DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration
Office of Commercial Space Transportation

Adoption of the Environmental Assessment
and
Finding of No Significant Impact
for
Boost-back and Landing of the Falcon 9 Full Thrust First Stage at SLC-4 West at Vandenberg Air Force Base, California and Offshore Landing Contingency Option

Summary

The U.S. Air Force (USAF) acted as the lead agency, and the Federal Aviation Administration (FAA) was a cooperating agency, in the preparation of the April 2016 *Final Environmental Assessment, Boost-Back and Landing of the Falcon 9 Full Thrust First Stage at SLC-4 West, Vandenberg Air Force Base, California and Offshore Landing Contingency Option* (EA or 2016 EA), which analyzed the potential environmental impacts of Space Exploration Technologies Corp. (SpaceX) constructing a landing pad and improving infrastructure at Space Launch Complex 4 West (SLC-4W) at Vandenberg Air Force Base (VAFB), as well as conducting boost-backs and landings of the Falcon 9 first stage booster at SLC-4W or on a special-purpose barge, no less than 31 miles offshore in the Pacific Ocean. The National Aeronautics and Space Administration (NASA) also participated as a cooperating agency in the preparation of the EA. The EA was prepared in accordance with the National Environmental Policy Act of 1969, as amended (NEPA; 42 United States Code [U.S.C.] § 4321 et seq.); Council on Environmental Quality NEPA implementing regulations (40 Code of Federal Regulations [CFR] parts 1500 to 1508); the USAF's Environmental Impact Analysis Process (32 CFR 989); and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*.

In 2011, the USAF published the *Final Environmental Assessment, Falcon 9 and Falcon 9 Heavy Launch Vehicle Programs from Space Launch Complex 4 East, Vandenberg Air Force Base, California* (2011 EA), which analyzed the potential environmental impacts of operating the Falcon 9 and Falcon Heavy launch vehicle programs from SLC-4 East (SLC-4E). The FAA was also a cooperating agency in the preparation of

the 2011 EA. The USAF issued a Finding of No Significant Impact (FONSI), and the FAA issued its own FONSI, to support the issuance of launch licenses to SpaceX for Falcon 9 and Falcon Heavy commercial launch operations at SLC-4E. The 2011 EA did not include construction of a landing pad or Falcon 9 boost-backs and landings. Therefore, the scope of the 2016 EA included pad construction, infrastructure improvements, and Falcon 9 boost-backs and landings at SLC-4W and on a barge. The 2016 EA did not include the launch/takeoff of the Falcon 9 at SLC-4E, which was addressed in the 2011 EA.

SpaceX is required to obtain a license from the FAA for Falcon 9 launch operations, to include boost-backs and landings. Based on its independent review and consideration of the EA, the FAA issues this FONSI concurring with, and formally adopting, the analysis of impacts and findings in the 2016 EA supporting the FAA's issuance of licenses to SpaceX for Falcon 9 launch operations to include boost-backs and landings. If, in their license application to the FAA, SpaceX makes changes to their operations which fall outside the scope of the 2016 EA, additional environmental review would be required prior to the FAA issuing a license associated with such an application.

After reviewing and analyzing available data and information on existing conditions and potential impacts, including the 2016 EA, the FAA has determined the issuance of licenses to SpaceX to conduct Falcon 9 boost-backs and landings at SLC-4W or on a barge would not significantly affect the quality of the human environment within the meaning of NEPA. Therefore, the preparation of an environmental impact statement is not required, and the FAA is independently issuing this FONSI. The FAA has made this determination in accordance with applicable environmental laws and FAA regulations. The 2016 EA is incorporated by reference into this FONSI.

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Purpose and Need

The purpose of SpaceX's proposal to conduct Falcon 9 boost-backs and landings during its launch operations is to substantially reduce the cost of reliable U.S. enterprise access to space through reuse of

the Falcon 9 first stage, thus complying with the National Space Policy of 2010 (https://www.whitehouse.gov/the-press-office/fact-sheet-national-space-policy). The reuse of the first stage will enable SpaceX to efficiently conduct lower cost launch missions from VAFB in support of commercial and government clients. This purpose supports SpaceX's overall mission for both the USAF and NASA under an established Space Act Agreement (https://www.nssc.nasa.gov/saa).

The purpose of FAA's Proposed Action is to fulfill the FAA's responsibilities as authorized by Executive Order 12465, *Commercial Expendable Launch Vehicle Activities* (49 FR 7099, 3 CFR, 1984 Comp., p. 163) and the Commercial Space Launch Act (51 U.S.C. Subtitle V, ch. 509, §§ 50901-50923) for oversight of commercial space launch activities, including licensing launch activities. The need for FAA's Proposed Action results from the statutory direction from Congress under the Commercial Space Launch Act, 51 U.S.C 50901(b) to, in part, "protect the public health and safety, safety of property, and national security and foreign policy interests of the United States" while "strengthening and [expanding] the United States space transportation infrastructure, including the enhancement of United States launch sites and launch-site support facilities, and development of reentry sites, with Government, State, and private sector involvement, to support the full range of United States space-related activities."

