Cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*)	
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.e.,* 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 *et al.* 2007) and PW pinniped (approximation).

The pinniped hearing group was modified from Southall *et al.* (2007) on the basis of data indicating that phocid species have consistently demonstrated an extended frequency range of hearing compared to otariids, especially in the higher frequency range (Hemilä *et al.,* 2006; Kastelein *et al.,* 2009; Reichmuth *et al.,* 2013). This division between phocid and otariid pinnipeds is now reflected in the updated hearing groups proposed in Southall et al. (2019).

For more detail concerning these groups and associated frequency ranges, please see NMFS (2018) for a review of available information.

Potential Effects of Specified Activities on Marine Mammals and Their Habitat

This section provides a discussion of the ways in which components of the specified activity may impact marine mammals and their habitat. The Estimated Take of Marine Mammals section later in this document presents the number of individual animals 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 of Marine Mammals 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 whether those impacts are reasonably expected to, or reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.

Acoustic effects on marine mammals during the specified activity are expected to potentially occur from impact pile driving. The effects of underwater noise from Columbia Gulf's activities have the potential to result in Level B harassment of marine mammals in the action area. These activities are not expected to cause serious injury or mortality, and no take by Level A harassment is proposed.

Background on Sound

This section contains a brief technical background on sound, on the characteristics of certain sound types, and on metrics used relevant to the specified activity and to a discussion of the potential effects of the specified activity on marine mammals found later in this document. For general information on sound and its interaction with the marine environment, please see, Erbe and Thomas (2022); Au and Hastings (2008); Richardson *et al.* (1995); Urick (1983); as well as the Discovery of Sound in the Sea (DOSITS) website at *https://dosits.org/.*

Sound is a vibration that travels as an acoustic wave through a medium such as a gas, liquid or solid. Sound waves alternately compress and decompress the medium as the wave travels. In water, sound waves radiate in a manner similar to ripples on the surface of a pond and may be either directed in a beam (narrow beam or directional sources) or sound may radiate in all directions (omnidirectional sources), as is the case for sound produced by the pile driving activity considered here. The compressions and decompressions associated with sound waves are detected as changes in pressure by marine mammals and human-made sound receptors such as hydrophones.

Sound travels more efficiently in water than almost any other form of energy, making the use of sound as a primary sensory modality ideal for inhabitants of the aquatic environment. In seawater, sound travels at roughly 1,500 meters per second (m/s). In air, sound waves travel much more slowly at about 340 m/s. However, the speed of sound in water can vary by a small amount based on characteristics of the transmission medium such as temperature and salinity.

The basic characteristics of a sound wave are frequency, wavelength, velocity, and amplitude. Frequency is the number of pressure waves that pass by a reference point per unit of time and is measured in hertz (Hz) or cycles per second. Wavelength is the distance between two peaks or corresponding points of a sound wave (length of one cycle). Higher frequency sounds have shorter wavelengths than lower frequency sounds, and typically attenuate (decrease) more rapidly with distance, except in certain cases in shallower water. The amplitude of a sound pressure wave is related to the subjective ''loudness'' of a sound and is typically expressed in decibels (dB), which are a relative unit of measurement that is used to express the ratio of one value of a power or pressure to another. A sound pressure level (SPL) in dB is described as the ratio between a measured pressure and a reference pressure, and is a logarithmic unit that accounts for large variations in amplitude; therefore, a relatively small change in dB corresponds to large changes in sound pressure. For example, a 10-dB increase is a ten-fold increase in acoustic power. A 20-dB increase is then a 100-fold increase in power and a 30-dB increase is a 1000-fold increase in power. However, a ten-fold increase in acoustic power does not mean that the sound is perceived as being 10 times louder. The dB is a relative unit comparing two pressures; therefore, a reference pressure must always be indicated. For underwater sound, this is 1 microPascal (μPa). For in-air sound, the reference pressure is 20 microPascal (μPa). The amplitude of a sound can be presented in various ways; however, NMFS typically considers three metrics: sound exposure level (SEL), root-mean-square (RMS) SPL, and peak SPL (defined below). The source level represents the SPL referenced at a standard distance from the source (Richardson *et al.,* 1995; American National Standards Institute (ANSI), 2013)(typically 1 m) (Richardson *et al.,* 1995; American National Standards Institute (ANSI), 2013), while the received level is the SPL at the receiver's position. For pile driving activities, the SPL is typically referenced at 10 m.

SEL (represented as dB referenced to 1 micropascal squared second (re 1 μPa^2-s)) represents the total energy in a stated frequency band over a stated time interval or event, and considers both intensity and duration of exposure. The per-pulse SEL (*e.g.,* single strike or single shot SEL) is calculated over the time window containing the entire pulse (*i.e.,* 100 percent of the acoustic energy). SEL can also be a cumulative metric; it can be accumulated over a single pulse (for pile driving this is the same as single-strike SEL, above; SEL_{ss}), or calculated over periods containing multiple pulses (SEL_{cum}). Cumulative SEL (SEL_{cum}) represents the total energy accumulated by a receiver over a defined time window or during an event. The SEL metric is useful because it allows sound exposures of different durations to be related to one another in terms of total acoustic energy. The duration of a sound event and the number of pulses, however, should be specified as there is no accepted standard duration over which the summation of energy is measured.

RMS SPL is equal to ten times the logarithm (base 10) of the ratio of the mean-square sound pressure to the specified reference value, and given in units of dB (International Organization for Standardization (ISO), 2017). RMS is calculated by squaring all of the sound amplitudes, averaging the squares, and then taking the square root of the average (Urick, 1983). RMS accounts for both positive and negative values; squaring the pressures makes all values positive so that they may be accounted for in the summation of pressure levels (Hastings and Popper, 2005). This measurement is often used in the context of discussing behavioral effects, in part because behavioral effects, which often result from auditory cues, may be better expressed through averaged units than by peak SPL. For impulsive sounds, RMS is calculated by the portion of the waveform containing 90 percent of the sound energy from the impulsive event (Madsen, 2005).

