DEPARTMENT OF THE AIR FORCE
UNITED STATES SPACE FORCE
SPACE LAUNCH DELTA 30

5 January 2024

MEMORANDUM FOR ALL INTERESTED GOVERNMENT AGENCIES, PUBLIC OFFICIALS, ORGANIZATIONS, AND INDIVIDUAL PARTIES

FROM: 30 CES/CEI
1028 Iceland Avenue
Vandenberg SFB, CA 93437-6010

SUBJECT: Draft Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) for the Phantom Space Corporation Daytona-E and Laguna-E Launch Operations at Space Launch Complex 5, Vandenberg Space Force Base, California.

1. In accordance with the National Environmental Policy Act (NEPA) of 1969, and the President's Council on Environmental Quality's and the Department of the Air Force (DAF) NEPA implementing regulations, Space Launch Delta 30 (SLD 30) prepared a Draft EA/FONSI for Phantom Space Corporation Daytona-E and Laguna-E Launch Operations at Space Launch Complex 5 (SLC-5), Vandenberg Space Force Base (VSFB), California.

2. The purpose of the Proposed Action is to provide greater mission capability to the Department of Defense, National Aeronautics and Space Administration, and commercial customers by implementing Phantom Space Corporations' Daytona-E and Laguna-E launch program and constructing a new launch facility at SLC-5 on VSFB. Resources analyzed in the Draft EA include air quality, climate, sound (airborne), biological resources, water resources, cultural resources, Department of Transportation Act Section 4(f) properties, recreation, transportation, human health and safety, hazardous materials and waste, solid waste, Coastal Zone, utilities, and socioeconomics. The Draft EA/FONSI concludes that there will be no significant environmental impacts resulting from the Proposed Action.

3. This Draft EA/FONSI is available at: the Lompoc, Santa Maria, and Santa Barbara Public Libraries, and the Vandenberg SFB Library and electronically at https://www.vandenberg.spaceforce.mil/About-Us/Environmental/EAS/. The public comment period for this Draft EA/FONSI will be from 10 January 2024 through 9 February 2024. During this time, comments may be sent to Space Launch Delta 30, Installation Management Flight Environmental Assets, Building 11146, Vandenberg SFB, California 93437, attention of Ms. Tiffany Whitsitt-Odell, e-mailed to tiffany.whitsitt-odell@spaceforce.mil, or faxed to (805) 606-6137. If you have any questions, please contact Ms. Tiffany Whitsitt-Odell at (805) 606-2044.

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BEATRICE L. KEPHART
Chief, Installation Management Flight

Attachment:
Draft EA/FONSI for the Phantom Space Corporation Daytona-E and Laguna-E Launch Operations at Space Launch Complex 5, Vandenberg Space Force Base, California.

PRIVACY ADVISORY

This Environmental Assessment (EA) is provided for public comment in accordance with the National Environmental Policy Act (NEPA), the President's Council on Environmental Quality NEPA Regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508) and 32 CFR Part 989, Environmental Impact Analysis Process (EIAP).

The EIAP provides an opportunity for public input on Department of the Air Force (DAF) decision making, allows the public to offer input on alternative ways for the DAF to accomplish what it is proposing, and solicits comments on the DAF's analysis of environmental effects.

Public commenting allows the DAF to make better, informed decisions. Letters or other written or oral comments provided may be published in the EA. As required by law, comments provided will be addressed in the EA and made available to the public. Providing personal information is voluntary. Any personal information provided will be used only to identify your desire to make a statement during the public comment portion of any public meetings or hearings or to fulfill requests for copies of the EA or associated documents. Private addresses will be compiled to develop a mailing list for those requesting copies of EA; however, only the names of the individuals making comments and specific comments will be disclosed. Personal home addresses and phone numbers will not be published in the EA.

Compliance with Section 508 of the Rehabilitation Act

To the extent possible, this document is compliant with Section 508 of the Rehabilitation Act. This allows assistive technology to be used to obtain the available information from the document. Due to the nature of graphics, figures, tables, and images occurring in the document, accessibility is limited to a descriptive title for each item.