Proposed Action

The FAA's Proposed Action is to issue licenses to SpaceX for Falcon 9 launch operations that include boost-backs and landings of the first stage at VAFB or in the Pacific Ocean. The Proposed Action analyzed in the 2016 EA includes construction of a new concrete landing pad and improving infrastructure at SLC-4W, as well as boost-backs and landings of the Falcon 9 first stage on the new pad. The Proposed Action also includes offshore barge landing of the first stage as an option.[1] A barge landing would take place no less than 31 miles offshore of VAFB. Under the Proposed Action, launches including boost-backs and landings would occur up to six times per year. The Proposed Action would not change the number of launches (takeoffs) occurring at VAFB. While the FAA has no Federal action associated with the proposed construction, potential impacts related to both the issuance of launch licenses and the proposed construction are addressed below.

[1] SpaceX may decide to land the Falcon 9 offshore on a barge rather than on the newly constructed landing pad at SLC-4W, depending on the specific mission. SpaceX may also attempt a barge landing as a contingency option should mission anomalies occur such that landing at SLC-4W is not feasible.

Construction

SpaceX would construct a 300-foot diameter concrete pad at the SLC-4W site to support landing the Falcon 9 first stage (see Figure 2-1 in the EA). The pad would be constructed, as required by SpaceX's model for reusability, close enough to the launch site (SLC-4E) to support timely processing of the recovered stage for subsequent launches. Grading would likely be required to provide a flat, compacted area on which to construct the pad. Approximately 25,000 cubic yards of soil would be excavated for site grading, and any soil excavated at the project site would be redistributed on-site. Stormwater runoff would be controlled from the pad, and a ditch would be constructed around the pad to convey stormwater to an infiltration basin designed and sized according to the National Pollutant Discharge Elimination System (NPDES) permit.

A FireX system (a water deluge system that can be used to help extinguish any fire that might develop) would be constructed to control any fires ignited during the landing. Existing underground water lines at SLC-4 are sufficient in size to support the FireX system. Trenching would be required for new water lines to connect the FireX system to the existing water distribution system.

Construction would also include improvements to the existing access road. The existing access road would be realigned, widened to approximately 40 feet, and paved with asphalt to support first stage removal from the landing pad and access of ground support equipment. Ground support equipment would be used to process the first stage and would include a 16-foot flatbed trailer and a fuel truck to offload any remaining fuel from the first stage.

The construction of the pad and roadway improvements would result in approximately 56,000 square feet of new impervious surface. Existing infrastructure at SLC-4W would be used to the greatest extent possible to reduce trenching requirements.

Operations

Landing at SLC-4W

Following the staging event during a Falcon 9 launch from SLC-4E, the Falcon 9 first stage would return to SLC-4W for landing. After the first stage engine cutoff, the first stage would be maneuvered into position for retrograde burn, and three of the nine engines would be restarted to conduct the retrograde burn in order to reduce the velocity of the first stage and place the stage in the correct angle to land. Once the first stage is in position and approaching the pad, two of the three engines would shut

down to end the boost-back burn. The landing legs on the first stage would deploy in preparation for a final single engine burn that would slow the first stage and enable a landing. During the return, a sonic boom is anticipated (see Figures 2-4 and 2-5 in the EA). Once the first stage has landed at SLC-4W and is secured, any remaining propellant would be off-loaded and disposed or reused.

Barge Landing

Following the staging event during a Falcon 9 launch from SLC-4E, the Falcon 9 first stage would land on a barge specifically designed as a landing platform for the first stage and located no less than 31 miles offshore of VAFB. The sequence of steps in the maneuvering and landing process described above would be the same for a barge landing. During the return, a sonic boom is anticipated (see Figures 2-9 and 2-10 in the EA). Three vessels would be required for a barge landing, including a barge/landing platform approximately 300 feet long and 150 feet wide, a support/research vessel approximately 165 feet long, and 120-foot commercial tug boat. The tug boat and support/research vessel would be staged outside the landing location.

The tug boat would tow the barge into position at the landing site. After landing, the first stage would be secured onto the barge and then the tug boat would tug the barge and rocket to Long Beach Harbor for off-loading and transport to a SpaceX testing facility. Hazardous materials would be off-loaded from the first stage after the barge is docked at the harbor. Once testing at a SpaceX facility is complete, the first stage would be transported by truck back to SLC-4W (or another SpaceX launch facility) for reuse.

Alternatives

Alternatives analyzed in the EA include (1) the Proposed Action (also referred to as Alternative 1 in the EA), (2) Alternative 2, and (3) the No Action Alternative. Under Alternative 2, the construction of the landing pad and infrastructure improvements at SLC-4W would not occur. The boost-backs and landings of the first stage would occur as described above for a barge landing, except the barge landing site would be located 320 miles offshore of VAFB (see Figure 2-15 in the EA).

Under the No Action Alternative, the landing pad and infrastructure improvements would not be constructed, and the current launch process from SLC-4E would continue. There would be no boost-back and landing of the Falcon 9 first stage. The first stage would splashdown in the Pacific Ocean approximately 300–500 miles west of the Baja California coast and subsequently sink. The No Action Alternative would not meet the stated purpose and need.

Other landing sites, contingency landing locations, and harbor locations for offloading were considered, although none were considered reasonable alternatives because they did not meet the underlying purpose of and need for the project (refer to Section 2.6 of the EA).

