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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648-XE443

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Boost-Backs and Landings of Rockets at Vandenberg Air Force Base

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

ACTION: Notice; Issuance of an Incidental Harassment Authorization.

SUMMARY: In accordance with the regulations implementing the Marine Mammal Protection Act (MMPA) as amended, notification is hereby given that we have issued an incidental harassment authorization (IHA) to Space Explorations Technology Corporation (SpaceX), to incidentally harass, by Level B harassment only, marine mammals incidental to boost-backs and landings of Falcon 9 rockets at Vandenberg Air Force Base in California, and at a contingency landing location approximately 30 miles offshore.

DATES: This Authorization is effective from June 30, 2016, through June 29, 2017.

FOR FURTHER INFORMATION CONTACT: Jordan Carduner, Office of Protected Resources, NMFS, (301) 427-8401.

SUPPLEMENTARY INFORMATION:

Availability

An electronic copy of SpaceX's IHA application and supporting documents, as well as a list of the references cited in this document, may be obtained by visiting the Internet at

www.nmfs.noaa.gov/pr/permits/incidental/. In case of problems accessing these documents, please call the contact listed under **FOR FURTHER INFORMATION CONTACT**.

Background

Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq*.) direct the Secretary of Commerce to allow, upon request by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified area, the incidental, but not intentional, taking of small numbers of marine mammals, providing that certain findings are made and the necessary prescriptions are established.

The incidental taking of small numbers of marine mammals may be allowed only if NMFS (through authority delegated by the Secretary) finds that the total taking by the specified activity during the specified time period will (i) have a negligible impact on the species or stock(s) and (ii) not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant). Further, the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of such taking must be set forth.

The allowance of such incidental taking under section 101(a)(5)(A), by harassment, serious injury, death, or a combination thereof, requires that regulations be established. Subsequently, a Letter of Authorization may be issued pursuant to the prescriptions established in such regulations, providing that the level of taking will be consistent with the findings made for the total taking allowable under the specific regulations. Under section 101(a)(5)(D), NMFS may authorize such incidental taking by harassment only, for periods of not more than one year,

pursuant to requirements and conditions contained within an IHA. The establishment of these prescriptions requires notice and opportunity for public comment.

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." 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]."

Summary of Request

On July 28, 2015, we received a request from SpaceX for authorization to take marine mammals incidental to Falcon 9 First Stage recovery activities, including in-air boost-back maneuvers and landings of the First Stage of the Falcon 9 rocket at Vandenberg Air Force Base (VAFB) in California, and at a contingency landing location approximately 50 km (31 mi) offshore of VAFB. SpaceX submitted a revised version of the request on November 5, 2015. This revised version of the application was deemed adequate and complete. Acoustic stimuli, including sonic booms (overpressure of high-energy impulsive sound), landing noise, and possible explosions, resulting from boost-back maneuvers and landings of the Falcon 9 First Stage have the potential to result in take, in the form of Level B harassment, of six species of pinnipeds.

Description of the Specified Activity

A detailed description of the Falcon 9 First Stage recovery project is provided in the Federal Register notice for the proposed IHA (81 FR 18574; March 31, 2016). Since that time, no changes have been made to the planned Falcon 9 First Stage recovery activities. Therefore, a detailed description is not provided here. Please refer to that Federal Register notice for the description of the specific activity.

Comments and Responses

A notice of NMFS's proposal to issue an IHA to SpaceX was published in the **Federal Register** on March 31, 2016 (81 FR 18574). That notice described, in detail, SpaceX's activity, the marine mammal species that may be affected by the activity, and the anticipated effects on marine mammals. During the 30-day public comment period, NMFS received comments from the Marine Mammal Commission. The Marine Mammal Commission recommended that NMFS issue the IHA, subject to inclusion of the proposed mitigation, monitoring, and reporting measures.

Description of Marine Mammals in the Area of the Specified Activity

There are six marine mammal species with expected occurrence in the project area (including at VAFB, on the NCI, and in the waters surrounding VAFB, the NCI and the contingency landing location) that are expected to be affected by the specified activities. These include the Steller sea lion (*Eumetopias jubatus*), northern fur seal (*Callorhinus ursinus*), northern elephant seal (*Mirounga angustirostris*), Guadalupe fur seal (*Arctocephalus townsendi*), California sea lion (*Zalophus californianus*), and Pacific harbor seal (*Phoca vitulina richardsi*). There are an additional 28 species of cetaceans with expected or possible occurrence in the

project area. However, despite the fact that the ranges of these cetacean species overlap spatially with SpaceX's planned activities, we have determined that none of the potential stressors associated with the planned activities (including exposure to debris strike, rocket fuel, and visual and acoustic stimuli, as described further in "Potential Effects of the Specified Activity on Marine Mammals") are likely to result in take of cetaceans. As we have concluded that the likelihood of a cetacean being taken incidentally as a result of SpaceX's planned activities is so low as to be discountable, cetaceans are not considered further in this authorization. Please see Table 3-1 in the IHA application for a complete list of species with expected or potential occurrence in the project area.

A detailed description of the of the species likely to be affected by the dock construction project, including brief introductions to the species and relevant stocks as well as available information regarding population trends and threats, and information regarding local occurrence, were provided in the Federal Register notice for the proposed IHA (81 FR 18574; March 31, 2016); since that time, we are not aware of any changes in the status of these species and stocks; therefore, detailed descriptions are not provided here. Please refer to that Federal Register notice for these descriptions. Please also refer to NMFS' website for generalized species accounts, at: *www.nmfs.noaa.gov/pr/species/mammals*.

Table 1 lists the marine mammal species with expected potential for occurrence in the vicinity of the project during the project timeframe that are likely to be affected by the specified activities, and summarizes key information regarding stock status and abundance. Please see NMFS' Stock Assessment Reports (SAR), available at *www.nmfs.noaa.gov/pr/sars*, for more detailed accounts of these stocks' status and abundance.

Table 1. Marine mammals expected to be present in the vicinity of the project location that are likely to be affected by the specified activities.