Peak SPL (also referred to as zero-to-peak sound pressure or 0-pk) is the maximum instantaneous sound pressure measurable in the water, which can arise from a positive or negative sound pressure, during a specified time, for a specific frequency range at a specified distance from the source, and is represented in the same units as the RMS sound pressure (ISO, 2017). Along with SEL, this metric is used in evaluating the potential for permanent threshold shift (PTS) and temporary threshold shift (TTS) associated with impulsive sound sources.

Sounds are also characterized by their temporal components. Continuous sounds are those whose sound pressure level remains above that of the ambient or background sound with negligibly small fluctuations in level (ANSI, 2005) while intermittent sounds are defined as sounds with interrupted levels of low or no sound (National Institute for Occupational Safety and Health (NIOSH), 1998). A key distinction between continuous and intermittent sound sources is that intermittent sounds have a more regular (predictable) pattern of bursts of sounds and silent periods *(i.e.,* duty cycle), which continuous sounds do not.

Sounds may be either impulsive or non-impulsive (defined below). The distinction between these two sound types is important because they have differing potential to cause physical effects, particularly with regard to noise-induced hearing loss *(e.g.,* Ward, 1997 in Southall *et al.,* 2007). Please see NMFS (2018) and Southall *et al.* (2007; 2019) for an in-depth discussion of these concepts.

Impulsive sound sources (*e.g.,* sonic booms, seismic airgun shots, impact pile driving) produce signals that are brief (typically considered to be less than one second), broadband, atonal transients (ANSI, 1986; NIOSH, 1998; ANSI, 2005) and occur either as isolated events or repeated in some succession. Impulsive sounds are all characterized by a relatively rapid rise from ambient pressure to a maximal pressure value followed by a rapid decay period that may include a period of diminishing, oscillating maximal and minimal pressures, and generally have an increased capacity to induce physical injury as compared with sounds that lack these features. Impulsive sounds are intermittent in nature. The duration of such sounds, as received at a distance, can be greatly extended in a highly reverberant environment.

Non-impulsive sounds can be tonal, narrowband, or broadband, brief or prolonged, and may be either continuous or non-continuous (ANSI, 1995; NIOSH, 1998). Some of these non-impulsive sounds can be transient signals of short duration but without the essential properties of impulses (*e.g.,* rapid rise time). Examples of non-impulsive sounds include those produced by vessels, aircraft, machinery operations such as drilling (including DTH systems) or dredging, vibratory pile driving, and active sonar systems.

Even in the absence of sound from the specified activity, the underwater environment is characterized by sounds from both natural and anthropogenic sound sources. Ambient sound is defined as a composite of naturally-occurring (*i.e.* non-anthropogenic) sound from many sources both near and far (ANSI, 1995). Background sound is similar, but includes all sounds, including anthropogenic sounds, minus the sound produced by the proposed (NMFS, 2012; 2016). The sound level of a region is defined by the total acoustical energy being generated by known and unknown sources. These sources may include physical (*e.g.,* wind and waves, earthquakes, ice, atmospheric sound), biological (*e.g.,* sounds produced by marine mammals, fish, and invertebrates), and anthropogenic (*e.g.,* vessels, dredging, construction) sound. A number of sources contribute to background and ambient sound, including wind and waves, which are a main source of naturally occurring ambient sound for frequencies between 200 Hz and 50 kilohertz (kHz) (Mitson, 1995). In general, background and ambient sound levels tend to increase with increasing wind speed and wave height. Precipitation can become an important component of total sound at frequencies above 500 Hz, and possibly down to 100 Hz during quiet times. Marine mammals can contribute significantly to background and ambient sound levels, as can some fish and snapping shrimp. The frequency band for biological contributions is from approximately 12 Hz to over 100 kHz. Sources of background sound related to human activity include transportation (surface vessels), dredging and construction, oil and gas drilling and production, geophysical surveys, sonar, and explosions. Vessel noise typically dominates the total background sound for frequencies between 20 and 300 Hz. In general, the frequencies of many anthropogenic sounds, particularly those produced by construction activities, are below 1 kHz (Richardson *et al.,* 1995). When sounds at frequencies greater than 1 kHz are produced, they generally attenuate relatively rapidly (Richardson *et al.,* 1995), particularly above 20 kHz due to propagation losses and absorption (Urick, 1983).

Transmission loss (TL) defines the degree to which underwater sound has spread in space and lost energy after having moved through the environment and reached a receiver. It is defined by the International Standards Organization (ISO) as the reduction in a specified level between two specified points that are within an underwater acoustic field (ISO, 2017). Careful consideration of transmission loss and appropriate propagation modeling is a crucial step in determining the impacts of underwater sound, as it helps to define the ranges (isopleths) to which impacts are expected and depends significantly on local environmental parameters such as seabed type, water depth (bathymetry), and the local speed of sound. Geometric spreading laws are powerful tools which provide a simple means of estimating TL, based on the shape of the sound wave front in the water column. For a sound source that is equally loud in all directions and in deep water, the sound field takes the form of a sphere, as the sound extends in every direction uniformly. In this case, the intensity of the sound is spread across the surface of the sphere, and thus we can relate intensity loss to the square of the range (as area = $4*pi*r^2$). When expressing logarithmically in dB as TL, we find that TL = $20*Log_{10}$(range), this situation is known as spherical spreading. In shallow water, the sea surface and seafloor will bound the shape of the sound, leading to a more cylindrical shape, as the top and bottom of the sphere is truncated by the largely reflective boundaries. This situation is termed cylindrical spreading, and is given by TL = $10*Log_{10}$(range) (Urick, 1983). An intermediate scenario may be defined by the equation TL = $15*Log_{10}$(range), and is referred to as practical spreading. Though these geometric spreading laws do not capture many often important details (scattering, absorption, etc.), they offer a reasonable and simple approximation of how sound decreases in intensity as it is transmitted. In the absence of measured data indicating the level of transmission loss at a given site for a specific activity, NMFS recommends practical spreading (*i.e.,* $15*Log_{10}$(range)) to model acoustic propagation for construction activities in most nearshore environments.