Environmental Impacts

The following presents a brief summary of the potential environmental impacts considered in the EA for the Proposed Action (Alternative 1). Potential environmental impacts from Alternative 2 (no construction and barge landing 320 miles offshore) would be similar to or less than the impacts that would occur for a barge landing under Alternative 1. This FONSI incorporates the EA by reference and is based on the potential impacts discussed therein. The FAA has determined the analysis of impacts presented in the EA represents the best available information regarding the potential impacts associated with the FAA's regulatory responsibilities as described in this FONSI. Although not required by FAA Order 1050.1F, this FONSI includes the following additional impact categories because they are addressed by the lead agency (USAF) in the EA: geology and earth resources, human health and safety, and transportation.

Air Quality

Construction and Landing at SLC-4W

Santa Barbara County is classified as an attainment/unclassified area for the National Ambient Air Quality Standards (NAAQS) for all criteria pollutants. Santa Barbara County is considered a nonattainment area for the California Ambient Air Quality Standards (CAAQS) for ozone and particulate matter up to 10 micrometers in size (PM10), and as an attainment/unclassified area for all other criteria pollutants. Construction activities would generate dust emissions from grading, exhaust emissions from heavy construction equipment, and emissions from worker vehicles and trucks. Emissions associated with the first stage landing would result from combustion of RP-1 during the final single engine burn, and minor emissions of reactive organic gases would be associated with offloading the remaining fuel from the first stage. Construction emissions would not exceed the significance threshold for any criteria pollutant, and operational emissions for all criteria pollutants would be below the major source threshold of 100 tons per year. Emissions during boost-back are not quantified in the EA because boost-back would occur above the mixing height (approximately 3,000 feet above ground level) and would not

have the potential to affect ambient air quality. Construction, boost-back, and landing at SLC-4W would result in less than significant impacts to air quality [EA 4.1 at 128 and 130].

Barge Landing

Emissions associated with the barge landing would result from combustion of RP-1 during the final single engine burn. Minor emissions of reactive organic gases would be associated with off-loading the remaining RP-1 from the Falcon 9 fuel tank. Emissions would occur no less than 31 miles offshore of VAFB, but are otherwise the same as those for a landing at SLC-4W. Air emissions occurring beyond the 3-nautical-mile limit of California waters would be outside the boundaries of any air district.

In addition to emissions from the rocket engine, a barge landing would result in emissions from the three vessels (barge, tug, and support vessel) as they transit between Long Beach Harbor and the landing site. All three vessels use diesel fuel. Emissions from the operation of these vessels would be below the major source threshold of 100 tons per year for all criteria pollutants. In summary, a barge landing would result in less than significant impacts to air quality [EA 4.1 at 132].

Biological Resources (including Fish, Wildlife, and Plants)

Construction and Landing at SLC-4W

Construction would result in permanent losses of 2.6 acres of non-native grassland and 0.4 acre of mixed central coast scrub and non-native grassland. There would be no effect to federally listed or state-listed plant species from construction; however, seacliff buckwheat (Eriogonum parvifolium), the host plant of the federally endangered El Segundo blue butterfly (ESBB), may be disturbed, damaged, or destroyed as a result of construction activities. The USAF completed Endangered Species Act (ESA) Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) for potential impacts to the ESBB from construction and would ensure implementation of all applicable avoidance, minimization, and mitigation measures, as well as monitoring activities included in the USFWS Biological Opinion (see Appendix D of the EA). SpaceX would also implement additional environmental protection measures (EPMs), as listed in Section 2.3.4 of the EA. As a result, potential effects to plants from construction would be less than significant [EA 4.3 at 142]. Potential impacts to terrestrial vegetation from boost-back and landing would be limited to scorching/burning. The FireX system would help minimize vegetation scorching. Ground firefighting crews would also be present to distinguish any fires as soon as the site is cleared for access. Thus, boost-back and landing would not result in significant impacts to plants [EA 4.3 at 142].

Terrestrial wildlife, including the federally threatened California red-legged frog (CRLF), could be disturbed by construction activities or inadvertently killed if not able to move away from construction equipment. The CRLF was included in the formal Section 7 consultation with the USFWS regarding the ESBB. The USAF would ensure implementation of all applicable avoidance, minimization, and mitigation measures as required by the Biological Opinion. For example, to avoid or minimize adverse effects to the CRLF, a qualified biologist must conduct daily pre-construction surveys to ensure that dispersing frogs have not entered the project site, if construction activities are conducted during the wet season and water is present in Spring Canyon.

To avoid or minimize potential impacts on migratory birds, vegetation or structures that could support nesting birds would be cleared or demolished outside the nesting season or would be checked for active nests by a qualified biologist. Given the measures included in the Biological Opinion, EPMs listed in Section 2.3.4 of the EA, and the small quantity of habitat that would be permanently lost, significant impacts to wildlife, including protected species, from construction are not expected [EA 4.3 at 143].

During boost-back and landing, wildlife would be temporarily disturbed by the sonic boom and launch vehicle landing noise. Wildlife responses to noise can be physiological or behavioral. Physiological responses can range from mild, such as an increase in heart rate, to more damaging effects on metabolism and hormone balance. Behavioral responses to man-made noise include attraction, tolerance, and aversion. Each has the potential for negative and positive effects, which vary among species and among individuals of a particular species due to temperament, sex, age, and prior experience with noise. Responses to noise are species-specific; therefore, it is not possible to make exact predictions about hearing thresholds of a particular species based on data from another species, even those with similar hearing patterns. Given the site's past and current use as a launch complex and the infrequent, short-term nature of operational noise (including a sonic boom), no significant impacts, including cumulative impacts, to common wildlife species are anticipated [EA 4.3 at 144].