Compliance with Revised CEQ Regulations

This EA has been verified to be compliant with the 75-page limit, not including appendices, required by 40 CFR 1501.5(f). As defined in 40 CFR 1508.1(v) a "page" means 500 words and does not include maps, diagrams, graphs, tables, and other means of graphically displaying quantitative or geospatial information.

DRAFT

Environmental Assessment

Phantom Space Corporation Daytona-E and Laguna-E Launch Operations at Space Launch Complex 5, Vandenberg Space Force Base, California

2 January 2024

Space Launch Delta 30, Installation Management Flight Environmental Assets
1028 Iceland Avenue, Building 11146
Vandenberg Space Force Base, California 93437

UNITED STATES SPACE FORCE
DRAFT FINDING OF NO SIGNIFICANT IMPACT

Phantom Space Corporation Daytona-E and Laguna-E Launch Operations at Space Launch Complex 5, Vandenberg Space Force Base, California

This DRAFT Finding of No Significant Impact (FONSI) hereby incorporates by reference and attaches hereto the *Draft Environmental Assessment (EA), Phantom Space Corporation (Phantom) Daytona-E and Laguna-E Launch Operations at Space Launch Complex 5 (SLC-5), Vandenberg Space Force Base (VSFB), California*. The EA considered all potential environmental impacts of the Proposed Action (Alternative 1) and the No Action Alternative, and identified management protective measures to avoid, prevent, or minimize environmental impacts.

PROPOSED ACTION (ALTERNATIVE 1)

The Proposed Action (Alternative 1) is to implement Phantom's Daytona-E and Laguna-E launch program and the associated construction of a new launch facility at SLC-5 on VSFB. SLC-5 is a decommissioned, demolished launch site on south VSFB. Phantom would construct two launch pads and a Horizontal Integration Facility at the site and install utilities and firebreaks. To meet fire safety standards, access roads around SLC-5 would require improvements and repairs. Phantom proposes to perform up to a combined total of 48 launches of the Daytona-E and the Laguna-E from SLC-5 annually. In addition, Phantom would conduct up to 48 vertical tests (static fire) annually.

The purpose of the Proposed Action is to address the lack of accessible U.S. enterprise access to space and to fulfill requirements of commercial and governmental entities in the small satellite orbital and suborbital market. Phantom's mission is to provide low-cost access to satellite technology by mass manufacturing launch vehicles, satellites, and space propulsion systems.

The Proposed Action also fulfills Congress's grant of authority to the Secretary of Defense (SECDEF), pursuant to 10 USC Section 2276(a), *Commercial Space Launch Cooperation*, that SECDEF is permitted to act to:

> (1) maximize the U.S. private sector's capacity to use Department of Defense (DOD) space transportation infrastructure;
>
> (2) maximize DOD's space transportation infrastructure effectiveness and efficiency;
>
> (3) reduce DOD provided services costs related to space transportation infrastructure at launch support facilities and space recovery support facilities;
>
> (4) encourage commercial space activities by enabling covered entities to invest in DOD's space transportation infrastructure; and
>
> (5) foster cooperation between the DOD and covered entities.

By increasing VSFB launch capacity, the Proposed Action allows continued fulfillment of the National Space Policy goals of promoting a "robust commercial space industry and strengthen

United States leadership as the country of choice for conducting commercial space activities." The Proposed Action ensures that U.S. space launch capability is not reduced or limited, and that the U.S. remains the space launch technology leader.

The FAA forecasts that commercial launch operations will increase in the U.S. from an all-time high of 64 launches in 2021 to up to 186 launches by just 2026. The space consulting company, Euroconsult, estimates that worldwide 2,500 satellites will be launched per year between 2022 and 2031. BIS Research market reports state the global commercial space payload market is supposed to reach $56.32 billion by 2031, with a growth rate of 5.51% during 2021-2031.