The sum of the various natural and anthropogenic sound sources at any given location and time depends not only on the source levels, but also on the propagation of sound through the environment. Sound propagation is dependent on the spatially and temporally varying properties of the water column and sea floor, and is frequency-dependent. As a result of the dependence on a large number of varying factors, background and ambient sound levels can be expected to vary widely over both coarse and fine spatial and temporal scales. Sound levels at a given frequency and location can vary by 10–20 dB from day to day (Richardson *et al.,* 1995). The result is that, depending on the source type and its intensity, sound from the specified activity may be a negligible addition to the local environment or could form a distinctive signal that may affect marine mammals.

Description of Sound Sources for the Specified Activities

In-water construction activities expected to generate sound at levels resulting in Level B harassment include impact pile installation. Impact hammers operate by repeatedly dropping and/or pushing a heavy piston onto a pile to drive the pile into the substrate. Sound generated by impact hammers is impulsive, characterized by rapid rise times and high peak levels, a potentially injurious combination (Hastings and Popper, 2005).

The likely or possible impacts of the Columbia Gulf's proposed activities on marine mammals could involve both non-acoustic and acoustic stressors. Potential non-acoustic stressors could result from the physical presence of the equipment and personnel; however, visual and other non-acoustic stressors would be limited, and any impacts to marine mammals are expected to primarily be acoustic in nature.

Acoustic Impacts

The introduction of anthropogenic noise into the aquatic environment from pile driving or drilling is the primary means by which marine mammals may be harassed from the Columbia Gulf's specified activity. 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; 2019). Exposure to pile driving 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). Exposure to anthropogenic noise can also lead to non-observable physiological responses, such an increase in stress hormones. 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 pile driving on marine mammals is 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). Here we discuss physical auditory effects (threshold shifts) followed by behavioral effects and potential impacts on habitat.

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 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.* (2014)), and the overlap between the animal and the source (*e.g.,* spatial, temporal, and spectral). When considering auditory effects for Columbia Gulf's proposed activities, impact pile driving is treated as an impulsive source.

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). PTS does not generally affect more than a limited frequency range, and an animal that has incurred PTS has incurred some level of hearing loss at the relevant frequencies; typically animals with PTS are not functionally deaf (Au and Hastings, 2008; Finneran, 2016). 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 marine mammal TTS measurements (see Southall *et al.* (2007; 2019)), 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 (Finneran *et al.,* 2000; Schlundt *et al.,* 2000; Finneran *et al.,* 2002). As described in Finneran (2015), marine mammal studies have shown the amount of TTS increases with 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 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.

Many studies have examined noise-induced hearing loss in marine mammals (see Finneran (2015) and Southall *et al.* (2019) for summaries). TTS is the mildest form of hearing impairment that can occur during exposure to sound (Kryter, 2013). While experiencing TTS, the hearing threshold rises, and a sound must be at a higher level in order to be heard. In terrestrial and marine mammals, TTS can last from minutes or hours to days (in cases of strong TTS). In many cases, hearing sensitivity recovers rapidly after exposure to the sound ends. For cetaceans, published data on the onset of TTS are limited to captive bottlenose dolphin (*Tursiops truncatus*), beluga whale (*Delphinapterus leucas*), harbor porpoise (*Phocoena phocoena*), and Yangtze finless porpoise (*Neophocoena asiaeorientalis*) (Southall *et al.,* 2019). These studies examine hearing thresholds measured in marine mammals before and after exposure to intense or long-duration sound exposures. The difference between the pre-exposure and post-exposure thresholds can be used to determine the amount of threshold shift at various post-exposure times.

The amount and onset of TTS depends on the exposure frequency. Sounds at low frequencies, well below the region of best sensitivity for a species or hearing group, are less hazardous than those at higher frequencies, near the region of best sensitivity (Finneran and Schlundt, 2013). At low frequencies, onset-TTS exposure levels are higher compared to those in the region of best sensitivity (*i.e.,* a low frequency noise would need to be louder to cause TTS onset when TTS exposure level is higher), as shown for harbor porpoises and harbor seals (Kastelein *et al.,* 2019a; 2019c). Note that in general, harbor seals and harbor porpoises have a lower TTS onset than other measured pinniped or cetacean species (Finneran, 2015). In addition, TTS can accumulate across multiple exposures, but the resulting TTS will be less than the TTS from a single, continuous exposure with the same SEL (Mooney *et al.,* 2009; Finneran *et al.,* 2010; Kastelein *et al.,* 2014; 2015). This means that TTS predictions based on the total, cumulative SEL will overestimate the amount of TTS from intermittent exposures, such as sonars and impulsive sources. Nachtigall *et al.* (2018) describe measurements of hearing sensitivity of multiple odontocete species (bottlenose dolphin, harbor porpoise, beluga, and false killer whale (*Pseudorca crassidens*)) when a relatively loud sound was preceded by a warning sound. These captive animals were shown to reduce hearing sensitivity when warned of an impending intense sound. Based on these experimental observations of captive animals, the authors suggest that wild animals may dampen their hearing during prolonged exposures or if conditioned to anticipate intense sounds. Another study showed that echolocating animals (including odontocetes) might have anatomical specializations that might allow for conditioned hearing reduction and filtering of low-frequency ambient noise, including increased stiffness and control of middle ear structures and placement of inner ear structures (Ketten *et al.,* 2021). Data available on noise-induced hearing loss for mysticetes are currently lacking (NMFS, 2018). Additionally, the existing marine mammal TTS data come from a limited number of individuals within these species.