Species	Stock	ESA status/ MMPA status; Strategic (Y/N)[1]	Stock abundance[2]	Occurrence in Project Area
Order Carnivora – Superfamily Pinnipedia				
Family Otariidae (eared seals and sea lions)				
Steller sea lion	Eastern U.S. DPS	- / D; Y	60,131	Rare
California sea lion	U.S. stock	- / -; N	296,750	Common
Family Phocidae (earless seals)				
Harbor seal	California stock	- / -; N	30,968	Common
Northern elephant seal	California breeding stock	- / -; N	179,000	Common
Northern fur seal	California stock	- / -; N	12,844	Common
Guadalupe fur seal	n/a	T / D; Y	7,408[3]	Rare

[1]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 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]For certain stocks of pinnipeds, abundance estimates are based upon observations of animals (often pups) ashore multiplied by some correction factor derived from knowledge of the species (or similar species) life history to arrive at a best abundance estimate.

[3]Abundance estimate for this stock is greater than ten years old and is therefore not considered current. We nevertheless present the most recent abundance estimate, as this represents the best available information for use in this document.

Potential Effects of the Specified Activity on Marine Mammals

The effects of noise from sonic booms resulting from the Falcon 9 First Stage recovery project have the potential to result in behavioral harassment of marine mammals in the vicinity of the action area. The **Federal Register** notice for the proposed IHA (81 FR 18574; March 31, 2016) included a discussion of the effects of anthropogenic noise on marine mammals, therefore

that information is not repeated here; please refer to the **Federal Register** notice (81 FR 18574; March 31, 2016) for that information. No instances of hearing threshold shifts, injury, serious injury, or mortality are expected as a result of the Falcon 9 First Stage recovery activities.

Anticipated Effects on Marine Mammal Habitat

The main impact associated with the Falcon 9 First Stage recovery project would be temporarily elevated sound levels and the associated direct effects on marine mammals. We do not anticipate that the planned activities would result in any temporary or permanent effects on the habitats used by the marine mammals in the action area, including the food sources they use (i.e. fish and invertebrates). The project would not result in permanent impacts to habitats used directly by marine mammals, such as haulout sites and are unlikely to result in long term or permanent avoidance of the exposure areas or loss of habitat. The planned activities are also not expected to result in any reduction in foraging habitat or adverse impacts to marine mammal prey. This is discussed in greater detail in the Federal Register notice for the proposed IHA (81 FR 18574; March 31, 2016), therefore that information is not repeated here; please refer to that **Federal Register** notice for that information.

Mitigation Measures

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.

SpaceX's IHA application contains descriptions of the mitigation measures to be implemented during the specified activities in order to effect the least practicable adverse impact on the affected marine mammal species and stocks and their habitats. These mitigation measures include the following:

- Unless constrained by other factors including human safety or national security concerns, launches will be scheduled to avoid, whenever possible, boost-backs and landings during the harbor seal pupping season of March through June.

We have carefully evaluated SpaceX's planned mitigation and considered their likely effectiveness relative to implementation of similar mitigation measures in previously issued incidental take authorizations to determine whether they are likely to affect the least practicable impact on the affected marine mammal species and stocks and their habitat. Our evaluation of potential measures included consideration of the following factors in relation to one another:

(1) The manner in which, and the degree to which, the successful implementation of the measure is expected to minimize adverse impacts to marine mammals;

(2) The proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and

(3) The practicability of the measure for applicant implementation.

Any mitigation measure(s) we prescribe should be able to accomplish, have a reasonable likelihood of accomplishing (based on current science), or contribute to the accomplishment of one or more of the general goals listed below:

(1) Avoidance or minimization of injury or death of marine mammals wherever possible (goals 2, 3, and 4 may contribute to this goal).

(2) A reduction in the number (total number or number at biologically important time or location) of individual marine mammals exposed to stimuli expected to result in incidental take (this goal may contribute to 1, above, or to reducing takes by behavioral harassment only).

(3) A reduction in the number (total number or number at biologically important time or location) of times any individual marine mammal would be exposed to stimuli expected to result in incidental take (this goal may contribute to 1, above, or to reducing takes by behavioral harassment only).

(4) A reduction in the intensity of exposure to stimuli expected to result in incidental take (this goal may contribute to 1, above, or to reducing the severity of behavioral harassment only).

(5) Avoidance or minimization of adverse effects to marine mammal habitat, paying particular attention to the prey base, blockage or limitation of passage to or from biologically important areas, permanent destruction of habitat, or temporary disturbance of habitat during a biologically important time.

(6) For monitoring directly related to mitigation, an increase in the probability of detecting marine mammals, thus allowing for more effective implementation of the mitigation.

Based on our evaluation of SpaceX's planned measures, we have determined that the mitigation measures provide the means of effecting the least practicable impact on marine mammal species or stocks and their habitat.

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

incidental take 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 action area.

Any monitoring requirement we prescribe should accomplish one or more of the following general goals:

1. An increase in the probability of detecting marine mammals, both within defined zones of effect (thus allowing for more effective implementation of the mitigation) and in general to generate more data to contribute to the analyses mentioned below;

2. An increase in our understanding of how many marine mammals are likely to be exposed to stimuli that we associate with specific adverse effects, such as behavioral harassment or hearing threshold shifts;

3. An increase in our understanding of how marine mammals respond to stimuli expected to result in incidental take and how anticipated adverse effects on individuals may impact the population, stock, or species (specifically through effects on annual rates of recruitment or survival) through any of the following methods:

- Behavioral observations in the presence of stimuli compared to observations in the absence of stimuli (need to be able to accurately predict pertinent information, e.g., received level, distance from source);
- Physiological measurements in the presence of stimuli compared to observations in the absence of stimuli (need to be able to accurately predict pertinent information, e.g., received level, distance from source); and

- Distribution and/or abundance comparisons in times or areas with concentrated stimuli versus times or areas without stimuli.

4. An increased knowledge of the affected species; or

5. An increase in our understanding of the effectiveness of certain mitigation and monitoring measures.

SpaceX submitted a monitoring plan as part of their IHA application. SpaceX's marine mammal monitoring plan was created with input from NMFS and was based on similar plans that have been successfully implemented by other action proponents under previous authorizations for similar projects, specifically the USAF's monitoring of rocket launches from VAFB.