The USAF consulted the USFWS and the National Marine Fisheries Service (NMFS) to identify and address potential impacts from operations on protected species (i.e., species listed under the ESA and species protected by the Marine Mammal Protection Act [MMPA]). Regarding ESA-listed species under USFWS jurisdiction, the USFWS concurred with the USAF's determination that operations "may affect, but would not likely adversely affect" the CRLF, southern sea otter, California least tern, and Western snowy plover (see Appendix D of the EA). Regarding ESA-listed species under NMFS jurisdiction, NMFS concurred with the USAF's determination that operations "may affect, but would not likely adversely

affect" the Guadalupe fur seal, blue whale, fin whale, gray whale, humpback whale, sei whale, and sperm whale (see Appendix E of the EA).

Regarding species protected by the MMPA, construction would not affect marine mammals [EA 4.3 at 151]. Boost-back and landing would generate landing noise and a sonic boom up to 2.0 pounds per square foot (psf) that would impact pinniped (seals and sea lions) haul outs near VAFB. The overflight and landing noise could cause a temporary startle response in marine mammals hauled-out near SLC-4W. VAFB has monitored the effects of sonic booms on pinnipeds at the Northern Channel Islands during many prior launches and the reactions and impacts are well characterized. The sonic boom would likely startle hauled-out pinnipeds, causing them to temporarily flush into the ocean. Past sonic booms have shown that behavior and numbers of hauled out pinnipeds typically return to normal within 24 hours or less after a launch event. No observations of pinniped injury or mortality during monitoring have been attributable to past launches.

The 30th Space Wing at VAFB was issued a 5-year Letter of Authorization (LOA) to take Pacific harbor seals, California sea lions, northern elephant seals, Stellar sea lions, and northern fur seals incidental to launches, aircraft, and helicopter operations at VAFB from March 26, 2014 to March 26, 2019. The LOA authorizes Level B harassment (i.e., species would be disturbed but not injured or killed) to these species, including harassment from launch vehicle boost-back noise and sonic booms. The LOA does not include the Guadalupe fur seal that could be affected by boost-back and landing under the Proposed Action. SpaceX submitted an application to NMFS for an Incidental Harassment Authorization (IHA) to incidentally take small numbers of Pacific harbor seals, California sea lions, northern elephant seals, Stellar sea lions, northern fur seals, and Guadalupe fur seals as a result of the boost-back and landing. NMFS issued an IHA to SpaceX on May 19, 2016.

The potential impacts on protected wildlife species would be minimized to the greatest extent practicable by compliance with measures included in the Biological Opinion, LOA, and any IHA subsequently issued by NMFS. SpaceX would also implement additional EPMs, as listed in Section 2.3.4 of the EA. Therefore, potential effects to protected wildlife species would be less than significant [EA 4.3 at 144–157].

Barge Landing

A barge landing would not affect plant species [EA 4.3 at 142]. Engine noise during landing would not extend onshore and therefore would not affect terrestrial wildlife (see Figure 2-11 in the EA). A sonic

boom of up to 0.4 psf may impact land (see Figures 2-9 and 2-10 in the EA) and could cause temporary physiological or behavioral responses in terrestrial species. Given the infrequent, short-term nature of a sonic boom and the boom's low magnitude, no significant impacts to wildlife species, including protected species, are anticipated [EA 4.3 at 144, 150–151].

Environmental stressors from a barge landing that may cause adverse effects to marine species occurring in the vicinity of the landing site include noise and potential debris strike during an unsuccessful landing. Landing noise, which would last approximately 17 seconds, is expected to disturb pinnipeds that may be at the surface in the area of exposure. Also, vessel noise has the potential to disturb marine species and elicit an alerting, avoidance, or other behavioral reaction. SpaceX submitted an application to NMFS for an IHA that would authorize Level B harassment to marine mammals (see Appendix E of the EA).

Upon an unsuccessful barge landing, individual marine species could be struck by debris. Debris modeling for the EA indicates a low probability of an animal strike occurring. In addition to concurring with USAF's effect determination for ESA-listed marine mammals (see above), NMFS also concurred with the USAF's determination that a barge landing "may affect, but is not likely to adversely affect" ESA-listed sea turtles and ESA-listed fish species (see Appendix E of the EA). Therefore, an unsuccessful barge landing would not have a significant effect on marine species.

The barge landing site is located within essential fish habitat (EFH) for coastal pelagic fish and groundfish. Estuaries, canopy kelp, and rocky reefs are Habitat Areas of Particular Concern (HAPCs) that provide habitat for groundfish in the vicinity of VAFB. During an unsuccessful barge landing, the surface area potentially exposed to debris is expected to be less than 114 acres. Since the EFH area that would be impacted by falling debris is small, the likelihood of large-scale impacts to EFH is low. The landing site is approximately 31 miles from the nearest kelp beds and estuary habitat and any floating debris would be retrieved. Therefore, there would be no impact to the HACPs. Debris that would sink is anticipated to sink relatively quickly and is composed of inert materials. The USAF consulted NMFS regarding potential impacts to EFH. NMFS concluded the action would adversely affect EFH and provided an EFH Conservation Recommendation (see Appendix E of the EA). As a result, the USAF is developing an appropriate compensatory marine debris removal plan in coordination with NMFS to offset EFH impacts. Therefore, unsuccessful barge landings would not have a significant effect on EFH [EA 4.3 at 175].