Relationships between TTS and PTS thresholds have not been studied in marine mammals, and there is no PTS data for cetaceans, but such relationships are assumed to be similar to those in humans and other terrestrial mammals. PTS typically occurs at exposure levels at least several decibels above that inducing mild TTS (*e.g.,* a 40-dB threshold shift approximates PTS onset (Kryter *et al.,* 1966; Miller, 1974), while a 6-dB threshold shift approximates TTS onset (Southall *et al.,* 2007; 2019). Based on data from terrestrial mammals, a precautionary assumption is that the PTS thresholds for impulsive sounds (such as impact pile driving pulses as received close to the source) are at least 6 dB higher than the TTS threshold on a peak-pressure basis and PTS cumulative sound exposure level thresholds are 15 to 20 dB higher than TTS cumulative sound exposure level thresholds (Southall *et al.,* 2007; 2019). Given the higher level of sound or longer exposure duration necessary to cause PTS as compared with TTS, it is considerably less likely that PTS could occur.

Behavioral Harassment—Exposure to noise also has the potential to behaviorally disturb marine mammals to a level that rises to the definition of harassment under the MMPA. Generally speaking, NMFS considers a behavioral disturbance that rises to the level of harassment under the MMPA a non-minor response—in other words, not every response qualifies as behavioral disturbance, and for responses that do, those of a higher level, or accrued across a longer duration, have the potential to affect foraging, reproduction, or survival. 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. Behavioral responses may include changing durations of surfacing and dives, changing direction and/or speed; reducing/increasing vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); eliciting a visible startle response or aggressive behavior (such as tail/fin 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.,* 2004; Southall *et al.,* 2007; Weilgart, 2007; Archer *et al.,* 2010; Southall *et al.,* 2019). 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 and C of Southall *et al.* (2007) and Gomez *et al.* (2016) for reviews of studies involving marine mammal behavioral responses to sound.

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.,* 2004). 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; Wartzok *et al.,* 2004; National Research Council (NRC), 2005). 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 (Richardson *et al.,* 1995; Morton and Symonds, 2002; 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 does react briefly to an underwater sound by changing its behavior or moving a small distance, 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). However, there are broad categories of potential response, 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, 2013b). 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.

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.

Respiration rates vary naturally 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; 2005; 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) or vocalizations (Foote *et al.,* 2004), respectively, while North Atlantic 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.,* 2007). 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 (*Eschrictius 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).

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; Bowers *et al.,* 2018). 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 (England *et al.,* 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 fishes 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 5-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.,* Selye, 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, 2005), however distress is an unlikely result of this project based on observations of marine mammals during previous, similar construction projects and given the anticipated effectiveness of proposed mitigation measures.

Auditory Masking—Since many marine mammals rely on sound to find prey, moderate social interactions, and facilitate mating (Tyack, 2008), noise from anthropogenic sound sources can interfere with these functions, but only if the noise spectrum overlaps with the hearing sensitivity of the receiving marine mammal (Southall *et al.,* 2007; Clark *et al.,* 2009; Hatch *et al.,* 2012). Chronic exposure to excessive, though not high-intensity, noise could cause masking at particular frequencies for marine mammals that utilize sound for vital biological functions (Clark *et al.,* 2009). Acoustic masking is when other noises such as from human sources interfere 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; Erbe *et al.,* 2016). Therefore, under certain circumstances, marine mammals whose acoustical sensors or environment are being severely masked could also be impaired from maximizing their performance fitness for survival and reproduction. 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 (Hotchkin and Parks, 2013).

Under certain circumstances, marine mammals experiencing significant masking could also be impaired from maximizing their performance fitness in survival and reproduction. Therefore, when the coincident (masking) sound is human-made, it may be considered harassment when disrupting or altering critical behaviors. It is important to distinguish TTS and PTS, which persist after the sound exposure, from masking, which occurs during the sound exposure. Because masking (without resulting in TS) is not associated with abnormal physiological function, it is not considered a physiological effect, but rather a potential behavioral effect.

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.,* 2007; Di Iorio and Clark, 2010; 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 (Hotchkin and Parks, 2013). 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).

Marine mammals at or near the project site may be exposed to anthropogenic noise which may lead to some habituation, but is also a source of masking. Vocalization changes may result from a need to compete with an increase in background noise and include increasing the source level, modifying the frequency, increasing the call repetition rate of vocalizations, or ceasing to vocalize in the presence of increased noise (Hotchkin and Parks, 2013).

Masking is more likely to occur in the presence of broadband, relatively continuous noise sources. Energy distribution of pile driving covers a broad frequency spectrum, and sound from pile driving would be within the audible range of marine mammals. While some construction during Columbia Gulf's activities may mask some acoustic signals that are relevant to the daily behavior of BBES dolphins if they are in the vicinity of the project, the short-term duration and limited areas affected make it very unlikely that reproductive success or survival of individual animals would be affected.

Water quality—Temporary and localized reduction in water quality will occur as a result of in-water construction activities. The installation of piles and proposed dredging for pipeline installation will disturb bottom sediments and will cause a temporary increase in suspended sediment in the project area. In general, turbidity associated with pile driving is localized to about a 25-ft (7.6m) radius around the pile (Everitt et al. 1980). The small resulting sediment plume is expected to settle out of the water column within a few hours. Studies of the effects of turbid water on fish (marine mammal prey) suggest that concentrations of suspended sediment can reach thousands of milligrams per liter before an acute toxic reaction is expected (Burton, 1993).

Effects from project-related turbidity and sedimentation are expected to be short-term, minor, and localized. Following the completion of sediment-disturbing activities, suspended sediments in the water column are expected to dissipate and return to background levels. In general, turbidity within the water column can contribute to reduced oxygen levels in the water and can irritate the gills of prey fish species in the proposed project area. However, turbidity plumes associated with the project would be temporary and localized, and fish in the proposed project area would be able to move away from and avoid the areas where plumes may occur. Therefore, it is expected that the impacts on prey fish species from turbidity, and therefore on marine mammals, would be minimal and temporary. In general, the area that may be impacted by the proposed construction activities is relatively small compared to the available marine mammal habitat in Barataria Bay.

