BILLING CODE 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648-XF603

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Casitas Pier Fender Pile Replacement

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

ACTION: Notice; proposed incidental harassment authorization; request for comments.

SUMMARY: NMFS has received a request from Venoco, LLC (Venoco) for authorization to take marine mammals incidental to fender pile replacement at Casitas Pier in Carpinteria, CA. 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 will consider public comments prior to making any final decision on the issuance of the requested MMPA authorizations and agency responses will be summarized in the final notice of our decision.

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

ADDRESSES: Comments should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service. Physical comments should be sent to 1315 East-West Highway, Silver Spring, MD 20910 and electronic comments should be sent to *ITP.Young@noaa.gov*.

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

FOR FURTHER INFORMATION CONTACT: Sara Young, Office of Protected Resources, NMFS, (301) 427-8401. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: *www.nmfs.noaa.gov/pr/permits/incidental/construction.htm*. In case of problems accessing these documents, please call the contact listed above.

SUPPLEMENTARY INFORMATION:

Background

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

An authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s), will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant), and if the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of such takings are set forth.

NMFS has defined "negligible impact" in 50 CFR 216.103 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.

The MMPA states that the term "take" means to harass, hunt, capture, kill or attempt to harass, hunt, capture, or kill any marine mammal.

Except with respect to certain activities not pertinent here, 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).

National Environmental Policy Act

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

This action is consistent with categories of activities identified in CE B4 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 June 13, 2017, NMFS received a request from Venoco LLC for an IHA to take marine mammals incidental to replacement of fender piles at Casitas Pier in Carpinteria, California. Venoco's request is for take of harbor seal, California sea lions, and bottlenose dolphins by Level B harassment only. Neither Venoco LLC nor NMFS expect mortality to result from this activity and, therefore, an IHA is appropriate.

Description of Proposed Activity

Overview

Venoco is proposing to replace 13 fender piles at Casitas Pier (herein after "Pier") in Carpinteria, California. Fender piles at the end of the Pier are used to enable safe transfer of personnel and equipment between the Pier and vessels. Certain fender piles on both the west and east side of the Pier have failed or are likely to fail due to corrosion and physical damage from many years of use and require replacement. Repairs are planned prior to the 2017-2018 winter storm season to enable safe transfer of personnel and equipment on both sides of the Pier.

Dates and Duration

Venoco proposes to replace these 13 fender piles during the fall of 2017 to minimize impact to the local harbor seal population which uses Carpinteria beach as a haulout. Work on the pier will take place over a period of 2 to 3 weeks during fall 2017. Any work that is not completed during this period will be deferred to late summer or fall 2018. Two and a half days of pile driving are needed to complete the work but these days may not be consecutive. The proposed authorization effective dates would be October 1, 2017 through September 30, 2017 to allow pile driving to occur when all of the necessary permits and permissions are acquired.

Specific Geographic Region

The Pier is located on the Pacific Ocean along the south coast of Santa Barbara County in Southern California, near the southeastern corner of the City of Carpinteria. This area is used routinely for oil and gas operations, as well as for recreation. The Carpinteria Bluffs, located immediately upland of the Pier, provide a heavily used recreational trail system connecting downtown Carpinteria and the Carpinteria Beach State Park to the west with the Carpinteria Bluffs Nature Preserve to the east. The beach at the base of the Pier is accessible from points to the west, and is open to the public during summer and fall months. During the City of Carpinteria's established beach closure period for the seal pupping season (December 1 to May 31), the City restricts public access along the beach in an area extending approximately 750 feet (230 meters) east and west of the base of the Pier.

Detailed Description of Specific Activity

The Pier is owned by the City of Carpinteria and leased to Venoco, who operates and maintains the Pier. The Pier is located in offshore tidelands, owned and governed by the City of Carpinteria. The Pier was built in the mid- to late-1960s and extends approximately 720 feet (220 meters) from shore. The onshore uplands, adjacent to the Pier, are owned by Venoco. Fender piles at the end of the Pier are used to enable safe transfer of personnel and equipment between the Pier and vessels. Certain fender piles on both the west and east side of the Pier have failed or are likely to fail due to corrosion and physical damage from many years of use and require replacement. Up to 13 fender piles located on the end of the Pier will be replaced (six on west side, and seven on the east side). The replacement piles will consist of an upper section approximately 48 to 50 feet (15 meters) to long consisting of 16-inch diameter x 0.50-inch wall thickness steel pipe pile with a 12-foot (4-meter) long driven lower section consisting of 14 inch x 73 pound H-pile spliced to the bottom of the upper pipe pile section. Epoxy coating will be used on the new fender piles. Installation will be accomplished utilizing impact and vibratory pile driving techniques supported from the Pier. The replacement piles will be installed offset slightly (about 2 feet) from the original fender pile positions. This spliced pile design has been in service for more than 60 years at the Pier.

The flow of work for the pile replacement is outlined below. The contractor will mobilize diving equipment, welding equipment, replacement pile, and associated rigging to the site. Divers, along with on-site facility crane and personnel, will remove debris and damaged fender pile from the work area, as required. The damaged portions of existing fender piles will be cut above the mudline and removed, and the remainder of the piles below the mudline will remain in place unless they present a hazard to the pier. A project-specific pile driving crew, crane and pile driving hammer will be positioned on, and operated from, the Pier to place and drive the replacement piles. Each new pile will be guided by a diver and positioned adjacent to an existing stub. Once positioned, the weight of the pile and vibratory pile hammer will be applied to the seabed and the pile will penetrate into the seabed slightly. At this point, the diver will confirm that the replacement pile remains adjacent to the old stub and exit the water or reposition the new pile and repeat. Once the replacement pile has slightly penetrated the seabed adjacent to the old pile stub and the diver has exited the water, the pile will be driven to an approximate elevation of

12 feet (4 meters) below the mudline or to refusal. Once the replacement pile is driven, welders will connect the replacement pile top to the main horizontal fender beam. Project-related debris will be removed from the seafloor and Pier. Debris will be properly disposed of, and project personnel and equipment will be demobilized from site.

Each pile will require approximately 25 minutes of vibratory driving, and up to six piles could be installed by this method in a single day (*i.e.*, up to 2.5 hours of vibratory pile driving per day). During this time the sound levels above and in water will be in excess of normal pier operations. Sound levels from various other fender pile construction activities will not be discernible from daily pier operations and are below NMFS' thresholds. In the unlikely event that an impact hammer is used, installation of a single pile will require an estimated 400 hammer strikes over 15 minutes, and up to six piles could be installed by this method in a single day (*i.e.*, up to 1.5 hours of pile driving per day). This information is summarized in Table 1.

Table 1. **Pile Driving Summary Information.**

Pile Driving Method	Estimated Duration of Driving Per Pile	Estimated Strikes per Pile	Maximum Number of Piles per day	Total Duration per Day
Vibratory Hammer	25 minutes	N.A.	6	150 minutes
Impact Hammer	15 minutes	400	6	90 minutes

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

There are three marine mammal species that may likely transit through the waters nearby the project area, and are expected to potentially be taken by the specified activity. These include harbor seal (*Phoca vitulina*), California sea lion (*Zalophus californianus*), and bottlenose dolphin (*Tursiops truncatus*). Multiple additional marine mammal species may occasionally enter coastal

California waters but they would not be expected to occur in shallow nearshore waters of the action area.

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 potentially affected species. Additional information regarding population trends and threats may be found in NMFS's Stock Assessment Reports (SAR; *www.nmfs.noaa.gov/pr/sars/*) and more general information about these species (*e.g.*, physical and behavioral descriptions) may be found on NMFS's website (*www.nmfs.noaa.gov/pr/species/mammals/*).

Table 2 lists all species with expected potential for occurrence in coastal southern California and summarizes information related to the population or stock, including regulatory status under the MMPA and ESA and potential biological removal (PBR), where known. For taxonomy, we follow Committee on Taxonomy (2016). PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (as described in NMFS's SARs). While no mortality is anticipated or authorized here, PBR and annual serious injury and mortality from anthropogenic sources are included here as gross indicators of the status of the species and other threats.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS's stock abundance estimates for most species represent the total estimate of individuals within the geographic area, if known, that comprises that stock. For some species, this geographic area may extend beyond U.S. waters. All managed stocks in this region are assessed in NMFS's U.S. Pacific SARs (NMFS 2016). All values presented in

Table 2 are the most recent available at the time of publication and are available in the 2016 SARs (NMFS, 2016).

Table 2. Marine Mammal Potentially Present in the Vicinity of Carpinteria.

Common name	Scientific name	Stock	ESA/MMPA status; Strategic (Y/N)[1]	Stock abundance (CV, N_{min}, most recent abundance survey)[2]	PBR	Annual M/SI[3]
Order Cetartiodactyla – Cetacea – Superfamily Mysticeti (baleen whales)						
Family Eschrichtiidae						
Gray whale	Eschrichtius robustus	Eastern North Pacific	-;N	.05, 20,125, 2011	624	132
Family Balaenopteridae (rorquals)						
Bryde's whale	Balaenoptera edeni	Eastern Pacific	-;N	Unk, unk, unk, N/A	unk	unk
Humpback whale	Megaptera novaeangliae	California-Oregon-Washington	-;N	.03, 1,876, 2014	11	6.5
Blue whale	Balaenoptera musculus	Eastern North Pacific	E;Y	.07, 1,551, 2011	2.3	0.9
Fin whale	Balaenoptera physalus	California-Oregon-Washington	E;Y	.12, 8,127, 2014	81	2
Sei whale	Balaenoptera borealis	California-Oregon-Washington	E;Y	0.4, 374, 2104	0.75	0
Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Physeteridae						
Sperm whale	Physeter macrocephalus	California-Oregon-Washington	E;Y	0.58, 1,332, 2008	2.7	1.7
Family Kogiidae						
Pygmy sperm whale	Kogia breviceps	California-Oregon-Washington	-;N	1.12, 1,924, 2014	19	0
Dwarf sperm whale	Kogia sima	California-Oregon-Washington				
Family Ziphiidae (beaked whales)						
Baird's beaked whale	Berardius bairdii	Eastern North Pacific	-;N	0.81, 466, 2008	4.7	0
Cuvier's beaked whale	Ziphius cavirostris	California-Oregon-Washington	-;N	Unk, unk, 2014	Unk	0
Mesoplodont beaked whales (six species)	Mesoplodon spp.	California-Oregon-Washington	-;Y	0.65, 389, 2008	0.5	3.9
Family Delphinidae						
Short-beaked common dolphin	Delphinus delphis d.	California-Oregon-Washington	-;N	0.17, 839,325, 2014	5,393	40
Long-beaked common dolphin	Delphinus capensis c.	California	-;N	0.49, 88,432, 2014	657	35.4