The Proposed Action is needed to fulfill the United States' *National Space Policy* (U.S. Government 2020) to reduce space transportation costs and ensure continued exploration, development, and space use is more affordable. Additionally, this Proposed Action would modernize launch infrastructure through resuming operations at SLC-5, which has been unused since the NASA Scout program ended in 1994. The Proposed Action supports Space Launch Delta 30's (SLD 30's) vision to become the "world's most innovative space launch and landing team."

ALTERNATIVES CONSIDERED

The Council on Environmental Quality's (CEQ's) regulation requires assessing reasonable alternatives (40 Code of Federal Regulations [C.F.R.] § 1502.14). Phantom considered reasonable alternatives for its launch program but dismissed them from detailed analysis as they did not meet program requirements. Phantom assessed several sites at VSFB and the Pacific Spaceport Complex (PSCA) at Kodiak Island, Alaska. Both locations are existing spaceports providing access to high-inclination, polar, and sun-synchronous orbits. At VSFB, Phantom evaluated SLC-8, SLC-5, Boat Dock, Sudden Flats, and Boathouse Flats. At PSCA, Phantom considered Launch Pad (LP)-1, LP-2, LP-3C, and LP-3E. The Boat Dock, Sudden Flats, and Boathouse Flats at VSFB and LP-3E at PSCA have not previously had or currently have active launch operations, causing uncertainty in their potential to support efficient launch operations. These uncertainties were primarily related to the ability to extend Base utilities (e.g., water, electricity, gas, communications) to these sites since they had not previously been developed. Additionally, these sites had little to no prior studies to identify potential constraints and limitations related to sensitive resources. The time necessary to resolve the uncertainties through research and studies failed to meet the Daytona-E's initial launch target date in 2023; therefore, Phantom eliminated these sites from further consideration. SLC-5 has existing or nearby utilities and an existing body of studies and data on its characteristics and area natural resources because the Air Force launched at SLC-5 between 1962 and 1994.

VSFB's SLC-8 and PSCA's LP-1, LP-2, and LP-3C are now approved for launch operations. However, they are shared multi-user launch sites for commercial and government launch operators. As such, Phantom would only be able to temporarily use these pads. This would considerably disrupt and logistically challenge Phantom operations and not support its regular launch cadence. Therefore, Phantom also eliminated these alternatives from further consideration, and only carried forward the Proposed Action and No Action Alternative for further evaluation.

No Action:

A CEQ regulation requires assessing reasonable alternatives, including no action, which the U.S. Space Force (USSF) considered (40 C.F.R. § 1502.14(c)). Under the No Action Alternative, Phantom would not implement the Daytona-E and Laguna-E launch program at SLC-5 on VSFB; therefore, the USSF would be unable to comply with *National Space Policy* or meet mission requirements to promote national economic interests by supporting commercial investment and space use. Thus, the No Action Alternative would not meet the purpose of and need for the Proposed Action but is carried forward as a baseline analysis in this EA, as the National Environmental Policy Act (NEPA) requires.

SUMMARY OF FINDINGS

The attached EA analyzed the potential environmental consequences of activities associated with the Proposed Action and No Action Alternative. Based on the analysis, neither the Proposed Action nor the No-Action Alternative would result in individual or cumulatively significant impacts to any resources. However, potential adverse impacts were noted for the Proposed Action to the following resources: air quality, climate, sound (airborne), biological resources, water resources, cultural resources, Department of Transportation Act Section 4(f) properties, recreation, transportation, human health and safety, hazardous materials and waste management, solid waste management, Coastal Zone management, and utilities. The No-Action Alternative would result in impacts less than the Proposed Action; however, it would not meet the Proposed Action's purpose and need. Environmental protection measures that are incorporated into the Proposed Action (identified as required in the EA) would be implemented to avoid and/or minimize the potential adverse impacts. Discretionary environmental protection measures may further reduce potential impacts of the Proposed Action.

PUBLIC REVIEW AND COMMENT

Following publishing the Notice of Availability (NOA) in the *Lompoc Record* and *Santa Maria Times*, we made the Draft EA and FONSI available for public review and comment for 30 days. SLD 30 also distributed the Draft EA and FONSI per its current NEPA Distribution List, including the State Clearinghouse. Appendix Q contains copies of the Notice of Availability for Public Review, proof of publication, proof of library deliveries, a NEPA distribution list, public comments, and SLD 30's responses.