In addition to sediment, due to the natural and human history of Barataria bay, work that disturbs the substrate could encounter residual, undetected petroleum material deposited as a result of naturally occurring seeps or that resulted from past extraction activities. The most likely location for encountering such material is in at the coastline and within or proximate to the intertidal zone. Columbia Gulf will take all appropriate precautions to prevent the resuspension of contaminated media and will notify all appropriate authorities if weathered oil is encountered during construction activities

Potential Effects on Prey—Sound may affect marine mammals through impacts on the abundance, behavior, or distribution of prey species (*e.g.,* crustaceans, cephalopods, fishes, zooplankton). Marine mammal prey varies by species, season, and location and, for some, is not well documented. Studies regarding the effects of noise on known marine mammal prey are described here.

Fishes utilize the soundscape and components of sound in their environment to perform important functions such as foraging, predator avoidance, mating, and spawning (*e.g.,* Zelick *et al.,* 1999; Fay, 2009). Depending on their hearing anatomy and peripheral sensory structures, which vary among species, fishes hear sounds using pressure and particle motion sensitivity capabilities and detect the motion of surrounding water (Fay *et al.,* 2008). The potential effects of noise on fishes depends on the overlapping frequency range, distance from the sound source, water depth of exposure, and species-specific hearing sensitivity, anatomy, and physiology. Key impacts to fishes may include behavioral responses, hearing damage, barotrauma (pressure-related injuries), and mortality.

Fish react to sounds that are especially strong and/or intermittent low-frequency sounds. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. The reaction of fish to noise depends on the physiological condition of the fish, past exposures, motivation (*e.g.,* feeding, spawning, migration), and other environmental factors. (Hastings and Popper, 2005) identified several studies that suggest fish may relocate to avoid certain areas of sound energy. Additional studies have documented effects of pile driving on fishes (*e.g.* Scholik and Yan, 2001; 2002; Popper and Hastings, 2009). Several studies have demonstrated that impulse sounds might affect the distribution and behavior of some fishes, potentially impacting foraging opportunities or increasing energetic costs (*e.g.,* Fewtrell and McCauley, 2012; Pearson *et al.,* 1992; Skalski *et al.,* 1992; Santulli *et al.,* 1999; Paxton *et al.,* 2017). However, some studies have shown no or slight reaction to impulse sounds (*e.g.,* Peña *et al.,* 2013; Wardle *et al.,* 2001; Jorgenson and Gyselman, 2009; Cott *et al.,* 2012. More commonly, though, the impacts of noise on fishes are temporary.

SPLs of sufficient strength have been known to cause injury to fishes and fish mortality (summarized in Popper *et al.* (2014)). However, in most fish species, hair cells in the ear continuously regenerate and loss of auditory function likely is restored when damaged cells are replaced with new cells. Halvorsen *et al.* (2012b) showed that a TTS of 4–6 dB was recoverable within 24 hours for one species. Impacts would be most severe when the individual fish is close to the source and when the duration of exposure is long. Injury caused by barotrauma can range from slight to severe and can cause death, and is most likely for fish with swim bladders. Barotrauma injuries have been documented during controlled exposure to impact pile driving (Halvorsen *et al.,* 2012a; Casper *et al.,* 2013; Casper *et al.,* 2017).

Fish populations in the proposed project area that serve as marine mammal prey could be temporarily affected by noise from pile installation. The frequency range in which fishes generally perceive underwater sounds is 50 to 2,000 Hz, with peak sensitivities below 800 Hz (Popper and Hastings, 2009). Fish behavior or distribution may change, especially with strong and/or intermittent sounds that could harm fishes. High underwater SPLs have been documented to alter behavior, cause hearing loss, and injure or kill individual fish by causing serious internal injury (Hastings and Popper, 2005).

The greatest potential impact to fishes during construction would occur during impact pile driving. In-water construction activities would only occur during daylight hours, allowing fish to forage and transit the project area in the evening. In general, impacts on marine mammal prey species are expected to be minor and temporary.

Potential Effects on Foraging Habitat—The proposed activities would not result in permanent impacts to habitats used directly by marine mammals. The total seafloor area affected by the project during construction is estimated to be 2.79 acres, of which .02 acres would be permanently altered. This alteration represents a small portion of the foraging area available to marine mammals outside this project vicinity and in broader Barataria Bay. Construction would have minimal impacts on invertebrate species (principally shrimp), which have been identified as target prey of BBES dolphins (Bowens-Stevens, 2021). Barataria Bay is designated as essential fish habitat for several species, some of which serve as prey for BBES dolphins. However, given the short daily duration of sound associated with individual pile driving and the relatively small areas being affected, pile driving associated with the project is not likely to have a permanent adverse effect on any fish habitat, or populations of fish species. Also, the area impacted by the project is relatively small compared to the available habitat just outside the project area. Therefore, impacts of the project are not likely to have adverse effects on marine mammal foraging habitat in the proposed project area.

In summary for this project, serious injuries to or mortality of BBES dolphins are not anticipated as a result of shore side activities or in-water construction for the project and neither, as described in greater detail in the Estimated Take section, is PTS (Level A harassment). However, behavioral impacts could occur due to the increase in underwater noise resulting from pile driving activities. Potential acoustic disturbance originating from the specified activities considered here is expected to be of a relatively short duration, likely in the form of avoidance of the area while activities are being conducted. Pile driving is proposed to take place from 7 a.m. to 7 p.m. (adjusted as appropriate to conduct work during daylight hours), and may occur on any day of the week for approximately 25 days of in-water work. Bottlenose dolphins are expected to avoid the project area during pile driving activities, though dolphins could be present when pile driving begins. Columbia Gulf proposes to implement mitigation measures such as pre-clearance monitoring and adherence to a soft-start protocol in order to mitigate against adverse impacts to dolphins that may be in the area when work commences or is restarted. Sufficient monitoring will be maintained in order to detect marine mammals in the area and implement any necessary response including work stoppage, should it become necessary.

The specified activity could cause localized impacts to dolphin prey, but is otherwise unlikely to affect habitat. While some injury or loss of prey animals may occur, fish are expected to avoid the project area during pile driving activities and changes in abundance of prey are not expected.

Estimated Take of Marine Mammals

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

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 sound emanated from pile driving activity. Based on the nature of the activity and the anticipated effectiveness of the mitigation measures including the utilization of Protected Species Observers to monitor for marine mammals and implementation of pre-clearance and soft start protocols discussed in detail below in the Proposed Mitigation section, Level A harassment is neither anticipated nor proposed to be authorized.