Monitoring protocols vary according to modeled sonic boom intensity and season. Sonic boom modeling will be performed prior to all boost-back events. PCBoom, a commercially available modeling program, or an acceptable substitute, will be used to model sonic booms. Launch parameters specific to each launch will be incorporated into each model. These include direction and trajectory, weight, length, engine thrust, engine plume drag, position versus time from initiating boost-back to additional engine burns, among other aspects. Various weather scenarios will be analyzed from NOAA weather records for the region, then run through the model. Among other factors, these will include the presence or absence of the jet stream, and if present, its direction, altitude and velocity. The type, altitude, and density of clouds will also be considered. From these data, the models will predict peak amplitudes and impact locations.

Marine Mammal Monitoring

Marine mammal monitoring procedures will consist of the following:

- Should sonic boom model results indicate that a peak overpressure of 1.0 psf or greater is likely to impact VAFB, then acoustic and biological monitoring at VAFB will be implemented.
- If it is determined that a sonic boom of 1.0 psf or greater is likely to impact one of the Northern Channel Islands between 1 March and 30 June; a sonic boom greater than 1.5 psf between 1 July and 30 September, and a sonic boom greater than 2.0 psf between 1 October and 28 February, then monitoring will be conducted at the haulout site closest to the predicted sonic boom impact area.
- Monitoring would commence at least 72 hours prior to the boost-back and continue until at least 48 hours after the event.
- Monitoring data collected would include multiple surveys each day that record the species; number of animals; general behavior; presence of pups; age class; gender; and reaction to booms or other natural or human-caused disturbances. Environmental conditions such as tide, wind speed, air temperature, and swell would also be recorded.
- If the boost-back is scheduled for daylight; video recording of pinnipeds would be conducted during the Falcon 9 First Stage recovery in order to collect data on reactions to noise.
- For launches during the harbor seal pupping season (March through June), follow-up surveys will be conducted within 2 weeks of the boost-back/landing.

Acoustic Monitoring

Acoustic measurements of the sonic boom created during boost-back at the monitoring location will be recorded to determine the overpressure level.

Reporting

SpaceX will submit a report within 90 days after each Falcon 9 First Stage recovery event that includes the following information:

- Summary of activity (including dates, times, and specific locations of Falcon 9 First Stage recovery activities)
- Summary of monitoring measures implemented
- Detailed monitoring results and a comprehensive summary addressing goals of monitoring plan, including:
    - Number, species, and any other relevant information regarding marine mammals observed and estimated exposed/taken during activities;
    - Description of the observed behaviors (in both presence and absence of activities);
    - Environmental conditions when observations were made; and
    - Assessment of the implementation and effectiveness of monitoring measures.

In addition to the above post-activity reports, a draft annual report will be submitted within 90 calendar days of the expiration of the IHA, or within 45 calendar days prior to the effective date of a subsequent IHA (if applicable). The annual report will summarize the information from the post-activity reports, including but not necessarily limited to: (a) numbers of pinnipeds present on the haulouts prior to commencement of Falcon 9 First Stage recovery activities; (b) numbers of pinnipeds that may have been harassed as noted by the number of pinnipeds estimated to have entered the water as a result of Falcon 9 First Stage recovery noise; (c) for pinnipeds that entered the water as a result of Falcon 9 First Stage recovery noise, the length of time(s) those pinnipeds remained off the haulout or rookery; and (d) any behavioral modifications by pinnipeds that likely were the result of stimuli associated with the planned activities.

In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner not authorized by the IHA, such as a Level A harassment, or a take of a marine mammal species other than those authorized, SpaceX would immediately cease the specified activities and immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources. The report would include the following information:

- Time, date, and location (latitude/longitude) of the incident;
- Description of the incident;
- Status of all Falcon 9 First Stage recovery activities in the 48 hours preceding the incident;
- Description of all marine mammal observations in the 48 hours preceding the incident;
- Species identification or description of the animal(s) involved;
- Fate of the animal(s); and
- Photographs or video footage of the animal(s) (if equipment is available).

Activities would not resume until NMFS is able to review the circumstances of the prohibited take. NMFS would work with SpaceX to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. SpaceX would not be able to resume their activities until notified by NMFS via letter, email, or telephone.

In the event that SpaceX discovers an injured or dead marine mammal, and the lead MMO determines the cause of the injury or death is unknown and the death is relatively recent (i.e., in less than a moderate state of decomposition), SpaceX would immediately report the

incident tomailto: the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and the NMFS West Coast Region Stranding Coordinator.

The report would include the same information identified in the paragraph above. Authorized activities would be able to continue while NMFS reviews the circumstances of the incident. NMFS would work with SpaceX to determine whether modifications in the activities are appropriate.

In the event that SpaceX discovers an injured or dead marine mammal, and the lead MMO determines 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, or scavenger damage), SpaceX would report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and NMFS West Coast Region Stranding Coordinator, within 24 hours of the discovery. SpaceX would provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS and the Marine Mammal Stranding Network.

Estimated Take by Incidental Harassment

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]."

All anticipated takes would be by Level B harassment only, resulting from noise associated with sonic booms and involving temporary changes in behavior. Estimates of the number of harbor seals, California sea lions, northern elephant seals, Steller sea lions, northern fur seals, and Guadalupe fur seals that may be harassed by the planned activities is based upon the number of potential events associated with Falcon 9 First Stage recovery activities (maximum six per year) and the average number of individuals of each species that are present in areas that will be exposed to the activities at levels that are expected to result in Level B harassment.

In order to estimate the potential incidents of take that may occur incidental to the specified activity, we must first estimate the extent of the sound field that may be produced by the activity and then incorporate information about marine mammal density or abundance in the project area. We first provide information on applicable thresholds for determining effects to marine mammals before describing the information used in estimating the sound fields, the available marine mammal density or abundance information, and the method of estimating potential incidences of take. It should be noted that estimates of Level B take described below are not necessarily estimates of the number of individual animals that are expected to be taken; a smaller number of individuals may accrue a number of incidences of harassment per individual than for each incidence to accrue to a new individual, especially if those individuals display some degree of residency or site fidelity and the impetus to use the site (e.g., because of foraging opportunities) is stronger than the deterrence presented by the harassing activity.

