

CALIFORNIA COASTAL COMMISSION

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STAFF REPORT: REGULAR CALENDAR

Consistency Determination No. **CD-0003-24**

Applicant: Department of the Air Force – U.S. Space Force

Location: Vandenberg Space Force Base (VSFB), Santa Barbara County

Project Description: Increase in Space Exploration Technologies Corporation's (SpaceX) Falcon 9 launch activities at VSFB from six to 36 per year as well as the addition of offshore landing locations in the Pacific Ocean.

Staff Recommendation: Concurrence

SUMMARY OF STAFF RECOMMENDATION

On May 5, 2023, the Executive Director of the Commission concurred¹ with a negative determination (Negative Determination No. ND-0009-23) by the Department of the Air Force (DAF), U.S. Space Force for the proposed expansion of the Space Exploration Technologies Corporation's (SpaceX) Falcon 9 space program. The SpaceX program's expansion included increasing launch activities from an existing launch complex at Vandenberg Space Force Base (VSFB) from six to 36 per year as well as carrying out

¹ The Energy, Ocean Resources and Federal Consistency Deputy Director reported the concurrence at the June 2023 Commission hearing.

up to 12 landings per year of the rocket's first stage at a second existing launch complex at VSFB, associated payload and rocket processing activities and the addition of offshore landing locations in the Pacific Ocean.

Shortly after the Executive Director's concurrence with DAF's ND-0009-23, Commission staff learned through discussions with staff from Santa Barbara County's Parks and Recreation Department that the number of temporary closures and evacuations of the beach and campground at Jalama Beach due to SpaceX launches within the first seven months of the year had already surpassed the annual maximum that DAF committed not to exceed in its negative determination. Further, Commission staff learned that public coastal access and recreation at Jalama Beach was being affected by more than just the temporary closure and evacuation of the beach and campground.

These adverse impacts to public coastal access and recreation were not described or evaluated by DAF in its negative determination, and thus were also not considered by the Executive Director before issuing her concurrence. In addition, as noted by DAF in its negative determination and confirmed through review of publicly available SpaceX launch records by Commission staff, SpaceX carried out at least 13 launches from VSFB in 2022, more than double the six previously considered and concurred with by the Executive Director in a prior negative determination.

Commission and DAF staff worked collaboratively to understand and develop and approach to resolve these issues and, consistent with that approach, on December 15, 2023, the Commission approved a resolution² "re-opening" the Executive Director's prior concurrence,³ finding that the original negative declaration made by DAF for the subject SpaceX launch activity was no longer applicable to the project as it was being carried out. Approval of that resolution also authorized the Executive Director to prepare and send a letter to DAF requesting remedial actions, including preparation and submittal of a consistency determination for Commission review, to resolve the situation and help ensure launch activities by SpaceX are carried out consistent with the enforceable policies of the CCMP (**Exhibit 9**). As reflected in the testimony provided by DAF staff at the Commission's December 15 public meeting, DAF supported this approach.

After receiving notification of the Commission's action to "re-open" the Executive Director's prior concurrence and receiving the Executive Director's letter requesting remedial actions, DAF prepared and submitted a consistency determination (CD) on March 7, 2024.

² This was presented to the Commission at the December 2023 Commission hearing.

³ Under the Coastal Zone Management Act's federal consistency regulations, 15 CFR § 930.45, federal consistency review may be revisited in several circumstances, including where a project was "Previously determined not to be a Federal agency activity affecting any coastal use or resource, but which the State agency later maintains is being conducted or is having an effect on any coastal use or resource substantially different than originally described and, as a result, the activity affects any coastal use or resource and is not consistent to the maximum extent practicable with the enforceable policies of the management program."

The project as described in the CD includes increasing launch activities from an existing launch complex at VSFB from six to 36 per year as well as carrying out up to 12 landings per year of the rocket's first stage at a second existing launch complex at VSFB, associated payload and rocket processing activities and the addition of offshore landing locations in the Pacific Ocean. It also includes measures to offset the adverse impacts to access and recreation that have been occurring.

The project has the potential to result in a variety of effects on California coastal resources, including through the release of debris into the ocean and disturbance to sensitive species due to elevated sound levels.

With respect to marine debris, the proposed project includes two sources: weather balloons and the "first stage" and "fairings" sections of the rockets. Up to 36 weather balloons would be released prior to each launch to measure upper atmosphere conditions and would then fall to the ocean below in state or federal waters. Due to the height it would fall from and large ocean area it may land in, DAF has stated that it would not be feasible to recover each weather balloon and associated instrument array. DAF has therefore committed to ensure that SpaceX provide a monetary donation to UC Davis' California Lost Fishing Gear Recovery Project to offset this source of marine debris through the recovery of lost and abandoned fishing nets and other gear.

The project would also expose sensitive species to elevated sound levels from launches. DAF has conducted extensive monitoring across VSFB over the past two decades to understand wildlife responses to launch activity and, to date, has found that no adverse impacts have occurred and that significant wildlife populations continue to be present at VSFB despite periodic launch events and elevated sound levels.

However, the proposed project represents a sharp increase in the frequency of launches on VSFB compared to the historic number of launches carried out there and it remains uncertain if and how this increased launch cadence affects sensitive wildlife species. To demonstrate that adverse impacts to sensitive wildlife and habitats continue to be absent and that the increased launch frequency remains compatible with the continued use of environmentally sensitive habitat areas (ESHA) near the launch and landing complexes, DAF will implement an enhanced monitoring program focused on the sensitive species and habitats most likely to be found in those areas. This includes the California reg-legged frog, western snowy plover, California least tern, marine mammal haul-out areas, and two species of bat designated by the California Department of Fish and Wildlife as state Species of Special Concern. The proposed monitoring programs were developed in coordination with the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS) and scientific experts from Bat Conservation International.

The proposed project also has the potential to affect commercial and recreational fishing activities through notices to mariners (NOTMARs) advising fishers to avoid fishing grounds off the coast of VSFB before and during launch and landing activities. To minimize adverse impacts to fishing, DAF and SpaceX have committed to establishing a communication protocol and regular dialogue with the commercial and

recreational fishing industry in the area. Prior to each planned launch, DAF and SpaceX would provide NOTMARs indicating the date and time of the launch and any hazardous areas that should be avoided. DAF and SpaceX have also committed to additional coordination with fishermen, including real-time radio communications on the day of the launches.

Finally, the proposed project is one of several projects proposing increased launch frequency at VSFB, raising the potential for cumulative impacts. The average launch frequency at VSFB has been 6.2 launches annually over the past five years, although DAF has authorized private launch companies to, collectively, conduct up to 169 space launches annually, over three per week. In addition to the 36 launches annually proposed under this project, the Commission recently concurred with a CD from DAF for launches at a new launch complex to be constructed and operated by Phantom Space Corporation (Phantom) that will allow up to 48 launches and 48 engine fire tests annually (Consistency Determination No. CD-0010-22). To address concerns about overall launch frequency and negative impacts to sensitive wildlife at and around VSFB, DAF committed as part of that project to come back to the Executive Director in five years, before the full launch frequency starts, to report on the findings of their base-wide environmental monitoring. USFWS noted in its Biological Opinion for that project how the rapid increase in launch frequency at VSFB represents a novel impact, and emphasized that sufficient annual monitoring data and statistical analysis is needed in order to fully assess how species may be reacting to the increase in the number of launches. Due to the nature of the species and monitoring program and the increasing frequency of launches, some of these reactions may take several years to observe and record. DAF has reiterated this commitment as part of the SpaceX launch program currently being considered and shortened the reporting frequency to every year (rather than five years). Because SpaceX has already been operating at the increased launch frequency⁴, the first of these annual reports would be provided in June of 2024. Initial review of preliminary data being compiled for this report appears to indicate that a higher level of wildlife disturbance is occurring but a causal link to population declines or habitat abandonment has not been demonstrated.

With implementation of DAF's monitoring and reporting commitments, staff recommends that the Commission **concur** with DAF consistency determination No. CD-0003-24 and find the proposed project consistent with the enforceable policies of the California Coastal Management Program. The motion to concur is on **page 6**.

⁴ SpaceX carried out 13 launches in 2022, 28 in 2023 and has completed 11 so far in 2024. These are in addition to 8, 8, and 0 carried out by other space launch operators in 2022, 2023 and 2024, respectively.

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I. FEDERAL AGENCY’S CONSISTENCY DETERMINATION

Space Launch Delta 30 of the Department of the Air Force (DAF), United States Space Force, has determined the project is consistent to the maximum extent practicable with the California Coastal Management Program (CCMP).

II. MOTION AND RESOLUTION

Motion:

*I move that the Commission **concur** with Consistency Determination CD-0003-24 on the grounds that the project described therein would be fully consistent, and thus consistent to the maximum extent practicable, with the enforceable policies of the CCMP.*

Staff recommends a **YES** vote on the forgoing motion. Passage of this motion will result in a concurrence with the determination of consistency, and adoption of the following resolution and findings. An affirmative vote of a majority of the Commissioners present is required to pass the motion.

Resolution:

*The Commission hereby **concurs** with Consistency Determination CD-0003-24 on the grounds that the project is fully consistent, and thus consistent to the maximum extent practicable, with the enforceable policies of the CCMP.*

III. APPLICABLE LEGAL AUTHORITIES

A. STANDARD OF REVIEW

SpaceX’s space launch activities are not a government program and are carried out solely by a private entity on a portion of Vandenberg Space Force Base (VSFB) leased to SpaceX by the Department of the Air Force (DAF). DAF nevertheless has determined that the proposed project is a “federal agency activity,” as defined in the Coastal Zone Management Act’s federal consistency regulations and has therefore prepared a consistency determination for the Commission’s review. The federal consistency regulations at 15 C.F.R. Section 930.31(a) state that:

The term “Federal agency activity” means any functions performed by or on behalf of a Federal agency in the exercise of its statutory responsibilities. The term “Federal agency activity” includes a range of activities where a Federal agency makes a proposal for action initiating an activity or series of activities when coastal effects are reasonably foreseeable, e.g., a Federal agency’s proposal to physically alter coastal resources, a plan that is used to direct future agency actions, a proposed rulemaking that alters uses of the coastal zone. “Federal agency activity” does not include the issuance of a federal license or permit to an applicant or

person (see subparts D and E of this part) or the granting of federal assistance to an applicant agency (see subpart F of this part).

Commission staff previously and consistently questioned this interpretation and the Commission's review of consistency determinations for projects submitted by DAF rather than a coastal development permit applications or consistency certifications since those are the standard mechanisms by which the Commission reviews activities proposed by private entities within the coastal zone and/or affecting any coastal use or resource. In response, DAF has previously stated that "All activities taking place on federally owned (Department of Defense) land, including those that utilize private entities, are done so in a manner exercising our statutory responsibilities." Although the Commission has a long history of reviewing and authorizing development activities carried out by private entities on federally owned land, including VSFB, through the coastal development permit application or consistency certification processes, DAF maintains that the proposed project is different due to the unique partnership arrangement it has with commercial space launch companies like SpaceX. In short, because the federal government no longer carries out space launch activities, DAF relies on private companies such as SpaceX to send government payloads to space and to establish and maintain satellite infrastructure and networks that are available to support DAF needs and priorities. Accordingly, while the project would be operated by a private company to serve its business objectives and would only occasionally launch materials at the behest of DAF, it would also help meet the needs of the federal government. Based on this mixed purpose and at the request of DAF, Commission staff agreed to bring forward the proposed project for the Commission's consideration as a consistency determination from DAF. However, future projects will continue to be considered on a case-by-case basis and different review approaches will be used when appropriate.

The federal Coastal Zone Management Act (CZMA), 16 U.S.C. §§ 1451-1464, requires that federal agency activities affecting coastal resources be "carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs." *Id.* at § 1456(c)(1)(A). The implementing regulations for the CZMA (federal consistency regulations), at 15 C.F.R. Section 930.32(a)(1), define the phrase "consistent to the maximum extent practicable" to mean:

... fully consistent with the enforceable policies of management programs unless full consistency is prohibited by existing law applicable to the federal agency.

This standard allows a federal activity that is not fully consistent with California's Coastal Management Program (CCMP) to proceed, if full compliance with the CCMP would be "prohibited by existing law." In its March 2024 consistency determination, DAF did not argue that full consistency was prohibited by existing law or provide any documentation to support a maximum extent practicable argument. Therefore, there is no basis to conclude that existing law applicable to the federal agency prohibits full consistency. Since DAF has raised no issue of practicability, as so defined, the standard before the Commission is full consistency with the enforceable policies of the CCMP,

which are the policies of Chapter 3 of the Coastal Act (Cal. Pub. Res. Code §§ 30200-30265.5).

Similar to what occurred in December 2023 with DAF’s Negative Determination No. ND-0009-23, the Commission also has the ability under the federal consistency regulations to re-open this consistency determination should the proposed federal activity have effects on any coastal use or resources substantially different from those originally described in DAF’s consistency determination. Should this scenario occur, the Commission’s finding that the project is “fully consistent” with the enforceable policies of the CCMP could be re-examined in light of new circumstances.

B. FEDERAL LANDS EXCLUDED FROM THE COASTAL ZONE

Under the federal CZMA, the Commission is authorized to review federal agency activities and actions that occur within or outside of California’s coastal zone and that affect any land or water use or natural resource of the coastal zone. However, the CZMA defines “coastal zone” to exclude certain land under the ownership and sole control of the federal government. Thus, in cases such as this where a proposed project that is being reviewed under the Commission’s federal consistency authority is to be located on federal land under the sole control of the federal government (such as on VSFB), the Commission’s review is limited to evaluating whether the activities will result in effects that extend outside of the federal property and will “spill over” into the coastal zone. For example, public safety zones implemented during rocket launches such as those proposed in the current project would extend outside of VSFB and could result in the closure of public beaches and campgrounds, including those at Jalama Beach County Park. This would affect public beach access and recreation within the coastal zone even though the space launch complex where launches would take place is located on the federal land of VSFB. As such, the Commission has the authority to review federal agency activities on federal property like VSFB.

IV. FINDINGS AND DECLARATIONS

A. PROJECT HISTORY

In 1998, the Commission concurred with a consistency determination (No. CD-049-98) (hereinafter, “CD”) by the DAF for development and operation of the Evolved Expendable Launch Vehicle Program (EELVP), a space launch program involving four types of rockets developed by the Boeing Company and the Lockheed Martin Corporation. The program involved the substantial modification of two existing space launch complexes (SLC-3W and SLC-6) and replaced four older launch systems (Atlas II, Delta II, Titan II and Titan IVB). The goal of the EELVP was to provide a lower cost system with the capability to launch Department of Defense, National Aeronautics and Space Administration (NASA) and commercial payloads to space orbit through the year 2020.

As had been the case during its prior federal consistency reviews for space programs at VSFB, the Commission’s primary concern in considering the program was the potential

for adverse impacts to public coastal access and recreation resources associated with temporary public safety closures during space launches. Specifically, the Commission focused on the three publicly accessible beaches in northern Santa Barbara County nearest to the city of Lompoc: Surf Beach, Ocean Park Beach and Jalama Beach. In concurring with the CD for the program, the Commission found that because it would replace other existing space launch programs and therefore not increase the overall frequency of launches from the base and existing number of associated temporary beach closures (established as an annual average of eight and maximum of 14), and included implementation of a variety of measures to minimize coastal access and recreation impacts, the CD was consistent with the public coastal access and recreation policies of the CCMP. Those measures included DAF's proposal to "minimize [its] impact by limiting the number of launches per year and considering access impacts in its scheduling decisions (i.e., attempt to avoid launches during holiday weekends and minimize the number of launches during summer months)." Additionally, DAF committed to "monitor beach closures and provide an annual report to the Commission. The monitoring provided data on the number of launches that included beach closures, the location of the closure, and the duration of each closure."

In November 2010, the Executive Director concurred with a negative determination (ND) by DAF (No. ND-055-10) for modification of space launch complex SLC-4E to support the Space Exploration Technologies Corporation's (SpaceX) Falcon 9 and Falcon 9 Heavy launch vehicle programs at VSF and the use of SLC-4E for a maximum of five launches annually of each rocket type. The Executive Director determined that those programs would not generate new or additional adverse impacts on coastal resources not previously examined by the Commission in its concurrence with CD-049-98 for the EELVP, a program that had been phased out, and other prior CDs for programs involving larger rockets, many of which had also been ended.

In August 2015, the Executive Director concurred with another ND by DAF (No. ND-0027-15) for expansion of the SpaceX program to include up to six SpaceX Falcon 9 launches per year from SLC-4E and associated first-stage landings at space launch complex SLC-4W or on an offshore barge specifically designed as a first-stage landing platform and located at least 31 miles offshore of VSF. The Executive Director's concurrence acknowledged that Surf Beach and Ocean Park may be closed to public access to ensure public safety starting approximately three hours prior to a launch and ending up to two hours after. No closure or other effects to Jalama Beach were noted.

Negative Determination No. ND-0009-23

On May 5, 2023, the Executive Director concurred with a negative determination by the U.S. DAF (No. ND-0009-23), for a further increase to the SpaceX space program from six to 36 annual launches of its Falcon 9 rocket from the existing SLC-4E launch complex as well as up to 12 landings per year of the rocket's first stage at the existing SLC-4W launch complex and associated activities such as payload processing and the designation of a new offshore landing location. The proposed launches would serve the primary purpose of placing into Earth orbit thousands of small satellites for SpaceX's "Starlink" commercial satellite internet business.

Although the proposed expanded program initially called for continuance of the temporary public access closures to Surf Beach and Ocean Park in advance of each launch event, over the course of Commission staff's review, DAF's Space Launch Delta 30 Range Safety and the Security Forces Squadron re-evaluated its public safety protocols for VSFB and was able to eliminate the need for all launch related public access and recreation restrictions to Surf Beach and Ocean Park, a significant reduction in potential adverse impacts to coastal access and recreation, particularly for residents of the nearby City of Lompoc.