As described previously, no serious injury or mortality is anticipated or proposed to be authorized for this activity. Below we describe how the proposed take numbers are estimated.

For acoustic impacts, 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 for example, permanent threshold shift (or PTS); (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 factors can contribute to a basic calculation to provide an initial prediction of potential 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 estimates.

Acoustic Thresholds

NMFS recommends the use of 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—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 or exposure context (*e.g.,* frequency, predictability, duty cycle, duration of the exposure, signal-to-noise ratio, distance to the source), the environment (*e.g.,* bathymetry, other noises in the area, predators in the area), and the receiving animals (hearing, motivation, experience, demography, life stage, depth) and can be difficult to predict (*e.g.,* Southall *et al.,* 2007, 2021, Ellison *et al.,* 2012). Based on what the available science indicates and the practical need to use a threshold based on a metric that is both predictable and measurable for most activities, NMFS typically uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS generally predicts that marine mammals are likely to be behaviorally harassed in a manner considered to be Level B harassment when exposed to underwater anthropogenic noise above root-mean-squared pressure received levels (RMS SPL) of 120 dB (referenced to 1 micropascal (re 1 μPa)) for continuous (*e.g.,* vibratory pile driving, drilling) and above RMS SPL 160 dB re 1 μPa for nonexplosive impulsive (*e.g.,* seismic airguns) or intermittent (*e.g.,* scientific sonar) sources. Generally speaking, Level B harassment take estimates based on these behavioral harassment thresholds are expected to include any likely takes by Temporary Threshold Shift (TTS) as, in most cases, the likelihood of TTS occurs at distances from the source less than those at which behavioral harassment is likely. TTS of a sufficient degree can manifest as behavioral harassment, as reduced hearing sensitivity and the potential reduced opportunities to detect important signals (conspecific communication, predators, prey) may result in changes in behavior that would not otherwise occur.

Columbia Gulf's Request for Authorization includes actions known to generate impulsive sound (impact pile driving) that may cause incidental harassment, and therefore the RMS SPL threshold of 160 re 1 μPa is applicable.

Level A harassment—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). The specified activity proposed by Columbia Gulf includes the use of an impulsive source type and is proposed to occur in an area where BBES bottlenose dolphins, a mid-frequency cetacean, are found.

These thresholds are provided in the table below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS' 2018 Technical Guidance, available 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 μPa, and cumulative sound exposure level (L_E) has a reference value of 1μPa²s. 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 are used in estimating the area that may be ensonified to levels above the acoustic thresholds, including source levels and transmission loss coefficient.

To calculate the ensonified area, Columbia Gulf used the NMFS User Spreadsheet and accompanying 2018 guidance. Columbia Gulf located data for impact installation of a 36 inch concrete pile (McGillvary, 2007), measured at 50 meters, to serve as a suitable proxy source level for the 104 36-inch spun-cast piles selected for the project (see Table 6). The applicant then elected to apply the source levels for the 36-in proxy pile to all piles being driven, including the 20 18-inch piles, likely resulting in an overestimate of resulting noise from these smaller piles.

Transmission loss (TL) is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry and bottom composition and topography. The general formula for underwater TL is:

TL = B * Log10 (R1/R2), where:
TL = Transmission loss in dB,
B = Transmission loss coefficient,
R1 = the distance of the modeled SPL from the driving pile, and
R2 = the distance from the driven pile of the initial measurement.

Absent site-specific acoustical monitoring with differing measured transmission loss, a practical spreading value of 15 is used as the transmission loss coefficient. Site-specific transmission loss data for the project area in Barataria Bay is not available; therefore, the default coefficient of 15 is used to determine the distances to the Level A harassment and Level B harassment thresholds. The ensonified area associated with Level A harassment is more technically challenging to predict due to the need to account for a duration component. There, NMFS developed an optional User Spreadsheet and accompanying Technical Guidance that can be used to relatively simply predict an isopleth distance for use in conjunction with marine mammal density or occurrence to help predict potential takes. We note that because of some of the assumptions included in the methods underlying the optional tool, we anticipate that the resulting isopleth estimates are typically going to be overestimates of some degree, which may result in an overestimate of potential Level A harassment. However, this optional tool offers the best way to estimate isopleth distances when more sophisticated modeling methods are not available or practical. For stationary sources such as pile driving, the options User Spreadsheet tool predicts the distance at which, if a marine mammal remained at that distance for the duration of the activity, it would be expected to incur PTS. Inputs used in the option User Spresheet tool, and the resulting estimated isopleths, are reported in Tables 6 and 7, below. The applicant as applied a 15LogR propagation loss rate in the User Spreadsheet, and included a 5 dB attenuation factor for proposed use of a bubble curtain which is consistent with NMFS guidelines.

TABLE 6—PROXY PILE CHARACTERISTICS (USER SPREADSHEET INPUT)

Pile type	SLs			Measured distance	Source
	dB Peak	dB rms	dB SEL		
36” concrete pile, Impact pile driven (5 dB attenuated).	186	174	160	50 meters	MacGillivary, 2007.

To calculate the harassment zones, Columbia Gulf identified a representative location in the center of the Tie-in Facility and second representative location in the center of the POD Meter Station and used these locations to calculate the harassment zones for each site. Given the close proximity of individual piles to one another, NMFS concurred with this approach. Columbia Gulf then accessed the User Spreadsheet to calculate the distance from each of the two representative pile driving locations to the furthest extent of Level A and Level B thresholds for mid-frequency cetaceans. In order to ensure conservative results, the source level data for 36 inch piles was used as a proxy for all pile driving activities, including installation of smaller diameter piles.

TABLE 7—HARASSMENT ZONE ISOPLETHS ATTRIBUTABLE TO PROPOSED PILE DRIVING

Activity	Distance from representative sound source	
	PTS: Level A harassment zone (mid-frequency cetaceans)	Behavioral disturbance: Level B harassment zone (all marine mammals)
Impact pile driving in Barataria Bay [a]	142.0 feet	1,407.0 feet.