Climate

Construction and Landing at SLC-4W

Greenhouse gas (GHG) emissions include emissions associated with construction of the landing pad and Falcon 9 boost-back and landing. As presented in the EA, GHG emissions associated with the construction of the landing pad would produce 62.66 tons (56.84 metric tons) of carbon dioxide equivalent (CO2e). These emissions would only occur during construction and would not contribute to annual GHG emissions beyond the first year. The amount of CO2e emissions released during landing would be between 60 and 88 percent less than a Falcon 9 launch, since only three engines would be re-lit, and only one engine would operate during landing. For six boost-backs and landings per year, the amount of CO2e produced would be 281.98 tons (255.81 metric tons) per year. Though emissions from construction and Falcon landings would increase the yearly levels of GHGs at VAFB, the emissions would be well below the Environmental Protection Agency mandatory reporting threshold for stationary sources of 25,000 metric tons of CO2e, and would represent a negligible fraction of local (VAFB), national, or global GHG emissions. Accordingly, the Proposed Action would not result in significant impacts related to climate or climate change [EA 4.1 at 135].

Barge Landing

GHG emissions for the barge landing would be the same for boost-back and landing at SLC-4W, but with the additional emissions from the barge, tug, and support vessel. Assuming six landing events per year, the maximum total GHG emissions for operation of these vessels would be 1,009.56 tons (915.86 metric tons) of CO2e. Accordingly, the Proposed Action would not result in significant impacts related to climate or climate change [EA 4.1 at 135].

Department of Transportation Act, Section 4(f)

Construction and Landing at SLC-4W

Construction would not result in restricted access to any Section 4(f) property. Noise levels from construction would not be audible above typical ambient noise levels at the closest Section 4(f) property. Thus, construction of the landing pad would not result in a use of any Section 4(f) property.

Surf Beach, Ocean Beach County Park, and Jalama Beach County Park would be closed to the public during launch/landing events because these parks fall within the debris impact corridor. Since 1979, an evacuation and closure agreement has been in place between the USAF and Santa Barbara County. This

agreement includes closing Surf Beach, Ocean Beach, and Jalama Beach County Parks in the event of launch activities, including commercial launches. Under this agreement, the USAF must provide notice of a launch at least 72 hours prior to the closure, and the closure is not to exceed 48 hours. Although the parks are not directly overflown by the launch vehicle, a launch anomaly could impact them. Therefore, for the safety of park visitors, the County Parks Department and the County Sheriff close the parks upon request from VAFB. Because the parks would be closed as part of a launch (takeoff), the Proposed Action would not add any additional park closures. Closure of the parks would only last as long as necessary to assure the public is safe during a launch/landing, with coastal access restricted for a short period of time (6 to 8 hours).

Construction, boost-back, and landing would not substantially diminish the protected activities, features, or attributes of Surf Beach, Ocean Beach County Park, and Jalama Beach County Park, and therefore would not result in substantial impairment of these properties. Similarly, there would only be a maximum of six landings per year and site closures would be of short duration. Therefore, the Proposed Action would not be considered a constructive use of these Section 4(f) properties and thus would not invoke Section 4(f) of the Department of Transportation Act [EA 4.13 at 192].

Barge Landing

A barge landing would not result in the use of a Section 4(f) property. The properties mentioned above would already be closed as part of the Falcon 9 launch from SLC-4E. A barge landing would not result in additional closures of Section 4(f) properties.

Geology and Earth Resources

Construction and Landing at SLC-4W

Construction activities have the potential to impact geology and soils. Vegetation would be removed to pour concrete/asphalt and to conduct grading for stormwater control. The Stormwater Pollution and Prevention Plan required for the project would include erosion control measures. Additionally, the EPMs listed in Section 2.3.4 of the EA would be implemented during ground-disturbing activities. As a result, no long-term soil impacts from erosion would be expected.

The project site is not underlain by any active faults, and the potential for surface fault rupture and liquefaction at the site from active faults in the region is low. Therefore, adverse impacts associated with seismically-induced ground shaking would not occur. The boost-backs and landings would not have any

impacts on seismicity. In summary, construction, boost-back, and landing at SLC-4W would not result in significant impacts on geology and earth resources [EA 4.6 at 180–181].

Barge Landing

There would be no impacts on geology or earth resources from a barge landing given the offshore location of the landing site [EA 4.6 at 181].

Hazardous Materials, Solid Waste, and Pollution Prevention

Construction and Landing at SLC-4W

The use of hazardous materials during construction would be limited to vehicle maintenance (fuels, oils, and lubricants). Such materials would be required to be properly contained, manifested, and managed in accordance with all Federal, State, and local regulations and directives; the site-specific health and safety plan; and the VAFB Hazardous Materials Management Plan. Hazardous materials for the boost-back and landing would include propellant, ordnance, and chemicals. A site-specific spill plan would be developed and spills would be quickly contained onsite and in accordance with existing procedures.

Solid waste generated during construction would include packaging from materials (cardboard and plastic), scrap rebar, wood, pipes, wiring, and miscellaneous waste generated by onsite construction workers. Contractors would be responsible for the disposal or recycling of all waste generated during the scope of the project. Solid waste would be minimized by strict compliance with VAFB's Integrated Solid Waste Management Plan. Pollution prevention options would be exercised in the following order: reuse of materials, recycling of materials, and then regulatory-compliant disposal.