However, the proposed program also included up to 12 landings per year of the SpaceX rocket's first stage. These landings were anticipated to result in short term (between four and eight hours) public safety closures of Surf Beach and Ocean Park. In addition, closures of Jalama Beach were anticipated for certain launch trajectories. To help ensure the proposed expanded program and increased number of Falcon 9 launches continued to meet the negative determination standard and did not result in additional effects to public coastal access and recreation beyond those previously concurred with by the Commission in CD-049-98, DAF stated in its ND that "Launches from SLC-4E due to the Proposed Action would not cause an exceedance of 12 closures of Jalama Beach County Park per year."

This is below the number of annual beach closures that, in combination with implementation of several minimization measures, the Commission found to be consistent with the CCMP's coastal access and recreation policies in its concurrence with CD-049-98. DAF further committed in its ND to (1) track closures of Jalama Beach, Surf Beach and Ocean Beach County Park (Ocean Park) during their normal operating hours and to provide calendar year totals to the Commission by March 1 of the following year; (2) notify the Commission if more than 12 closures will be required in one calendar year during open hours at Jalama Beach, Surf Beach or Ocean Park and complete either a ND or CD at that time; and (3) follow up with the Commission after five years with a summation of biological monitoring results, launch totals, and the amount of unrecovered marine debris and documentation of funds contributed to lost fishing gear recovery efforts as compensatory mitigation. In her May 5, 2023, concurrence with DAF's ND, the Executive Director found the following:

With [the] reduction in proposed safety closures of Ocean Beach County Park and Surf Beach to only boost-back landing activities (rather than during launches and landings, as is the current practice) as well as the commitment to not exceed 12 closures per year of any northern Santa Barbara County beaches (Jalama Beach, Ocean Beach County Park, and Surf Beach), the Commission staff agrees that the proposed project will not generate new or additional adverse impacts on coastal access and recreation not previously examined and found to be consistent by the Commission and Executive Director in CD-049-98 and subsequent negative determinations for launch activities on VSFB.

However, SpaceX did not adhere to these limits in the implementation of its expanded launch program and carried out that program in a manner that differed significantly from what DAF described in its ND. Between January and July 2023, SpaceX launches required 16 evacuations and closures of Jalama Beach and Jalama Road, 21 evacuation notification emails to reservation holders, and an unknown number of reservations that were not made due to concerns about potential evacuations. In addition, information regarding SpaceX launches from VSFb over the past two years (2022 and 2023) indicated that it had expanded its launch operations well in advance of the Executive Director's May 2023 concurrence with ND-0009-23, including by carrying out in 2022 more than double the six Falcon 9 launches per year as described and concurred with by the Executive Director in ND-0027-15.

“Re-opening” of Executive Director’s Concurrence with the ND

As a result of this enhanced understanding of SpaceX's recent launch activities, the Commission found on December 15, 2023, that the launches were being conducted and were having effects on coastal uses and resources substantially different than originally described by DAF in its negative determination. In addition, because these effects exceed those which the Commission had previously determined to be consistent with the public coastal access and recreation policies of the CCMP, the Commission also found that the substantially different effects from the SpaceX launch activity were not consistent to the maximum extent practicable with the enforceable policies of the CCMP.

On December 15, 2023, the Commission also approved a resolution making the above findings and “re-opened” the Executive Director's prior concurrence by concluding that the original negative declaration made by DAF for the subject SpaceX launch activity was no longer applicable to the project as described and conducted. Approval of that resolution reversed the Executive Director's prior concurrence with the May 5, 2023, and authorized the Executive Director to prepare and send a letter to DAF requesting remedial actions to resolve this situation and ensure launch activities by SpaceX are carried out consistent with the enforceable policies of the CCMP.

The Executive Director transmitted the letter to DAF requesting remedial actions on February 22, 2024 (**Exhibit 10**), and DAF confirmed receipt of the letter that same day. After reviewing the letter, DAF prepared and submitted the subject CD on March 7, 2024, to resolve the situation.

B. PROJECT DESCRIPTION

Launches

The proposed project would include launching the Falcon 9 rocket from SLC-4E up to 36 times per year. After launching the rocket, SpaceX would land the first stage either at VSFb at SLC-4W or would land the first stage downrange on a dronship stationed offshore in the international waters of the Pacific Ocean. No more than a total of 12 first stage landings would occur at VSFb on SLC-4W per year. Each launch may be

preceded by a static fire test of the engines lasting several seconds which would be conducted one to three days before the launch. The need to conduct a static fire test is mission dependent and there would be no more than 36 static fire events per year. Launch operations would occur at any time, day or night.

Existing infrastructure at SLC-4E and SLC-4W would be used. No construction activities would be required. However, in order to avoid and minimize adverse impacts to nesting migratory birds within Spring Canyon from hot steam produced as a result of the deluge curtain, SpaceX has been removing vegetation within a 1.121-acre area of arroyo willow wetland habitat adjacent to SLC-4E. Some vegetation clearance has historically happened at the SLC-4E location, and Commission staff previously reviewed vegetation clearance up to 30 feet beyond the fence line (the Executive Director previously concurred that this amount of vegetation clearance would not result in new or additional adverse effects to coastal resources beyond what was included in CD-049-98 and ND-055-10). However, Commission staff understands that this vegetation control has expanded well beyond what was previously reviewed and concurred with. All of the first stage processing protocols that SpaceX currently uses for launching rockets from SLC-4E would remain the same. However, the frequency of processing protocols would increase in order to support the increased launch frequency. The locations of the launch complexes are shown in **Exhibits 1 and 2**.

The project would not require any closure or alteration of existing shipping lanes or airspace. In the event that SpaceX launch and reentry operations pose an extreme risk to public safety over navigable waters, the United States Coast Guard (USCG) would have the authority to determine whether risk mitigating strategies would need to be implemented, including restricting vessel traffic. USCG would be responsible for issuing a Notice to Mariners (NOTMAR) that would provide vessel operators with a location of potential hazards as well as dates and times of the hazardous conditions. Launches would be scheduled in advance to minimize the interruption of airspace and waterways. Once a NOTMAR is issued, there is no requirement for vessels to alter their routes or change their navigation speeds and if vessels are within the potentially hazardous area. Despite the NOTMAR, a scheduled launch would be delayed or altered to avoid potential hazards to vessels.

Payload Fairing Recovery Operations

The Falcon 9 system includes a fairing to protect payloads until they can be delivered to their designated orbit. The fairings consist of two halves which separate to release the payload into space. After separating, the fairing halves would fall back to earth, and a built-in parachute system would slow the descent of each fairing and enable a soft splashdown so that the two halves can be recovered. The splashdown site would be outside of California's jurisdictional waters and United States territorial waters. The parachute system consists of a drogue parachute and a parafoil which are approximately 110 sq. ft. and 3,000 sq. ft. in size, respectively.

SpaceX would attempt to recover both halves of the fairing after each launch using a salvage ship stationed in the area of the anticipated splashdown site. For safety reasons, the salvage ship could not be within 12 nautical miles of the splashdown site. Parachutes, parafoils, and their assemblies are made of Kevlar and nylon and would quickly sink once they become waterlogged after splashdown. SpaceX would attempt to recover all parafoils, but ocean conditions or weather conditions could prevent salvage operations from recovering the foil.

Weather Balloons

Prior to each launch, SpaceX would need to measure windspeeds in the landing area using weather balloons in order to create profiles of expected wind conditions during each landing. Each balloon unit would consist of a radiosonde, which is an instrument approximately the size of a shoebox powered by a 9-volt battery, attached to a weather balloon. The radiosonde would transmit data to SpaceX and the operating systems aboard the Falcon 9 rocket. The balloon is comprised of latex and would ascend to an altitude of 12 to 19 miles before the atmospheric pressures cause the balloon to burst. The balloon fragments and radiosonde would then fall back to earth and are assumed to land in the ocean. The radiosonde does not have a parachute and would not be recovered.

Landing

Each landing of the first stage, either in the ocean atop the dronship or back at VSF B at SLC-4W, would produce a sonic boom. Some payloads necessitate orbits or destinations which require additional transport from the first stage. In these instances, the use of additional propellant from the booster would prevent the first stage from being able to boost-back and land aboard the dronship or at VSF B. As such, first stages during these launches would be disposed of in the open ocean, outside of state and federal waters. These types of missions where the first stage is unable to boost back are rare and SpaceX has not disposed of a first stage in the ocean since 2018, despite carrying out several dozen launches over that period.

Ground Operations, Support, and Transport

To support the increased launch cadence, SpaceX would add up to 100 personnel at VSF B. After salvage and landing operations are complete any first stages, fairings and other materials would be transported via barge to the VSF B harbor. Once at the harbor, the equipment and materials would be loaded onto trucks for transport back to processing facilities at VSF B. SpaceX would continue to use an existing fleet of specialized trucks for any overland transport of boosters and marine barges for transport of any boosters, fairings, and other materials.

C. OTHER AGENCY APPROVALS

United States Fish and Wildlife Service

DAF has completed a formal consultation with the U.S. Fish and Wildlife Service (USFWS) for federally listed species protected under the federal Endangered Species Act that may be affected by the proposed project. The biological opinion issued by the USFWS, dated April 24, 2023, found that the proposed project “may affect but is not likely to adversely affect” marbled murrelet, southern sea otter, California condor, unarmored threespine stickleback and tidewater goby. The USFWS further found that the proposed project is likely to adversely affect but would not likely jeopardize the continued existence of California red-legged frog, western snowy plover and California least tern. The USFWS made these determinations due to the protection and mitigation measures that DAF has agreed to implement. These protection and mitigation measures are provided in Appendix A.

National Marine Fisheries Service

DAF has consulted with the National Marine Fisheries Service (NMFS) regarding rocket and missile launches and aircraft operations at VSBF under the Marine Mammal Protection Act and received a Letter of Authorization (LOA) from NMFS in 2019. The LOA is provided in Appendix A. The LOA is valid for five years and allows for up to 110 rocket launches annually across all launch facilities at VSBF. DAF indicates in its consistency determination that the proposed project falls within the scope of the activities covered by the LOA. Additionally, DAF has more recently consulted with the NMFS and completed Section 7 consultation. NMFS provided a Section 7 concurrence letter on January 20, 2023.

Federal Aviation Administration

The Federal Aviation Administration (FAA) has a role in licensing commercial space launch operations and approving airspace closures for launch operations. FAA issues launch licenses that can cover multiple years of launches and can be modified as necessary. SpaceX has been launching Falcon 9 vehicles from SLC-4E under a launch license that was most recently modified on September 29, 2023.

Regional Water Quality Control Board

Wastewater discharges that may occur during project activities, including accumulated stormwater and non-stormwater discharges, would continue to be managed in accordance with the Regional Water Quality Control Board (RWQCB) letter for Enrollment in the General Waiver of Waste Discharge Requirements for SLC-4E Process Water Discharges.

Tribal Outreach and Consultation

Pursuant to the National Historic Preservation Act and Section 106, DAF carried out government-to-government consultation with the Santa Ynez Band of Chumash Indians but did not receive an official response within the 30-day review period of CFR 800.3(c)4.

Consistent with the Commission's Tribal Consultation policy, Commission staff received a list of Tribes with potential cultural connections to the project area from the Native American Heritage Commission and completed outreach to those Tribes in March of 2024 after receipt of the DAF consistency determination. Consultation invitations were mailed to the Barbareño/Ventureño Band of Mission Indians, the Chumash Council of Bakersfield, the Coastal Band of the Chumash Nation, the Northern Chumash Tribal Council, the San Luis Obispo County Chumash Council, and the Santa Ynez Band of Chumash Indians.

Commission staff received a request for consultation from the Coastal Band of the Chumash Nation. Commission staff carried out this consultation with the Coastal Band of the Chumash Nation on Wednesday, March 27, 2024. Further discussion of this tribal consultation and potential project effects on cultural resources is available below in the Cultural Resources section of this report.

D. PUBLIC ACCESS AND RECREATION

Coastal Act Section 30210 of the Coastal Act states:

In carrying out the requirement of Section 4 of Article X of the California Constitution, maximum access, which shall be conspicuously posted, and recreational opportunities shall be provided for all the people consistent with public safety needs and the need to protect public rights, rights of private property owners, and natural resource areas from overuse.

Section 30213 of the Coastal Act states (in relevant part):

Lower cost visitor and recreational facilities shall be protected, encouraged, and, where feasible, provided. Developments providing public recreational opportunities are preferred...

Section 30220 of the Coastal Act states (in relevant part):

Coastal areas suited for water-oriented recreational activities that cannot readily be provided at inland water areas shall be protected for such uses.

Section 30221 of the Coastal Act states:

Oceanfront land suitable for recreational use shall be protected for recreational use and development unless present and foreseeable future demand for public or commercial recreational activities that could be accommodated on the property is already adequately provided for in the area.

Section 30223 of the Coastal Act states:

Upland areas necessary to support coastal recreational uses shall be reserved for such uses, where feasible.

The proposed project involves a six-fold increase (from six per year to 36 per year) in launches of the SpaceX Falcon 9 rocket from the existing space launch complex SLC-4E on the southern portion of Vandenberg DAF Base (VSFB), as well as up to 12 first stage landings at the existing SLC-4W launch complex. Depending on the trajectory of these rockets, prevailing atmospheric conditions, potential debris corridors from rocket explosion or catastrophic failure, and modeled public safety risks, closure and evacuation of public areas under the rocket trajectories has been historically necessary to protect the public from these potential rocket hazards. These closures and evacuations have had adverse impacts on public coastal access and recreation at Jalama Beach and the Jalama Beach County Park campground (referred, collectively, as "Jalama"), inconsistent with Chapter 3 policies of the Coastal Act.

Jalama Beach is an important public recreational resource because of its upland and water oriented recreational values and scenic resources. It is popular for surfing and wind surfing and used by people from all over the state. The Commission's California Coastal Resource Guide also describes this area as a popular fishing spot: "An offshore reef protects the nearshore waters from turbulent wave action, creating a popular sport fishing... spot." In addition, Jalama Beach County Park provides some of the only overnight beach camping sites within northern Santa Barbara County and is heavily used throughout the year. The sandy beach and estuary along Jalama Creek provide ample opportunity for the public to bird watch, walk, and passively enjoy coastal resources. The scenic resources of Jalama Beach provide a unique place to enjoy coastal recreational resources as well due to its remote location and the absence of visible development such as homes, buildings and lights in surrounding areas.

In the past, the Commission has had significant concerns about public beach closures in this area. The Commission has generally agreed that beach closures are necessary part of the space launching activities at VSFB and the Commission has generally supported these space launching activities. However, in evaluating these activities, the Commission required some mitigation for the beach closures. This mitigation included a limitation on the number of launches annually and other measures designed to reduce the significance of the impact.

The Commission has historically considered and analyzed the number of temporary closures to beaches in northern Santa Barbara County associated with launch activities and determined that with implementation of measures to minimize and offset adverse

effects to the public, a total of 14 closures per year is consistent with the public access and recreation policies of the CCMP.

In its most recent negative determination (No. ND-0009-23), DAF analyzed the potential effects of the proposed increase in SpaceX launch and landing activity on coastal access and recreation uses and resources:

Since 1979, an evacuation and closure agreement has been in place between the Department of the Air Force (DAF) and Santa Barbara County (County). For the safety of park visitors, the County Parks Department and the County Sheriff currently close the parks upon request from the DAF. This agreement includes closing Jalama Beach County Park, Ocean Beach County Park, Surf Beach, and Point Sal Road, in the event of launch activities that have been determined by SLD 30 Range Safety to have certain human health and safety risks. These closures are communicated at least 72 hours prior to closure and can be closed for a maximum of 48 hours per the agreement. Point Sal Road is not anticipated to be closed due to SpaceX launches.

Under the Proposed Action, public access to the coastline via Jalama Beach County Park, Ocean Beach County Park, and Surf Beach may be temporarily restricted during launch and landing operations. The length and frequency of temporary closures are mission dependent and determined by SLD 30 Range Safety; however, typical closures for launches from SLC-4E last between 4 to 8 hours. Launches from SLC-4E due to the Proposed Action would not cause an exceedance of 12 closures of Jalama Beach County Park per year. In the past, SLD 30 has restricted access to Ocean Beach County Park and Surf Beach for all launches from SLC-4E. Based on updated modeling and safety considerations, SLD 30 Range Safety and the Security Forces Squadron have determined closures are only required if the first stage of the Falcon 9 launch vehicle will boost back to land at SLC-4W. Thus, closures due to the Proposed Action would be infrequent (up to 12 times per year) and would not substantially diminish the protected activities, features, or attributes of Jalama Beach, Surf Beach, or Ocean Beach County Parks.

If it is later determined there are public safety issues or other human health and safety concerns, additional closures may be authorized. The DAF would notify the California Coastal Commission and determine the best path forward to offset impacts if more than 12 closures will occur in a calendar year during open public access hours (Attachment 2).

Access to the coastline from Surf Beach is available year-round. During the western snowy plover season, beach access is available from 0800-1800 and restricted during evening hours from 1800-0800. Access to the coastline from Ocean Beach County Park is available via a trail established by SLD 30 connecting this area to the coastal access available at nearby Surf Beach.

Ocean Beach County Park is open from 8:00 AM to dusk year-round. A portion of launches would occur at night when these locations are closed. Accordingly, the Proposed Action would only restrict public access to the coastline during daytime launches with boost back to SLC-4W.

Activity Conducted and Having Effects Substantially Different than Described

In its December 15, 2023, findings, the Commission discussed how the SpaceX space launch activity was affecting public coastal access and recreation different than as described in the ND. The Commission found that:

Based on this description and analysis, effects to coastal access and recreation from SpaceX's increase in launch and landing activities (from 6 to 36 launches and 6 to 12 landings) were expected to be limited to no more than 12 temporary closures of Jalama per year during launches. Closures were expected to last four to eight hours.