Pacific white-sided dolphin	Lagenorhynchus obliquidens	California-Oregon-Washington northern and southern stocks	-;N	0.28, 21,195, 2014	191	7.5
Striped dolphin	Stenella coeruleoalba	California-Oregon-Washington	-;N	0.2, 24,782, 2014	238	0.8
Risso's dolphin	Grampus griseus	California-Oregon-Washington	-;N	0.32, 4,817, 2014	46	3.7
Common bottlenose dolphin	Tursiops truncatus t.	California-Oregon-Washington offshore stock	-;N	0.54, 1,255, 2014	11	1.6
Common bottlenose dolphin	Tursiops truncatus t.	California coastal stock	-;N	0.06, 346, 2011	2.7	2
Northern right whale dolphin	Lissodelphis borealis	California-Oregon-Washington	-;N	0.44, 18,608, 2014	179	3.8
Killer whale	Orcinus orca	Eastern North Pacific offshore	-;N	0.49, 162, 2014	1.6	0
Killer whale	Orcinus orca	West Coast Transient	-;N	Unk, 243, 2009	2.4	0
Short-finned pilot whale	Globicephala macrorhynchus	California-Oregon-Washington	-;N	0.79, 466, 2014	4.5	1.2
Family Phocoenidae (porpoises)						
Dall's porpoise	Phocoenoides dalli	California-Oregon-Washington	-;N	0.45, 17,954, 2014	172	0.3
Order Carnivora – Superfamily Pinnipedia						
Family Otariidae (eared seals and sea lions)						
Guadalupe fur seal	Arctocephalus townsendi	Guadalupe Island	E;Y	Unk, 15,830, 2010	542	3.2
California sea lion	Zalophus californianus	U.S. stock	-;N	Unk, 153,337, 2011	9,200	389
Steller sea lion	Eumetopias jubatus	Eastern	-;N	Unk, 41,638, 2015	2,498	108
Northern fur seal	Callorhinus ursinus	California stock	-;N	Unk, 7,524, 2013	451	1.8
Northern elephant seal	Mirounga angustirostris	California breeding stock	-;N	Unk, 81,368, 2010	4,882	8.8
Family Phocidae (earless seals)						
Pacific harbor seal	Phoca vitulina richardii	California stock	-;N	Unk, 27,348, 2012	1,641	43

1 - Endangered Species Act (ESA) status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.

2- NMFS marine mammal stock assessment reports online at: www.nmfs.noaa.gov/pr/sars/. CV is coefficient of variation; Nmin is the minimum estimate of stock abundance. In some cases, CV is not applicable [explain if this is the case]

3 - These values, found in NMFS's SARs, represent annual levels of human-caused mortality plus serious injury from all sources combined (*e.g*., commercial fisheries, ship strike). Annual M/SI often cannot be determined precisely and is in some cases presented as a minimum value or range. A CV associated with estimated mortality due to commercial fisheries is presented in some cases.

NOTE - Italicized species are not expected to be taken or proposed for authorization

All species that could potentially occur in the proposed construction area are included in Table 2. However, the temporal and spatial occurrence of all but three of the species listed in Table 2 with respect to the timing and location of the specified activity is such that take is not expected to occur, and they are not discussed further beyond the explanation provided here.

Most of the species included in Table 2 above are unlikely to occur during the proposed work because they are not resident to this part of California during the late summer and early fall months. For those species that may occur in coastal southern California during that time, they are unlikely to occur at such close proximity to the shoreline and the proposed work is conducted from a pier connected to a beach with maximum water depths of 4-8 meters. The long-beaked common dolphin may occasionally venture within one nautical mile of the project site but is unlikely. The short-beaked common dolphin is much less likely to appear in the vicinity than the long-beaked common dolphin. The gray whale occurs within one nautical mile of the project site, but it does not migrate through the region until late December through May, with most gray whales sighted near the project area in the spring. The other species generally occur farther offshore and have not been reported in the vicinity of this area of the Southern California Bight (SCB), so they will not be discussed further in this document.

Of the MMPA-listed species of marine mammals summarized in Table 2, only the Pacific harbor seal, the California sea lion, and the coastal stock of bottlenose dolphin are anticipated to be found in the immediate vicinity of the project site and subsequently may be taken by pile driving. Below are descriptions of those species and the relevant stock, as well as information regarding population trends and threats, and describe any information regarding local occurrence.

Harbor seal

Pacific harbor seals inhabit the entire coast of California, including the offshore islands, forming small, relatively stable populations. The California stock of harbor seals is estimated at 30,968 (Carretta *et al*., 2015). This species is non-migratory, but local movements of short to moderate distances sometimes occur (California Department of Fish and Game [CDFG] 1990). They breed along the California coast between March and June. The preferred habitat of the Pacific harbor seal includes offshore rocks, sandy beaches, gravelly or rocky beaches, and estuarine mud flats (NMFS 1997). Molting occurs from late May through July or August and lasts approximately 6 weeks. Between fall and winter, harbor seals spend less time on land, but they usually remain relatively close to shore while at sea.

The project area is in the vicinity of one of the most well-known seal rookeries on the mainland shore of the SCB. This rookery, east of the base of the Pier, is inhabited year-round but the beach is closed to all activity, including construction during the winter pupping season. Since 1991 the Carpinteria seal rookery has been monitored from January 1 through May 30 by the Carpinteria Seal Watch, an ad hoc citizens' group. (The group does not start watches until January 1 because of the holidays.) In the 15-year period prior to 2008, the highest record of seals hauling out during pupping season (December to May) was 390 animals in 2006. A calculation, known as Hanan's and Beeson's formula (1994), was applied to the observed number of 390 individuals, to account for individuals in the water during the count. Such a calculation brings the population to 507 individuals in 2006. However, Hanan's and Beeson's formula was designed to estimate total population from aerial counts conducted once a year, one time over each area, as opposed to extensive daily ground counts over a period of six months each year.

Population counts have occasionally occurred during or after molting season (April to June), when the number of seals utilizing the rookery are believed to be even higher than during pupping season. However, the rookery beach is open to the public during this time, so accurate counts are more difficult to obtain, since human use of the beach disturbs the animals. As such, the most accurate counts have occurred early in the morning before animals have been disturbed. The highest number of seals ever recorded by a Carpinteria Seal Watch member (not during their usual watch season) totaled 364 in September 1993. Applying Hanan's and Beeson's formula to this count revealed a total population during molting season of 473.

In 2006, field studies of marine mammals were conducted for the environmental evaluation of the Paredon project, which would have involved slant drilling under the Carpinteria seal rookery to offshore oil reserves. These studies resulted in a count of 482 animals in October and 462 animals in November (Marine Mammal Consulting Group 2007a and b). Boveng (1988) calculated that 50 to 70 percent of all harbor seals were hauled out during molting. However, his calculations were based on once-a-year annual aerial surveys, with only one pass over each site. These were conducted during daytime hours. The MMCG studies were conducted on multiple occasions at night from October through December, using black and white film, digital photos, and infrared photos. These were pasted into photo mosaics to accurately count every animal by dividing the area up into segments. The lowest total number of animals was selected from the photos taken during the highest count (482), which was tallied in October. In November, another count revealed 452 animals, suggesting that the high count was not an anomaly. The lowest nighttime count was 310. Using Boveng's formula, this suggests that the population ranged from

443 to 964 animals. Obviously the highest actual count exceeded Boveng's lowest estimate. It is clear that the minimum population was 482, but that assumes all animals were present on the beach. The more likely population estimate is probably from 500 to 700 animals. This is believed to be an accurate estimate of the total population of harbor seals at Carpinteria in 2006. However, this estimate was derived from a nighttime count and does not reflect a daytime estimate of the Carpinteria population, especially when the beaches are open to the public and very few seals are present (MMCG 2007b).

Years of observations have revealed that harbor seals sometimes react to various anthropogenic stimuli. These include low-flying aircraft of all descriptions (including even a blimp on one occasion) hang and para gliders, people and dogs on the beach and bluff, bicyclists, boats, jet skis, surfers, divers, swimmers, fishers, passing trains, equipment activity and people on the Pier, crews coming and going from boats, and various oil company repair activities. All of these activities have been short-lived and have not deterred the seals from the haul-out area except during daytime from June 1 through November 30, when the beach is open to the public. At such times, the beach is often deserted by the seals, although some haul out on offshore rocks beyond the action area to the west during low tides (MMCG 2007a and b). During very high tides, when the beach is inaccessible to humans because of prominent points jutting to the sea, a few seals may remain on the beach.

Natural disturbances also startle the seals. These include birds suddenly taking flight or making low passes, coyotes roaming the beach, ground squirrels and rabbits burrowing into the coastal bluffs, large waves washing ashore, high tides that preclude most seals from finding a spot to haul out, excessive heat during periods of little wind, and white sharks in the water

(MMCG 1995; 1998a, b, d, and e; 2001a and b; 2006; 2007a and b; 2011c; 2013b; and 2014b; SBMMC 1976-2015; SBMMC 1976-2015; Seagars 1988).

Based on review of the available observational data, similar past experience in the project vicinity, and project timing (fall season, during daytime hours), an estimated range of zero to 50 harbor seals is anticipated to be present on the beach and in the ocean within the project vicinity during work periods.

California sea lion

California sea lions are the most abundant pinniped in the SCB. Although no rookeries occur on the mainland shore of the SCB, this species regularly hauls out on buoys, oil platforms, docks, breakwaters and other structures along the coast in the vicinity of the project. Individuals are regularly observed hauled out on mooring buoys used by oil supply vessels southeast of the Pier, although these buoys are small and only allow less than a dozen animals to haul out. These buoys are beyond the action area. They also haul out on oil platforms and attendant buoys off Carpinteria, but these are miles away for the action area. Occasionally, individual stranded specimens haul out at the Carpinteria seal rookery (MMCG 1995; 1998a, b, d, and e; 2001a and b; 2006; 2011c, 2013b, and 2014b; SBMMC 1976-2015). Such occurrences are rare, with less than half a dozen animals stranded in the action area a year and usually even less (SBMMC 1976-2015). The action area is not a sea lion haul-out site.

During the breeding season, the majority of California sea lions are found in Southern California and Mexico. Rookery sites in Southern California are limited to San Miguel Island and to the more southerly Channel Islands of San Nicolas, Santa Barbara, and San Clemente (NMFS 1997). Rocky ledges and sandy beaches on offshore islands are the preferred rookery habitat. Pupping season begins in mid-May, peaking in the third week of June and tapering off in

July. The California sea lion molts gradually over several months during late summer and fall. California sea lions exhibit annual migratory movements; in the spring, males migrate southward to breeding rookeries in the Channel Islands and Mexico, then migrate northward in late summer following breeding season. Females migrate as far north as San Francisco Bay in winter, but during El Niño events, have moved as far north as central Oregon.