With adherence to existing policies and procedures as outlined in applicable Federal, State, and local regulations and directives, as well as the EPMs listed in the EA, construction, boost-back, and landing would not result in significant impacts related to hazardous materials, pollution prevention, and solid waste [EA 4.8 at 184; 4.9 at 186].

Barge Landing

Compliance with all applicable Federal, State, and local regulations and directives would govern the barge landing and minimize the potential for adverse effects associated with hazardous materials, pollution prevention, and solid waste. Therefore, a barge landing would not result in significant impacts related to this environmental impact category [EA 4.8 at 184; 4.9 at 186].

Historical, Architectural, Archeological, and Cultural Resources

Construction and Landing at SLC-4W

There are no properties listed in or eligible for listing in the National Register of Historic Places at SLC-4W. Therefore, construction activities would not affect historic properties. Similarly, boost-backs and landings would not affect historic properties. The State Historic Preservation Officer concurred with this determination. Therefore, the Proposed Action would not have a significant impact on historical, architectural, archeological, and cultural resources [EA 4.5 at 180].

Barge Landing

A barge landing would not affect historical, architectural, archeological, or cultural resources given the offshore location of the landing site [EA 4.5 at 180].

Human Health and Safety

Construction and Landing at SLC-4W

Construction could result in the exposure of construction workers to hazards associated with construction activities, including potential for trips, slips, falls, vehicular accidents, exposure to hazardous materials and waste, etc. To minimize exposure to hazards, awareness training would be incorporated into the worker health and safety protocol. Contractors would be required to develop a site-specific safety plan that would address potential hazards. Daily safety briefings would be conducted and workers would be expected to comply with federal Occupational Safety and Health Administration (OSHA) and Air Force Occupational and Environmental Safety regulations. Furthermore, the FAA would conduct its own public safety review in accordance with the implementing regulations of the Commercial Space Launch Act of 1984, 14 CFR Parts 400 to 460, prior to issuing a license. Therefore, construction, boost-back, and landing at SLC-4W are not expected to result in significant impacts on human health and safety [EA 4.7 at 182].

Barge Landing

To minimize potential adverse impacts to human health and safety, all safety precautions for operations and evacuation procedures would be followed in accordance with Space Launch Vehicle Flight Hazard Zone requirements. Workers would comply with Federal OSHA regulations, and a U.S. Coast Guard Certificate of Inspection would be completed before the barge landing. The U.S. Coast Guard would

issue a Local Notice to Mariners that defines a Public Ship Avoidance Area for landing events. Therefore, a barge landing is not expected to result in significant impacts on human health and safety [EA 4.7 at 182].

Land Use (Including Farmlands and Coastal Resources)

Construction and Landing at SLC-4W

Construction and landing at SLC-4W would not change land use or affect land use planning at VAFB. SLC-4W is designated for space launch activities. No prime agricultural land would be affected. In compliance with the Coastal Zone Management Act, the USAF determined that construction, boost-back, and landing at SLC-4W would not adversely affect coastal zone resources, and the USAF filed a Negative Determination to the California Coastal Commission. The Commission concurred with the USAF's determination [EA 4.11 at 190]. Therefore, construction, boost-back, and landing at SLC-4W is not expected to result in significant impacts on land use, including farmlands and coastal resources [EA 4.10 at 187; 4.11 at 188].

Barge Landing

A barge landing would not affect land use, farmlands, or coastal resources given the offshore location of the landing site [EA 4.10 at 187; 4.11 at 189].

Natural Resources and Energy Supply

Construction and Landing at SLC-4W

Existing utilities (electrical, communications, domestic water supply, and domestic wastewater) would be extended form their current location at the launch complex to serve construction, boost-back, and landing at SLC-4W. The extensions would occur in areas already disturbed. No new utility use above that previously experienced at the project site would occur. Therefore, there would be no significant impacts related to natural resources and energy supply [EA 4.14 at 193].

Barge Landing

A barge landing would not require utility use above that previously experienced at the project site. There would be no significant impacts related to natural resources and energy supply [EA 4.14 at 193].

Noise and Noise-Compatible Land Use

Construction and Landing at SLC-4W

Noise effects from the Proposed Action could include conversation interruption, sleep interference, distraction, and annoyance. The construction site is located well away from any noise sensitive areas (e.g., schools, residences, commercial lodging facilities, hospitals, and care facilities). Noise from construction activities would not be audible above typical background noise levels and would not impact noise sensitive areas. According to the EA, noise in excess of 65 A-weighted decibels (dBA) from construction activities would occur only on an intermittent basis and only in areas immediately adjacent to construction activities; therefore, construction activities would not result in significant noise impacts [EA 4.2 at 138].

Noise impacts would occur during landing of the Falcon 9 first stage at SLC-4W for a period of approximately 60 seconds. As presented in the EA, acoustic levels were modeled for the landing using the models PAD and RNOISE, and noise contours for the landing and sonic boom footprint were developed. The use of PAD and RNOISE for this project was approved by the FAA's Office of Environment and Energy on July 6, 2015. Noise levels at the landing site are expected to reach a maximum of 110 to 120 dBA. Received noise levels above 90 dBA would occur on VAFB, but the contours would not extend beyond the VAFB boundary. The western portion of Lompoc, which is the closest residential area to SLC-4W, would be exposed to landing noise above 80 dBA but below 90 dBA, which is slightly lower than the noise of a passing motorcycle at 25 feet. The remainder of the Lompoc area would be exposed to noise levels above 70 dBA but not above 80 dBA, which is comparable to a passing car traveling at 65 miles per hour at 25 feet. Given the short duration (typically 60 seconds) of the landing noise and the relatively low received noise levels at sensitive receptors, the contribution of launch noise would be minimal and would not result in significant impacts based on the approved noise modeling for this particular project. Furthermore, according to the analytical results produced by the approved noise methodology, noise impacts from boost-backs and landings would be less than the noise impacts from the launch of the Falcon 9 at SLC-4E, which were determined to be insignificant in the 2011 EA.