Shortly after the Executive Director's concurrence with DAF's negative determination (No. ND-0009-23), however, Commission staff were informed through discussions with Santa Barbara County Parks and Recreation Department staff responsible for the management of Jalama Beach County Park that the number of closures at Jalama due to SpaceX launches within the first seven months of the year had already exceeded the maximum annual number committed to by DAF. While there may be some discrepancy based on data collection methods, it is Commission staff's understanding that Jalama had been closed and evacuated 15 times by July 7, 2023, three more than the "no more than 12" stated by DAF in its negative determination.

In addition, over a dozen more launches and potential closures of Jalama were scheduled to occur before the end of that year.⁵ Additionally, as noted above, launch frequency [and beach closure] information from 2022 indicates that the number of SpaceX launches and related beach closures also exceeded the numbers evaluated in the prior ND concurrence (ND-0027-15).

The Commission went on to find that:

These exceedances appear to be due, in part, to SpaceX directly communicating with Santa Barbara County regarding scheduled launches and closures in a manner that DAF was unaware of and that did not take into consideration DAF's commitment and, in part, due to the fact that the process for evacuations and closures of Jalama in anticipation of a scheduled launch was not as simple and linear as one closure per launch. Rather, a single scheduled launch could require multiple evacuations and closures of Jalama. Several variables, such as weather,

⁵ Following Commission staff's identification of this issue with DAF, a refined protocol was established that only required the closure and evacuation of Jalama during launches if 500 or more members of the public were present at the beach and campground. In addition, SpaceX shifted launch trajectories and/or launch timing to overnight hours when numbers are lowest at Jalama

could result in a launch being scheduled, cancelled, and rescheduled any number of times before successful completion. As such, Jalama could be closed multiples times because of a single launch.

Through discussions with Santa Barbara County Parks and Recreation Department staff, Commission staff also came to understand that adverse impacts to public access and recreation at Jalama as a result of launches were not limited to only closures and evacuations of the beach and park – as described and analyzed in DAF’s negative determination - but rather that they occurred in four primary ways.

The first is through an advanced email notification to camping reservation holders that they may be required to temporally evacuate Jalama during their stay due to safety concerns over potential hazards from a scheduled launch. Jalama includes a total of 110 individual camp sites ranging from basic campsites for tent campers, group sites for large parties of tent campers, sites with water and electricity hookups for recreational vehicles (RVs), and cabins equipped with additional amenities. Based on information provided to Commission staff by Santa Barbara County, these evacuation notifications often result in cancellations by approximately 25% of reservation holders, due to concerns about needing to pack up and evacuate approximately 30-40 minutes away to Highway 1 several hours in advance of a scheduled launch – some of which occur late at night or during early morning hours. At maximum capacity, Jalama can accommodate approximately 900 campers per night so any particular launch could result in significant disruption and loss of coastal recreation and low-cost overnight accommodation resources. Each evacuation notification and resulting reservation cancellation can also result in lost revenue for Santa Barbara County, which owns and operates the campground

The second way that public access and recreation was adversely affected was through similar notices that are provided through the County’s reservations website to those attempting to book a campsite during the time of a scheduled launch. These notifications also resulted in cancellations and limit bookings, both of which reduce public coastal access and recreation.

In addition to overnight camping, Jalama offers day use parking and facilities for members of the public. Popular activities for day use visitors include exploring Jalama’s beaches, picnicking, fishing, and surfing. The third way that public access was adversely impacted is through closure of the road to Jalama to prevent day-use patrons from entering the park during evacuations or to limit the number of people at Jalama in order to remain below the 500-person level that would trigger an evacuation and closure event. Jalama includes dozens of parking spaces for day-use patrons and, as one of the few publicly available beaches in northern Santa Barbara County, is a popular and well used area. Thus, in addition to the displacement of campers, a particular launch and closure of Jalama Road also has the potential to eliminate public access and recreation opportunities for day-use patrons.

The fourth and most severe type of adverse impact to public access and recreation was through evacuation sweeps of the park to remove all campers and day-use patrons currently within Jalama prior to a scheduled launch. Any campers and day-use patrons were asked to leave Jalama and not return until the launch has completed. Jalama is located in a remote part of the County, with the nearest town being Lompoc located 20 miles to the north. Jalama is accessed by a narrow, two-lane road. Vacating the park and traveling to Lompoc to wait for launch completion takes significant time, approximately 45 minutes each way. Considering the time needed to drive out of Jalama to Lompoc, the time for a launch to initiate and complete, and the time needed to drive back to Jalama from Lompoc, campers and day-use patrons who had been evacuated from Jalama could be displaced for much of the day, between four and eight hours.

As noted by DAF in its 2023 negative determination (ND-0009-23), in 2022, a total of 13 SpaceX launches occurred. Although there may be discrepancies based on data collection methods, it is Commission staff's understanding based on information provided by County staff, that these triggered 18 evacuation notification emails to reservation holders as well as eight evacuation and closure events at Jalama.

In 2023, it is Commission staff's understanding that a total of 28 SpaceX launches occurred. Between January and July 2023, these launches required 16 evacuations and closures of Jalama Beach and Jalama Road, 21 evacuation notification emails to reservation holders and an unknown number of reservations that were not made due to concerns about potential evacuations. Between August 2023 and March 2024, 30 launches were carried out but no evacuations of Jalama Beach or closures of Jalama Road were required or carried out. This is because the launches were scheduled during nighttime hours when the occupancy of Jalama has been below the evacuation threshold. Further, no evacuation emails have been sent and only seven contingency emails⁶ have been sent. Santa Barbara County has indicated that less than one percent of reservationist have cancelled or changed their reservations due to the contingency emails during this time. Thus far, through the end of March 2024, a total of 10 SpaceX launches have occurred. Although any increase in SpaceX launches beyond the 36 per year currently proposed by DAF and evaluated in this report would trigger additional federal consistency review by the Commission, an additional 40 SpaceX launches are tentatively scheduled through the end of 2024. These could result in additional camper notifications, closures of Jalama Road, and evacuation sweeps.

The Commission's findings on how the activity was being conducted and was having effects substantially different than described concluded by stating:

⁶ These emails consist of notifications sent by Santa Barbara County staff to Jalama campground reservation holders once the County receives contingency evacuation notices from DAF about an upcoming scheduled SpaceX launch and potential evacuation. Emails are sent several days in advance of the anticipated launch date.

Because DAF's negative determination stated that no more than 12 closures would occur⁷ and did not describe or evaluate the full range of adverse impacts to coastal access and recreation resulting from SpaceX's expanded launch program, a program that, at the time of the negative determination's submittal, had already expanded well beyond the level previously considered and concurred with by the Executive Director, the Commission found in December of 2023 that the SpaceX program was being conducted and was having coastal effects substantially different than originally described by DAF in its negative determination. This finding led to the consistency determination currently being considered.

Effects on Coastal Resources and Consistency with the CCMP

Due to the limited availability of coastal access and recreation opportunities in northern Santa Barbara County – which only includes three publicly accessible beaches in the approximately 63 miles between Gaviota State Beach and Pt. Sal – and their high levels of use and regional importance, the Commission has long been concerned about any potential adverse effects to them.

In prior reviews of coastal and recreational access impacts from space launch activities at VSFB, adverse impacts to public coastal access and recreation have been described in terms of “beach closures.” As noted above, in its concurrence with the DAF's Consistency Determination No. CD-049-98, the Commission found that with the addition of minimization measures (such as avoiding high use holidays and summer months), an average of eight and maximum of 14 launches per year and associated temporary beach closures would be consistent with the coastal access and recreation policies of the CCMP.

Although this numeric limit was established in 1998 and prior to the authorization of a wide range of new space launch programs with significantly higher stated levels of launch activity, the DAF adhered to it consistently through 2021. However, the number of launches from VSFB has steadily increased over the past two years and exceeded the limit of 14 closures per year maximum considered by the Commission in CD-049-98. In addition, as described above, Commission staff have learned that adverse impacts to public coastal access and recreation in northern Santa Barbara County associated with the SpaceX expanded rocket launch and landing activities, particularly at Jalama, take a variety of forms and cannot simply be categorized as “beach closures.”

Accordingly, the scope and magnitude of adverse impacts to the coastal access and recreation resources of northern Santa Barbara County that have occurred as part of SpaceX's expanded launch and landing program significantly exceed those previously considered and concurred with by the Commission and Executive Director in their review of prior space programs at VSFB. These adverse impacts are not consistent with the relevant coastal access and recreation protection and maximization policies of the California Coastal Management Program, including Sections 30210, 30213, 30220, 30221 and 30223.

⁷ The commitment that no more than 12 closures would occur was also included in the subject CD.

On December 15, 2023, the Commission approved a resolution making these findings, and “re-opened” the Executive Director’s prior concurrence by concluding that the original negative declaration made by DAF for the subject SpaceX launch activity was no longer applicable to the project as described and conducted. Approval of that resolution made the Executive Director’s prior concurrence with the ND no longer applicable and authorized the Executive Director to prepare and send a letter to DAF requesting remedial actions to resolve this situation and help ensure that launch activities by SpaceX are carried out consistent with the enforceable policies of the CCMP. The Executive Director’s letter was officially transmitted to the DAF on February 22, 2024, and DAF confirmed receipt of the letter that same day.

Consistency Determination and Remedial Actions

On March 7, 2024, DAF submitted the subject CD in response to the Executive Director’s letter. The project, as described in the CD, would be identical to the project concurred with by the Executive Director in ND-0009-23:

SpaceX Falcon 9 launch operations would continue with up to 36 launches per year. Existing infrastructure will be used and no construction activities or ground disturbance is proposed. First stage processing protocols at VSFB would remain unchanged but would increase in frequency. In addition, a new offshore landing location would be designated, SpaceX may add up to 100 personnel at VSFB and would increase its current level of use of specialized trucks for overland transport and barges for in-water transport of boosters, fairings, and other materials. SpaceX would also increase its processing of payloads and refurbishment of boosters and fairings at existing SpaceX facilities on VSFB. Up to 36 boosters and 36 fairings would be refurbished each year.

In addition, the CD submitted by DAF also addresses coastal access and recreation effects with respect to how SpaceX launch activities are conducted.

Ocean Beach County Park and Surf Beach

Access to Surf Beach is available throughout the year except during western snowy plover nesting season when beach access is available from 8:00 a.m. to 6:00 p.m. and restricted from 6:00 p.m. until 8:00 a.m. These restrictions to access at Surf Beach were previously concurred with by the Commission in CD-0004-18 as part of a Beach Management Plan to help protect and enhance coastal access and recreation while simultaneously promoting the survival and recovery of the western snowy plover. Access at Ocean Beach County Park is available from 8:00 a.m. to dusk year-round and at Ocean Beach County Park there is a trail created by DAF that leads directly to the coast at Ocean Beach.

Historically, DAF has additionally restricted access to Ocean Beach County Park and Surf Beach during all launches from SLC-4E based on modeling and safety considerations as determined by the Range Safety and the Security Forces Squadron. In response to the Executive Director’s letter, DAF engaged in discussions with the Range Safety and the Security Forces Squadron to discuss the modeling and whether

adjustments were feasible in order to minimize restriction in access and recreation at these locations. After updating the modeling and revisiting the safety considerations DAF, in coordination with the Range Safety and the Security Forces Squadron, determined that evacuations of Ocean Beach County park and Surf Beach would only be required in the event that the first stage of the Falcon 9 launch vehicle would be boosting back to land at SLC-4W. Launches with the first stage boosting back to land at SLC-4W would be expected to occur 12 times per year.

Since nighttime access at Surf Beach is already restricted during western snowy plover nesting season and nighttime access at Ocean Beach County Park is restricted year-round, any SpaceX launches scheduled during the night that would boost back to land at SLC-4W would not adversely impact access and recreation at these locations. This means that only daytime launches with boost back to land at SLC-4W would affect access and recreation at Ocean Beach County Park. At Surf Beach, boost back would only affect access and recreation during daytime launches or during nighttime launches scheduled outside of the snowy plover nesting season. DAF anticipates that in response to SpaceX launches, these two locations would only be evacuated up to 14 times per year for approximately four to eight hours for each launch attempt.

Jalama

At Jalama, the determination whether to evacuate the campground and adjacent beaches is dependent on a risk analysis completed by DAF for each individual launch. The DAF describes the process for calculating this risk analysis in the CD submittal as follows:

The launch risk factors are estimated based on the probability of vehicle failure, population size in the high-risk area, day of launch weather, trajectory, and other factors. SLD 30 Range Safety considers the number of people within the Impact Limit Line and thirty days prior to launch, conducts prelaunch debris risk assessments that determine high risk areas that contribute to the allowable risk criteria. If the risk of a Conditional Expected Casualty (CEc; a factor that estimates the risk of a multiple casualty event and assumes 100% vehicle failure) is greater than 0.01, Individual Risk is greater than 1/1,000,000, or the Expected Casualty risk is greater than 1/10,000, SLD 30 issues an evacuation requirement letter 25 days prior to launch. Generally, for launches from south VAFB, the population size in the Impact Limit Line determines the need for evacuation of Jalama Beach County Park and a CEc greater than 0.01 is typically triggered when the population exceeds 500. Therefore, the number of users, including day users, campers, and staff, at Jalama Beach County Park may or may not exceed a level that triggers evacuation.

The project concurred with under ND-0009-23 included a process whereby if evacuation would be required for a particular launch, DAF would notify the County and the County subsequently would notify reservation holders via email as described earlier. A copy of the County's email notification system is included as **Exhibit 10**. As described by DAF in the CD submittal, pursuant to discussions with the County, the email notification typically resulted in three to four reservations being cancelled for each launch. This

number of reservation cancellations could include up to a maximum of 32 individuals no longer camping at Jalama.

In response to discussions with Commission staff, DAF reviewed the risk analysis to consider alternatives that could minimize adverse impacts to access and recreation. One option included changing the trajectory of the launch to a “dog leg” trajectory so that the Impact Limit Line would shift away from Jalama such that the risk to persons from vehicle failure would be effectively zero. This would eliminate the need to evacuate Jalama completely. However, the maneuvering required for this trajectory would result in a significant performance reduction for the launch vehicles which would then reduce the total payload mass that could be placed into orbit. This would then require more launches to place the same amount of mass in orbit compared to the current trajectory. Also, if the mass of the payload is sufficiently great then this maneuver would preclude certain missions from launching.

Since one component of the risk factor analysis is the number of people within the Impact Limit Line, DAF proposed changing the launch schedule to avoid launching during the day and instead launching during the night. During the day, members of the public at Jalama include campers with reservations as well as day use visitors who are exploring Jalama’s beaches, picnicking, fishing, and surfing. At night, visitors at Jalama are limited to campers with reservations. Thus, by shifting the launch schedule to avoid daytime hours and take place primarily at night the number of people within the park would be less and therefore fall below the risk factor. DAF has committed to primarily launch during the night to avoid any evacuations of Jalama to the extent practicable. If scheduling is unable to completely avoid evacuations, DAF has committed to ensure that the total number of evacuations of Jalama within a given year would not exceed 14, consistent with previous Commission approvals for launch programs at VSNB.

Finally, in order to help offset the adverse impacts to access and recreation at Jalama that have been occurring as a result of the SpaceX launches and public coastal access and recreation restrictions that exceeded the scope of ND-0009-23, DAF is proposing four additional measures:

- DAF would provide high-speed internet terminals at Jalama Beach County Park in order to improve internet coverage there;
- DAF would fund a variable messaging sign for use by Santa Barbara County Parks and Recreation to replace the existing sign at the intersection of Highway One and Jalama Road;
- In the event that an evacuation of Jalama is necessary, DAF would operate a shuttle program to evacuate campers from the park to a safe location so that their camps can remain intact. After the launch is complete the shuttles would bring campers back into the park;
- DAF, in coordination with the Lompoc Unified School District (LUSD) and SpaceX, will fund transportation for all 3rd graders in LUSD to visit Surf Beach/Ocean Park on an annual basis.

Currently, cell phone service in the area of Jalama is limited. More reliable internet would increase the efficiency of County Parks and Recreation operations at Jalama and allow the County to more efficiently manage its reservation system. Greater efficiency would help avoid congestions for members of the public looking to reserve a camping site at Jalama, thus helping to increase its usage. Also, this greater efficiency would allow County staff to more quickly process transactions for visitors passing through the entrance kiosk, therefore helping to reduce congestion at the entrance and getting more people into Jalama more quickly. Finally, more reliable internet would allow County emergency responders to communicate more effectively. Depending on the amount of bandwidth required by the County any remaining data could also provide the public with some reliable connectivity.

Jalama offers 110 campsites, including 12 walk-in, first-come first-served sites. The drive from Highway One to Jalama can take upwards of 45 minutes and cellphone connectivity in this area can be intermittent. For any members of the public in the area who may be considering a stay at Jalama but do not know the current availability of the campsites, the only option currently available is to drive into the site and inquire. The proposed variable messaging sign at the intersection of Highway One would allow County staff to post vacancy status and campsite availability information to members of the public so they can check the status of available campsites at Jalama before committing to driving 45 minutes to the park from Highway 1. Additionally, making this information more readily available would encourage greater use of Jalama by the public and thus encourage access and recreation.

Regarding the evacuation shuttles, under the current system once an evacuation order is issued campers within Jalama are instructed to prepare to leave the campground and asked to secure their valuables. Depending on the type of camping equipment being used an evacuation order could require campers to break down equipment to ensure it is secure. For larger recreational vehicles (RV) an evacuation order could mean securing the vehicle and driving the entire vehicle out of the campsite along Jalama Road. This system for evacuation could create frustrations for campers, particularly if the evacuation order is issued during the night or at some other inopportune time. Additionally, once an evacuation order is issued campers are instructed to leave the campground and not return until the launch is complete. However, it may be difficult for campers to monitor the status of the launch and therefore know when it is safe to return to the park which could result in campers waiting an unnecessarily long time. The proposed shuttle service would help to alleviate these issues since it would avoid the need to break down camping equipment and would also allow campers to return to the park as soon as possible.