[a] User Spreadsheet output based on installation by impact hammer of (proxy) 36-inch-diameter concrete piles, and use of bubble curtains (estimated 5 dB reduction, per consultations with NMFS) (MacGillivray *et al.,* 2007).

Based on the user spreadsheet outputs reflected in Table 5, the Level B harassment zone would have a radius of approximately 1,407.0 feet (428.9 meters) from the source pile, or an approximate area of 0.58 square kilometers (km^2). The Level A zone would have a calculated radius of approximately 142.0 feet (43.2 meters), or an approximate area of 63,347 square feet (0.006 km^2). Columbia Gulf plans to implement a 50 meter shutdown zone that extends coverage beyond the 43.2 meter Level A harassment zone indicated by the User Spreadsheet. As a result, given that detection of bottlenose dolphins within this distance is expected to be successful, no Level A take is anticipated to occur, or proposed to be authorized, as a result of project activities.

Marine Mammal Occurrence

In order to estimate the distribution and density of BBES dolphins that may occur in the area affected by the specified activity, we turn to prior area-specific surveys and studies conducted in the Bay.

Density estimates for Columbia Gulf's proposal reference the findings of the 2017 McDonald (*et al.*) study and an average of the calculated densities for each habitat region defined within the study area. Density estimates for bottlenose dolphins within Barataria Bay were derived from estimates calculated through vessel-based capture-mark-recapture photo-ID surveys conducted during ten survey sessions from June 2010 to May 2014 (McDonald *et.al.*, 2017). Because the surveys were conducted during the DWH oil spill, the resulting density estimate does not account for mortality following the spill.

The study was conducted from June 2010 to May 2014 and utilized vessel-based capture-mark-recapture photo ID surveys. The study area for these surveys included Barataria Bay and Pass, Bayou Rigaud, Caminada Bay and Pass, Barataria Waterway, and Bay des Ilettes. Densities varied in different areas within broader Barataria Bay, and the study area was divided into three (East, West, and Island) habitat regions to capture these observed density variations. Results were parsed and densities were calculated for each habitat region. Project activities may have some effect on both the East and West habitat regions, with estimated densities of 0.601 individuals per km^2 and 1.24 individuals per km^2, respectively. Study results indicate density of 11.4 individuals per km^2 for the Island region. Given uncertainties regarding fidelity to and transiting among habitat regions, the average densities for each habitat region in the study area are then averaged together to create an estimated density for the project area. NMFS concurs with this approach. Inclusion of the higher estimated density from the Island habitat region results in a cumulative average higher than the estimated density for the East and West habitat regions alone, and reflects a conservative approach. Based on this calculation and using the best available information for estimating density given the project type and location, the average bottlenose dolphin density for the project is estimated to be 2.83 individuals per km^2.

Take Estimation

Here we describe how the information provided above is synthesized to produce a quantitative estimate of the take that is reasonably likely to occur and proposed for authorization.

TABLE 8—LEVEL B HARASSMENT TAKES REQUESTED AND PERCENTAGE OF STOCK POTENTIALLY AFFECTED

Pile driving location	Species	Estimated density	Level B harassment area	Level B takes requested (individuals)	Stock abundance (individuals)	Percentage (%) of stock potentially affected by Level B take
Tie-In Facility	Bottlenose Dolphin	2.83 individuals per km^2	0.58 km^2	40	2,071	1.93
POD Meter Station	2	0.10.				
Project Totals	42	—	2.03			

Level B Take estimates for pile driving activities were calculated using the density estimate described above, averaging across the three areas in Barataria Bay. The Level B harassment zone is calculated using source level data for 36-inch concrete piles (including use of bubble curtains) and assumes an even distribution of animals throughout the affected area. Initial Level B take estimates for Tie-in Facility and POD Meter Station pile driving activity were calculated using the area of the Level B harassment zone (0.58 km^2) multiplied by the calculated density (2.83 individuals per km^2). This results in a daily take estimate of 1.64 individuals for pile driving at the Tie-in Facility and the POD Meter Station. The daily Level B harassment estimate (1.64 individuals) was then multiplied by the number of days when pile driving will take place (24 days at the Tie-in Facility and 1 day at the POD Meter Station) to calculate the number of requested takes for pile driving related to the Project. The estimated takes are indicated in Table 8.

Level A harassment is not anticipated to occur and authorization of Level A take is not requested. In-water construction activities will be completed within one to two months (a total of 25 to 42 days) and are not expected to result in serious injury or mortality to marine mammals within Barataria Bay. Based on calculated threshold distances in Table 7 for mid-frequency cetaceans, an individual would need to remain within 142.0 feet of the piles being driven throughout the entire day of pile driving activities for cumulative exposure injury to occur. Given the mobility of bottlenose dolphins and the expected behavior of the species to avoid noise disturbance (*i.e.,* pile driving), such a scenario is extremely unlikely to occur.

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, NMFS considers 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.

Mitigation for Marine Mammals and Their Habitat

Columbia Gulf will retain and deploy qualified Protected Species Observers to ensure that dolphins are not present within 1,407.0 feet (428.8 meters) of the pile driving area when pile driving activities begin. If dolphins are observed entering the area in which the injury threshold will be exceeded (*i.e.,* Level A, calculated to be 142.0 feet [43.2 meters] and established at 50 meters), pile driving will cease until they leave the area. All vessels engaged in construction and crew transport will adhere to NMFS's Vessel Strike Avoidance Measures and to related reporting requirements for mariners. Through the implementation of these measures and those that follow, Columbia Gulf will ensure that dolphins and other marine mammals are not present within an area where Level A harassment could occur.