Sound Thresholds

Typically NMFS relies on the acoustic criteria shown in Table 2 to estimate the extent of take by Level A and/or Level B harassment that is expected as a result of an activity. If we relied on the acoustic criteria shown in Table 2, we would assume harbor seals exposed to airborne sound at levels at or above 90 dB rms re 20 µPa, and non-harbor seal pinnipeds exposed to airborne sound at levels at or above 100 dB rms re 20 µPa, would experience Level B harassment. However, in this case we have the benefit of more than 20 years of observational data on pinniped responses to the stimuli associated with the planned activities that we expect to result in harassment (sonic booms) in the particular geographic area of the planned activity (VAFB and the NCI). Therefore, we consider these data to be the best available information in regard to estimating take based on modeled exposures among pinnipeds to sounds associated with the planned activities. These data suggest that pinniped reactions to sonic booms are dependent on the species, the age of the animal, and the intensity of the sonic boom (see Table 3).

Table 2: NMFS Criteria for Acoustic Impacts to Marine Mammals

Criterion	Criterion Definition	Threshold
In-Water Acoustic Thresholds		
Level A	PTS (injury) conservatively based on TTS	190 dB_{rms} for pinnipeds 180 dB_{rms} for cetaceans
Level B	Behavioral disruption for impulsive noise	160 dB_{rms}
Level B	Behavioral disruption for non-pulse noise	120 dB_{rms}
In-Air Acoustic Thresholds		
Level A	PTS (injury) conservatively based on TTS	None established
Level B	Behavioral disruption for harbor seals	90 dB_{rms}
Level B	Behavioral disruption for non-harbor seal pinnipeds	100 dB_{rms}

As described above, data from launch monitoring by the USAF on the NCI and at VAFB have shown that pinniped reactions to sonic booms are correlated to the level of the sonic boom. Low energy sonic booms (< 1.0 psf) have resulted in little to no behavioral responses, including

head raising and briefly alerting but returning to normal behavior shortly after the stimulus. More powerful sonic booms have flushed animals from haulouts (but not resulted in any mortality or sustained decreased in numbers after the stimulus). Table 3 presents a summary of monitoring efforts at the NCI from 1999 to 2011. These data show that reactions to sonic booms tend to be insignificant below 1.0 psf and that, even above 1.0 psf, only a portion of the animals present react to the sonic boom. Therefore, for the purposes of estimating the extent of take that is likely to occur as a result of the planned activities, we assume that Level B harassment occurs when a pinniped (on land) is exposed to a sonic boom at or above 1.0 psf. Therefore the number of expected takes by Level B harassment is based on estimates of the numbers of animals that would be within the area exposed to sonic booms at levels at or above 1.0 psf.

Table 3. Pinniped Reactions to Sonic Booms at San Miguel Island

Launch Event	Sonic Boom Level (psf)	Location	Species & Associated Reaction
Athena II (27 April 1999)	1.0	Adams Cove	Calif. sea lion – 866 alerted; 232 flushed into water northern elephant seal – alerted but did not flush northern fur seal – alerted but did not flush
Athena II (24 September 1999)	0.95	Point Bennett	Calif. sea lion – 600 alerted; 12 flushed into water northern elephant seal – alerted but did not flush northern fur seal – alerted but did not flush
Delta II 20 (November 2000)	0.4	Point Bennett	Calif. sea lion – 60 flushed into water; no reaction from rest Northern elephant seal – no reaction
Atlas II (8 September 2001)	0.75	Cardwell Point	Calif. sea lion – no reaction northern elephant seal – no reaction harbor seal – 2 of 4 flushed into water
Delta II (11 February 2002)	0.64	Point Bennett	Calif. sea lion– no reaction northern fur seal – no reaction northern elephant seal – no reaction
Atlas II (2 December 2003)	0.88	Point Bennett	Calif. sea lion – 40% alerted; several flushed to water northern elephant seal – no reaction
Delta II (15 July 2004)	1.34	Adams Cove	Calif. sea lion – 10% alerted
Atlas V (13 March 2008)	1.24	Cardwell Point	northern elephant seal – no reaction
Delta II (5 May 2009)	0.76	West of Judith	Calif. sea lion – no reaction

		Rock	
Atlas V (14 April 2011)	1.01	Cuyler Harbor	northern elephant seal – no reaction
Atlas V (3 April 2014)	0.74	Cardwell Point	harbor seal – 1 of ~25 flushed into water; no reaction from others
Atlas V (12 December 2014)	1.16	Point Bennett	Calif. sea lion – 5 of ~225 alerted; none flushed

The data recorded by USAF at VAFB and the NCI over the past 20 years has also shown that pinniped reactions to sonic booms vary between species. As described above, little or no reaction has been observed in harbor seals, California sea lions, northern fur seals and northern elephant seals when overpressures were below 1.0 psf (data on responses among Steller sea lions and Guadalupe fur seals is not available). At the NCI sea lions have reacted more strongly to sonic booms than most other species. Harbor seals also appear to be more sensitive to sonic booms than most other pinnipeds, often resulting in startling and fleeing into the water. Northern fur seals generally show little or no reaction, and northern elephant seals generally exhibit no reaction at all, except perhaps a heads-up response or some stirring, especially if sea lions in the same area mingled with the elephant seals react strongly to the boom. No data is available on Steller sea lion or Guadalupe fur seal responses to sonic booms.

Exposure Area

As described above, SpaceX performed acoustic modeling to estimate overpressure levels that would be created during the return flight of the Falcon 9 First Stage (Wyle, Inc. 2015). The predicted acoustic footprint of the sonic boom was computed using the computer program PCBoom (Plotkin and Grandi 2002; Page et al. 2010). Modeling was performed for a landing at VAFB and separately for a contingency barge landing (see Figures 2-1, 2-2, 2-3 and 2-4 in the IHA application).