Finally, although there are some programs within the LUSD focused on marine resource education for children in grades four through seven, including the aquarium at Cabrillo High School, there is currently no program for children younger than fourth grade. In response, DAF has proposed a new program for third graders described in the CD as follows:

SLD 30, in coordination with LUSD and SpaceX, will fund transportation for all 3rd graders in LUSD to visit Surf Beach/Ocean Park on an annual basis. SLD 30 will coordinate with LUSD and set up a field trip date for all 9 schools each school year. SLD 30 will coordinate with the individual teachers and provide structured activities during the beach visit that are generally focused on environmental stewardship and understanding our coastal resources, particularly the Western Snowy Plover. This program will ensure that an average of 700+ third graders, 25+ teachers, and 100+ chaperones (typically student family members) would visit Surf Beach/Ocean Park annually. This will likely have secondary effect of families visiting the beach more often after the facilitated introduction provided through this program.

Coastal Act Section 30213 requires that lower cost visitor and recreational facilities be protected. As described previously, SpaceX launching activities were adversely affecting access and recreation at Jalama due to excessive evacuations and closures. The modified launch program proposed by DAF would result in most launches occurring at night, lowering the safety risk factors and thereby reducing the number of necessary evacuations to levels that the Commission has historically concurred with. Additionally, Coastal Act Sections 30210, 30220, 30221 and 30223 require maximum access and recreational opportunities within coastal areas. The offsets proposed by DAF as part of the subject CD will increase access and recreation at Jalama while the LUSD program will promote coastal access and recreation within the greater area of Northern Santa Barbara County.

Conclusion

Therefore, the Commission finds that, with the DAF's commitments and mitigation measures, the proposed activities would be conducted in a manner that would protect, encourage, and provide coastal access and recreation consistent with Sections 30210, 30213, 30220, 30221, and 30223 of the Coastal Act.

E. COASTAL WATERS AND MARINE RESOURCES

Section 30230 of the Coastal Act states:

Marine resources shall be maintained, enhanced, and where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes.

Section 30231 of the Coastal Act states (in relevant part):

The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through...controlling runoff, preventing depletion of ground

water supplies and substantial interference with surface waterflow, [and] maintaining natural vegetation buffer areas that protect riparian habitats.

The proposed project has the potential to negatively affect water quality in Spring Canyon and the Pacific Ocean due the use of deluge water during launch events and the ocean disposal of the rockets' fairing and weather balloons. The project will use existing infrastructure at Space Launch Complex 4 (SLC-4) so there is no potential for adverse impacts to water quality from construction activities. The proposed project has the potential to contribute to the depletion of groundwater supplies and interfere with surface water flow due to its water supply needs. The proposed project also has the potential to adversely affect marine resources due to inputs of marine debris. Finally, the proposed project also has the potential to adversely impact marine mammals, including in areas of special biological significance such as breeding and haul-out sites, due to launch noise.

Section 30231 of the Coastal Act requires development to maintain the biological productivity and quality of coastal waters and wetlands by various means including depletion of ground water supplies. Sections 20231 and 30232 collectively require the protection of coastal waters from adverse effects runoff and spillage of hazardous substances.

Water Quality

VSFB is divided into northern and southern halves by the Santa Ynez River. The two launch facilities (SLC-4E and SLC-4W) where SpaceX would be operating are located on South VSFB (**Exhibit 1**). Major drainages in the area of South VSFB include Bear Creek, Canada Honda Creek, and Jalama Creek. There are also several unnamed minor drainages with intermittent ephemeral streams. All of these creeks and streams flow west and ultimately release into the Pacific Ocean. The two most proximal water bodies to SLC-4E and SLC-4W are Spring Canyon and the Pacific Ocean (**Exhibit 2**). Spring Canyon, which contains a seasonal, ephemeral stream, is located immediately adjacent to the southern perimeter of SLC-4E and SLC-4W with the Pacific Ocean is approximately 0.5 miles to the west. The project would utilize existing launch and landing facilities and no new construction of any kind is proposed. However, launching of vehicles and daily operations have the potential to result in release of sediment and various contaminants which could eventually migrate to the aforementioned water systems.

The DAF's water quality analysis in its CD submittal focused on potential water quality effects from launch operations. The DAF concluded that:

Launch activities at SLC-4 would create exhaust clouds; however, Falcon does not use solid fuels. Wastewater discharges that may occur during project activities, including accumulated stormwater and non-stormwater discharges, would continue to be managed in accordance with the Regional Water Quality Control Board (RWQCB) letter for Enrollment in the General Waiver of Waste

Discharge Requirements for SLC-4E Process Water Discharges. After a launch, approximately 9,000 gallons of deluge water per Falcon 9 launch would remain in the existing retention basin after evaporation. Samples of the deluge water would be collected and analyzed. If the water is clean enough to go to grade, it would be discharged from the retention basin via the spray field. Currently, the water can be discharged to grade via the spray field approximately 90-95% of the time. It would then percolate into the groundwater system and flow down gradient into Spring Canyon. Therefore, impacts to surface water from launch operations under the Proposed Action would not be significant.

Commercial space companies are independently responsible for compliance with provisions of the Clean Water Act and its requirements for development of site-specific Spill Prevention, Contingency, and Countermeasures (SPCC) plan under 40 C.F.R. 112. Inspection and enforcement of each SPCC and any permitted tanks are delegated to the Santa Barbara County Certified Unified Programs Agency. The SPCC requirements for commercial space companies do not fall under the jurisdiction of SLD 30. SpaceX maintains and operates under an SPCC with Santa Barbara County CUPA. Under 40 C.F.R. 112, the SPCC includes elements that the Commission considers critical for these plans, including: an oil spill risk and worst-case scenario spill assessment, response capability analysis of the equipment, personnel, and strategies (both on-site and under contract) capable of responding to a worst-case spill, including alternative response technologies, oil spill preparedness training and drills, and evidence of financial responsibility demonstrating capability to pay for costs and damages from a worst-case spill. SpaceX's secondary containment is sized to capture all materials contained within any tanks present and the SPCC includes the necessary specifications on the spill response supplies needed at the site during operations.

The propellant for the Falcon 9 rocket would not include any solid fuels and would instead use liquid fuels consisting of rocket grade kerosene (RP-1) and liquid oxygen. Combustion of solid fuels release greater amounts of reactive chemicals and other pollutants compared to liquid fuels⁸. Also, the Falcon 9 rocket would use oxidizer-rich staged combustion engines that produce a diminutive amount of soot. After ignition a deluge of water would be flooded onto the launch pad. The purpose of this deluge of water is to absorb or deflect the high levels of acoustic energy that are released as the rocket lifts off and avoid damage to the vehicle and payload. The exhaust cloud comprised of combusted fuel and water from the deluge would largely consist of steam with insignificant amounts of hazardous materials due to the oxidizer-rich staged combustion engines. Any deluge water that is not converted into steam would remain in the retention basin and would only be discharged after it meets the required certifications. As such, the launching of the Falcon 9 rocket would not result in adverse impacts to surface water quality.

⁸ <https://www.space.com/rocket-launches-environmental-impact>

Water Supply

Water use for SpaceX launches would include water for personnel and operational activities as well as deluge water for the launches, as discussed above. At the full proposed cadence of up to 36 launches per year, the annual amount of deluge water needed for SpaceX operations would be up to 7.2 million gallons. However, DAF reports that SpaceX has, over time, greatly reduced the amount of water needed for launch activities:

Since the original project's implementation, SpaceX has reduced the amount of water needed in the flame duct per launch from 200,000 gallons to 70,000 gallons. In November 2022, SpaceX also replaced the former deluge water system with a closed loop system for cooling water that eliminates the need to utilize launch pad water for cooling.

By incorporating this closed loop system, the total annual requirement of water for the deluge system is reduced by 65 percent to 2.52 million gallons. In addition, up to 2.1 million gallons annually would be required to support the personnel and operational activities at the launch complex. The total maximum water supply need for the SpaceX launches is up to 4.28 million gallons annually, which is roughly the equivalent water use of twenty-three American households annually.

Section 30231 of the Coastal Act states that proposed projects should prevent depletion of groundwater supplies and prevent substantial interference with surface water flow. The water supply for VSFb includes four wells in the San Antonio Creek Valley Groundwater Basin. According to the 2022 Annual Report for the San Antonio Basin Groundwater Sustainability Agency (SAGSA), VSFb used up to 2,600 acre-feet of water in 2022. The majority of water users of the groundwater basin are agricultural. SAGSA found that the cumulative levels of groundwater storage in the San Antonio Creek Valley Groundwater Basin have decreased by 147,700 acre-feet between 2015 and 2022. Overall, San Antonio Basin Groundwater Sustainability Agency states:

Current basin conditions, comparison of current and historical groundwater elevation contour maps, and the basin historical water budget presented in the [Groundwater Sustainability Plan], indicate groundwater pumping in excess of the sustainable yield has created challenging conditions for sustainable management.

However, DAF has indicated in its consistency determination that the proposed project would not increase DAF pumping or water use from the San Antonio Creek Valley Groundwater Basin and is within the normal fluctuation of water demand at VSFb. This is due to the low water needs of the project, estimated to be approximately 0.7% of total base-wide water use. In its consistency determination, DAF states:

The Proposed Action's water usage would therefore be negligible and not result in any measurable impacts to flow rates, hydration periods, or water levels in San

Antonio Creek and not contribute in any measurable way to the collective effects of water extraction requirements for all VSFB operations.

In essence, DAF has concluded that the impacts to surface water in San Antonio Creek as a result of SpaceX launches would not be significant.

Ocean Release of Rocket First Stage

Some payloads necessitate orbits or destinations that require additional transport from the first stage. In these instances, the use of additional propellant from the booster would prevent the first stage from being able to boost-back and land aboard the dronship or at VSFB. As such, first stages during these launches would be disposed of in the open ocean, outside of state and federal waters. These types of missions where the first stage is unable to boost back are rare and SpaceX has not disposed of a first stage in the ocean since 2018.

If the first stage booster is intentionally disposed of it would be expected to break up upon reentering the atmosphere and land in international waters. As described by DAF in the CD, any propellant remaining in the booster would be less than one percent of the booster's capacity and would consist of "very light oils" which have a low viscosity, low specific gravity and are highly volatile. Since the oils have high volatility they would completely dissipate within one to days and would spread into a thin layer which would evaporate quickly. Although it would require a total of one to two days for the propellant to completely dissipate, over 90 percent of the overall mass of the propellant would evaporate within the first seven minutes and within the first hour over 99 percent of the mass would evaporate.

Due to the limited quantity of fuel remaining in the booster after splash down, the anticipated quick evaporation, and the location in international waters where the booster would land, the Commission finds that it is not expected to adversely affect the quality of waters upon landing nor is it expected to enter California's coastal zone.

Marine Debris

Several elements of the proposed project could result in the release of marine debris. These include the release and eventual abandonment into the ocean of weather balloons, parafoils from payload fairings, and potential mishaps during a launch that lead to some or all of the rocket falling into the ocean, and the intentional abandonment into the ocean of the rocket first stage and fairings. It should be noted, however, that SpaceX has not had any mishaps during any of its Falcon 9 launches from VSFB since it began launch operations at the base.

Prior to launches, SpaceX would release a weather balloon to monitor upper atmosphere wind conditions. Attached to the latex weather balloon would be a plastic-encased electronic device to measure atmospheric data and transmit it by radio to a ground receiver. The device is roughly the size of a shoe box and is powered by a 9-volt

battery. Upon reaching an altitude of 12-19 miles above sea-level and providing the necessary data, the balloon would pop due to the reduction in atmospheric pressure. The likelihood of recovering the weather balloons and instrumentation is small due to the extreme height at which the balloon destruction would be triggered, the trajectory of its descent and the potential for it to sink or become lost in the ocean. Due to these factors, the balloon and associated materials would be expected to land in the ocean and become marine debris.

The Falcon 9 system includes a fairing to protect payloads until they can be delivered to their designated orbit. The fairings consist of two halves which separate to release the payload into space. After separating the fairing halves would fall back to earth and each half contains a parachute system to slow the descent of the fairing and enable a soft splashdown so that the two halves can be recovered. The splashdown site would be outside of California's jurisdictional waters and United States territorial waters. The parachute system consists of a drogue parachute and a parafoil which are approximately 110 sq. fr. and 3,000 sq. ft. in size, respectively.

Additionally, launches could contribute to marine debris if a mishap occurs, the rocket fails to launch successfully, and it instead lands in ocean waters. These marine debris inputs could, depending on where they land, negatively affect areas of special biological significance, such as Channel Islands National Park, Channel Islands National Marine Sanctuary, and state-designated marine protected areas. As discussed in DAF's CD, SpaceX's objective is to land and recover the first stage boosters for reuse. However, some missions may require orbits and fuel usage that make recovery and reuse impossible, in which case the first stage booster is intentionally disposed of. The first stage is expected to break up upon atmospheric reentry, and upon making impact with the ocean surface the booster is expected to sink. SpaceX has not conducted an expendable booster mission from SLC-4E since 2018.

SpaceX would attempt to recover both halves of the fairing after each launch using a salvage ship stationed in the area of the anticipated splashdown site. For safety reasons the salvage ship could not be within 12 nautical miles of the splashdown site. Parachutes, parafoils, and their assemblies attached to the fairings to control their descent and aid in recovery are made of Kevlar and nylon and would quickly sink once they become waterlogged after splashdown. SpaceX would attempt to recover all parafoils, but ocean conditions or weather conditions could prevent salvage operations from recovering the foil.

To address these potential adverse impacts from marine debris, DAF has committed to ensuring that SpaceX provide contributions to the California Lost Fishing Gear Recovery Project to offset the release of unrecoverable debris in state and federal waters.

U.C. Davis' California Lost Fishing Gear Recovery Project has removed lost or discarded commercial fishing gear from California waters since 2005. Its work now focuses on gear removal from the waters of Southern California, ensuring that gear

recovery is occurring close to the areas that would be affected by the proposed project. Lost fishing gear such as nets, traps and lines is hazardous to wildlife, including seabirds, fish, turtles, sea otters, whales and other marine animals. The entanglement hazards posed by lost fishing gear to wildlife are similar to the entanglement hazards from the weather balloons. Lost fishing gear, specifically traps, typically have a buoy attached to several dozen feet of nylon line; similarly, the weather balloon, which is relatively buoyant, is attached with lightweight lines to heavier scientific instruments. Thus, weather balloons would be expected to pose similar entanglement risks to marine wildlife as lost fishing gear, and lost gear recovery would effectively offset adverse impacts associated with weather balloons.

On an annual basis, the amount of material potentially released into the ocean would be recorded and, for every one pound of such material, SpaceX would make a compensatory donation of \$10.00 to the California Lost Fishing Gear Recovery Project. The administrators of that program have confirmed this contribution would be sufficient to recover approximately one pound of lost fishing gear. This commitment is consistent with the approach used by other launch programs on VSBF for their marine debris impacts, including the Phantom programs considered by the Commission in CD-0010-22.

Marine Species and Noise

The proposed project also has the potential to adversely affect marine biological resources through exposure of marine species to noise. As described by DAF in the CD submittal there are four components of the Falcon 9 launches that would generate significant, potentially disruptive sound and noise:

- 1) continuous engine noise created by the launch vehicle during static fire tests (lasting several seconds);
- 2) continuous engine noise created during ascent (lasting several minutes);
- 3) impulsive sonic boom created by the launch of the rocket as well as returning first stage (both lasting less than one second); and
- 4) continuous engine noise as the first stage lands (lasting approximately 60 seconds).

During launch operations and static fire tests, the project would produce noise of up to 150 (decibels) dBA near SLC-4; maps showing the extent of modeled engine noise are included in **Exhibit 6**. The engine noise estimates provided here are for in-air sound, and it is worth noting that a significant amount of sound energy (loudness) is lost when transmitting across the air-water interface, such that underwater sound is expected to be much lower during launches.

Marine Mammals

Marine mammals are sensitive to sound and are used as indicator species to understand noise impacts on the marine environment. Marine mammals that may be present in the nearshore environment, particularly those that spend time above the water line, include southern sea otters, sea lions, and seals. Each launch event would

generate in-air noise up to a maximum of 150 decibels (dB) for several minutes in the immediate area of the launch pad. This sound level would be generated during liftoff and boost-back landings. Based on modeling conducted by DAF, in-air noise levels directly off the coast where marine mammals could be located would be less than 130 dB and would attenuate outward in all directions, reaching 100 dB up to 14.5 miles away.

To the human ear, 120 dB would be as loud as a jet taking off and 110 dB would be as loud as amplified music at a concert. However, marine mammal hearing differs from human hearing in the frequencies they are receptive to and their sensitivity to loud sounds. To help evaluate potential adverse impacts to marine mammal hearing from elevated sound, Southall et al (2019) identifies threshold levels for various marine mammal species beyond which temporary threshold shifts (i.e. temporary hearing loss) would be expected to occur. Although elevated, the sounds anticipated to be produced by the proposed project would fall below these threshold levels. To confirm this, DAF has conducted extensive monitoring of marine mammal responses to launch activities and has found that launch activities have not had any observable long-term consequences for marine mammal populations or their use of habitat at and around VSFB. Specifically, the Environmental Assessment (EA) prepared for the project found:

The USSF has also monitored pinnipeds on VSFB during many launches to characterize the effects of noise and visual disturbance on pinnipeds during numerous launches over the past two decades and determined there are generally no substantial behavioral disruptions or anything more than temporary effects to the number of pinnipeds hauled out on VSFB. Reactions between species are also different. For example, harbor seals and California sea lions tend to be more sensitive to disturbance than northern elephant seals. Normal behavior and numbers of hauled out pinnipeds typically return to normal within 24 hours or less (often within minutes) after a launch event. No observations of injury or mortality to pinnipeds during monitoring have been attributed to past launches. As a result, the Proposed Action's potential impacts on MMPA-protected pinnipeds are expected to be limited to brief behavioral reactions.