The minimum population size of the U.S. stock of California sea lions in 2011 was estimated at 296,750 (Carretta *et al*., 2015). This estimate is likely to be revised downward because of a long- lasting Unusual Mortality Event (UME). The causes are still being studied, but lack of prey, domoic acid outbreaks, and shark predation are being examined. Based on review of the available opportunistic sightings data from the Seal Watch, other construction projects in the project vicinity, and project timing (fall season), an estimated range of zero to 15 sea lions is anticipated to be present within the project vicinity during work periods.

Bottlenose dolphin

Coastal bottlenose dolphins (*Tursiops truncatus*) range from San Francisco, California to Baja California. This stock prefers coastal waters between the surf zone and 0.6 nautical miles offshore. Almost all (99 percent) are found within 0.6 nautical miles of shore (Hansen and DeFran 1993). The stock size is estimated at only 323 animals throughout its entire range (Carretta *et al.*, 2015). The project site represents a very small portion of its overall range. Past projects in the vicinity of the pier have revealed anywhere from 2 to 32 animals present at any one time, with an average pod size of 8 animals, although many days or even weeks go by with no dolphins seen (MMCG 1995; 1998a, b, d, and e; 2001a and b; 2006; 2011c, 2013b, and 2014b). Carpinteria Seal Watch data are incomplete, in that bottlenose dolphins are sometimes noted and sometimes not. Long-beaked common dolphins are occasionally noted as bottlenose dolphins during opportunistic sighting reports.

Based on review of opportunistic sightings data in the area from Seal Watch and other construction projects in the project vicinity, and project timing (fall season, during daytime hours), an estimated range of 2 to 32 coastal bottlenose dolphins is anticipated to be present within the project vicinity during work periods, with an average pod size of 8 animals, although many days or even weeks go by with no dolphins seen.

Potential Effects of Specified Activities on Marine Mammals and their Habitat

This section includes a summary and discussion of the ways that components of the specified activity may impact marine mammals and their habitat. The "Estimated Take by Incidental Harassment" section later in this document includes a quantitative analysis of the number of individuals that are expected to be taken by this activity. The "Negligible Impact Analysis and Determination" section considers the content of this section, the "Estimated Take by Incidental Harassment" section, and the "Proposed Mitigation" section, to draw conclusions regarding the likely impacts of these activities on the reproductive success or survivorship of individuals and how those impacts on individuals are likely to impact marine mammal species or stocks.

Description of Sound Sources

Sound travels in waves, the basic components of which 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 of a sound wave; lower frequency sounds have longer wavelengths than higher frequency sounds. Amplitude is the height of the sound pressure wave or the ‘loudness’ of a sound and is typically measured using the decibel (dB) scale. A dB is the ratio between a measured pressure (with sound) and a reference pressure (sound at a constant pressure, established by scientific standards). It is a logarithmic unit that accounts for large variations in amplitude; therefore, relatively small changes in dB ratings correspond to large changes in sound pressure. When referring to sound pressure levels (SPLs; the sound force per unit area), sound is referenced in the context of underwater sound pressure to 1 microPascal (μPa). One pascal is the pressure resulting from a force of one newton exerted over an area of one square meter. The source level (SL) represents the sound level at a distance of 1 m from the source (referenced to 1 μPa). The received level is the sound level at the listener’s position. Note that all underwater sound levels in this document are referenced to a pressure of 1 µPa and all airborne sound levels in this document are referenced to a pressure of 20 µPa.

Root mean square (rms) is the quadratic mean sound pressure over the duration of an impulse. 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 pressures.

When underwater objects vibrate or activity occurs, sound-pressure waves are created. These waves alternately compress and decompress the water as the sound wave travels. Underwater sound waves radiate in all directions away from the source (similar to ripples on the surface of a pond), except in cases where the source is directional. The compressions and decompressions associated with sound waves are detected as changes in pressure by aquatic life and man-made sound receptors such as hydrophones.

Even in the absence of sound from the specified activity, the underwater environment is typically loud due to ambient sound. Ambient sound is defined as environmental background sound levels lacking a single source or point (Richardson *et al.*, 1995), and 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.*, waves, earthquakes, ice, atmospheric sound), biological (*e.g.*, sounds produced by marine mammals, fish, and invertebrates), and anthropogenic sound (*e.g.*, vessels, dredging, aircraft, construction). A number of sources contribute to ambient sound, including the following (Richardson *et al.*, 1995):

- Wind and waves: The complex interactions between wind and water surface, including processes such as breaking waves and wave-induced bubble oscillations and cavitation, are a main source of naturally occurring ambient noise for frequencies between 200 Hz and 50 kHz (Mitson 1995). In general, ambient sound levels tend to increase with increasing wind speed and wave height. Surf noise becomes important near shore, with measurements collected at a distance of 8.5 km from shore showing an increase of 10 dB in the 100 to 700 Hz band during heavy surf conditions.

- Precipitation: Sound from rain and hail impacting the water surface can become an important component of total noise at frequencies above 500 Hz, and possibly down to 100 Hz during quiet times.

- Biological: Marine mammals can contribute significantly to ambient noise levels, as can some fish and shrimp. The frequency band for biological contributions is from approximately 12 Hz to over 100 kHz.

- Anthropogenic: Sources of ambient noise related to human activity include transportation (surface vessels and aircraft), dredging and construction, oil and gas drilling and production, seismic surveys, sonar, explosions, and ocean acoustic studies. Shipping noise typically dominates the total ambient noise for frequencies between 20 and 300 Hz. In general, the frequencies of anthropogenic sounds are below 1 kHz and, if higher frequency sound levels are created, they attenuate rapidly (Richardson *et al.*, 1995). Sound from identifiable anthropogenic sources other than the activity of interest (*e.g.*, a passing vessel) is sometimes termed background sound, as opposed to ambient sound.

The sum of the various natural and anthropogenic sound sources at any given location and time – which comprise "ambient" or "background" sound – depends not only on the source levels (as determined by current weather conditions and levels of biological and shipping activity) but also on the ability of sound to propagate through the environment. In turn, 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, 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.

In-water construction activities associated with the project would include impact pile driving and vibratory pile driving. The sounds produced by these activities fall into one of two general sound types: pulsed and non-pulsed (defined in the following). The distinction between these two sound types is important because they have differing potential to cause physical effects, particularly with regard to hearing (*e.g.*, Ward, 1997 in Southall *et al.*, 2007). Please see Southall *et a.l* (2007) for an in-depth discussion of these concepts.

Pulsed sound sources (*e.g.*, explosions, gunshots, sonic booms, impact pile driving) produce signals that are brief (typically considered to be less than one second), broadband, atonal transients (ANSI 1986; Harris 1998; NIOSH 1998; ISO 2003; ANSI 2005) and occur either as isolated events or repeated in some succession. Pulsed 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.

Non-pulsed 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-pulsed sounds can be transient signals of short duration but without the essential properties of pulses (*e.g.*, rapid rise time). Examples of non-pulsed sounds include those produced by vessels, aircraft, machinery operations such as drilling or dredging, vibratory pile driving, and active sonar systems (such as those used by the U.S. Navy). The duration of such sounds, as received at a distance, can be greatly extended in a highly reverberant environment.

Impact hammers operate by repeatedly dropping a heavy piston onto a pile to drive the pile into the substrate. Sound generated by impact hammers is characterized by rapid rise times and high peak levels, a potentially injurious combination (Hastings and Popper 2005). Vibratory hammers install piles by vibrating them and allowing the weight of the hammer to push them into the sediment. Vibratory hammers produce significantly less sound than impact hammers. Peak SPLs may be 180 dB or greater, but are generally 10 to 20 dB lower than SPLs generated during impact pile driving of the same-sized pile (Oestman *et al.*, 2009). Rise time is slower, reducing the probability and severity of injury, and sound energy is distributed over a greater amount of time (Nedwell and Edwards 2002; Carlson *et al.*, 2005).

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Current data indicate that not all marine mammal species have equal hearing capabilities (*e.g*., Richardson *et al.*, 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.* (2007) recommended that marine mammals be divided into functional hearing groups based on directly measured or estimated hearing ranges on the basis of available behavioral response data, audiograms derived using auditory evoked potential techniques, anatomical modeling, and other data. Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e*., low-frequency cetaceans). Subsequently, NMFS (2016) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 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. The functional groups and the associated frequencies are indicated below (note that these frequency ranges correspond to the range for the composite group, with the entire range not necessarily reflecting the capabilities of every species within that group):

Table 3. Marine mammal hearing groups and their generalized hearing range.

Hearing Group	Generalized Hearing Range*
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 35 kHz
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz
High-frequency (HF) cetaceans (true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* and *L. australis*)	275 Hz to 160 kHz
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 39 kHz
***** Represents the generalized hearing range for the entire group as a composite (*i.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 functional 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 and Holt, 2013). For more detail concerning these groups and associated frequency ranges, please see NMFS (2016) for a review of available information. As mentioned previously in this document, three marine mammal species (one cetacean and two pinnipeds) may occur in the project area. Of these three, the bottlenose dolphin is classified as a mid-frequency cetacean (Southall *et al*., 2007). Additionally, harbor seals are classified as members of the phocid pinnipeds in water functional hearing group while California sea lions are grouped under the Otariid pinnipeds in water functional hearing group. A species' functional hearing group is a consideration when we analyze the effects of exposure to sound on marine mammals.

Acoustic Impacts

Please refer to the information given previously (Description of Sound Sources) regarding sound, characteristics of sound types, and metrics used in this document. Anthropogenic sounds cover a broad range of frequencies and sound levels and can have a range of highly variable impacts on marine life, from none or minor to potentially severe responses, depending on received levels, duration of exposure, behavioral context, and various other factors. The potential effects of underwater sound from active acoustic sources can potentially result in one or more of the following; temporary or permanent hearing impairment, non-auditory physical or physiological effects, behavioral disturbance, stress, and masking (Richardson *et al.*, 1995; Gordon *et al*., 2004; Nowacek *et al*., 2007; Southall *et al*., 2007; Gotz *et al*., 2009). The degree of effect is intrinsically related to the signal characteristics, received level, distance from the source, and duration of the sound exposure. In general, sudden, high level sounds can cause hearing loss, as can longer exposures to lower level sounds. Temporary or permanent loss of hearing will occur almost exclusively for noise within an animal's hearing range. We first describe specific manifestations of acoustic effects before providing discussion specific to the Venoco's construction activities.

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

We describe the more severe effects (*i.e*., permanent hearing impairment, certain non-auditory physical or physiological effects) only briefly as we do not expect that there is a reasonable likelihood that Venoco's activities may result in such effects (see below for further discussion). Marine mammals exposed to high-intensity sound, or to lower-intensity sound for prolonged periods, can experience hearing threshold shift (TS), 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 2016). TS can be permanent (PTS), an 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, or temporary (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 2016). Repeated sound exposure that leads to TTS could cause PTS. In severe cases of PTS, there can be total or partial deafness, while in most cases the animal has an impaired ability to hear sounds in specific frequency ranges (Kryter 1985).