The model results predicted that sonic overpressures would reach up to 2.0 pounds psf in the immediate area around SLC-4W (see Figures 2-1 and 2-2 in the IHA application) and an overpressure between 1.0 and 2.0 psf would impact the coastline of VAFB from approximately 8 km north of SLC-4W to approximately 18 km southeast of SLC-4W see (Figures 2-1 and 2-2 in the IHA application). A substantially larger area, including the mainland, the Pacific Ocean, and the NCI would experience an overpressure between 0.1 and 1.0 psf (see Figure 2-1 in the IHA application). In addition, San Miguel Island and Santa Rosa Island may experience an overpressure up to 3.1 psf and the west end of Santa Cruz Island may experience an overpressure up to 1.0 psf (see Figures 2-1 and 2-3 in the IHA application). During a contingency barge landing event, an overpressure of up to 2.0 psf would impact the Pacific Ocean at the contingency landing location approximately 50 km offshore of VAFB. San Miguel Island and Santa Rosa Island would experience a sonic boom between 0.1 and 0.2 psf, while sonic boom overpressures on the mainland would be between 0.2 and 0.4 psf.

SpaceX assumes that actual sonic booms that occur during the planned activities will vary slightly from the modeled sonic booms; therefore, when estimating take based on areas anticipated to be impacted by sonic booms at or above 1.0 psf, haulouts within approximately 8.0 km (5 miles) of modeled contour lines for sonic booms at or above 1.0 psf were included to be conservative. Therefore, in estimating take for a VAFB landing, haulouts were included from the areas of Point Arguello and Point Conception, all of San Miguel Island, the north western half of Santa Rosa Island, and northwestern quarter of Santa Cruz Island (see Figure 2-2 and 2-3 in the IHA application). For a contingency landing event, sonic booms are far enough offshore so that only haulouts along the northwestern edge of San Miguel Island may be exposed to a 1.0 psf or

greater sonic boom (see Figure 2-4 in the IHA application). As modeling indicates that substantially more haulouts would be impacted by a sonic boom at or above 1.0 psf in the event of a landing at VAFB versus a landing at the contingency landing location, estimated takes are substantially higher in the event of a VAFB landing versus a barge landing.

Description of Take Calculation

The take calculations presented here rely on the best data currently available for marine mammal populations in the project location. Data collected from marine mammal surveys represent the best available information on the occurrence of the six pinniped species in the project area. The quality of information available on pinniped abundance in the project area is varies depending on species; some species, such as California sea lions, are surveyed regularly at VAFB and the NCI, while for others, such as northern fur seals, survey data is largely lacking. See Table 4 for total estimated incidents of take. Take estimates were based on "worst case scenario" assumptions, as follows:

- All six Falcon 9 First Stage recovery actions are assumed to result in landings at VAFB, with no landings occurring at the contingency barge landing location. This is a conservative assumption as sonic boom modeling indicates landings at VAFB are expected to result in a greater number of exposures to sound resulting in Level B harassment than would be expected for landings at the contingency landing location offshore. Some landings may ultimately occur at the contingency landing location; however, the number of landings at each location is not known in advance.
- All pinnipeds estimated to be in areas ensonified by sonic booms at or above 1.0 psf are assumed to be hauled out at the time the sonic boom occurs. This assumption is conservative as some animals may in fact be in the water with heads submerged when a sonic boom occurs and would therefore not be exposed to the sonic boom at a level that would result in Level B harassment.

- Actual sonic booms that occur during the planned activities are assumed to vary slightly from the modeled sonic booms; therefore, when estimating take based on areas expected to be impacted by sonic booms at or above 1.0 psf, an additional buffer of 8.0 km (5 miles) was added to modeled sonic boom contour lines. Thus haulouts that are within approximately 8.0 km (5 miles) of modeled sonic booms at 1.0 psf and above were included in the take estimate. This is a conservative assumption as it expands the area of ensonification that would be expected to result in Level B harassment.

California sea lion – California sea lions are common offshore of VAFB and haul out on rocks and beaches along the coastline of VAFB, though pupping rarely occurs on the VAFB coastline. They haulout in large numbers on the NCI and rookeries exist on San Miguel and Santa Cruz islands. Based on modeling of sonic booms from Falcon 9 First Stage recovery activities, Level B harassment of California sea lions is expected to occur both at VAFB and at the NCI. Estimated take of California sea lions at VAFB was calculated using the largest count totals from monthly surveys of VAFB haulout sites from 2013-2015. These data were compared to the modeled sonic boom profiles. Counts from haulouts that were within the area expected to be ensonified by a sonic boom above 1.0 psf, plus the buffer of 8km as described above, were included in take estimates; those haulouts outside the area expected to be ensonified by a sonic boom above 1.0 psf, plus the buffer of 8 km, were not included in the take estimate. The estimated number of California sea lion takes on the NCI and at Point Conception was derived from aerial survey data collected from 2002 to 2012 by the NOAA Southwest Fishery Science Center (SWFSC). The estimates are based on the largest number of individuals observed in the count blocks that fall within the area expected to be ensonified by a sonic boom above 1.0 psf plus a radius of 8 km, based on sonic boom modeling. Estimates of Level B harassment for California sea lions are shown in Table 4.

Harbor Seal – Pacific harbor seals are the most common marine mammal inhabiting VAFB, congregating on several rocky haul-out sites along the VAFB coastline. They also haul out, breed, and pup in isolated beaches and coves throughout the coasts of the NCI. Based on modeling of sonic booms from Falcon 9 First Stage recovery activities, Level B harassment of harbor seals is expected to occur both at VAFB and at the NCI. Estimated take of harbor seals at VAFB was calculated using the largest count totals from monthly surveys of VAFB haulout sites from 2013-2015. These data were compared to the modeled sonic boom profiles. Counts from haulouts that were within the area expected to be ensonified by a sonic boom above 1.0 psf plus a radius of 8 km were included in take estimates; those haulouts outside the area expected to be ensonified by a sonic boom above 1.0 psf plus a radius of 8 km were not included in the take estimate. The estimated number of harbor seal takes on the NCI and at Point Conception was derived from aerial survey data collected from 2002 to 2012 by the NOAA SWFSC.
The estimates are based on the largest number of individuals observed in the count blocks that fall within the area expected to be ensonified by a sonic boom above 1.0 psf plus a radius of 8 km, based on sonic boom modeling.