Similarly, DAF has also monitored Southern sea otters (*Enhydra lutris*) during launches to document their reaction to sound. According to that monitoring, no abnormal behavior, mortality, or injury effects have been documented from launch-related noise. According to DAF, the reason that pinnipeds and sea otters are not significantly affected by noise is because of their ability to dive under water when exposed to launch noise generated from launches at SLC-4. Since little sound is transmitted across the air-water interface, any in-air sound would not have a significant effect on pinnipeds and otters that are below the water surface. In summary, DAF's on-going monitoring indicates that past levels of launch activities have not resulted in injury or mortality to pinnipeds or sea otters in the project vicinity, but may result in short-term behavioral changes, such as movement away from on-land haul-out areas and/or increased diving. Under past launch cadences, there is no indication that behavioral responses have translated into longer-term changes in habitat use or population levels. However, as discussed below,

continued monitoring is needed to assure that such effects are avoided as the SpaceX launch frequency increases to up to 36 launches per year and is combined with other ongoing space launch activities that are currently occurring at VSF and anticipated in coming years. With SpaceX launches proposed at an average of less than once per week, marine mammals are expected to have time to recover sufficiently from any launch-related disturbance between launches and to not abandon haul-out locations or other habitat areas around VSF. However, if the number of launches increases further and time between launches is reduced, more substantial reactions may occur.

In addition to engine noise, the SpaceX launch ascent and landing would create sonic booms with a range of 1.0 to 5.0 pounds per square foot (psf). Due to the proposed launch trajectory, the sonic booms from the proposed project would occur at Santa Rosa Island, which are part of Channel Islands National Park and within the Channel Islands National Marine Sanctuary. **Exhibit 6** provides a map of the predicted sonic boom footprint from the Falcon 9 launch vehicle. Although the figures in **Exhibit 6** do not include any modeling of the effect of sonic booms on other portions of Santa Barbara County outside of VSF or Ventura County, weather conditions can cause the sonic boom footprint to expand significantly to include these areas.

NMFS has reviewed rocket launches at VSF and through its Letter of Authorization (LOA), requires DAF to avoid launches which are predicted to produce a sonic boom over the Northern Channel Islands during the harbor seal pupping season from March through June, whenever possible. Additionally, NMFS requires increased monitoring when sonic booms are expected to exceed 2.0 pounds per square foot over the Northern Channel Islands. With the information by DAF on the potential effects of sonic boom sounds and launch noise on offshore marine mammals, and DAF's commitment to working with NMFS and the Executive Director to address any unexpected impacts on marine mammals, the Commission finds that the sonic booms produced by the proposed project would not adversely affect the marine mammals located in coastal waters. It should be noted, however, that due to its unique sound footprint and associated pressure wave, sonic booms can affect wildlife for far longer than the factin of a second that the sound is experienced.

In both its consistency determination and as part of its consultation with the National Marine Fisheries Service, DAF has committed to monitoring pinnipeds during all launches at VSF, including those launches proposed by SpaceX. Between January 1 and June 30, pinniped monitoring at south VSF haul out locations would occur at least 72 hours prior to a launch event and would continue at least 48 hours after each event. As stated by DAF in its consistency determination, if this monitoring demonstrates that launch activity results in injury or mortality to marine mammals, DAF would immediately cease launch activities and report the incident to NMFS. DAF further states in its consistency determination that launch activities would not resume until NMFS is able to review the associated data and circumstances and work with DAF to determine the additional measures necessary to minimize the likelihood of further impacts to marine mammals. In addition, DAF has committed to continuing its marine mammal monitoring program during launches, including monitoring of long-term habitat use and local

species populations. If on-going marine mammal monitoring observes (a) injury or mortality or (b) significant changes in habitat use and/or local populations associated with launch activities, DAF would also notify the Executive Director and share relevant information to help determine if the activity is being conducted or is having an effect on any coastal use or resource substantially different than originally described in the consistency determination and, as a result, is no longer consistent with the enforceable policies of the CCMP. This is particularly important given the uncertainty about how marine mammals will react to the proposed significant increases in launch events and frequencies. While existing data does not indicate that adverse impacts would occur, most of that data was collected when launch frequency was in the six to ten per year range and only one-year of data is available from the increased launch cadence of over 30 per year.

With the information provided by DAF on the potential effects of engine noise on nearshore marine mammals, the absence of data demonstrating adverse impacts during similar launches over the past roughly 20 years of monitoring marine mammal populations along the shoreline of VSFB, the monitoring that would continue to be carried out as part of the proposed project, and DAF's commitment to work with NMFS and the Executive Director to address any unexpected impacts on marine mammals, the Commission finds that engine noise and sonic booms from the proposed project – including up to 36 SpaceX launches per year -- would not adversely affect the biological productivity of coastal waters or adversely affect marine mammal species of special biological significance.

Wetlands

As discussed previously, a water deluge of the launch area is required during Falcon 9 launches to reduce the potential for damage from vibration during liftoff. SLC-4E currently has a civil water diversion structure to help capture and divert any water from this deluge that could potentially flow overland and into Spring Canyon. However, even with this diversion structure, approximately 25,000 gallons of steam could reach Spring Canyon for each launch event. As discussed above, any water discharged into Spring Canon would meet the water quality thresholds identified by the California State Water Resource Control Board (SWRCB) in the statewide low threat discharge to surface waters permit.

The hydrology of Spring Canyon is described by DAF as follows:

Spring Canyon Creek originates approximately 1.4 miles inland and flows toward the Pacific Ocean. Lower Spring Canyon is an ephemeral creek that occasionally has intermittent standing water upstream from Surf Road. Surface flow percolates into the groundwater to pass beneath road embankments and eventually enters the Pacific Ocean (USAF, 1987)...the physical connectivity in Spring Canyon is blocked at Coast Road.

Vegetation types within Spring Canyon consist of: Central Coast Arroyo Willow Riparian Forest and Scrub; non-native trees such as Tasmanian bluegum eucalyptus (*Eucalyptus globulus*) which is a documented Monarch butterfly (*Danaus Plexippus*) roost; maritime chaparral with chamise (*Adenostoma fasciculatum*), La Purisima manzanita (*Arctostaphylos purissima*), and Santa Barbara mountain lilac (*Ceanothus impressus*); central coastal scrub; and invasive non-native plant cover.

Bird species within Spring Canyon consist of common species such as finch (*Carpodacus mexicanus*) and Brewer's blackbird (*Euphagus cyanocephalus*). No special status bird or reptile species have been documented in Spring Canyon. Spring Canyon may contain upland habitat for amphibians. However, due to the ephemeral nature of the drainage and lack of standing water during most years, Spring Canyon is considered only marginal habitat for the California red-legged frog (*Rana draytonii*).

In order to avoid and minimize adverse impacts to nesting migratory birds within Spring Canyon from hot steam produced as a result of the deluge curtain, SpaceX would remove all vegetation within a 3.3-acre area consisting of arroyo willow riparian habitat (**Exhibit 4**). Since Spring Canyon is a relatively short, 1.4-mile, ephemeral creek with intermittent flows and standing water, and the area of the vegetation removal is outside of the creek corridor and would consist of arroyo willow riparian habitat that does not host any sensitive or listed species, the area of the vegetation removal does not meet the definition of ESHA pursuant to 30107.5. However, arroyo willow riparian vegetation is wetland vegetation - one of the parameters indicative of wetland habitats - and as such, the area of arroyo willow riparian vegetation constitutes coastal wetlands.

Removal of the vegetation would be performed by mowers and hand equipment prior to nesting bird season, and attempts would be made to reduce impacts to the drainage as much as possible. Additional vegetation removal (e.g., mowing) of the impact area would be performed outside of nesting bird season (15 February to 15 August) annually as needed to maintain low stature vegetation. Vegetation removal would result in an estimated 1.121 acres of permanent impacts to arroyo willow habitat. The vegetation clearance within this area would not maintain optimum populations of wetland species consistent with 30231.

During the course of Commission staff's review of this CD, DAF staff noted that vegetation clearance in this area has occurred at least as far back as 2010 and that it was their understanding that this activity was considered by the Commission in negative determination no. to ND-055-10. However, in the concurrence letter associated with that ND the vegetation clearance activities were described as extending approximately 30 feet beyond the perimeter of the facility. At present, and as described in the subject CD, however, vegetation clearance extends approximately 300-450 feet beyond the perimeter of the facility and into wetland habitat. Several other agencies also appear not to have been initially aware of this expanded vegetation clearance activity and in 2017, the Regional Water Quality Control Board (RWQCB) provided after-the-fact authorization for it in December of 2017 and required DAF to prepare and implement a

wetland habitat enhancement and monitoring effort as mitigation. This wetland habitat enhancement has been occurring at a nearby location on VSFB at a ratio of 2:1.

However, the Commission has historically required mitigation for adverse impacts to wetlands at ratios greater than 2:1, particularly in cases where mitigation consists of the enhancement of existing habitats rather than the creation of new wetlands. In the present case, the current wetland enhancement at a 2:1 ratio, pursuant to the RWQCB monitoring plan, is insufficient to compensate for the loss of wetland habitat associated with the vegetation removal. Commission staff raised the issue of the increased vegetation management with DAF staff and DAF staff is preparing a response to be integrated into this report through a forthcoming addendum. Commission staff expects this response to include either a commitment to amend the restoration currently taking place to add acreage and meet the Commission's typically required mitigation ratio or to explain why no such expansion of mitigation is necessary to ensure consistency with the coastal wetland protection policies of the CCMP.

Conclusion

With the testing of and appropriate discharge of deluge water, the lack of adverse impacts to available water supply, the low volume and rapid dispersal of fuel within rocket stages released into the ocean, DAF's commitment to continue monitoring and address any unexpected impacts to marine mammals, and appropriate resolution of the wetland habitat impacts described above, the Commission finds the proposed project consistent with the water quality and marine resource provisions of the Coastal Act, including Sections 30230 and 30231.

F. ENVIRONMENTALLY SENSITIVE HABITAT AREAS

Section 30240 of the Coastal Act states:

- (a) Environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values, and only uses dependent on those resources shall be allowed within those areas.
- (b) Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.

Section 30107.5 of the Coastal Act Defines Environmentally Sensitive areas as:

“Environmentally sensitive area” means any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could be easily disturbed or degraded by human activities and developments.

Environmentally Sensitive Habitat Areas or ESHA are areas where plant communities or species are rare or especially valuable and easily disturbed or degraded by human activities. There are several types of ESHA adjacent to the project site including: western snowy plover nesting habitat and least tern nesting habitat. Section 30240(b) requires development adjacent to ESHA be sited and designed to prevent impacts that would significantly degrade ESHA habitat and be compatible with continued use of ESHA habitat. The proposed project has the potential to adversely affect ESHA adjacent to the project site due to the elevated levels of noise produced by the proposed launches and static fire tests at the launch complex.

DAF states in its consistency determination that the proposed project is consistent with Section 30240. Since the launch operations would take place within an existing launch facility at SLC-4 the project would not require any construction within ESHA. DAF has also proposed monitoring and reporting to help determine if unexpected adverse impacts occur.

Types of Environmentally Sensitive Habitat Areas

California red-legged frog

Although California red-legged frog (CRLF) are not present in Spring Canyon, DAF have documented CRLF within Bear Creek and Honda Creek, located 0.75 miles and 2 miles to the south of SLC-4, respectively. The Commission's staff ecologist has identified these locations as ESHA because they provide breeding habitat, forage and refuge for CRLF.

The rarity of California red-legged frogs is widely recognized and has resulted in its state and federal special species designations. CRLF are sensitive to disturbance and their habitat could be easily disturbed or degraded from development including direct habitat loss due to stream alteration, loss of aquatic habitat, and indirect effects of expanding urbanization affecting their dispersal and migration into new habitats, as noted in the USFWS Biological Opinion. CRLF are found outside of VSFB in the coastal zone in streams along the coast and transverse ranges of California, including coastal Santa Barbara County. The populations on VSFB add to the genetic diversity and population of frogs outside of the base, particularly because California red-legged frogs are known to make long-distance overland migrations (up to 1.75 miles in wet environments) to suitable breeding habitat elsewhere. The USFWS notes that coastal California red-legged frog populations in Santa Barbara County and to the north show genetic connectivity, indicating that there is migration and gene flow between California red-legged frog populations on VSFB and those in the coastal zone outside of federal property (USFWS 2023). The loss of CRLF populations on VSFB would reduce genetic diversity and gene flow between frog populations, which could affect the overall population of California red-legged frog in the coastal zone outside of the base. For rare species, maintaining genetic diversity is particularly critical in the face of climate change due to the variety of environmental stressors it can bring and the need for adaptation and new traits that will enable survival.

Pallid Bat and Western Red Bat

The pallid bat and western red bat are also known to be present within the region of impact (ROI), particularly within the riparian habitat of Honda Creek roughly two miles south of the SpaceX launch complex. These bat species have been designated by the California Department of Fish and Wildlife (CDFW) as Species of Special Concern. Bats play a special role in the ecosystem due to their high metabolic needs and extensive feeding on insects.

CDFW identified pallid bats as a Species of Special Concern because they have experienced a marked population decline in recent years in California. Pallid bats are not tolerant of suburban or urban development, and habitat conversion has led to their decline (CDFW 1998). CDFW identified Western red bats as a Species of Special Concern because they face increased predation from species associated with human development (jays and opossums), and their primary habitat in riparian corridors is under consistent threat of conversion to other land uses, specifically agriculture (CDFW 1998). CDFW's findings show that the habitat of both bat species is easily disturbed or degraded by development, leading to population declines. Within California, both pallid bats and Western red bats are vulnerable and at moderate risk for extinction due to a restricted range, relatively few populations or recent and widespread declines. Populations of these species (and bat populations in general) are at risk for significant declines in California due to the recent emergence of white-nose syndrome, a disease caused by a fungal infection that frequently results in high mortality rates and the catastrophic loss of entire bat colonies (CDFW 2023). The special role of these bat species in the ecosystem and their vulnerability to population declines supports identification of their roosting habitat as ESHA.

Acoustic data collection carried out by DAF biologists within Honda Creek have identified the presence of multiple bat species, including pallid bat and western red bat. Although formal surveys for roosting areas have not been conducted, the riparian habitat and geology of Honda Canyon provides characteristic roosting habitat and bats are expected to engage in roosting behavior there. The California Natural Diversity Database includes records of Western red bat and pallid bat in Honda Canyon.

These bat species occur both on VSFB and outside of VSFB in the coastal zone of Northern Santa Barbara County. Adverse impacts to the populations on VSFB would have spillover effects to outside areas, including within the coastal zone, by reducing overall carrying capacity⁹ and genetic diversity of western red bats and pallid bats in Santa Barbara County.

Western Snowy Plover Nesting Habitat

Surveys carried out by Point Blue Conservation Science, an independent avian research organization, for DAF and provided to Commission staff as part of previous

⁹ Carrying capacity is the maximum number of animals that can be supported by a given area or habitat.

consistency determinations have documented western snowy plover (*Charadrius nivosus nivosus*) nesting habitat on the beach approximately 2 miles northwest of the proposed project site within VSFB (USFWS 2023). The rarity and vulnerability of snowy plover is well established, with the species being listed as threatened under the federal Endangered Species Act since 1993. The west coast-wide recovery objective for snowy plover is 3,000 birds, and the current population estimate falls over 20% below that at 2,371 birds. The USFWS notes that threats to snowy plover and their habitat include “habitat loss and degradation attributed to human disturbance, urban development, introduced beachgrass, and expanding predator populations,” indicating that snowy plover nesting habitat is easily degraded by human activities and developments (USFWS 2023). The USFWS additionally identified that active efforts to improve habitat at breeding beaches have improved snowy plover population numbers (USFWS 2023). Therefore, snowy plover habitat has been identified as ESHA by the Commission.

Snowy plovers are present throughout the coastal zone in California, both north and south of VSFB. In the winter, snowy plovers migrate to non-nesting beaches to forage (USFWS 2023). The populations of snowy plover nesting and reproducing on VSFB therefore disperse to other beaches outside the base in the winter and may use beaches in the coastal zone for nesting the following year. Thus, nesting habitat on VSFB contributes to snowy plover population growth within the coastal zone. Impacts to snowy plover nesting habitat on VSFB would affect snowy plovers in the coastal zone due to species movement during the winter season and reduced population viability.

Preventing the degradation of this nesting habitat is important for the continued population growth and recovery of snowy plover. VSFB contributes to the largest sub-population of snowy plovers from San Luis Obispo County through Ventura County. The population target established by the USFWS for snowy plover in San Luis Obispo, Santa Barbara, and Ventura Counties is 1,200 breeding adults. In 2022, the USFWS found that the population remains well below this target at 804 breeding adults (USFWS 2023). This comparatively large population is critical to maintain and grow for long-term success of the species along the west coast.

California Least Tern

The California least tern (*Sternula antillarum browni*) has been listed under the Federal and California State Endangered Species Acts since 1972. California least tern is a migratory bird species that prefers to nest in small, scattered clusters on natural or artificial open areas near estuaries, bays, or harbors where small fish are abundant. At VSFB, California least tern nest in colonies in several locations along the coastal strand of the north VSFB coastline (USFWS, 2023). The primary colony at VSFB for California least tern is at Purisima Point which is located approximately 8 miles north of the launch facility at SLC-4. California least tern forage in the lagoon at the mouth of the Santa Ynez River and other near-shore locations at VSFB (USFWS, 2023).