When PTS occurs, there is physical damage to the sound receptors in the ear (*i.e*., tissue damage), whereas TTS represents primarily tissue fatigue and is reversible (Southall *et al.,* 2007). In addition, other investigators have suggested that TTS is within the normal bounds of physiological variability and tolerance and does not represent physical injury (*e.g.,* Ward 1997). Therefore, NMFS does not consider TTS to constitute auditory injury.

Relationships between TTS and PTS thresholds have not been studied in marine mammals – PTS data exists only for a single harbor seal (Kastak *et al.*, 2008) – but are assumed to be similar to those in humans and other terrestrial mammals. PTS typically occurs at exposure levels at least several dB above a 40-dB threshold shift approximates PTS onset; *e.g.*, Kryter *et al.*, 1966; Miller, 1974) that inducing mild TTS (a 6-dB threshold shift approximates TTS onset; *e.g.*, Southall *et al.*, 2007). Based on data from terrestrial mammals, a precautionary assumption is that the PTS thresholds for impulse 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). 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.

Non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to high level underwater sound or as a secondary effect of extreme behavioral reactions (*e.g.*, change in dive profile as a result of an avoidance reaction) caused by exposure to sound include neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage (Cox *et al.*, 2006; Southall *et al.*, 2007; Zimmer and Tyack 2007). Venoco's activities do not involve the use of devices such as explosives or mid-frequency active sonar that are associated with these types of effects; therefore, no non-auditory physical effects or injuries is anticipated

Temporary threshold shift – TTS is the mildest form of hearing impairment that can occur during exposure to sound (Kryter 1985). 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. Few data on sound levels and durations necessary to elicit mild TTS have been obtained for marine mammals. Marine mammal hearing plays a critical role in communication with conspecifics, and interpretation of environmental cues for purposes such as predator avoidance and prey capture. 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. 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 occurs during a time 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 a time when communication is critical for successful mother/calf interactions could have more serious impacts.

Currently, TTS data only exist for four species of cetaceans (bottlenose dolphin, beluga whale (*Delphinapterus leucas*), harbor porpoise, and Yangtze finless porpoise (*Neophocoena asiaeorientalis*)) and three species of pinnipeds (northern elephant seal, harbor seal, and California sea lion) exposed to a limited number of sound sources (*i.e.*, mostly tones and octave-band noise) in laboratory settings (*e.g.*, Finneran *et al*., 2002; Nachtigall *et al*., 2004; Kastak *et al*., 2005; Lucke *et al*., 2009; Popov *et al*., 2011). In general, harbor seals (Kastak *et al*., 2005; Kastelein *et al*., 2012a) and harbor porpoises (Lucke *et al*., 2009; Kastelein *et al*., 2012b) have a lower TTS onset than other measured pinniped or cetacean species. Additionally, the existing marine mammal TTS data come from a limited number of individuals within these species. There are no data available on noise-induced hearing loss for mysticetes. For summaries of data on TTS in marine mammals or for further discussion of TTS onset thresholds, please see Southall *et al.* (2007) and Finneran and Jenkins (2012).

Behavioral effects – Behavioral disturbance may include a variety of effects, including subtle changes in behavior (*e.g*., minor or brief avoidance of an area or changes in vocalizations), more conspicuous changes in similar behavioral activities, and more sustained and/or potentially severe reactions, such as displacement from or abandonment of high-quality habitat. Behavioral responses to sound are highly variable and context-specific and any reactions depend on numerous intrinsic and extrinsic factors (*e.g*., species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day), as well as the interplay between factors (*e.g*., Richardson *et al*., 1995; Wartzok *et al*., 2003; Southall *et al*., 2007; Weilgart, 2007; Archer *et al*., 2010). Behavioral reactions can vary not only among individuals but also within an individual, depending on previous experience with a sound source, context, and numerous other factors (Ellison *et al*., 2012), and can vary depending on characteristics associated with the sound source (*e.g*., whether it is moving or stationary, number of sources, distance from the source). Please see Appendices B-C of Southall *et al.* (2007) for a review of studies involving marine mammal behavioral responses to sound.

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

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

Available studies show wide variation in response to underwater sound; therefore, it is difficult to predict specifically how any given sound in a particular instance might affect marine mammals perceiving the signal. If a marine mammal 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,b). Variations in dive behavior may reflect interruptions in biologically significant activities (*e.g*., foraging) or they may be of little biological significance. The impact of an alteration to dive behavior resulting from an acoustic exposure depends on what the animal is doing at the time of the exposure and the type and magnitude of the response.

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.

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

Marine mammals vocalize for different purposes and across multiple modes, such as whistling, echolocation click production, calling, and singing. Changes in vocalization behavior in response to anthropogenic noise can occur for any of these modes and may result from a need to compete with an increase in background noise or may reflect increased vigilance or a startle response. For example, in the presence of potentially masking signals, humpback whales and killer whales have been observed to increase the length of their songs (Miller *et al*., 2000; Fristrup *et al*., 2003; Foote *et al*., 2004), while right whales (Eubalaena glacialis) have been observed to shift the frequency content of their calls upward while reducing the rate of calling in areas of increased anthropogenic noise (Parks *et al*., 2007b). In some cases, animals may cease sound production during production of aversive signals (Bowles *et al*., 1994).

Avoidance is the displacement of an individual from an area or migration path as a result of the presence of a sound or other stressors, and is one of the most obvious manifestations of disturbance in marine mammals (Richardson *et al*., 1995). For example, gray whales (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). The result of a flight response could range from brief, temporary exertion and displacement from the area where the signal provokes flight to, in extreme cases, marine mammal strandings (Evans and England 2001). However, it should be noted that response to a perceived predator does not necessarily invoke flight (Ford and Reeves 2008), and whether individuals are solitary or in groups may influence the response.

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

Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (24-hour cycle). Disruption of such functions resulting from reactions to stressors such as sound exposure are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall *et al*., 2007). Consequently, a behavioral response lasting less than one day and not recurring on subsequent days is not considered particularly severe unless it could directly affect reproduction or survival (Southall *et al*., 2007). Note that there is a difference between multi-day substantive behavioral reactions and multi-day anthropogenic activities. For example, just because an activity lasts for multiple days does not necessarily mean that individual animals are either exposed to activity-related stressors for multiple days or, further, exposed in a manner resulting in sustained multi-day substantive behavioral responses.

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

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

The primary distinction between stress (which is adaptive and does not normally place an animal at risk) and "distress" is the cost of the response. During a stress response, an animal uses glycogen stores that can be quickly replenished once the stress is alleviated. In such circumstances, the cost of the stress response would not pose serious fitness consequences. However, when an animal does not have sufficient energy reserves to satisfy the energetic costs of a stress response, energy resources must be diverted from other functions. This state of distress will last until the animal replenishes its energetic reserves sufficient to restore normal function.

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

Auditory masking – Sound can disrupt behavior through masking, or interfering with, an animal's ability to detect, recognize, or discriminate between acoustic signals of interest (*e.g.*, those used for intraspecific communication and social interactions, prey detection, predator avoidance, navigation) (Richardson *et al.*, 1995). Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher intensity, and may occur whether the sound is natural (*e.g.*, snapping shrimp, wind, waves, precipitation) or anthropogenic (*e.g.*, shipping, sonar, seismic exploration) in origin. The ability of a noise source to mask biologically important sounds depends on the characteristics of both the noise source and the signal of interest (*e.g.*, signal-to-noise ratio, temporal variability, direction), in relation to each other and to an animal's hearing abilities (*e.g.*, sensitivity, frequency range, critical ratios, frequency discrimination, directional discrimination, age or TTS hearing loss), and existing ambient noise and propagation conditions.

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 man-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*., 2007b; Di Iorio and Clark 2009; Holt *et al*., 2009). Masking can be reduced in situations where the signal and noise come from different directions (Richardson et al., 1995), through amplitude modulation of the signal, or through other compensatory behaviors (Houser and Moore 2014). Masking can be tested directly in captive species (*e.g*., Erbe 2008), but in wild populations it must be either modeled or inferred from evidence of masking compensation. There are few studies addressing real-world masking sounds likely to be experienced by marine mammals in the wild (*e.g*., Branstetter *et al.*, 2013).

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

Acoustic Effects, Underwater

Potential Effects of Pile Driving Sound

The effects of sounds from pile driving might include one or more of the following: temporary or permanent hearing impairment, non-auditory physical or physiological effects, behavioral disturbance, and masking (Richardson *et al*., 1995; Gordon *et al*., 2003; Nowacek *et* *al*., 2007; Southall *et al*., 2007). The effects of pile driving on marine mammals are dependent on several factors, including the type and depth of the animal; the pile size and type, and the intensity and duration of the pile driving sound; the substrate; the standoff distance between the pile and the animal; and the sound propagation properties of the environment. Impacts to marine mammals from pile driving activities are expected to result primarily from acoustic pathways. As such, the degree of effect is intrinsically related to the frequency, received level, and duration of the sound exposure, which are in turn influenced by the distance between the animal and the source. The further away from the source, the less intense the exposure should be. The substrate and depth of the habitat affect the sound propagation properties of the environment. In addition, substrates that are soft (*e.g*., sand) would absorb or attenuate the sound more readily than hard substrates (*e.g*., rock), which may reflect the acoustic wave. Soft porous substrates would also likely require less time to drive the pile, and possibly less forceful equipment, which would ultimately decrease the intensity of the acoustic source.

In the absence of mitigation, impacts to marine species could be expected to include physiological and behavioral responses to the acoustic signature (Viada *et al*., 2008). Potential effects from impulsive sound sources like pile driving can range in severity from effects such as behavioral disturbance to temporary or permanent hearing impairment (Yelverton *et al*., 1973). Due to the nature of the pile driving sounds in the project, behavioral disturbance is the most likely effect from the proposed activity. Marine mammals exposed to high intensity sound repeatedly or for prolonged periods can experience hearing threshold shifts. PTS constitutes injury, but TTS does not (Southall *et al*., 2007). Based on the best scientific information available, the SPLs for the construction activities in this project are below the thresholds that could cause TTS or the onset of PTS (Table 4).

Non-auditory Physiological Effects

Non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to strong underwater sound include stress, neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage (Cox *et al*., 2006; Southall *et al*., 2007). Studies examining such effects are limited. In general, little is known about the potential for pile driving to cause non-auditory physical effects in marine mammals. Available data suggest that such effects, if they occur at all, would presumably be limited to short distances from the sound source and to activities that extend over a prolonged period. The available data do not allow identification of a specific exposure level above which non-auditory effects can be expected (Southall *et al*., 2007) or any meaningful quantitative predictions of the numbers (if any) of marine mammals that might be affected in those ways. We do not expect any non-auditory physiological effects because of mitigation that prevents animals from approach the source too closely, as well as source levels with very small Level A isopleths. Marine mammals that show behavioral avoidance of pile driving, including some odontocetes and some pinnipeds, are especially unlikely to incur on-auditory physical effects.