It should be noted that total take estimates shown in Table 4 represent incidents of exposure to sound resulting in Level B harassment from the planned activities, and not estimates of the number of individual harbor seals exposed. As described above, harbor seals display a high degree of site fidelity to their preferred haulout sites, and are non-migratory, rarely traveling more than 50 km from their haulout sites. Thus, while the estimated abundance of the California stock of Pacific harbor seals is 30,968 (Carretta et al. 2015), a substantially smaller number of individual harbor seals is expected to occur within the project area. The number of harbor seals

expected to be taken by Level B harassment, per Falcon 9 First Stage recovery action, is 2,157 (Table 4). We expect that, because of harbor seals' site fidelity to haulout locations at VAFB and the NCI, and because of their limited ranges, the same individuals are likely to be taken repeatedly over the course of the planned activities (six Falcon 9 First Stage recovery actions). Estimates of Level B harassment for harbor seals are shown in Table 4.

Steller Sea Lion – Steller sea lions occur in small numbers at VAFB (maximum 16 individuals observed at any time) and on San Miguel Island (maximum 4 individuals recorded at any time). They have not been observed on the Channel Islands other than San Miguel Island and they not currently have rookeries on the NCI or at VAFB. Estimated take of Steller sea lions at VAFB was calculated using the largest count totals from monthly surveys of VAFB from 2013-2015. These data were compared to the modeled sonic boom profiles. Counts from haulouts that were within the area expected to be ensonified by a sonic boom above 1.0 psf plus a radius of 8 km were included in take estimates; those haulouts outside the area expected to be ensonified by a sonic boom above 1.0 psf plus a radius of 8 km were not included in the take estimate. Estimates of Level B harassment for Steller sea lions are shown in Table 4.

Northern elephant seal – Northern elephant seals haul out sporadically on rocks and beaches along the coastline of VAFB and at Point Conception, but they do not currently breed or pup at VAFB or at Point Conception. Northern elephant seals have rookeries on San Miguel Island and Santa Rosa Island. They are rarely seen on Santa Cruz Island and Anacapa Island. Based on modeling of sonic booms from Falcon 9 First Stage recovery activities, Level B harassment of northern elephant seals is expected to occur both at VAFB and at the NCI.

Estimated take of northern elephant seals at VAFB was calculated using the largest count totals from monthly surveys of VAFB haulout sites from 2013-2015. These data were compared to the modeled sonic boom profiles. Counts from haulouts that were within the area expected to be ensonified by a sonic boom above 1.0 psf plus a radius of 8 km were included in take estimates; those haulouts outside the area expected to be ensonified by a sonic boom above 1.0 psf plus a radius of 8 km were not included in the take estimate. The estimated number of northern elephant seal takes on the NCI and at Point Conception was derived from aerial survey data collected from 2002 to 2012 by the NOAA SWFSC. The estimates are based on the largest number of individuals observed in the count blocks that fall within the area expected to be ensonified by a sonic boom above 1.0 psf plus a radius of 8 km, based on sonic boom modeling.

As described above, monitoring data has shown that reactions to sonic booms among pinnipeds vary between species, with northern elephant seals consistently showing little or no reaction (Table 3). USAF launch monitoring data shows that northern elephant seals have never been observed responding to sonic booms. No elephant seal has been observed flushing to the water in response to a sonic boom. Because of the data showing that elephant seals consistently show little to no reaction to the sonic booms, we conservatively estimate that 10 percent of northern elephant seal exposures to sonic booms at or above 1.0 psf will result in Level B harassment. Estimates of Level B harassment for northern elephant seals are shown in Table 4. Note that the take estimate for northern elephant seals shown in Table 4 has been revised from the take estimate in the proposed IHA.

Northern fur seal – Northern fur seals have rookeries on San Miguel Island, the only island in the NCI on which they have been observed. No haulout or rookery sites exist for

northern fur seals at VAFB or on the mainland coast, thus take from sonic booms is only expected on San Miguel Island and not on the mainland. Comprehensive count data for northern fur seals on San Miguel Island are not available. Estimated take of northern fur seals was derived from northern fur seals pup and bull census data (Testa 2013), and personal communications with subject matter experts based at the NMFS National Marine Mammal Laboratory. Northern fur seal abundance on San Miguel Island varies substantially depending on the season, with a maximum of 6,000-8,000 seals hauled out on the western end of the island and at Castle Rock (~1 km northwest of San Miguel Island) during peak pupping season in July; the number of seals on San Miguel Island then decreases steadily from August until November, when very few seals are present. The number of seals on the island does not begin to increase again until the following June (pers. comm., T. Orr, NMFS NMML, to J. Carduner, NMFS, 2/27/16). As the dates of Falcon 9 First Stage recovery activities are not known, the activities could occur when the maximum number or the minimum number of fur seals is present, depending on season. We therefore estimated an average of 5,000 northern fur seals would be present in the area affected by sonic booms above 1.0 psf.

As described above, monitoring data has shown that reactions to sonic booms among pinnipeds vary between species, with northern fur seals consistently showing little or no reaction (Table 3). As described above, launch monitoring data shows that northern fur seals sometimes alert to sonic booms but have never been observed flushing to the water in response to sonic booms. Because of the data showing that fur seals consistently show little to no reaction to sonic booms, we conservatively estimate that 10 percent of northern fur seal exposures to sonic booms

at or above 1.0 psf will result in Level B harassment. Estimates of Level B harassment for northern fur seals are shown in Table 4.