Columbia Gulf proposes the following additional mitigation measures:

- Establishment and monitoring of Pre-clearance zones to survey for presence of marine mammals prior to commencement/resumption of work.
- Implementation of soft start protocols to ensure initial sound stimulus is not at a harmful level.
- Adoption of a conservative 50 meter shutdown zone to preclude Level A take.
- Positioning of Protected Species Observers authorized to direct work stoppage if circumstances warrant.
- Deployment of a submerged bubble curtain to dampen sound from impact driving.
- Work stoppage should any marine mammal take not permitted by the IHA occur followed by reporting to NOAA Fisheries as soon as practicable and within 24 hours.

Based on our evaluation of the applicant's proposed measures, NMFS has preliminarily determined that the proposed mitigation measures provide the means of effecting the least practicable impact to BBES bottlenose dolphins and their habitat.

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 while conducting the activities.

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 activity; 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.

Below is a summary of the monitoring measures included in the application and proposed for pile installation activities associated with the Project (see the draft IHA for additional detail):

- At least one NOAA Fisheries-approved observers (*i.e.,* Protected Species Observers [PSOs]) will be on duty and assigned to the highest possible vantage point in order to maintain a 360-degree view of the project area.
- A 1,407.0 feet (428.8 meters) pre-clearance zone for marine mammals will be established using range finding equipment and monitored by the PSOs.
- Observers will monitor the NOAA-approved 50 meter shutdown zone during all pile installation activities.
- Observers will maintain a continuous watch while pile driving activities are under way, using binoculars and/or naked eye observations to continuously search for marine mammals.
- If marine mammals are observed in the Project area, the sighting will be fully documented, including the following (among others), when possible:
  - Bearing to animal relative to observer position;
  - Number of individuals observed;
  - Estimated location within the Project area;
  - Type of construction activity (*i.e.,* impact pile driving); and
- Behavioral state, possible reaction of the animal(s) to the pile driving, and any behaviors of the animal/s while in the Project area.Observers will make note of the state of Barataria Bay using the Beaufort scale and collect and record weather conditions during the course of marine mammal monitoring.

Proposed Reporting

Columbia Gulf would provide the NOAA Fisheries Service with a draft comprehensive monitoring report within 90 days of the conclusion of monitoring. This report would include the following (please see draft IHA for additional detail):

- A summary of the Project activity (*e.g.,* Project actions, dates, times, durations, and locations)
- A summary of mitigation implementation
- Monitoring results and a summary that addresses the goals of the monitoring plan, including (but not limited to):
  - Environmental conditions when observations were made (*e.g.,* water conditions and weather);
  - Date and time of observations (initiation and termination);
  - Date, time, number, species, and any other relevant data regarding marine mammals observed;
  - Description of the observed behaviors; and
  - Assessment of implementation and effectiveness of prescribed mitigation and monitoring measures.

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 impacts or responses (*e.g.,* intensity, duration), the context of any impacts or responses (*e.g.,* critical reproductive time or location, foraging impacts affecting energetics), 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' 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 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).

The BBES stock of bottlenose dolphins is considered a strategic stock because mortality attributable to human activity is thought to exceed PBR. Potential effects of this project on BBES dolphins include behavioral modification resulting from Level B harassment and temporary avoidance of the construction area. As decribed above, no Level A harassment is expected and no authorization of Level A take is not proposed. Given the nature of the harassment, its temporary nature and proposed mitigation, NMFS anticipates impacts from the specified activity on individuals and the stock would be negligible.

The project site is within a designated Biologically Important Area for Small and Resident Populations. The BBES stock is present within the area year-round. All life activities may occur within the designated BIA including the project area. The project area represents a small portion of available habitat and the BIA, and adjacent areas of open water within the embayment that would remain accessible to BBES dolphins throughout the construction process. Proper implementation of the mitigation measures described above support a finding that the impacts of Level B harassment would be minimized and likely have negligible effect on individual animals or the BBES population of bottlenose dolphins.

In summary and as described above, the following factors primarily support our preliminary determination that the impacts resulting from this activity are not expected to adversely affect BBES bottlenose dolphins by reducing annual rates of recruitment or survival:

- No serious injury or mortality is anticipated or authorized; and no impacts to reproductive success or survival of any individual animals are expected.
- The required mitigation measures are expected to avoid any Level A harassment and to reduce the number and severity of takes by Level B harassment.
- Behavioral impacts and displacement that may occur in response to pile driving, is expected to be limited in duration to approximately 25 days concurrent with in-water construction activity.
- The specified activities do not impact any known important habitat areas such as calving grounds or unique feeding areas, and alternate habitat is readily available.

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 the proposed pile driving activity will have a negligible impact on BBES bottlenose dolphins.

Small Numbers

As noted previously, only take of small numbers of marine mammals 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.

Based on a conservative estimate of the number of takes that may occur as a result of pile driving activities, less than two percent of the BBES population would be subject to take via Level B harassment.

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 would be taken relative to the population size of the affected species or stocks.

Unmitigable Adverse Impact Analysis and Determination

No subsistence uses of BBES bottlenose dolphins are known to occur. Therefore, NMFS has determined that the total taking of affected species or stocks would not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence purposes.

Endangered Species Act

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq.*) requires that each Federal agency insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. To ensure ESA compliance for the issuance of IHAs, NMFS consults internally whenever we propose to authorize take for endangered or threatened species.

No incidental take of ESA-listed species is proposed under the auspices of this authorization. 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 an IHA to Columbia Gulf, LLC to conduct the specified pile driving activity in Barataria Bay, Louisiana during the 1-year period of authorization, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. A draft of the proposed IHA 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 authorization, and any other aspect of this notice of proposed IHA for the specified activity. We also request comment on the potential renewal of this proposed IHA 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 this IHA or a subsequent renewal IHA.

On a case-by-case basis, NMFS may issue a one-time, 1-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 activities as described in the Description of Proposed Activity section of this notice is planned or (2) the activities as described in the Description of Proposed Activity 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.

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: September 1, 2023.

Kimberly Damon-Randall,

Director, Office of Protected Resources, National Marine Fisheries Service.

[FR Doc. 2023–19310 Filed 9–6–23; 8:45 am]

BILLING CODE 3510–22–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[RTID 0648–XD323]

Pacific Fishery Management Council; Public Meeting

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and