During descent of the first stage, a sonic boom would be generated while the booster is supersonic. The overpressure could reach as high as 2.0 psf on VAFB and 3.1 psf on the Northern Channel Islands. The majority of the boom would occur over the ocean. Overpressures would occur onshore in two areas: VAFB and immediate vicinity; and in a crescent from the northern Channel Islands in the ocean

extending to the northeast over portions of Santa Barbara, Ventura, and Kern Counties (see Figures 2-4 and 2-5 in the EA).

At VAFB, sonic boom overpressures would be between 1.0 and 2.0 psf, with the boom focused just south of SLC-4W. Overpressures between 1.0 and 1.6 psf would extend off-base approximately 5 miles to the east, impacting the western portion of Lompoc. The modeled 1.0 psf footprint extends approximately 12 miles beyond the VAFB boundary. Booms with overpressures of about 1.0 psf are generally audible and can startle people, but generally do not cause adverse effects such as damage to buildings.

One of the sonic boom overpressure crescents extends from the ocean to the northeast, covering portions of Santa Barbara, Ventura, and Kern Counties. While this crescent is extensive in distribution, the expected overpressure would be between 0.2 and 0.4 psf. A boom of that magnitude could be heard by someone who is expecting it and listening for it, but would usually go unnoticed. Additionally, these overpressures do not cause adverse effects such as building damage.

In summary, Falcon 9 landing noise and sonic boom overpressures would not be significant [EA 4.2 at 139].

Barge Landing

Noise would occur for a barge landing, but would be focused on an area well offshore of California (refer to Figure 2-11 in the EA). During descent, a sonic boom would be generated while the first stage is supersonic (refer to Figures 2-9 and 2-10 in the EA). The overpressure would be directed at the ocean and would reach as high as 2.0 psf. Portions of Santa Barbara County would experience sonic boom overpressures between 0.2 and 0.4 psf. The landing noise would fall below 70 dB at 10 miles from the landing site. Since the barge would be located 31 miles offshore, there would be no impacts to noise sensitive areas. A barge landing would not result in significant noise impacts [EA 4.2 at 139].

Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks

Construction and Landing at SLC-4W

Temporary jobs may be created from construction. Once construction is complete, operation of SLC-4W would be conducted by existing SpaceX staff and its subcontractors. Any new jobs would not have a significant effect on the socioeconomic environment of the region (Lompoc Valley and Santa Maria Valley).

Construction, boost-back, and landing would not affect low-income or minority populations within the region. Construction and operations would occur within an unpopulated area of VAFB and potential environmental impacts would not extend into populated areas. Similarly, construction and operations would not have high and disproportionate effects on children.

In summary, construction, boost-back, and landing would not result in significant impacts related to socioeconomics, environmental justice, and children's environmental health and safety [EA 3.0 at 43].

Barge Landing

A barge landing would not create any temporary jobs. Like a landing at SLC-4W, a barge landing would not result significant impacts related to socioeconomics, environmental justice, and children's environmental health and safety [EA 3.0 at 43].

Transportation

Construction and Landing at SLC-4W

During construction, increases to traffic would occur as a result of commuting by construction workers and trucks transporting construction materials and equipment. The slight increase in daily truck traffic anticipated would not result in adverse impacts to the road capacity in and around VAFB. No new access would be required and no unsafe roadways conditions are anticipated. There would be no significant impacts related to transportation [EA 4.12 at 190–191].

Barge Landing

Transporting the first stage from Long Beach Harbor to VAFB after a successful barge landing would involve additional vehicles being operated between the harbor and VAFB. This increase in vehicle traffic, which could occur up to six times a year, would not result in adverse impacts to road capacity. A barge landing would not result in significant impacts related to transportation [EA 4.12 at 190–191].

Visual Effects (including Light Emissions)

Construction and Landing at SLC-4W

Construction, boost-back, and landing would result in light emissions and visual impacts. The visual presence of the proposed landing pad would not affect the visual integrity of the area, as this type of infrastructure is well established at VAFB and considered part of the local landscape. Boost-backs and landings would not substantially degrade the existing visual character or quality of the site and its

surroundings. Thus, construction, boost-back, and landing would not result in significant impacts related to light emissions and visual resources [EA 4.10 at 187].

Barge Landing

A barge landing would have no effect related to light emissions and visual impacts given the offshore location of the landing site [EA 4.10 at 187].

Water Resources (including Wetlands, Floodplains, Surface Waters, Groundwater, and Wild and Scenic Rivers)

Construction and Landing at SLC-4W

SLC-4W is not located within a floodplain, and there are no wild and scenic rivers located near the launch complex; therefore, there would be no impact on these resources [EA 3.0 at 44].