Disturbance Reactions

Responses to continuous sound, such as vibratory pile installation, have not been documented as well as responses to pulsed sounds. With both types of pile driving, it is likely that the onset of pile driving could result in temporary, short term changes in an animal's typical behavior and/or avoidance of the affected area. These behavioral changes may include (Richardson *et al*., 1995): changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); avoidance of areas where sound sources are located; and/or flight responses (*e.g*., pinnipeds flushing into water from haul-outs or rookeries). Pinnipeds may increase their haul-out time, possibly to avoid in-water disturbance (Thorson and Reyff 2006). If a marine mammal responds to a stimulus by changing its behavior (*e.g*., through relatively minor changes in locomotion direction/speed or vocalization behavior), the response may or may not constitute taking at the individual level, and is unlikely to affect the stock or the species as a whole. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on animals, and if so potentially on the stock or species, could potentially be significant (*e.g*., Lusseau and Bejder 2007; Weilgart 2007).

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

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

The onset of behavioral disturbance from anthropogenic sound depends on both external factors (characteristics of sound sources and their paths) and the specific characteristics of the receiving animals (hearing, motivation, experience, demography) and is difficult to predict (Southall *et al*., 2007).

Auditory Masking

Natural and artificial sounds can disrupt behavior by masking. The frequency range of the potentially masking sound is important in determining any potential behavioral impacts. Because sound generated from in-water pile driving is mostly concentrated at low frequency ranges, it may have less effect on high frequency echolocation sounds made by porpoises. The most intense underwater sounds in the proposed action are those produced by impact pile driving. Given that the energy distribution of pile driving covers a broad frequency spectrum, sound from these sources would likely be within the audible range of marine mammals present in the project area. Impact pile driving activity is relatively short-term, with rapid pulses occurring for approximately fifteen minutes per pile. The probability for impact pile driving resulting from this proposed action masking acoustic signals important to the behavior and survival of marine mammal species is low. Vibratory pile driving is also relatively short-term, with rapid oscillations occurring for approximately one and a half hours per pile. It is possible that vibratory pile driving resulting from this proposed action may mask acoustic signals important to the behavior and survival of marine mammal species, but the short-term duration and limited affected area would result in insignificant impacts from masking. Any masking event that could possibly rise to Level B harassment under the MMPA would occur concurrently within the zones of behavioral harassment already estimated for vibratory and impact pile driving, and which have already been taken into account in the exposure analysis. Pile driving would occur for only two to three hours per day for two to three days so we do not anticipate masking to significantly affect marine mammals.

Acoustic Effects, Airborne

Pinnipeds that occur near the project site could be exposed to airborne sounds associated with pile driving that have the potential to cause behavioral harassment, depending on their distance from pile driving activities. This primarily is related to harbor seals due to the close proximity of the adjacent rookery; however, California sea lions may also be randomly haul-out nearby. Cetaceans are not expected to be exposed to airborne sounds that would result in harassment as defined under the MMPA.

Airborne noise will primarily be an issue for pinnipeds that are swimming or hauled out near the project site within the range of noise levels elevated above the acoustic criteria. The airborne threshold for harbor seals is 90 dB rms re 20µPa and for other pinnipeds is 100 dB rms re 20µPa. We recognize that pinnipeds in the water could be exposed to airborne sound that may result in behavioral harassment when looking with their heads above water. Most likely, airborne sound would cause behavioral responses similar to those discussed above in relation to underwater sound. For instance, anthropogenic sound could cause hauled-out pinnipeds to exhibit changes in their normal behavior, such as reduction in vocalizations, or cause them to temporarily abandon the area and move further from the source. However, these animals would previously have been ‘taken’ as a result of exposure to underwater sound above the behavioral harassment thresholds, which are in all cases larger than those associated with airborne sound. Thus, the behavioral harassment of these animals is already accounted for in these estimates of potential take. Multiple instances of exposure to sound above NMFS’ thresholds for behavioral harassment are not believed to result in increased behavioral disturbance, in either nature or intensity of disturbance reaction. Therefore, we do not believe that authorization of incidental take resulting from airborne sound for pinnipeds is warranted, and airborne sound is not discussed further here.

Anticipated Effects on Habitat

The proposed activities at the Project area would not result in permanent negative impacts to habitats used directly by marine mammals, but may have potential short-term impacts to food sources such as forage fish and may affect acoustic habitat (see masking discussion above). There are no known foraging hotspots or other ocean bottom structure of significant biological importance to marine mammals present in the marine waters of the project area during the construction window. Therefore, the main impact issue associated with the proposed activity would be temporarily elevated sound levels and the associated direct effects on marine mammals, as discussed previously in this document. The primary potential acoustic impacts to marine mammal habitat are associated with elevated sound levels produced by vibratory and impact pile driving in the area. Physical impacts to the environment such as construction debris are unlikely and no pile driving will occur on the haulout beach.

In-water Construction Effects on Potential Prey (Fish)

Construction activities would produce continuous (*i.e.*, vibratory pile driving) and pulsed (*i.e*. impact driving) sounds. 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. 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 fish, although several are based on studies in support of large, multiyear bridge construction projects (*e.g.*, Scholik and Yan 2001, 2002; Popper and Hastings 2009). Sound pulses at received levels of 160 dB may cause subtle changes in fish behavior. SPLs of 180 dB may cause noticeable changes in behavior (Pearson *et al.*, 1992; Skalski *et al.*, 1992). SPLs of sufficient strength have been known to cause injury to fish and fish mortality.

The most likely impact to fish from pile driving activities at the project area would be temporary behavioral avoidance of the area. The duration of fish avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated. In general, impacts to marine mammal prey species are expected to be minor and temporary due to the short timeframe for the project.

In summary, given the short daily duration of sound associated with individual pile driving events and the relatively small areas being affected, pile driving associated with the proposed action are not likely to have a permanent, adverse effect on any fish habitat, or populations of fish species. Thus, any impacts to marine mammal habitat are not expected to cause significant or long-term consequences for individual marine mammals or their populations.

Estimated Take

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

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

Authorized takes would be by Level B harassment only, in the form of disruption of behavioral patterns for individual marine mammals resulting from exposure to pile driving. Based on the nature of the activity, Level A harassment is neither anticipated nor proposed to be authorized.

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

Described in the most basic way, we estimate take by considering: 1) acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be behaviorally harassed or incur some degree of permanent hearing impairment; 2) the area or volume of water that will be ensonified above these levels in a day; 3) the density or occurrence of marine mammals within these ensonified areas; and, 4) and the number of days of activities. Below, we describe these components in more detail and present the proposed take estimate.

Acoustic Thresholds

Using the best available science, NMFS has developed acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to be behaviorally harassed (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment).

Level B Harassment for non-explosive sources – Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors related to the source (*e.g.*, frequency, predictability, duty cycle), the environment (*e.g.*, bathymetry), and the receiving animals (hearing, motivation, experience, demography, behavioral context) and can be difficult to predict (Southall *et al.*, 2007, Ellison *et al.*, 2011). Based on what the available science indicates and the practical need to use a threshold based on a factor that is both predictable and measurable for most activities, NMFS uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS predicts that marine mammals are likely to be behaviorally harassed in a manner we consider Level B harassment when exposed to underwater anthropogenic noise above received levels of 120 dB re 1 μPa (rms) for continuous (*e.g.* vibratory pile-driving, drilling) and above 160 dB re 1 μPa (rms) for non-explosive impulsive (*e.g.*, seismic airguns) or intermittent (*e.g.*, scientific sonar) sources.

Venoco's project includes the use of continuous (vibratory pile driving) and impulsive (impact pile driving) sources, and therefore the 120 and 160 dB re 1 μPa (rms) thresholds are applicable.

Level A harassment for non-explosive sources - NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Technical Guidance, 2016) 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). Venoco's construction activity includes the use of impulsive (impact pile driving) and non-impulsive (vibratory pile driving) sources.

These thresholds were developed by compiling and synthesizing the best available science and soliciting input multiple times from both the public and peer reviewers to inform the final product, and are provided in the table below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2016 Technical Guidance, which may be accessed at: *http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm.*

Table 4. Thresholds identifying the onset of Permanent Threshold Shift.

	PTS Onset Acoustic Thresholds* **(Received Level)**	
Hearing Group	**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 1μPa^{2}s. In this Table, thresholds are abbreviated to reflect American National Standards Institute standards (ANSI 2013). However, peak sound pressure is defined by ANSI as incorporating frequency weighting, which is not the intent for this Technical Guidance. Hence, the subscript "flat" is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (i.e., varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.

Ensonified Area

Here, we describe operational and environmental parameters of the activity that will feed into identifying the area ensonified above the acoustic thresholds.

Pile driving generates underwater noise that can potentially result in disturbance to marine mammals in the project area. 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

R1 = the distance of the modeled SPL from the driven pile, and

R2 = the distance from the driven pile of the initial measurement.

This formula neglects loss due to scattering and absorption, which is assumed to be zero here. The degree to which underwater sound propagates away from a sound source is dependent on a variety of factors, most notably the water bathymetry and presence or absence of reflective or absorptive conditions including in-water structures and sediments. Spherical spreading occurs in a perfectly unobstructed (free-field) environment not limited by depth or water surface, resulting in a 6 dB reduction in sound level for each doubling of distance from the source (20*log[range]). Cylindrical spreading occurs in an environment in which sound propagation is bounded by the water surface and sea bottom, resulting in a reduction of 3 dB in sound level for each doubling of distance from the source (10*log[range]). A practical spreading value of 15 is often used under conditions, such as at the Biorka Island dock, where water increases with depth as the receiver moves away from the shoreline, resulting in an expected propagation environment that would lie between spherical and cylindrical spreading loss conditions. Practical spreading loss (4.5 dB reduction in sound level for each doubling of distance) is assumed here.

Underwater Sound – The intensity of pile driving sounds is greatly influenced by factors such as the type of piles, hammers, and the physical environment in which the activity takes place. A number of studies, primarily on the west coast, have measured sound produced during underwater pile driving projects. These data are largely for impact driving of steel pipe piles and concrete piles as well as vibratory driving of steel pipe piles.