VSFB supports a relatively small percentage of the total number of California’s total California least tern breeding population. However, the population at VSFB is significant

because it is one of only three breeding colonies between Monterey and Point Conception. Also, the breeding colony at VSFB tends to be reproductively successful (USFWS, 2023).

Similar to Western snowy plover, since VSFB is a significant location for hosting breeding colonies of California least tern, California least tern habitat is considered ESHA by the Commission. Additionally, since the populations of California least tern disperse to other areas of the coast during the winter, nesting habitat on VSFB contributes to California least tern population recovery within the coastal zone, and impacts to California least tern habitat on VSFB would affect California least tern in the coastal zone dune to species movement and reduced population viability. As such, preventing degradation of this nesting habitat is important for the continued population growth and recovery of the California least tern.

Potential Impacts to ESHA

Engine Noise

The proposed project has the potential to cause adverse impacts to wildlife use of riparian habitat in Bear Creek and Honda Creek, and Western snowy plover and California least tern nesting habitat in nearby shoreline areas, through exposure to elevated sound levels during static fire tests, launches and landings. Launch and landing noise would be expected to last for several minutes and static fire noise would be expected to last for several seconds. Maps of nearby wildlife occurrences, including California red-legged frogs, pallid bat, western red bat, Western snowy plover, and California least tern along with expected sound levels from launch, landing and engine testing activities are available in **Exhibit 6**. SpaceX launch activities would include up to 36 static fire tests, 36 launches and 12 landings annually, leading to a total of 84 proposed events with elevated sound levels. This would result in a total of approximately 90 minutes of elevated sound divided between 84 events spread throughout the year. During these events, the maximum decibel (dB) levels found in the riparian area of Honda Creek, where bats are present, would be expected to reach approximately 120 dB, based on modeling carried out by DAF. The areas of Bear Creek and Honda Creek that contain California red-legged frogs would receive up to 130 dB and 120 dB, respectively. The Western snowy plover nesting habitat would receive sound levels between 100 and 130 dB. The California least tern nesting site at Purisima Point would receive sound levels between 80 dB and 100 dB.

Each landing of the first stage back at VSFB would also generate a sonic boom which lasts a fraction of a second and would create an overpressure between 0.5 to 4 pounds per square foot (psf) across the majority of VSFB. Maps of the sonic boom overpressure are included in **Exhibit 6**. CRLF within Honda Creek would experience a sonic boom overpressure estimated between 2 and 3 psf and CRLF within Bear Creek would experience an overpressure between 3 and 4 psf. For western snowy plovers the level of overpressure is dependent upon which stretch of Surf Beach they are occupying at the time of the landing event, but overpressures would be estimated between 1 and 4

psf. California least tern nesting and foraging sites would experience between an estimated 1 and 1.5 psf.

The extent to which these sound levels could significantly degrade wildlife habitat would be dependent on each species' individual sensitivity.

Bats

The bat species found in Honda Canyon are very sensitive to sound, as they use echolocation to navigate around obstacles and hunt in the dark. A 2016 report from Caltrans notes:

In bats, damage to high frequency hearing cells would likely result in impaired echolocation. Damage to the lower frequency hearing cells would likely result in impaired capacity for passive listening. Either effect could potentially be life threatening. Failure to accurately assess the locations of trees, branches, and other obstacles in their flight path could result in fatal collisions or debilitating injury. Failure to accurately detect and determine the precise location and movement patterns of prey (both aerial and ground) would likely result in significantly diminished capture success. Similarly, failure to detect the approach of a predator could be fatal. Because bats simply do not have the luxury of extended recovery time, even temporary shifts in hearing abilities have the potential to result in negative effects on affected individuals.

DAF's integrated resources management plan states that studies on the hearing sensitivity of bat species show that they have excellent hearing in the higher frequency ranges (above 20 kHz) but are insensitive to lower frequencies where launch noise has most of its energy (e.g., highest decibel measurements). This may reduce potential impacts to bats and to continued use of their habitat, but as noted in the Caltrans report cited above, damage to lower frequency hearing cells in bats would still affect their passive listening abilities.

Consultations between Commission staff and staff of the California Department of Fish and Wildlife (CDFW) during the review of other space vehicle launching projects have indicated that birds and bats can experience permanent hearing loss at continuous sound exposure above 110 dB. CDFW staff recommend that continuous sounds be kept below the temporary threshold shift or temporary hearing loss threshold of 93 dB and that impulse noise should not exceed 110 dB at any point in operations measured at bat roosting locations. Bat habitat in Honda Canyon is expected to receive engine noise exceeding these thresholds, as described above. However, there is very little research on rocket engine noise and its impact on bats. Existing studies on the impacts of other types of noise on bats may not be very representative of bat response to rocket engine noise. This is because engine noise exposure is very intermittent, with long periods of quiet between launches or static fire tests, and very short periods of elevated sounds (e.g. one minute or less).

With SpaceX's proposed launch schedule, bat habitat in Honda Creek would receive engine noise from launches and static fire tests for a total of up to 90 minutes per year. 90 minutes of engine noise across the 10,000 minutes that pass in a week means that engine noise would not be generated for a majority of the time. Finally, DAF actively monitors bat diversity and distribution on VSFB, and has found that bat species use wetland, riparian, and forest habitats, despite launch activities on-base (Heady and Frick 2013). DAF's Integrated Natural Resources Management Plan states that:

Studies have shown that the effect of intermittent noise from aircraft overflights on small terrestrial mammal demography is likely to be small and difficult to detect, if it occurs at all (McClenaghan and Bowles 1995). Studies on the hearing sensitivity of a variety of bats (Dalland 1965; MacDonald 1984; Popper and Fay 1995) have shown that they have excellent hearing in the higher frequency ranges (above 20 kilohertz [kHz]) but are very insensitive to lower frequencies where launch noise has most of its energy. Therefore, impacts on these mammals are expected to be minimal to nonexistent.

Due to the intermittent nature of engine noise, the very short duration of engine noise relative to periods of quiet, and DAF's existing monitoring demonstrating that bats have used habitat on VSFB despite engine noise and launches, DAF has concluded that significant degradation of bat habitat in Honda Canyon from launch-related noise is unlikely, despite exceeding CDFW's sound exposure level recommendations for other types of projects.

Although prior monitoring has not demonstrated adverse impacts to or degradation of bat habitat on VSFB, an average of only 9.7 rocket and missile launches per year occurred from 2015-2021, during the course of that monitoring.

In contrast, SpaceX would carry out a greater frequency of launch activities, to include a maximum of 36 launches, 12 landings, and 36 static fire tests per year, resulting in a commensurate increase in elevated noise episodes. To confirm that elevated sound levels from this increased launch frequency will not be incompatible with the continued use of bat habitat, DAF would augment the acoustic monitoring it committed to carry out as part of Consistency Determination No. CD-0010-22 (the Phantom Space Corporation launch complex and program recently reviewed by the Commission) by expanding it to include the noise footprint of the proposed SpaceX launches, as shown in **Exhibit 6**, to determine the extent to which bat species are present in Honda Canyon and to record and assess their call rates before and after rocket launches. This monitoring program would augment DAF's existing bat monitoring programs on VSFB under its Integrated Natural Resources Management Plan. DAF has also committed to providing the Executive Director with annual written reports on the data and results of its biological monitoring.

If this monitoring demonstrates that launch activity results in significant degradation of bat habitat in Honda Canyon, as measured by bat call rates before and after launches, DAF would work with the Executive Director to determine the additional measures

necessary to minimize the likelihood of further impacts to bat habitat. These measures would include offsets by providing additional habitat or improving existing habitat for the species for which effects were documented. These actions could include providing additional shelter by installing bat boxes, retrofitting existing infrastructure to make suitable for bat roosting, and/or improvement of native riparian habitat. In such a situation, DAF would also share information with the Executive Director to help determine if the activity is being conducted or is having an effect on any coastal us or resource substantially different than originally described and, as a result, is no longer consistent with the enforceable policies of the CCMP.

With the information provided by DAF on the potential effects of engine noise on bat habitat in Honda Canyon, the absence of data demonstrating adverse impacts over the past roughly 20 years of monitoring bat populations at VSFB, the monitoring that would continue to be carried out as part of the proposed project, and DAF's commitment to working the Executive Director to address any unexpected impacts on bat habitat, the Commission finds that the proposed project would not significantly degrade bat habitat in Honda Canyon.

California red-legged frog

All life stages of California red-legged frogs can detect noise and vibrations (DAF 2023) and are assumed to be able to perceive the engine noise produced by rockets. The proposed project thus has the potential to adversely affect California red-legged frog habitat in Bear Creek and Honda Creek. DAF states:

Engine noise would likely trigger a startle response in California red-legged frog, causing them to flee to water or attempt to hide in place. It is likely that any reaction would be dependent on the sensitivity of the individual, the behavior in which it is engaged when it experiences the noise, and the sound level (e.g., higher stimuli would be more likely to trigger a response). Regardless, the reaction is expected to be the same – the frog's behavior would be disrupted, and it may flee to cover in a similar reaction to that of a frog reacting to a predator. As a result, there could be a temporary disruption of California red-legged frog behaviors including foraging, calling, and mating (during the breeding season). However, frogs tend to return to normal behavior quickly after being disturbed.

There are no known studies on the impacts of launch sound on the hearing capabilities of California red-legged frogs, however Simmons et al. (2014) found hearing damage to American bullfrogs, which are in the same family as California red-legged frogs, when they were exposed to sounds greater than 150 dB. After hearing damage, the bullfrogs showed full functional recovery of their hearing within 3 to 4 days. California red-legged frogs likely have similar hearing structures and a similar resilience to sounds below 150 dB as well as an ability to recover from hearing damage.

In its review of the potential project impacts to California red-legged frogs, the USFWS states that, "However, the specific acoustic thresholds for California red-legged frog are

unknown and the Service does not anticipate physiological effects to California red-legged frog's inner ears at this time due to the short duration and lower noise levels of the project's anticipated noise disturbance events." However, the USFWS did find that operational noise may impact frog behavior, including calling frequency, and lead to increased risk of predation due to a "freeze" response to excessive sound. Despite anticipating some local negative effects, the USFWS found overall that:

Using the available information and considering minimization measures, including potential mitigation ensuring no net loss, we expect adverse effects to the recovery of California red-legged frogs on VSFB would be low.

It is important to note that in its review of potential project impacts to California red-legged frogs, the USFWS' March 21, 2023, Biological Opinion regularly identifies the significant change in overall launch numbers as a result of the proposed SpaceX project from 12 to 36 launches annually and how this increase represents a novel disturbance. Especially when considered in conjunction with the other active and proposed launch programs at VSFB, the potential for increased disturbance from launch-related noise is significant. The USFWS Biological Opinion notes that:

"...until the novel effects of the project activity are studied, we are unable to adequately anticipate the magnitude of any specific response at this time.

California red-legged frogs would be startled between 6 to 9 times a month as a result of the proposed project alone when considering that each launch would include a static test fire and could include a terrestrial landing. When reviewing the proposed project in addition to other active/permitted launch programs (collectively totaling 129 to 217 launch related disturbance events between the Santa Ynez River and Honda Creek; MSRS 2022b, p. 76), the Service understands that launch activities would startle California red-legged frogs in these areas frequently each month, although the Space Force has clarified that multiple launch related disturbance events would not occur on the same day (Kaisersatt, pers. comm. 2023c). The Service anticipates the potential for long-term effects from chronic stress caused by routine intermittent acute noise from the proposed project's launch disturbance. These may include long-term population level effects including reduced reproductive success, survival, fitness, and spatial displacement. Although we do not have an estimated survivorship of displaced California red-legged frogs, this could result in injury or death to individuals as a result of increased intraspecific competition, lack of familiarity with new locations of potential breeding, feeding, and sheltering habitats, and increased risk of predation. However, it is unknown how California red-legged frogs would react to repetitive launch events of variable disturbance levels with increasing frequency. Improved monitoring information is needed to help identify thresholds that quantify what level of noise or frequency of disturbance would elicit stress hormone responses that may lead to impacts to breeding and reproduction or other negative population level effects."

As discussed above, DAF has conducted long-term monitoring on VSFB to assess wildlife populations, including California red-legged frogs, and their response to launch activities. DAF has consistently found that past launch activities have not decreased California red-legged frog populations or led to the abandonment of habitat areas and have only produced temporary observable changes in behavior. However, the DAF's monitoring and determinations to date have mainly included surveying during the much less intense launch frequencies that have occurred over the last several years and those previous determinations may not comport with the increased launch frequency being proposed and potential adverse impacts that could occur. For example, if it takes several days for individual frogs or populations to recover from a launch disturbance and another disturbance occurs before that recovery, chronic stress or habitat abandonment may occur. To address the need for better information about it an increased frequency in elevated sound levels from launches will be incompatible with the continued use of frog habitat near the proposed project site, DAF has committed to monitoring and mitigation as part of its Biological Opinion with the USFWS.

In the Biological Opinion, and as part of DAF's recent Consistency Determination No. CD-0010-22 for the Phantom Space Corporation's launch complex and operation at VSFB, DAF committed to placing passive bioacoustic recorders in Honda Creek and conducting California red-legged frog surveys there as well. This monitoring program will be carried out at part of the SpaceX launch program as well and is designed to track habitat occupancy, breeding behaviors (calling), and breeding success (egg mass and tadpole density). If habitat occupancy, calling frequency, or tadpole densities decline from baseline by 15% or more over two years, and the decline cannot be confidently attributed to other natural or human caused factors such as drought or wildfire, DAF will mitigate for impacts to California red-legged frog breeding habitat. To offset any impacts found, DAF will create new California red-legged frog breeding habitat at the San Antonio Creek Oxbow Restoration Area, an established wetland site on VSFB that is located outside of areas currently affected by launch noise and artificial lighting. A detailed description of this commitment is available in the Biological Opinion excerpt in **Appendix A**.

As discussed above, DAF has also committed to providing the Executive Director with written annual reports on the findings of its monitoring efforts as well as a comprehensive 5-year report on how the SpaceX project is or is not adversely affecting its surrounding environment. If this monitoring demonstrates that launch activity is resulting in significant degradation of California red-legged frog habitat in Bear Creek and Honda Creek, as measured by habitat occupancy and breeding success, DAF would work with the USFWS and Executive Director to determine the measures necessary to minimize the likelihood of further degradation to California red-legged frog habitat, including habitat enhancements and restoration. In such a situation, DAF would also share information with the Executive Director to help determine if the activity is being conducted or is having an effect on any coastal use or resource substantially different than originally described in the CD and, as a result, is no longer consistent with the enforceable policies of the CCMP.

With the information provided by DAF on the potential effects of engine noise on California red-legged frog habitat at Bear Creek and Honda Creek, the collecting of data to better understand the adverse effects from launch activities, the monitoring that would continue to be carried out as part of the proposed project, and DAF's commitment to working with the Executive Director to address any unexpected impacts on California red-legged frog habitat, the Commission finds that the proposed project would not significantly degrade California red-legged frog habitat in Honda Creek.

Western Snowy Plover

As mentioned above, western snowy plover nesting habitat is located approximately 0.8 miles northwest of SLC-4 at the southern end of Surf Beach. DAF has conducted monitoring of western snowy plover nests during numerous launches at VSFB. In its consistency determination, DAF states:

Direct observations of wintering birds were made during a Titan IV and Falcon 9 launch from SLC-4E (SRS Technologies, Inc. 2006b; Robinette and Ball 2013). The Titan IV launches resulted in sound levels of 130 dBA Lmax. SNPL [snowy plover] did not exhibit any adverse reactions to these launches (SRS Technologies, Inc. 2006b; Robinette and Ball 2013) with the exception of one observation. During the launch of a Titan II from SLC-4W in 1998, monitoring of SNPL found the nest located closest to the launch facility had one of three eggs broken after the launch (Applegate and Schultz 1998). The cause of the damaged egg was not determined.

More recently on 12 June 2019, SNPL response was documented during a SpaceX Falcon 9 launch and first stage recovery at SLC-4. The return flight of the first stage to VSFB produced a 3.36 psf sonic boom and landing engine noise of 138 dB Lmax and 130 dB SEL, as measured on South Surf Beach. SNPL response to the noise impacts was documented via pre- and post-launch monitoring and video recording during the launch event. Incubating SNPL captured on video were observed to startle and either jump or hunker down in response to the sonic boom. One SNPL egg showed signs of potential damage. This egg was part of a three-egg clutch in which the other two eggs successfully hatched. It is not uncommon for one or more eggs from a successful nest to not hatch. Failure of the egg to hatch could not be conclusively tied to the launch event (Robinette and Rice 2019).

The USFWS has also reviewed the potential for launch noise to adversely impact snowy plover, and states:

... past monitoring results suggest that western snowy plovers exhibit some level of tolerance to high thresholds of sound pressure level and that they are nest tenacious during the breeding season (typically March 1 to September 30). However, the proposed action may result in short-term adverse effects including interruption of courtship or breeding activities, flushing from nests, interruptions in foraging, and behavioral reactions, such as head raising, body shifting, moving short distances, and flapping of wings. Startle responses during nesting may result

in nest abandonment or dislodging of eggs from nest scrapes; adults may leave chicks unattended and vulnerable to elements or predation. We do not expect abandoned eggs and chicks to survive if adults do not return to the nest. Non-observable physiological responses of western snowy plover to noise disturbance may include an increased heart rate or altering of metabolism and hormone balance. These responses may cause energy expenditure, reduced feeding, habitat avoidance, reproductive losses, and bodily injury resulting in increased vulnerability to predation (Radle 2007, p. 5)...

... Considering the increase in launch cadence, the proposed project has the potential to contribute to long-term adverse effects that result from routine intermittent acute noise disturbance.