Nominal landing operations at SLC-4W would not affect water quality. Construction has the potential to impact water quality by removing vegetation and exposing soil, and hazardous material spills/releases. Pollutant discharges would be avoided or minimized by compliance with the NPDES permit. Also, implementation of EPMs described in the EA, which include best management practices designed to properly manage materials on-site, prevent and reduce the risk of spills, and minimize the potential for erosion, would avoid or minimize impacts to water quality. No significant impacts to water quality from construction are expected [EA 4.4 at 177–178].

Operations would not affect wetlands. The nearest wetland is Spring Canyon Creek, approximately 0.08 mile to the south of SLC-4W and outside the construction area. Implementation of the NPDES permit requirements as well as the EPMs described in the EA would ensure no impact to wetlands. Therefore, construction and boost-backs and landings would have no effect on wetlands [EA 4.4 at 178].

Barge Landing

A barge landing would not affect floodplains, wetlands, or wild and scenic rivers. A successful barge landing would not affect water quality. An unsuccessful barge landing would result in some RP-1 being released into the ocean. Also, according to the EA, approximately 25 pieces of floating debris would be present after a first stage explosion, which would be recovered by SpaceX. Light oils, including RP-1, are highly volatile, which means they evaporate quickly when exposed to the air, and are usually completely dissipated within one to two days after a spill. Clean-up following a spill is usually not necessary, or possible, with spills of light oil, particularly with such a small quantity of oil. Therefore, no attempt

would be made to boom or recover RP-1 if any of the fuel is released directly into the ocean. Any RP-1 remaining on the barge deck from an unsuccessful landing attempt would be recovered, contained, and handled in accordance with federal, state, and local agency requirements. In summary, an unsuccessful barge landing would not result in significant impacts on water resources [EA 4.4 at 177–178].

Cumulative Impacts

This FONSI incorporates by reference the EA, which addresses the potential impacts of past, present, and reasonably foreseeable future activities at and within the vicinity of VAFB that would affect the resources impacted by the Proposed Action. The region of influence for the cumulative impacts analysis includes North and South VAFB. Future large projects on VAFB that are currently projected for the next several years have the greatest potential to result in cumulative impacts. This section presents a brief summary of the potential cumulative environmental impacts considered in the EA, focusing on those resources with the greatest potential of experiencing cumulative impacts: air quality; biological resources (fish, wildlife, and plants); hazardous materials, pollution prevention, and solid waste; and noise.

Air Quality

Air emissions from other projects (refer to Table 4-17 in the EA) in the region of influence would be localized and short-term in nature, except for the Basewide Demolition Project, which is anticipated to continue for the next 15 years, contingent on funding. Long-term emissions from the projects are not anticipated to increase. Emissions from the Proposed Action combined with other past, present, and reasonably foreseeable future projects and launch operations would not exceed the NAAQS in Santa Barbara County and would not produce any significant cumulative air quality impacts [EA 4.15 at 199].

Biological Resources (including Fish, Wildlife, and Plants)

The Proposed Action and other construction and launch projects that involve ground-disturbing activities and related noise could have temporary and localized cumulative effects on biological resources. Disturbance to wildlife would be short-term and wildlife likely would continue to use habitat in the vicinity of the projects. Compliance with project-specific avoidance, minimization, and mitigation measures (including those in USFWS Biological Opinions) would minimize cumulative impacts to protected species. Therefore, implementation of the Proposed Action in conjunction with other past,

present, and reasonably foreseeable future projects would not result in cumulative impacts to biological resources [EA 4.15 at 200].

Hazardous Materials, Solid Waste, and Pollution Prevention

For all projects at VAFB, management of hazardous materials would comply with the VAFB Hazardous Materials Management Plan, and emergency responses to spills would follow the Hazardous Materials Emergency Response Plan. Projects must also comply with the Integrated Solid Waste Management Plan. EPMs would be implemented to minimize hazardous materials or hazardous waste management impacts. The Proposed Action would not contribute to cumulative effects to hazardous materials and wastes in or around VAFB. Therefore, implementation of the Proposed Action in conjunction with other past, present, and reasonably foreseeable future projects would not result in cumulative impacts associated with hazardous materials, pollution prevention, and solid waste [EA 4.15 at 202].

Noise and Noise-Compatible Land Use

Construction associated with the Proposed Action and other projects in the region of influence would result in temporary, intermittent noise at and near the project site. Construction projects are typically short-term in duration and only result in localized noise impacts. The noise impacts from construction projects in the region of influence would not significantly affect the noise setting at VAFB.

There are approximately eight rocket launches per year at VAFB. Noise effects associated with each of these launches are relatively short (no more than five minutes). Furthermore, more than one launch at a time does not occur. Therefore, implementation of the Proposed Action in conjunction with other past, present, and reasonably foreseeable future projects would not result in cumulative noise impacts [EA 4.15 at 200].

Agency Finding and Statement

The FAA has determined that no significant impacts would occur as a result of the Proposed Action and, therefore, that preparation of an Environmental Impact Statement is not warranted and a FONSI in accordance with 40 CFR Section 1501.4(e) is appropriate.

After careful and thorough consideration of the facts contained herein, the undersigned finds that the proposed Federal action is consistent with existing national environmental policies and objectives as set forth in Section 101 of NEPA and other applicable environmental requirements and will not significantly

affect the quality of the human environment or otherwise include any condition requiring consultation pursuant to Section 102(2)(C) of NEPA.

APPROVED: _____ DATE: 10/7/2016

Dr. George C. Nield
Associate Administrator for
Commercial Space Transportation