Guadalupe fur seal – There are estimated to be approximately 20-25 individual Guadalupe fur seals that have fidelity to San Miguel Island. The highest number of individuals observed at any one time on San Miguel Island is thirteen. No haul-out or rookery sites exist for Guadalupe fur seals on the mainland coast, including VAFB. Comprehensive survey data on Guadalupe fur seals in the NCI is not readily available. Though we are aware of no data on Guadalupe fur seal responses to sonic booms, because of the data showing that northern fur seals consistently show little to no reaction to sonic booms, we conservatively estimate that 10 percent of Guadalupe fur seal exposures to sonic booms at or above 1.0 psf will result in Level B harassment. The estimated number of takes of Guadalupe fur seals was based the maximum number of Guadalupe fur seals observed at any one time on San Miguel Island (pers. comm., J. LaBonte, ManTech, to J. Carduner, NMFS, Feb 29, 2016). Estimates of Level B harassment for Guadalupe fur seals are shown in Table 4. Note that the take estimate for Guadalupe fur seals shown in Table 4 has been revised from the take estimate in the proposed IHA.

As described above, the take estimates shown in Table 4 are considered reasonable estimates of the number of marine mammal exposures to sound resulting in Level B harassment that are likely to occur over the course of the project, and not necessarily the number of individual animals exposed.

Table 4. Number of Incidental Takes of Marine Mammals, and Percentage of Stock Abundance, As a Result of the Planned Activities.

Species	Geographic Location	Estimated takes per Falcon 9 First Stage	Total estimated takes over the duration of	Percentage of stock abundance

		recovery action	the IHA^	estimated taken
Harbor Seal	VAFB[a]	366	12,942	7%*
	Pt. Conception[b]	488		
	San Miguel Island[b]	752		
	Santa Rosa Island[b]	412		
	Santa Cruz Island[b]	139		
California Sea Lion	VAFB[a]	416	56,496	19%
	Pt. Conception	n/a		
	San Miguel Island[c]	9,000		
	Santa Rosa Island[c]			
	Santa Cruz Island[c]			
Northern Elephant Seal	VAFB[a]	19	1,020	0.5%
	Pt. Conception[d]	1		
	San Miguel Island[c]	150		
	Santa Rosa Island[c]			
	Santa Cruz Island[c]			
Steller Sea Lion	VAFB[a]	16	120	0.2%
	Pt. Conception	n/a		
	San Miguel Island	4		
	Santa Rosa Island	n/a		
	Santa Cruz Island	n/a		
Northern Fur Seal	VAFB	n/a	3,000	23%
	Pt. Conception	n/a		
	San Miguel Island[c]	500		
	Santa Rosa Island	n/a		
	Santa Cruz Island	n/a		
Guadalupe Fur Seal	VAFB	n/a	6	0.1%
	Pt. Conception	n/a		
	San Miguel Island[e]	1		
	Santa Rosa Island	n/a		
	Santa Cruz Island	n/a		

[a] VAFB monthly marine mammal survey data 2013-2015 (ManTech SRS Technologies, Inc. 2014, 2015 and VAFB, unpubl. data).
[b] NOAA Fisheries aerial survey data June 2002 and May 2004 (M. Lowry, NOAA Fisheries, unpubl. data).
[c] Testa 2013; USAF 2013; pers. comm., T. Orr, NMFS NMML, to J. Carduner, NMFS, Feb 27, 2016
[d] NOAA Fisheries aerial survey data February 2010 (M. Lowry, NOAA Fisheries, unpubl. data).
[e] DeLong and Melin 2000; J. Harris, NOAA Fisheries, pers. comm.
^ Based on six Falcon 9 First Stage recovery actions, with SLC-4W landings, per year.
* For harbor seals, estimated percentage of stock abundance taken is based on estimated number of individuals taken versus estimated total exposures.

Analyses and Determinations

Negligible Impact Analysis

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." 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 Level B harassment 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 behavioral harassment, we consider 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 the number and nature of estimated Level A harassment takes, the number of estimated mortalities, and effects on habitat.

To avoid repetition, the discussion of our analyses applies to all the species listed in Table 4, given that the anticipated effects of this activity on these different marine mammal stocks are expected to be similar. There is no information about the nature or severity of the impacts, or the size, status, or structure of any of these species or stocks that would lead to a different analysis for this activity.

Activities associated with the Falcon 9 First Stage recovery 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) only, from in-air sounds generated from sonic booms. Potential takes could occur if marine mammals are hauled out in areas where a sonic boom above 1.0 psf occurs, which is considered likely given the modeled acoustic footprint of the planned activities and the occurrence of pinnipeds in

the project area. Effects on individuals that are taken by Level B harassment, on the basis of reports in the literature as well as monitoring from similar activities that have received incidental take authorizations from NMFS, will likely be limited to reactions such as alerting to the noise, with some animals possibly moving toward or entering the water, depending on the species and the psf associated with the sonic boom. Repeated exposures of individuals to levels of sound that may cause Level B harassment are unlikely to result in hearing impairment or to significantly disrupt foraging behavior. In addition, it is expected that exposures of individuals to levels of sound that may cause Level B harassment will be very brief (a few seconds) and very infrequent (six total over the course of the Authorization). 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 to those individuals, and thus would not result in any adverse impact to the stock as a whole. Level B harassment will be reduced to the level of least practicable impact through use of mitigation measures described above.

If a marine mammal responds to a stimulus by changing its behavior (e.g., through relatively minor changes in locomotion direction/speed), 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 or on the stock or species could potentially be significant (e.g., Lusseau and Bejder, 2007; Weilgart, 2007). Flushing of pinnipeds into the water has the potential to result in mother-pup separation, or could result in stampede, either of which could potentially result in serious injury or mortality and thereby could potentially impact the stock or species. However, based the best available information, which in this case is over 20

years of monitoring data from the project location as described below, no serious injury or mortality of marine mammals is anticipated as a result of the planned activities.