Similar to the discussion above regarding California red-legged frogs, in the case of western snowy plover the USFWS Biological Opinion identifies the lack of information available for how plovers are expected to respond to the significant increase in annual launches. The USFWS Biological Opinion notes that:

“...Referencing current best available information, the Service cannot adequately determine the anticipated impacts of the proposed project’s 84 disturbance events annually on the western snowy plover population at Surf Beach. Similarly, the Service cannot adequately determine how the proposed project’s 84 disturbance events would contribute to the existing launch baseline average of 6.2 events or the current permitted annual launch baseline of up to 189 events. The Service considers that although the project has the potential to significantly contribute to the collective effects of the existing launch disturbance baseline and result in long term population level effects, until the novel effects of the project activity are studied, we are unable to anticipate the magnitude of response at this time.”

As part of the USFWS review, DAF committed to augmenting the existing snowy plover monitoring program on VSFB, which records habitat use, nesting efforts, nest fates, fledgling survival, and population size through each breeding season, with geospatial analysis of snowy plover nesting and the noise environment. Sound meters will be deployed immediately inland of South Surf Beach and at a control site to characterize the noise environment during the breeding season within the noise footprint of SpaceX launches. Geospatial analysis will be performed annually as SpaceX’s launch frequency increases to assess whether patterns of nesting activity, nest fates, or fledgling success are negatively impacted by noise from SpaceX operations. If the geospatial analysis shows that a statistically significant decline in breeding effort or nest success has occurred over two consecutive years, and this decline cannot confidently be attributed to other natural or human caused factors, DAF will offset this impact by increasing predator removal efforts on VSFB to include the non-breeding season, particularly focusing on raven removal adjacent to VSFB beaches with a goal of achieving no net loss of the species. A more detailed description of this commitment is available in the Biological Opinion in **Appendix A**.

As discussed above, DAF has also committed to providing written annual reports to the Executive Director on the findings of its monitoring efforts and a comprehensive 5-year report on how the SpaceX project is or is not impacting its surrounding environment. If this monitoring demonstrates that launch activity results in a statistically significant decline of snowy plover breeding effort or nesting success, as measured by nesting activity, nest fates and/or fledgling success, DAF would work with the USFWS and Executive Director to determine the measures necessary to minimize the likelihood of further degradation to snowy plover nesting habitat, including predator control, as described above. In such a situation, DAF would also share information with the Executive Director to help determine if the activity is being conducted or is having an effect on any coastal use or resource substantially different than originally described in the CD and, as a result, is no longer consistent with the enforceable policies of the CCMP.

The first of the monitoring reports provided for in the Biological Opinion was prepared for the 2023 calendar year and submitted in February 2024. A total of 24 Falcon 9 missions were performed on VSFB during the reporting period, including six boost-back landings at SLC-4W. Eleven of these 24 launches occurred during the western snowy plover nesting period. The report found no differences in incubation rates between launch events that included a sonic boom and those that didn't, but the report did identify reactions to the associated noise and noted stronger reactions to the sonic boom than the initial launch noise, mainly startle responses and hiding behavior. The report discussed how it is possible that the hiding or "hunker down" behavior could lead to damage to western snowy plover eggs. The majority of monitored eggs showed no signs of damage. However, several eggs were found either damaged or with an embryo that had stopped developing. The report couldn't attribute the damage to these eggs and the embryo from launches, but also could not conclusively discount the possibility that the launches and responses from plovers resulted in damage to the eggs. The report pointed out that when comparing north VSFB to south VSFB, north VSFB exhibited a greater proportion of damaged eggs than south VSFB. Finally, the monitoring documented higher rates of snowy plover nest abandonment on south VSFB compared to north VSFB. The report was unable to determine if this higher abandonment rate is due to launch activity or other factors.

Although it is difficult to affirmatively discern an effect from one year of monitoring, the monitoring conducted thus far suggests a possible correlation between launching the Falcon 9 rockets and reactions from western snowy plovers, including startling and flushing, damage to eggs, and abandonment of nests. These first year monitoring results highlight the need for additional monitoring and statistical analysis in order to more fully understand how launching of Falcon 9 rockets could be adversely impacting western snowy plover and what may happen if the frequency of launches increases further. This is consistent with the USFWS findings in the Biological Opinion that without long term population level effects analysis on the novel effects of increased launch cadence, it is difficult to accurately anticipate the magnitude of the response from western snowy plover.

With the information provided by DAF on the potential effects of engine noise on snowy plover nesting habitat, the monitoring and collection of data to better understand the effects from launch activities that would continue to be carried out as part of the proposed project, and DAF's commitment to working the Executive Director to address any unexpected impacts on snowy plover habitat, the Commission finds that the proposed project would not significantly degrade snowy plover nesting habitat.

California Least Tern (LETE)

The known California least tern nesting site at Purisima Point is approximately 8 miles north of the SLC-4 SpaceX launch site and the roosting location at Santa Ynez River is located approximately 3.7 miles north of SLC-4. If launches and static fire tests are performed when California least tern are present at VSFB the colony at Purisima Point would experience an engine noise of 102 dB to 108 dB while the colony at the Santa Ynez River mouth would receive an engine noise of 80 dB to 110 dB. In its consistency determination, DAF states:

At VSFB, LETE monitoring has been conducted for five Delta II launches from SLC-2 on north VSFB. SLC-2 is 0.4 mi. (0.6 km) from the Purisima Point nesting colony. LETE responses to launch noise have varied. Pre- and post-launch monitoring of non-breeding LETE for the 7 June 2007 Delta II COSMO-1 launch and monitoring of nesting LETE during the 20 June 2008 Delta II OSTM and 10 June 2011 Delta II AQUARIUS launches did not document any mortality of adults, young, or eggs, or any abnormal behavior resulting from launches (MSRS 2007a, 2008b, 2011). In addition, Delta II launches from SLC-2 in 2002 and 2005, when terns were arriving at the colony, may have caused temporary or permanent emigration from the colony because there was decreased attendance following the launches (Robinette et al. 2003; Robinette & Rogan 2005). These data imply that LETE response to noise relates to timing with the nesting cycle. For instance, at the beginning of the nesting season when LETE are arriving at the breeding colony, the adults seem to be more disturbed, but once courtship and nest-tending begins, the adults are more tenacious.

On 12 June 2019, LETE response was documented during a SpaceX Falcon 9 launch with first stage landing at SLC-4 on VSFB. The landing produced a 2.7 psf sonic boom, as measured at the Purisima LETE colony. LETE response to the launch and boost-back landing was documented via pre- and post-launch monitoring and video recording during the launch event. LETE response during the launch was difficult to determine since birds flushed before sonic boom impact. All LETE returned to their nests minutes after the launch event. One LETE egg was found to be damaged. The damaged LETE egg was from a one egg clutch and was inspected when it was a week past hatch date. The cause of the damage to the egg was inconclusive (Robinette & Rice 2019).

The effect of increasing noise disturbances on LETE will be uncertain based on the scientific literature. However, none of these studies in the scientific literature are

directly comparable to the noise impacts of the Proposed Action. Launch engine noise and sonic booms are acute, non-sustained, and unpredictable. It is more similar to aircraft noise disturbances studied in the literature yet would be relatively much less frequent. Beyond the launch monitoring efforts discussed above, there are almost no studies on the effects of rocket launch on birds.

In the Biological Opinion the USFWS found that “past monitoring results suggest that California least tern response to noise is related to timing within the nesting cycle and that launch operations that occur during the breeding season, particularly the early courtship season, may disturb nesting”. However, with DAF’s proposal to monitor and mitigate for any impacts at the local level to achieve no net loss of the species, the USFWS ultimately concluded that:

After reviewing the current status of the California least tern, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service’s biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the California least tern,

As discussed above, DAF has previously conducted long-term monitoring on VSFb to assess wildlife populations, including California least tern, and their response to launch activities. DAF monitoring of California least tern to date has found that launch activities have not decreased California least tern populations and have only produced temporary observable changes in behavior. To further demonstrate that an increased frequency in elevated sound levels from launches will not be incompatible with the continued use of snowy plover nesting habitat, DAF has committed to monitoring and mitigation as part of its Biological Opinion with the USFWS.

DAF will continue to monitor the impacts of noise from the SpaceX launches to assess any potential adverse impacts on California least tern as the launch frequency increases and reaches full tempo (36 launches/year). If adverse effects are found, DAF would mitigate those effects by increasing predator management efforts on VSFb to comply with the DAF’s sections 7(a)(1) and 7(a)(2) obligations under the Endangered Species Act (ESA). Mitigation activities would align with the California Least Tern Recovery Plan (USFWS 1985b) and 5-year review (USFWS 2020) with the goal of achieving no net loss to the species.

Even with this commitment to monitoring and mitigation if adverse impacts are determined, USFWS expressed concerns about the novelty of the cadence increase and potential impacts to California least tern compared to what has historically occurred as VSFb:

Referencing current best available information, the Service cannot adequately determine the anticipated impacts of the proposed project’s 36 disturbance events annually on the California least tern population at Purisima Point and the Santa Ynez River lagoon. Similarly, the Service cannot adequately determine how the proposed project’s 36 disturbance events would contribute to the existing launch

baseline average of 6.2 events or the current permitted annual launch baseline of up to 47 events. The Service considers that although the project has the potential to significantly contribute to the collective effects of the existing launch disturbance baseline and result in long term population level effects, until the novel effects of the project activity are studied, we are unable to anticipate the specific response at this time.

The first of the annual monitoring reports was prepared for the 2023 calendar year and submitted in February 2024. A total of 24 Falcon 9 missions were performed on VSFb during the reporting period, including six boost-back landings at SLC-4W. The report found no differences in incubation rates between launch events with and without a sonic boom but did identify reactions to the associated noise and noted stronger reactions to the sonic boom than the initial launch noise, mainly startle responses and “hunkering down” behavior. The monitoring also documented California least terns flushing off of nests during both initial launch events and sonic booms. The California least terns returned to their nests within minutes after the boost-back had completed.

Although it is difficult to affirmatively discern an effect from one year of monitoring, the monitoring conducted thus far suggests that there could possibly be a correlation between launching the Falcon 9 rockets and reactions from California least terns, including startling and flushing. The results of the first year of monitoring also highlight the need for additional monitoring and statistical analysis in order to more fully understand how launching of Falcon 9 rockets could be adversely impacting California least tern. This is consistent with the USFWS findings in the Biological Opinion that without long term population level effects analysis on the novel effects of increase in launch cadence it is not possible to anticipate the magnitude of the response from California least tern.

With the information provided by DAF on the potential effects of engine noise on California least tern nesting habitat, the monitoring and collection of data to better understand the adverse effects from launch activities that would continue to be carried out as part of the proposed project, and DAF’s commitment to working the Executive Director to address any unexpected impacts on California least tern habitat, the Commission finds that the proposed project would not significantly degrade California least tern nesting habitat.

Engine Noise and Cumulative Impacts

Noise associated with launches, static fire tests and landings occurs at and near multiple launch facilities across VSFb and may incrementally contribute to cumulative effects to sensitive species and ESHA. Over the past five years, VSFb has supported an average of 6.2 launches per year with a maximum of 17 in 2022. During 2023 a total of 24 Falcon 9 missions were performed on VSFb. As of the date of this staff report Commission staff have counted a total of 10 SpaceX launches in the first quarter of 2024. At its December 15, 2023 meeting, the Commission concurred with a CD from DAF for Phantom Space Corporation (Phantom) to construct a new commercial space

launch facility at the former site of SLC-5 and to carry out up to 48 rocket launches and 48 static fire engine tests per year. Additionally, the Commission is aware of several other pending launch programs (see Table 1, below), a proposed increase in SpaceX launches to 100 per year (anticipated to be submitted as a consistency determination this year), and the potential construction of new launch facilities at VSF to support future launch activities. All of these have the potential to increase the total launch activity on the base. The cumulative effects of engine noise from space launch activities are influenced by the geographic distance between launch sites, the timing of launches, the size and engine noise intensity created by different launch vehicles, and the actual number of launches that take place (as noted above, the number of actual launches has traditionally been ten percent or less of the authorized number).

Launch activities are spread out across the geography of VSF. The geographic distance between launch facilities reduces the frequency of intense impacts on any one population of wildlife near a particular launch facility, but also spreads less intense impacts across a larger geographic space. With operation of the proposed project, the highest number of contracted launches would be launched from the areas of SLC-4, the site of the proposed SpaceX project, and SLC-5, the site of launches for the Phantom program. Both of these sites are located in the southern portion of VSF. The habitats considered here would be affected by engine noise from several launch facilities. The USFWS Biological Opinion states:

The Service understands that the proposed project would contribute to the frequency of an existing launch disturbance baseline. Over the past five years, VSF has supported an average of 6.2 rocket launches per year with a maximum of 17 in 2022. However, other proponents have recently initiated several adjacent launch programs within the vicinity of SLC-4. Of these, those that will have noise impacts on Honda Creek, Bear Creek, and/or the Santa Ynez River of at least 100 dB SPL_{max} include Phantom Daytona-E (SLC-8) and Minotaur (SLC-8), Phantom Daytona-E/Laguna-E (SLC-8), ULA Vulcan (SLC-3), Blue Origin New Glenn (SLC-9), and Relativity Terran 1 (SLC-11). If all these programs achieve full launch tempo by 2028, the total number of launch disturbance events over 100 dB SPL_{max} would be up to 169 within the action area. With the addition of the proposed project, this permitted total would raise to 217 launch disturbance events.

Not all space launch vehicles create the same amount of engine noise, however. Table 1 below provides a summary of the engine noise produced at the launch pad by different space launch programs at VSF.¹⁰

¹⁰ This information was provided to Commission staff by DAF in a previous consistency determination submittal (CD-0010-22)

Table 1: Maximum Engine Noise produced at the Launch pad from space launch vehicles at VSFB

Space Launch Vehicle	Maximum Engine Noise at the Launch Pad During Launch (dB) ¹	Space Vehicle Height
Minotaur	unknown	63 feet
Firefly Alpha	120 dB ²	95 feet
ABL RS1	120 dB ²	88 feet
New Glenn (proposed)	120 dB ³	360 feet
Vulcan Centaur	120 dB ⁴	200 feet
Falcon 9	150 dB	178 feet
Laguna-E (proposed)	144 dB	78.7 feet
Daytona-E (proposed)	130 dB	54.4 feet
Delta IV (discontinued)	133 dB ⁵	236 feet

¹ Decibels (dB) and A-weighted decibels (dBA) reported here are for launch noise in the immediate vicinity of the launch pad unless otherwise stated

² Within 0.5 miles of launch pad

³ Within 5.6 miles of launch pad

⁴ Within 4.4 miles of launch pad

⁵ Highest recorded dB from monitored launches. Data is from NROL-49 Delta IV Heavy launch in January 2011; data recorded approximately 1.8 miles away from launch pad

In total, VSFB has contracted for up to six launches of heavy space launch vehicles, 53 launches of medium space launch vehicles, and 81 launches of small space launch vehicles annually. Additionally, up to 23 missiles are launched from the north portion of VSFB annually. These missiles are smaller, and do not produce the same level of engine noise as space launch vehicles.

However, as discussed in the Commission's findings for cd-0010-22, the significant discrepancy between contracted launches and actual launches at VSFB influences the cumulative effects of VSFB's launch programs. From 2017-2021, an average of 4.7 percent of the total number of contracted launches were carried out at VSFB. This means that although NEPA review and DAF agreements allow a high number of launches, the actual number of launches and their resulting sound effects are significantly lower. DAF has stated that the discrepancy between permitted launches and actual launches is due to the availability and need for each specific rocket. Rockets often require updates or become unavailable for extended periods of time. Authorization for launches beyond what is required allows for DAF to shift government contracts and payloads to another rocket or provider, when necessary. Additionally, DAF states:

There is variability in need for payloads to be delivered into orbit - the higher number of launches available at each site increases the flexibility of our national defense program. We also need to be primed and ready should there be an attack on our satellites/resources in orbit. We need to ensure there are enough resources

available to get additional satellites into orbit to support our warfighters and defend our nation should the need arise.

Given the current situation, DAF believes that the discrepancy between allowable launches and actual launches will continue. Ultimately, DAF has determined that the Western Range can support a maximum number of 110 space launches, and a maximum number of 15 missile launches annually. These limitations are due to personnel and range safety considerations, and the maximum number of launches remains below the potential total contracted number of launches, should all proposed space launch projects move forward.

DAF's long-standing monitoring of sensitive species and their responses to space launch vehicle engine noise has documented only temporary observable changes in wildlife behavior as a result of launch activities and has not shown changes in habitat occupancy or population numbers. However, these monitoring results – which have informed the DAF's effects determinations to date – reflect only the lower launch frequencies that have occurred over the last several years, and may not be predictive of the potential for adverse effects under the increased launch frequencies now being proposed. The proposed monitoring provided as part of the SpaceX project, and other projects like Phantom, would include monitoring of California red-legged frog habitat, snowy plover nesting sites, California least tern nesting sites, and bat habitat for adverse impacts from launch activities. Although the focus of this monitoring would be on the SpaceX project, the monitoring design would also capture adverse impacts to these species and their habitats from other launch activities at VAFB. If negative effects are observed and cannot be confidently attributed to other human-caused or natural causes, DAF will proceed with mitigation or habitat enhancement, as described above. Additionally, DAF will work with the Executive Director to determine the measures necessary to minimize the likelihood of further degradation to sensitive habitats. Additionally, the USFWS considered the impacts of multiple launch programs when working with DAF to design monitoring for federally listed species and developing its Biological Opinion and concluded that the proposed project, both individually and cumulatively in combination with other existing activities, is not expected to interfere with the recovery goals for California red-legged frog, western snowy plover, or California least tern.