Reference sound levels used by Venoco were based on underwater sound measurements documented for a number of pile-driving projects with similar pile sizes and types at similar sites in California (*i.e*., areas of soft substrate where water depths are less than 16 feet (5 meters) (Caltrans 2009)). The noise energy would dissipate as it spreads from the pile at a rate of at least 4.5 dB per doubling of distance, which is practical spreading (Caltrans 2009). This is a conservative value for areas of shallow water with soft substrates, and actual dissipation rates would likely be higher. Using this information, and the pile information presented in Table 1, underwater sound levels were estimated using the practical spreading model to determine over what distance the thresholds would be exceeded.

Venoco used the NMFS Optional User Spreadsheet, available at *http://www.nmfs.noaa.gov/pr/acoustics/Acoustic%20Guidance%20Files/march_v1.1_blank_spreadsheet.xlsx*, to input project-specific parameters and calculate the isopleths for Level A and Level B zones from both impact and vibratory pile driving. Input to the Optional User Spreadsheet are based on project-specific parameters that provide the sound source characteristics, including the estimated duration of pile driving, the estimated number of strikes per pile (for the impact hammer method); and the maximum number of piles to be driven in a day. The estimated source level, duration of pile driving for each pile, the number of strikes per pile (for impact driving), and the number of piles per day for each pile driving method, as listed in Table 1. As noted in Table 1, each pile will require approximately 25 minutes of vibratory driving, and up to 6 piles could be installed by this method in a single day. During this time the sound levels above and below water will be in excess of normal pier operations. In the unlikely event that an impact hammer is used, installation of a single pile will require an estimated 400 hammer strikes over 15 minutes, and up to 6 piles could be installed by this method in a single day.

Venoco used the Caltrans (2015) guidelines for selection of an appropriate pile driving sound source level for a composite 50-foot, 16-inch pipe/12-foot,14-inch H-pile configuration, for both vibratory and impact driving methods, taking into consideration that only the H-pile segment of the pile (the bottom portion) will be driven below the mudline, thus the predominant underwater noise source will emanate from the steel pipe segment.

Source Levels

For the impact hammer method, the average sound pressure level measured in dB is based on the 16-inch steel pipe sound levels (Caltrans 2015, Table I.2-1), adjusted upward for the composite 16-inch pipe/14-inch H-pile design because the sound level for the composite pile is anticipated to be greater than the Caltrans reference sound level for 16-inch steel pipe (158 dB), but less than the Caltrans reference sound level for 14-inch steel H-pile (177 dB). As described above, the replacement piles will be a composite of two materials, pre-welded into a single pile prior to driving. The upper section will consist of 48 to 50 feet (15 meters) of 16-inch diameter x 0.50- inch wall thickness pipe pile and the bottom segment will consist of a 12-foot (4-meter) long 14 inch x 73 pound H-pile. The water depth ranges from 13 to 27 feet (4 to 8 meters) at the end of the Pier, with seasonal variations due to beach sand withdraw and return between the winter and summer seasons. When impact driving is initiated the H-pile will partially enter the mud substrate (*e.g.*, up to two to four feet) pushed by hammer weight and the weight of the pipe itself due to soft substrate (mud) at the seafloor surface. Thus, when impact driving begins only a portion of the 12-foot H pile would be exposed in the water column and most of the length of pile within the water column will be steel pipe pile. As pile driving progresses, the H-pile portion of the fender pile will continue to enter the seabed, and the proportion of H-pile to steel pipe exposed to the water column will decrease until the H-pile is entirely buried or until pile driving is suspended at a minimum depth of 6 feet. Consequently, the sound level for the composite pile is anticipated to be greater than the Caltrans reference sound level for 16-inch steel pipe (158 dB), and less than the Caltrans reference sound level for 14-inch steel H-pile (177 dB).

Based on these factors, the reference sound level from composite pile was based on 16-inch steel pipe pile, with an upward adjustment of 6 dB (to 164 dB). This 6 dB adjustment is divided into two parts: 3 dB (one doubling) adjustment for the H-pile itself (*i.e.*, the portion of H-pile being driven by impact hammer); and 3 dB (a second doubling) adjustment for the H-pile that is acting as a foundation, and thus providing some resistance to the pipe pile while it is being driven by impact hammer. This sound level, which represents two doublings of the reference sound level of the 16-inch steel pipe, is considered sufficiently conservative to account for the H-pile portion of the fender pile that would be exposed in the water column and serving as a foundation to the pipe pile during impact driving.

For the vibratory driving method, the average sound pressure level measured in dB is based on the 12-inch H-pile sound levels (Caltrans 2015, Table I.2-2), adjusted upward by 4 dB for composite 16-inch pipe/14-inch H-pile design. Caltrans data do not include specific vibratory reference sound levels for the 14- inch H-pile. Therefore, it was assumed that doubling the reference sound level for 12-inch H-pile plus 1 dB [*i.e.*, a 4 dB increase], would provide a sufficiently conservative assumption for a 14-inch H-pile.

Table 5. NMFS Option User Spreadsheet Inputs.

USER SPREADSHEET INPUT			
	Impact Driver		**Vibratory Driver**
Spreadsheet Tab Used	E.1) Impact piledriving	Spreadsheet Tab Used	A) Non-impulsive, continuous
Source Level (Single Strike/shot SEL)	197.8	Source Level (RMS SPL)	154
Weighting Factor Adjustment (kHz)	2	Weighting Factor Adjustment (kHz)	2.5
a) Number of strikes per pile	400	Activity duration within 24 hours (hrs)	2.5
a) Number of piles per day	6		
Propagation (xLogR)	15	Propagation (xLogR)	15
Distance of source level measurement (meters)⁺	10		10

⁺Unless otherwise specified, source levels are referenced 1 m from the source.

Level A Isopleths

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

Inputs used in the User Spreadsheet, and the resulting isopleths are reported below. The inputs Venoco used to obtain the isopleths discussed below are summarized in Table 5 above.

Table 6. Expected Distances of Level A Threshold Exceedance with Impact and Vibratory Driver.

USER SPREADSHEET OUTPUT					
	PTS Isopleth (meters)				
Source Type	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
Impact driving	96.9	3.4	115.4	51.8	3.8
Vibratory driving	4.3	0.4	6.4	2.6	0.2

Level B Isopleths

Using the same source level and transmission loss inputs discussed in the Level A isopleths section above, the Level B distance was calculated for both impact and vibratory driving, assuming practical spreading. For vibratory driving, the Level B isopleth extends out to 1,848 meters (1.15 miles; 6,063 feet) from the pile driving site. For impact driving, the Level B isopleth extends out to 34 meters (112 feet) from the pile driving site.

Table 7. Expected Distances of Level B Threshold Exceedance with Impact and Vibratory Driver.

	Level B Isopleth (meters)	
Source Type	160 dB (Impact)	120 dB (Vibratory)
Impact driving	74	N/A
Vibratory driving	N/A	1,848

Marine Mammal Occurrence

In this section we provide the information about the presence, density, or group dynamics of marine mammals that will inform the take calculations.

At-sea densities for marine mammal species have not been determined for marine mammals in the coastal Carpinteria area; therefore, all estimates here are determined by using observational data from biologists, peer-reviewed literature, and information obtained from personal communication with other companies that have conducted activities on or near the Carpinteria beach area. Additionally, some harbor seal information was collected by the Carpinteria Seal Watch.

Take Calculation and Estimation

Here we describe how the information provided above is brought together to produce a quantitative take estimate.

Level A take is not expected or proposed to be authorized for this activity. Of the two types of pile driving, the largest Level A isopleth is from impact driving at 51.8 meters for harbor seals, 3.8 meters for California sea lion, and 3.45 meters for bottlenose dolphins. Neither bottlenose dolphins nor California sea lions are resident to this area and are not expected to remain in water near the beach for an extended duration of time. At 15 minutes per pile, this is equal to 90 minutes per day; however, those 90 minutes would be spread out over multiple hours to account for equipment re-sets, breaks, etc. Because dolphin and sea lion are not resident and not known to linger in the area, full exposure to all impact pile driving within a day is highly unlikely. It is even more unlikely that these species would remain within 4 meters of the sound source for a continuous period of two and a half hours in a day. Harbor seals are resident to the area and the beach at the base of the pier is a frequently used haulout. However, it is unlikely a harbor seal would remain in water during the total time of construction within a day, as they likely will be transiting out from the beach to forage and then returning to the beach. Therefore, it is estimated that no marine mammal of the three species most likely to occur would remain in close enough proximity for the duration of daily construction to be exposed to accumulated energy levels reaching the onset of PTS. Hence no Level A take is proposed to be authorized.

Because of the lack of at-sea density information in the region of the project, estimated marine mammal takes were calculated using the following formula:

Level B exposure estimate = N (number of animals) in the ensonified area * Number of days of noise generating activities.

Harbor seal

Harbor seals are the most abundant species found at the project site. This beach is a known rookery for the local population, although work will be conducted outside of the pupping season. Although a wealth of data exists from the Carpinteria Seal Watch, these data are sometimes incomplete and data from some periods are missing. Moreover, these data were gathered during the period the Carpinteria Seal Watch does its monitoring (about January 1 through May 30 of each year). From June 1 through December 30 of each year, such data are virtually absent. The project is scheduled to begin in the fall, when the seals have largely abandoned the beach because it is open to the public and disturbances are chronic. The seals switch to a nighttime haul-out pattern during this period, hauling out after sundown and before dawn, unless the tide is very high (Seagars 1988). In such cases, the amount of haul-out area is very restricted and the seals are largely absent during this season. Reliable density data are not available from which to calculate the expected number of harbor seals within the Level B harassment zone from vibratory pile driving. Based on review of the available observational data, similar past experience in the project vicinity, and project timing (fall season, daytime hours), an estimated range of 0 to 50 harbor seals is anticipated to be present within the project vicinity during work periods. Therefore, it is estimated that up to 50 seals may be taken per day by Level B harassment. Over two and a half days of activity, that results in a total of 125 instances of harbor seal takes during the project.

California sea lion

California sea lions are abundant throughout the SCB but do not regularly use Carpinteria as a haulout in large numbers. Individuals are usually observed hauled out on offshore structures approximately 0.75 miles southeast of the pier. Reliable density data are not available from which to calculate the expected number of sea lions within the Level B harassment impact zone for vibratory pile. Based on the available observational data and project timing (fall season), an estimated range of zero to 15 sea lions is anticipated to be present within the project vicinity during work periods. Therefore it is estimated that up to 15 California sea lions may be taken per day by Level B harassment in a day. Over two and a half days of activity, that results in a total of 38 California sea lions taken during the project as it is not known if the California sea lions that come to the beach are the same individuals.

Bottlenose dolphin

Bottlenose dolphins may occur sporadically near the project area, but never in large numbers. Past projects have revealed anywhere from 2 to 32 animals present at any one time, with an average pod size of 8 (MMCG 1995; 1998a, b, d, and e; 2001a and b; 2006; 2011c, 2013b, and 2014b). Therefore, it is estimated that no more than 16 coastal bottlenose dolphins (two pods of average group size) may be taken by Level B harassment in a day. Over two and a half days of activity, that results in a total of 40 bottlenose dolphins taken during the project as it is not known if any of the animals sighted would be repeated individuals.