Even in the instances of pinnipeds being behaviorally disturbed by sonic booms from rocket launches at VAFB, no evidence has been presented of abnormal behavior, injuries or mortalities, or pup abandonment as a result of sonic booms (SAIC 2013). These findings came as a result of more than two decades of surveys at VAFB and the NCI (MMCG and SAIC, 2012). Post-launch monitoring generally reveals a return to normal patterns within minutes up to an hour or two of each launch, regardless of species. For instance, eight space vehicle launches occurred from north VAFB, near the Spur Road and Purisima Point haul-out sites, during the period 7 February 2009 through 6 February 2014. Of these eight Delta II and Taurus launches, three occurred during the harbor seal pupping season. The continued use of the Spur Road and Purisima Point haulout sites indicates that it is unlikely that these rocket launches (and associated sonic booms) resulted in long-term disturbances of pinnipeds using the haulout sites. Moreover, adverse cumulative impacts from launches were not observed at this site. San Miguel Island represents the most important pinniped rookery in the lower 48 states, and as such extensive research has been conducted there for decades. From this research, as well as stock assessment reports, it is clear that VAFB operations (including associated sonic booms) have not had any significant impacts on San Miguel Island rookeries and haulouts (SAIC 2012). Based on this extensive record, we believe the likelihood of serious injury or mortality of any marine mammal as a result of the planned activities is so low as to be discountable. Thus we do not anticipate Level A harassment will occur as a result of the planned activities and we do not authorize take in the form of Level A harassment.

The activities analyzed here are substantially similar to other activities that have received MMPA incidental take authorizations previously, including Letters of Authorization for USAF launches of space launch vehicles at VAFB, which have occurred for over 20 years with no reported injuries or mortalities to marine mammals, and no known long-term adverse consequences to marine mammals from behavioral harassment. As described above, several cetacean species occur within the project area, however no cetaceans are expected to be affected by the planned activities.

In summary, this negligible impact analysis is founded on the following factors:

1. The possibility of injury, serious injury, or mortality may reasonably be considered discountable;
2. The anticipated incidences of Level B harassment consist of, at worst, temporary modifications in behavior (i.e., short distance movements and occasional flushing into the water with return to haulouts within at most two days), which are not expected to adversely affect the fitness of any individuals;
3. The considerable evidence, based on over 20 years of monitoring data, suggesting no long-term changes in the use by pinnipeds of rookeries and haulouts in the project area as a result of sonic booms; and
4. The presumed efficacy of planned mitigation measures in reducing the effects of the specified activity to the level of least practicable impact.

In combination, we believe that these factors, as well as the available body of evidence from other similar activities, demonstrate that the potential effects of the specified activity will be short-term on individual animals. Though the project area does represent an important pupping area for several species that may be taken, the specified activity is not expected to impact rates of recruitment or survival and will therefore not result in population-level impacts. 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 monitoring

and mitigation measures, we find that the total marine mammal take from SpaceX's Falcon 9 First Stage recovery activities will have a negligible impact on the affected marine mammal species or stocks.

Small Numbers Analysis

The numbers of authorized takes would be considered small relative to the relevant stocks or populations (23 percent for northern fur seals; 19 percent for California sea lions; 7 percent for Pacific harbor seals; less than 1 percent each for northern elephant seals, Guadalupe fur seals and Steller sea lions). But, it is important to note that the number of expected takes does not necessarily represent of the number of individual animals expected to be taken. Our small numbers analysis accounts for this fact. Multiple exposures to Level B harassment can accrue to the same individuals over the course of an activity that occurs multiple times in the same area (such as SpaceX's planned activity). This is especially likely in the case of species that have limited ranges and that have site fidelity to a location within the project area, as is the case with Pacific harbor seals.

As described above, harbor seals are non-migratory, rarely traveling more than 50 km from their haul-out sites. Thus, while the estimated abundance of the California stock of Pacific harbor seals is 30,968 (Carretta *et al*. 2015), a substantially smaller number of individual harbor seals is expected to occur within the project area. We expect that, because of harbor seals' site fidelity to locations at VAFB and the NCI, and because of their limited ranges, the same individuals are likely to be taken repeatedly over the course of the planned activities (maximum of six Falcon 9 First Stage recovery actions). Therefore the number of exposures to Level B harassment over the course of the authorization (the total number of takes shown in Table 4) is

expected to accrue to a much smaller number of individuals. The maximum number of harbor seals expected to be taken by Level B harassment, per Falcon 9 First Stage recovery action, is 2,157. As we believe the same individuals are likely to be taken repeatedly over the course of the planned activities, we use the estimate of 2,157 individual animals taken per Falcon 9 First Stage recovery activity for the purposes of estimating the percentage of the stock abundance likely to be taken.

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 mitigation and monitoring measures, we find that small numbers of marine mammals will be taken relative to the populations of the affected species or stocks.

Impact on Availability of Affected Species for Taking for Subsistence Uses

Potential impacts resulting from the planned activities will be limited to individuals of marine mammal species located in areas that have no subsistence requirements. Therefore, no impacts on the availability of marine mammal species or stocks for subsistence use are expected.

National Environmental Policy Act (NEPA)

In compliance with the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*), as implemented by the regulations published by the Council on Environmental Quality (40 CFR parts 1500-1508), the USAF prepared an Environmental Assessment (EA) to consider the direct, indirect and cumulative effects to the human environment resulting from the Falcon 9 First Stage recovery project. NMFS made the USAF's EA available to the public for review and comment, concurrently with the publication of the proposed IHA, on the NMFS web site (at *www.nmfs.noaa.gov/pr/permits/incidental/),* in relation to its suitability for adoption by NMFS in

order to assess the impacts to the human environment of issuance of an IHA to SpaceX. Also in compliance with NEPA and the CEQ regulations, as well as NOAA Administrative Order 216-6, NMFS has reviewed the USAF's EA, determined it to be sufficient, and adopted that EA and signed a Finding of No Significant Impact (FONSI) on May 6, 2016.

Endangered Species Act (ESA)

There is one marine mammal species (Guadalupe fur seal) listed under the ESA with confirmed occurrence in the area expected to be impacted by the planned activities. The NMFS West Coast Region Protected Resources Division has determined that the NMFS Permits and Conservation Division's authorization of SpaceX's Falcon 9 First Stage recovery activities are not likely to adversely affect the Guadalupe fur seal. Therefore, formal ESA section 7 consultation on this authorization is not required.

Authorization

NMFS has issued an IHA to SpaceX for the potential harassment of small numbers of six

marine mammal species incidental to the Falcon 9 First Stage recovery project in California and in the Pacific Ocean offshore California, provided the previously mentioned mitigation.

Dated: May 25, 2016.

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Perry Gayaldo,

Deputy Director,

Office of Protected Resources,

National Marine Fisheries Service.

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