Lighting

The pivotal role of light (electromagnetic radiation) in organismal biology raises the potential that there will be significant impacts on plants and animals from artificial lighting at night. Natural light (sun, moon, stars) is used by plants and animals to infer a wide range of information from their environment. In many species, light information, including day length, light intensity, and wavelength, contributes to the regulation of circadian rhythms (“biological clocks”) and life-cycle activity (e.g., plant flowering, animal migration, reproduction) on a daily, weekly, seasonal, and annual basis. Artificial night lighting changes the ambient light environment and may adversely effect both plants

and animals. For example, the effects of artificial night lighting on mammals may include avoidance, disorientation, disruption of foraging patterns, increased predation risk, disruption of biological clocks, increased mortality on roads, and disruption of dispersal movements. Similarly, many amphibians and insects are attracted to artificial light because it simulates a full moon, potentially causing them to be preyed upon more easily. Artificial night lights may also interfere with the accurate discernment of seasonal periods of weather conditions, food availability and/or predator activity, all of which are crucial for survival of many species.

At present, there is little available information about the intensity of night lighting at the SpaceX launch facility or its potential for adverse effects. A primary concern with both the regular illumination at the launch facility and the more episodic illumination from the rockets during night launches and landings is their location near the coast and the potential for night-migrating birds to become confused and attracted to the lights during inclement/foggy weather. Most migratory movement occurs early in the evening so any impacts to migrating birds due to the night lighting are likely to occur during the first two to three hours after sunset. Birds that migrate at night rely on the moon and stars for navigation. During clear weather the birds appear to be able to distinguish artificial lighting from light emanating from planets and stars. However, during inclement weather, birds can become confused and drawn to artificial lights. This phenomenon has been observed on numerous occasions at lighted buildings, oil platforms, and athletic fields. Once drawn into an artificial light source a number of negative outcomes including mortality can occur; birds may crash into something, circle the light source and become exhausted, or become confused and drawn off course.

In addition to the potential disruption of migratory patterns, the University of California Los Angeles (UCLA) published a study in 2021 examining how exposure to artificial light at night (ALAN) could affect the distributions of avian species, in particular western snowy plovers¹¹. The study included western snowy plover roosting sites from northern Ventura County line down to the southern Orange County line. The study used species distribution models with exposure to ALAN based on a ground-verified model of night sky illuminance. The study determined that significant declines were found in the likelihood of western snowy plover roosting locations where ALAN exposure exceeded illuminance levels equivalent to approximately one half a full moon. The study concluded that these disruptions in behaviors were likely the result of increased risk of predation and that control of nighttime illumination be used to mitigate disturbances to western snowy plover.

After salvage and landing operations are complete any first stages, fairings and other materials would be transported via barge to the VSFB harbor. Once at the harbor the equipment and materials would be loaded onto trucks for transport back to processing facilities at VSFB. Several marine species including pinnipeds and the federally threatened Southern Sea Otters (*Enhydra lutris nereis*) are known to frequent the area in and around the VSFB harbor. Any landing operations at the harbor occurring at night

¹¹ <https://meridian.allenpress.com/jcr/article-abstract/38/2/302/474456/Determining-the-Effects-of-Artificial-Light-at>

would require the use of artificial lighting to help facilitate project operations. The effects of artificial light on marine species have been documented in recent years and include effects on physiology, navigation, reproductive behavior, predation success, community structure and ecosystem services. In order to minimize adverse effects to marine species from artificial lighting the project incorporates several measures including entering the harbor at night when pinnipeds are not present and limiting and restricting nighttime activities and using artificial lighting.

Artificial night lighting also has the potential to negatively impact California red-legged frogs and their use of habitat areas. Although no California red-legged frog were located near the proposed project site, light from launch vehicles would extend beyond the project site and into other areas of VSFb. In studies on wood frogs, experimental exposure to artificial light at night was found to make them more vulnerable to other stressors such as parasites and pollution (DAF 2023). Another study focused on common toads found that artificial lighting reduced activity in male toads by half during the breeding season and changed their energy metabolism, which has the potential to adversely affect reproduction and overall fitness (DAF 2023). The effects of artificial lighting on frogs are inconsistent and vary by species and life stage; however available research indicates a potential risk to California red-legged frog breeding habitat from the proposed project.

As described previously in this report, the increased frequency of launches represents a novel disturbance to the habitats and species of VSFb and there currently is not sufficient data to demonstrate a negative response from species such as the western snowy plover. More population level monitoring and statistical analysis is necessary to better understand the potential for adverse effects from artificial night lighting from the proposed launch activities. USFWS has been investigating the increase in ALAN from launch activities at VSFb, including the SpaceX launches proposed in the CD, and has been coordinating with DAF. DAF is working with USFWS on measures to minimize the potential adverse impacts from night lighting including development of a light management plan. The plan would include Best Management Practices (BMPs) such as shielding, modifying the direction of lights to avoid sensitive receptors, and outlining parameters when lighting at night would be necessary. DAF has committed to keep Commission staff informed on the progress of this investigation and to work with the Executive Director to address any unexpected impacts to sensitive species from ALAN.

G. COMMERCIAL AND RECREATIONAL FISHING

Section 30234.5 of the Coastal Act states:

The economic, commercial, and recreational importance of fishing activities shall be recognized and protected.

The proposed project has the potential to impact commercial and recreational fishing activities off the coast of VSFb. Coastal Act Section 30234.5 requires that the commercial and recreational importance of fishing be recognized and protected.

A map depicting the range of SpaceX's launch angles with respect to areas of commercial fishing is provided in **Exhibit 8**. DAF describes SpaceX's launch azimuth and relation to fishing areas in the CD as follows:

Southern California's west coast is a leading recreational and commercial fishing area. SpaceX launches missions from VSFB with a launch azimuth between 140 and 325 degrees, supporting a wide range of U.S. Government missions. The maritime hazard area for any given mission would include up to approximately 54 California Commercial Fisheries Blocks as defined by the California Department of Fish and Wildlife. Southerly trajectories would cover more blocks than westerly trajectories, as the vehicle's trajectory is over state waters for longer. The maritime hazard area follows the path of the trajectory and is approximately 21 miles wide at its widest. These launch azimuths also include multiple State Marine Reserves, which prohibit or significantly limit fishing. These are generally clustered around VSFB and the Northern Channel Islands.

In the event that SpaceX launch and reentry operations pose an extreme risk to public safety over navigable waters, the United States Coast Guard (USCG) would have the authority to determine whether risk mitigating strategies would need to be implemented, including restricting vessel traffic. USCG would be responsible for issuing a Notice to Mariners (NOTMAR) that would provide vessel operators with a location of potential hazards as well as dates and times of the hazardous conditions. Launches would be scheduled in advance to minimize the interruption of airspace and waterways. Once a NOTMAR is issued, there is no requirement for vessels to alter their routes or change their navigation speeds and if vessels are within the potentially hazardous area despite the NOTMAR, a scheduled launch would be delayed or altered to avoid potential hazards to vessels.

In addition, DAF and SpaceX have committed to establishing a communication protocol and regular dialogue with the commercial and recreational fishing industry in this area of the coast including: the Port San Luis Commercial Fishermen's Association, other fishing associations, fish buyers and processors, harbor masters, and sport fishing companies. Prior to each scheduled launch, the chairperson of these entities would be sent an email which would include the date and time of the hazardous conditions as established in the NOTMAR, and how long the conditions would be in effect. This advance notice would allow fishermen to better understand the conditions and adjust their operations to help ensure fishermen meet their landing goals while also abiding by the NOTMAR. If these measures do not fully satisfy fishermen, DAF has committed to engage in additional coordination prior to and on the day of scheduled launches. This additional coordination would include updated safety calculations and real-time radio communications.

Section 30234.5 of the Coastal Act requires that the commercial and recreational importance of fishing be recognized and protected. Concerns about the launching of space vehicles from VSFB, NOTMARs, and the need to recognize and protect the

importance of fishing were previously expressed by local fishermen and processors at the Commission's December 2023 meeting for CD-0010-22. These same concerns apply to the proposed project. By committing to implement a notification protocol and maintain regular dialogue with the fishing industry the project would recognize the importance of fishing. Also, the project would protect the fishing industry by avoiding complete closures of fishing areas during launch events. Instead, DAF would use the notification and dialogue processed described above to ensure that fishermen are aware of the launch activities and NOTMARs. Finally, if a vessel is in a hazardous area despite a NOTMAR, a scheduled launch would be delayed or altered to avoid hazards to fishermen.

As such, the Commission finds the proposed project is consistent with the commercial and recreational fishing provisions of the Coastal Act, including Section 30234.5.

H. AIR QUALITY

Coastal Act Section 30253 states (in relevant part):

New development shall do all of the following:

(c) Be consistent with requirements imposed by an air pollution control district or the State Air Resources Board as to each particular development.

The proposed project has the potential to produce air pollution emissions through launch activities and static fire tests. Coastal Act Section 30253(c) requires that the proposed project be consistent with the requirements imposed by the Santa Barbara County Air Pollution Control District (APCD). The APCD has jurisdiction over stationary emission sources in its air basin; VSFB is within its jurisdictional air basin. In the context of launch projects and operations, stationary source emissions include fuel transfer on space launch complexes and also includes air emissions from ancillary sources such as diesel generators, special equipment, and solvents to clean equipment. The APCD does not have jurisdiction over emissions from rocket liftoff, as liftoff is considered a mobile emissions source.

In the CD the DAF states that the exhaust from Falcon 9 launches is fuel-rich and contains high concentrations of carbon monoxide (CO), and that subsequent entrainment of ambient air results in complete conversion of CO into carbon dioxide (CO₂) and oxidation of the soot from the exhaust. The Falcon 9 rocket would use liquid fuels consisting of rocket grade kerosene (RP-1) and liquid Oxygen and the rocket would use oxidizer-rich staged combustion engines that produce a diminutive amount of soot. Also, a small amount of nitrogen monoxide (NO) is formed. Since the project does not include any construction, any emissions would be from launches, including landings and recovery of the fairing and first stage (if necessary), and from ground operations, support and transport of the launch vehicle components.

The federal Clean Air Act (CAA) requires states to develop plans, known as State Implementation Plans (SIPs), stating how they will attain or maintain National Ambient

Air Quality Standards (NAAQS). A SIP is developed in order to improve or maintain air quality in designated nonattainment and maintenance areas. Through this plan, states propose their strategy for reducing criteria air pollutant emissions.¹² General Conformity is a key component of the CAA strategy intended to ensure federal actions conform with SIPs in achieving and maintaining the NAAQS. Section 176 of the federal CAA Amendments of 1990, contains requirements that apply specifically to federal agency actions, including actions receiving federal funding. This section of the CAA requires federal agencies to ensure that their actions are consistent with the CAA. General conformity applicability pertaining to the Proposed Action is codified in 40 CFR §93.153(b).

A federal action is exempt from general conformity analysis requirements if the total emissions resulting from the action are equal to or less than the de minimis thresholds specified in 40 CFR § 93.153(b)(1)¹³. Thus, the action's calculated emissions are compared against established de minimis emission levels based on the nonattainment status for each applicable criteria pollutant in the area of concern to determine the relevant compliance requirements.

Table 2 provides the expected annual emissions of air pollutions per year in comparison to the PSD thresholds.

Table 2: Estimated Annual Air Pollutant Emissions from Launches, Static Fire Tests and Project Operations

	Estimated Emissions (Tons)						
	CO	NO _x	VOC*	SO _x	PM _{2.5}	PM ₁₀	Pb
	8.3	16.4	9.4	0.2	0.4	0.1	0.0
Prevention of Significant Threshold	250	250	250	250	250	250	25
Below Threshold for all years?	Yes	Yes	Yes	Yes	Yes	Yes	Yes

As illustrated in Table 1 the proposed project is below the PSD threshold for all criteria pollutants and therefore, no significant impacts on air quality as a result of criteria pollutant emissions from the project would occur.

The United States Environmental Protection Agency (USEPA) is the agency responsible for writing and implementing federal regulation for the protection of the environment, including implementation of measures to address climate change and the USEPA pursues a number of efforts, including regulatory initiatives such as the GHG Reporting Program.

¹² <https://www.epa.gov/general-conformity/frequent-questions-about-general-conformity#4>, accessed August 12, 2021.

¹³ <https://www.epa.gov/general-conformity/de-minimis-tables>, accessed August 12, 2021.

The Greenhouse Gas (GHG) Reporting Program, codified in 40 CFR, Part 98, requires mandatory reporting of GHG emissions for certain industrial operations, most of which are large emitters of GHGs (e.g., electricity generation facilities, oil refineries, and manufacturing operations). Mandatory reporting is also required for facilities capable of emitting more than 25,000 metric tons of CO₂-equivalents (MTCO_{2e}) per year from all combined stationary fuel combustion sources (e.g., boilers and stationary engines). As illustrated in Table 3 below, the project is below the significance threshold for mandatory reporting of GHG emissions.

Table 3: Estimated Annual Greenhouse Gas Emissions

	Metric Tons	Significance Threshold	Below Threshold?
	23,565	25,000	Yes

Overall, the proposed project is not expected to exceed the annual CO_{2e} threshold or the annual threshold for criteria pollutants under the National Environmental Policy Act.

As such, the project is consistent with the requirements imposed by an air pollution control district and thus the project would be consistent with Section 30253(c).

I. CULTURAL RESOURCES

Section 30244 of the Coastal Act states:

Where development would adversely impact archaeological or paleontological resources as identified by the State Historic Preservation Officer, reasonable mitigation measures shall be required.

As discussed in the CD prepared for the project, the project would use an existing launch facility (SLC-4) and no construction or ground disturbance would be required as part of the project. Pursuant to the National Historic Preservation Act and Section 106, DAF carried out government-to-government consultation with the Santa Ynez Band of Chumash Indians tribal chairman, but did not receive an official response from the Santa Ynez Band of Chumash Indians within the 30-day review period of CFR 800.3(c)4.

As part of its review process, Commission staff also reached out to the Santa Ynez Band of Chumash Indians and several other Tribes with potential cultural connection to the project area, as indicated by the list provided to Commission staff by the Native American Heritage Commission. Consultation invitations were mailed to the Barbareño/Ventureño Band of Mission Indians, the Chumash Council of Bakersfield, the Coastal Band of the Chumash Nation, the Northern Chumash Tribal Council, the San Luis Obispo County Chumash Council, and the Santa Ynez Band of Chumash Indians. The Santa Ynez Band of Chumash Indians did not request additional

coordination or consultation with Commission staff beyond what had already been carried out by DAF.

Commission staff, however, did receive a request for consultation from the Coastal Band of the Chumash Nation. Commission staff scheduled a consultation with the Coastal Band of the Chumash Nation on Wednesday, March 27, 2024. During the consultation the Coastal Band of the Chumash Nation shared concerns that the force of overpressures from sonic booms could adversely impact sensitive cultural resources or exfoliate new, undiscovered cultural resources that were previously buried. The Tribe also expressed concerns about possible anchoring for the offshore dronships and whether anchoring could adversely impact submerged cultural resources.

Regarding overpressures and sensitive cultural resources, the EA prepared for the project discussed previous research which determined that noise levels of 120 dB and sonic booms exceeding 2.0 psf were the threshold at which archaeological resources could potentially be affected by noise. The project would not result in overpressures greater than 5.0 psf. However, a portion of the base would be subject to overpressures between 2.0 and 5.0 psf.

DAF archaeologists reviewed available literature and did a search of the California Historical Resources Information System (CHRIS) to determine which types of resources would be located within the area of potential affect (APE). DAF archaeologists also reviewed previous studies that specifically analyzed the potential effects to archaeological resources from rocket engine noise and sonic boom vibrations. Those studies included placement of a model slope sand cone and midden chunk located approximately 3,000 feet southwest of SLC-4W to determine if noise vibration resulting from SpaceX launches and boost back landings resulted in changes to the materials. No visual impacts were observed in either the midden chunk or sand cone, with the exception of a few fine grains of sand shifting down the cone which was determined to likely be from wind. DAF has also monitored a sheer cliff-face midden deposit in the southern portion of VSFB and a rock art site for adverse impacts from noise vibrations and found that no visible effect from noise vibrations has been observed at the sites. The DAF concluded that there is no potential for rocket launches and boost back to adversely impact archaeological resources.

The dronships that would be used for landing of the first stage of the Falcon 9 would be located offshore in deep international waters. Due to the depth of water it is unlikely that the dronships would be able to anchor. Additionally, since the dronships would be located 500 to 1,100 miles off the coast of Baja California it is not likely that sensitive cultural resources of California Native American Tribes would be adversely impacted by dronship operations in this area.

As such, the Commission therefore finds that the proposed project consistent with Section 30244 of the Coastal Act.

APPENDIX A – SUBSTANTIVE FILE DOCUMENTS

1. Air Force Consistency Determination, SpaceX Operations at Space Launch Complex 4, Vandenberg Space Force Base, March, 2024.
2. Air Force Final Supplemental Environmental Assessment Falcon 9 Cadence Increase at Vandenberg Space Force Base, California and Offshore Landing Locatinss, May 18, 2024.
3. Unites States Fish and Wildlife Service, Reinitiation of the Biological Opinion on the Launch, Boost-Back, and Landing of the Falcon 9 First Stage at Space Launch Complex 4 (SLC-4) at Vandenberg Space Force Base, Santa Barbara County, California (2017-F-0480), March 21, 2023.
4. Air Force Consistency Determinations for launches from Vandenberg AFB: CD-0010-22 (Construct SLC-5 and Carry out 48 Rocket Launches and 48 Static Fire Engine Tests Per Year), CD-059-03 (Ground Based Missile Defense), CD-006-99 (Theater Ballistic Missile (TBM) Targets Program), CD-064-91 (Modification to Delta II launch vehicle and complex), CD-028-90 (Conversion of SLC-6 for Titan IV/Centaur launch vehicles), CD-003-88 (Space launch vehicle modification), and CD-018-82 and CD-021-82 (Space Shuttle (SLC-6) improvements).