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 such activity, and other means of effecting the least practicable impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such 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 such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks and their habitat (50 CFR 216.104(a)(11)).

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

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

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

The following measures would apply to Venoco's mitigation through shutdown and disturbance zones:

Shutdown Zone

For all pile driving activities, Venoco will establish a shutdown zone intended to contain the area in which SELs equal or exceed the auditory injury criteria for cetaceans and pinnipeds. The purpose of a shutdown zone is to define an area within which shutdown of activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area), thus further preventing injury of marine mammals (as described previously under Potential Effects of the Specified Activity on Marine Mammals, serious injury or death are unlikely outcomes even in the absence of mitigation measures). Venoco proposes a shutdown zone for the largest Level A isopleth, which is the phocid Level A isopleth of 51.8 meters.

Disturbance Zone

Disturbance zones are the areas in which SPLs equal or exceed 160 and 120 dB rms (for impact and vibratory pile driving, respectively). Disturbance zones provide utility for monitoring conducted for mitigation purposes (*i.e.*, shutdown zone monitoring) by establishing monitoring protocols for areas adjacent to the shutdown zones and identifying amount of take. Monitoring of disturbance zones enables observers to be aware of and communicate the presence of marine mammals in the project area but outside the shutdown zone and thus prepare for potential shutdowns of activity. However, the primary purpose of disturbance zone monitoring is for documenting instances of Level B harassment; disturbance zone monitoring is discussed in greater detail later (see Proposed Monitoring and Reporting). Nominal radial distances for disturbance zones are shown in Table 7.

Given the size of the disturbance zone for vibratory pile driving, it is impossible to guarantee that all animals would be observed or to make comprehensive observations of fine-scale behavioral reactions to sound, and only a portion of the zone (*e.g.*, what may be reasonably observed by visual observers stationed on the pier and bluff above the beach) would be observed. In order to document observed instances of harassment, monitors record all marine mammal observations, regardless of location. The observer's location, as well as the location of the pile being driven, is known from a GPS. The location of the animal is estimated as a distance from the observer, which is then compared to the location from the pile. It may then be estimated whether the animal was exposed to sound levels constituting incidental harassment on the basis of predicted distances to relevant thresholds in post-processing of observational and acoustic data, and a precise accounting of observed incidences of harassment created. This information may then be used to extrapolate observed takes in the observable zone multiplied by the porton of the zone that is unseen to reach an approximate understanding of predicted total takes (Area seen / area unseen = takes observed / takes unobserved).

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

Monitoring Protocols

Monitoring would be conducted before, during, and after pile driving activities., Observers shall record all instances of marine mammal occurrence, regardless of distance from activity, and shall document any apparent behavioral reactions in concert with distance from piles being driven. Observations made outside the shutdown zone will not result in shutdown;

that pile segment would be completed without cessation, unless the animal approaches or enters the shutdown zone, at which point all pile driving activities would be halted. Monitoring will take place from 15 minutes prior to initiation through 30 minutes post-completion of pile driving activities. Pile driving activities include the time to install a single pile or series of piles, as long as the time elapsed between uses of the pile driving equipment is no more than 30 minutes. If pile driving ceases for more than 30 minutes, the 30 minute pre-pile driving monitoring effort will take place prior to onset of pile driving.

Prior to the start of pile driving activity, the shutdown zone will be monitored for 30 minutes to ensure that it is clear of marine mammals. Pile driving will only commence once observers have declared the shutdown zone clear of marine mammals. If the shutdown zone is not clear of a marine mammals, pile driving will not commence until the shut-down zone is clear. Any animals in the shut down zone prior to commencement of pile driving will be allowed to remain in the shutdown zone and their behavior will be monitored and documented. If the 51.84 m shutdown zone is not entirely visible (*e.g.*, due to dark, fog, etc), pile driving will not commence or proceed if it is underway.

If a marine mammal approaches or enters the shutdown zone during the course of pile driving operations, activity will be halted and delayed until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone or 15 minutes have passed without re-detection.

If a species for which authorization has not been granted, or if a species for which authorization has been granted but the authorized takes are met, approaches or is observed within the Level B harassment zone, activities will shut down immediately and not restart until the animals have been confirmed to have left the area for 15 minutes. If pile driving has ceased for more than 30 minutes, the 30 minute pre- pile driving monitoring will begin.

Soft Start

The use of a soft start procedure provides additional protection to marine mammals by warning or providing a chance to leave the area prior to the hammer operating at full capacity, and typically involves a requirement to initiate sound from the hammer at reduced energy followed by a waiting period. This procedure is repeated two additional times. It is difficult to specify the reduction in energy for any given hammer because of variation across drivers and, for impact hammers, the actual number of strikes at reduced energy will vary because operating the hammer at less than full power results in “bouncing” of the hammer as it strikes the pile, resulting in multiple “strikes.” For impact driving, we require an initial set of three strikes from the impact hammer at reduced energy, followed by a 30-second waiting period, then 2 subsequent 3 strike sets. Soft start will be required at the beginning of each day’s impact pile driving work and at any time following a cessation of impact pile driving of 30 minutes or longer.

Timing Restrictions

Venoco will only conduct construction activities during daytime hours. Construction will also be restricted to the fall and late summer months (July through November) to avoid overlap with harbor seal pupping.

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

Proposed Monitoring and Reporting

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

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

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g*., presence, abundance, distribution, density).
- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) action or environment (*e.g*., source characterization, propagation, ambient noise); (2) affected species (*e.g*., life history, dive patterns); (3) co-occurrence of marine mammal species with the action; or (4) biological or behavioral context of exposure (*e.g*., age, calving or feeding areas).
- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors.
- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks.

- Effects on marine mammal habitat (*e.g.*, marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat).
- Mitigation and monitoring effectiveness.

Visual Marine Mammal Observations

Venoco will collect sighting data and behavioral responses to construction for marine mammal species observed in the region of activity during the period of activity. All marine mammal observers (MMOs) will be trained in marine mammal identification and behaviors and are required to have no other construction-related tasks while conducting monitoring. A minimum of two MMOs will be required for all pile driving activities. Venoco will monitor the shutdown zone and disturbance zone before, during, and after pile driving, with observers located at the best practicable vantage points. Based on our requirements, Venoco would implement the following procedures for pile driving:

- MMOs would be located at the best vantage point(s) in order to properly see the entire shutdown zone and as much of the disturbance zone as possible;
- During all observation periods, observers will use binoculars and the naked eye to search continuously for marine mammals;
- If the shutdown zones are obscured by fog or poor lighting conditions, pile driving at that location will not be initiated until that zone is visible. Should such conditions arise while impact driving is underway, the activity would be halted; and
- The shutdown zone (51.84 m) and observable portion of the disturbance zone around the pile will be monitored for the presence of marine mammals 30 min before, during, and 30 min after any pile driving activity.

Data Collection

We require that observers use approved data forms. Among other pieces of information, Venoco will record detailed information about any implementation of shutdowns, including the distance of animals to the pile and description of specific actions that ensued and resulting behavior of the animal, if any. In addition, Venoco will attempt to distinguish between the number of individual animals taken and the number of incidences of take. We require that, at a minimum, the following information be collected on the sighting forms:

- Date and time that monitored activity begins or ends;
- Construction activities occurring during each observation period;
- Weather parameters (*e.g.*, percent cover, visibility);
- Water conditions (*e.g.*, sea state, tide state);
- Species, numbers, and, if possible, sex and age class of marine mammals;
- Description of any observable marine mammal behavior patterns, including bearing and direction of travel, and if possible, the correlation to SPLs;
- Distance from pile driving activities to marine mammals and distance from the marine mammals to the observation point;
- Description of implementation of mitigation measures (*e.g.*, shutdown or delay);
- Locations of all marine mammal observations; and
- Other human activity in the area.

Reporting

A draft report would be submitted to NMFS within 90 days of the completion of marine mammal monitoring, or 60 days prior to the requested date of issuance of any future IHA for projects at the same location, whichever comes first. The report will include marine mammal observations pre-activity, during-activity, and post-activity during pile driving days, and will also provide descriptions of any behavioral responses to construction activities by marine mammals and a complete description of all mitigation shutdowns and the results of those actions and an extrapolated total take estimate based on the number of marine mammals observed during the course of construction. A final report must be submitted within 30 days following resolution of comments on the draft report.

Negligible Impact Analysis and Determination

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

Pile driving activities associated from the Casitas Pier project, as outlined previously, have the potential to disturb or displace marine mammals. Specifically, the specified activities may result in take, in the form of Level B harassment (behavioral disturbance), from underwater sounds generated from pile driving. Potential takes could occur if individuals of these species are present in the ensonified zone when pile driving occurs.

No serious injury or mortality is anticipated given the nature of the activities and measures designed to minimize the possibility of injury to marine mammals. The potential for these outcomes is minimized through the construction method and the implementation of the planned mitigation measures. Specifically, vibratory and impact hammers and drilling will be the primary methods of installation. Impact pile driving produces short, sharp pulses with higher peak levels and much sharper rise time to reach those peaks. If impact driving is necessary, implementation of soft start and shutdown zones significantly reduces any possibility of injury. Given sufficient "notice" through use of soft start (for impact driving), marine mammals are expected to move away from a sound source that is annoying prior to it becoming potentially injurious. Venoco will use a minimum of two MMOs stationed strategically to increase detectability of marine mammals, enabling a high rate of success in implementation of shutdowns to avoid injury.

Venoco's proposed activities are localized and of relatively short duration (two and a half days of pile driving 16 piles). The project area is also very limited in scope spatially, as all work is concentrated on a single pier. These localized and short-term noise exposures may cause short-term behavioral modifications in harbor seals, California sea lions, and killer whales. Moreover, the proposed mitigation and monitoring measures are expected to further reduce the likelihood of injury, as it is unlikely an animal would remain in close proximity to the sound source with small

Level A isoplths, as well as reduce behavioral disturbances. While the project area is known to be a rookery for harbor seals, the work will be conducted in a season when few harbor seals are known to be present and no breeding activities occur.

The project also is not expected to have significant adverse effects on affected marine mammals' habitat. The project activities would not modify existing marine mammal habitat for a significant amount of time. The activities may cause some fish to leave the area of disturbance, thus temporarily impacting marine mammals' foraging opportunities in a limited portion of the foraging range. However, because of the short duration of the activities and the relatively small area of the habitat that may be affected, and the decreased potential of prey species to be in the Project area during the construction work window, the impacts to marine mammal habitat are not expected to cause significant or long-term negative consequences.

Effects on individuals that are taken by Level B harassment, on the basis of reports in the literature as well as monitoring from other similar activities, will likely be limited to temporary reactions such as increased swimming speeds, increased surfacing time, flushing, or decreased foraging (if such activity were occurring) (*e.g.*, Thorson and Reyff 2006; Lerma 2014). Most likely, individuals will simply move away from the sound source and be temporarily displaced from the areas of pile driving and drilling, although even this reaction has been observed primarily only in association with impact pile driving. Thus, even repeated Level B harassment of some small subset of the overall stock is unlikely to result in any significant realized decrease in fitness for the affected individuals, and thus would not result in any adverse impact to the stock as a whole.

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 the species or stock through effects on annual rates of recruitment or survival:

- No mortality is anticipated or authorized;
- Level B harassment may consist of, at worst, temporary modifications in behavior (*e.g*. temporary avoidance of habitat or changes in behavior);
- The lack of important feeding, pupping, or other areas in the action area during the construction window;
- The small impact area relative to species range size
- Mitigation is expected to minimize the likelihood and severity of the level of harassment; and
- The small percentage of the stock that may be affected by project activities (< 9 percent for all stocks).

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 activity will have a negligible impact on all affected marine mammal species or stocks.

Small Numbers

As noted above, only small numbers of incidental take may be authorized under Section 101(a)(5)(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. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

Table 8 details the number of instances (harbor seals) or individuals (California sea lions and bottlenose dolphins) that animals could be exposed to received noise levels that could cause Level B harassment for the proposed work at the project site relative to the total stock abundance. The numbers of animals authorized to be taken for all species would be considered small relative to the relevant stocks or populations even if each estimated instance of take occurred to a new individual. The total percent of the population (if each instance was a separate individual) for which take is requested is less than nine percent for all stocks (Table 8). 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 will be taken relative to the population size of the affected species or stocks.

Table 8. Estimated Numbers and Percentage of Stock That May Be Exposed to Level B Harassment.

Species	Proposed Authorized Level B Takes	Stock(s) Abundance Estimate[1]	Percentage of Total Stock (percent)
Harbor Seal (*Phoca vitulina*) *Alaska stock*	125	30,968	.40
California sea lion (*Eumatopias jubatus*) *U.S. Stock*	38	296,750	.013
Bottlenose dolphin (*Tursiops truncatus*) *California-Oregon-Washington Stock* *California Coastal Stock*	40	1,924 453	2.1 8.83

[1] All stock abundance estimates presented here are from the 2016 Pacific and Alaska Stock Assessment Report

Unmitigable Adverse Impact Analysis and Determination

There are no relevant subsistence uses of the affected marine mammal stocks or species implicated by this action. Therefore, NMFS has preliminarily 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 (ESA)

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, in this case with West Coast Regional Office, whenever we propose to authorize take for endangered or threatened species.

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

Proposed Authorization

As a result of these preliminary determinations, NMFS proposes to issue an IHA to Venoco LLC for conducting fender pile replacement at Casitas Pier from October 1, 2017 to September 30, 2018, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. This section contains a draft of the IHA itself. The wording contained in this section is proposed for inclusion in the IHA (if issued).

1. This Incidental Harassment Authorization (IHA) is valid for 1 year from October 1, 2017 through September 30, 2018.

2. This IHA is valid only for pile driving activities associated with the Casitas Pier Fender Pile Replacement in Carpinteria, California.

3. General Conditions

(a) A copy of this IHA must be in the possession of Venoco, its designees, and work crew personnel operating under the authority of this IHA.

(b) The species authorized for taking are summarized in Table 9.

(c) The taking, by Level B harassment only, is limited to the species listed in condition 3(b). See Table 9 for numbers of take authorized.

Table 9. Authorized Take Numbers.

Species	
	Level B
Harbor seal	125
California sea lion	38
Killer whale	40

(d) The taking by injury (Level A harassment), serious injury, or death of the species listed in condition 3(b) of the Authorization or any taking of any other species of marine mammal is prohibited and may result in the modification, suspension, or revocation of this IHA, unless authorization of take by Level A harassment is listed in condition 3(b) of this Authorization.

4. Mitigation Measures

The holder of this Authorization is required to implement the following mitigation measures.

(a) For all pile driving, Venoco shall implement a minimum shutdown zone of 51 m radius around the pile. If a marine mammal comes within or approaches the shutdown zone, such operations shall cease.

(b) Venoco shall establish monitoring locations as described below. Please also refer to Venoco's application (see *www.nmfs.noaa.gov/pr/permits/incidental/construction.htm).*

i. For all pile driving activities, a minimum of two observers shall be deployed, with one positioned on the pier and one on the bluff above the rookery.

ii. These observers shall record all observations of marine mammals, regardless of distance from the pile being driven, as well as behavior and potential behavioral reactions of the animals.

iii. All observers shall be equipped for communication of marine mammal observations amongst themselves and to other relevant personnel (*e.g.*, those necessary to effect activity delay or shutdown).

(d) Monitoring shall take place from 30 minutes prior to initiation of pile driving activity through 30 minutes post-completion of pile driving activity. In the event of a delay or shutdown of activity resulting from marine mammals in the shutdown zone, animals shall be allowed to remain in the shutdown zone (*i.e.*, must leave of their own volition) and their behavior shall be monitored and documented. Monitoring shall occur throughout the time required to drive a pile. The shutdown zone must be determined to be clear during periods of good visibility (*i.e.*, the entire shutdown zone and surrounding waters must be visible to the naked eye).

(e) If a marine mammal approaches or enters the 51m shutdown zone, all pile driving activities at that location shall be halted. If pile driving is halted or delayed due to the presence of a marine mammal, the activity may not commence or resume until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone or fifteen minutes have passed without re-detection of small cetaceans and pinnipeds.

(f) Using delay and shut-down procedures, if a species for which authorization has not been granted or if a species for which authorization has been granted but the authorized takes are met, approaches or is observed within the Level B harassment zone, activities will shut down immediately and not restart until the animals have been confirmed to have left the area.

(g) Venoco shall use soft start techniques recommended by NMFS for impact pile driving. Soft start requires contractors to provide an initial set of strikes at reduced energy, followed by a thirty-second waiting period, then two subsequent reduced energy strike sets. Soft start shall be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of thirty minutes or longer.

(h) Pile driving shall only be conducted during daylight hours.

(i) Pile driving shall only occur during July to November months.

5. Monitoring

The holder of this Authorization is required to conduct marine mammal monitoring during pile driving and removal activities. Marine mammal monitoring and reporting shall be conducted in accordance with the monitoring measures in the application.

(a) Venoco shall collect sighting data and behavioral responses to pile driving for marine mammal species observed in the region of activity during the period of activity. All observers shall be trained in marine mammal identification and behaviors, and shall have no other construction-related tasks while conducting monitoring.

(b) Monitoring shall be conducted by qualified observers. Trained observers shall be placed from the best vantage point(s) practicable to monitor for marine mammals and implement shutdown or delay procedures when applicable through communication with the equipment operator. Observer training must be provided prior to project start and in accordance with the monitoring measures in the application, and shall include instruction on species identification (sufficient to distinguish the species listed in 3(b)), description and categorization of observed behaviors and interpretation of behaviors that may be construed as being reactions to the specified activity, proper completion of data forms, and other basic components of biological monitoring, including tracking of observed animals or groups of animals such that repeat sound exposures may be attributed to individuals (to the extent possible).

(c) For all marine mammal monitoring, the information shall be recorded as described in the monitoring measures section of the application.

6. Reporting

The holder of this Authorization is required to:

(a) Submit a draft report on all monitoring conducted under the IHA within 90 days of the completion of marine mammal monitoring, or 60 days prior to the issuance of any subsequent IHA for projects at the Project area, whichever comes first. A final report shall be prepared and submitted within thirty days following resolution of comments on the draft report from NMFS. This report must contain the informational elements described in the application, at minimum (see *www.nmfs.noaa.gov/pr/permits/incidental/construction.htm*), and shall also include:

i. Detailed information about any implementation of shutdowns, including the distance of animals to the pile and description of specific actions that ensued and resulting behavior of the animal, if any.

ii. Description of attempts to distinguish between the number of individual animals taken and the number of incidents of take, such as ability to track groups or individuals.

iii. An estimated total take estimate extrapolated from the number of marine mammals observed during the course of construction activities, if necessary.

(b) Reporting injured or dead marine mammals:

i. In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by this IHA, such as a serious injury or mortality, Venoco shall immediately cease the specified activities and report the incident to the Office of Protected Resources, NMFS, and the Alaska Regional Stranding Coordinator. The report must include the following information:

A. Time and date of the incident;

B. Description of the incident;

C. Environmental conditions (*e.g.*, wind speed and direction, Beaufort sea state, cloud cover, and visibility);

D. Description of all marine mammal observations in the 24 hours preceding the incident;

E. Species identification or description of the animal(s) involved;

F. Fate of the animal(s); and

G. Photographs or video footage of the animal(s).

Activities shall not resume until NMFS is able to review the circumstances of the prohibited take. NMFS will work with Venoco to determine what measures are necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. Venoco may not resume their activities until notified by NMFS.

ii. In the event that the Venoco discovers an injured or dead marine mammal, and the lead observer determines that the cause of the injury or death is unknown and the death is relatively recent (*e.g.*, in less than a moderate state of decomposition), Venoco shall immediately report the incident to the Office of Protected Resources, NMFS, and the West Coast Regional Stranding Coordinator.

The report must include the same information identified in 6(b)(i) of this IHA. Activities may continue while NMFS reviews the circumstances of the incident. NMFS will work with Venoco to determine whether additional mitigation measures or modifications to the activities are appropriate.

iii. In the event that Venoco discovers an injured or dead marine mammal, and the lead observer determines that the injury or death is not associated with or related to the activities authorized in the IHA (*e.g.*, previously wounded animal, carcass with moderate to advanced decomposition, scavenger damage), Venoco shall report the incident to the Office of Protected Resources, NMFS, and the West Coast Regional Stranding Coordinator, NMFS, within 24 hours of the discovery. Venoco shall provide photographs or video footage or other documentation of the stranded animal sighting to NMFS.

7. This Authorization may be modified, suspended or withdrawn if the holder fails to abide by the conditions prescribed herein, or if NMFS determines the authorized taking is having more than a negligible impact on the species or stock of affected marine mammals.

Request for Public Comments

We request comment on our analyses, the draft authorization, and any other aspect of this Notice of Proposed IHA for the proposed fender pile replacement. Please include with your comments any supporting data or literature citations to help inform our final decision on the request for MMPA authorization.

Dated: September 1, 2017.

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Donna S. Wieting,

Director, Office of Protected Resources,

National Marine Fisheries Service.

[FR Doc. 2017-18974 Filed: 9/6/2017 8:45 am; Publication Date: 9/7/2017]