FINDING OF NO SIGNIFICANT IMPACT

Based on my review of the facts and analyses contained in the attached EA, conducted per the NEPA, 42 U.S. Code 4321 et seq., implementing CEQ's Regulations, 40 C.F.R. Parts 1500–1508, and 32 C.F.R. Part 989, Environmental Impact Analysis Process, I conclude that implementing the Proposed Action (Preferred Alternative) will not have a significant effect on the quality of the human environment. Therefore, further analysis with an Environmental Impact Statement is not required and this FONSI is appropriate. I decided this after considering all submitted information, including reviewing public and agency comments submitted during the 30-day public comment period, and considering a full range of reasonable [40 C.F.R. § 1502.14 concerns "reasonable" alternatives, which is not the same as "practical" alternatives] alternatives to meet project requirements that are within the Department of the Air Force's legal authority.

_____ _____

PAUL G. FILCEK, Col, USAF Date
Chief, Space Force Mission Sustainment
(Engineering, Logistics, & Force Protection)

Attachment: Draft Environmental Assessment Phantom Space Corporation Daytona-E and Laguna-E Launch Operations at Space Launch Complex 5, Vandenberg Space Force Base, California

TABLE OF CONTENTS

APPENDICES

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

%	percent
µg/m^3	micrograms per cubic meter
2 ROPS	2nd Range Operations Squadron
ac	acre(s)
ac-ft	acre-feet
ADI	Area of Direct Impact
ADT	Average Daily Traffic
ACAM	Air Conformity Applicability Model
AFCEC	Air Force Civil Engineer Center
AFI	Air Force Instruction
AFMAN	Air Force Manual
AFOSH	Air Force Occupational Safety and Health
AOC	Areas of Concern
AOI	Areas of Interest
APE	Area of Potential Effects
APZ	Accident Potential Zone
BA	Biological Assessment
Base	Vandenberg Space Force Base
BCC	Federal Bird Species of Conservation Concern
BGEPA	Bald and Golden Eagle Protection Act
bhp	brake horsepower
BMP	Best Management Practice
BO	Biological Opinion
C&D	construction and demolition
CAAQS	California Ambient Air Quality Standards
CARB	California Air Resources Board
CCA	California Coastal Act
CCC	California Coastal Commission
CCMP	California Coastal Management Plan
CCR	California Code of Regulations
CD	Consistency Determination
CDFW	California Department of Fish and Wildlife
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CINMS	Channel Islands National Marine Sanctuary
CINP	Channel Islands National Park
CNEL	A-weighted Community Noise Equivalent Level
CNPS	California Native Plant Society
CO	carbon monoxide
CO_2e	carbon dioxide equivalent
CRLF	California red-legged frog
CSLA	Commercial Space Launch Act
CY	cubic yard(s)
CZMA	Coastal Zone Management Act
DAF	Department of the Air Force
DAPTF	Declining Amphibians Population Task Force
dB	decibel(s)
dBA	A-weighted decibel(s)
DNL	Day-Night Average Sound Level
DOD	Department of Defense
DODI	Department of Defense Instruction
DOT	Department of Transportation
DPS	Distinct Population Segment
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMS	Environmental Management System
EO	Executive Order
EPM	Environmental Protection Measure
ERP	Environmental Restoration Program
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FE	federally endangered
FHWA	Federal Highway Administration
ft	foot/feet
ft^2	square feet
FT	federally threatened
GAO	Government Accountability Office
GHG	greenhouse gas
GIS	Geographic Information Systems
GN2	gaseous nitrogen
GSE	ground support equipment
GWP	global warming potential
HazMart	Hazardous Materials Pharmacy
HIF	Horizontal Integration Facility
HMMP	Hazardous Materials Management Process
HWMP	Hazardous Waste Management Plan
Hwy	Highway
IAW	in accordance with
IPA	isopropyl alcohol
IRP	Installation Restoration Program
ISWMP	Integrated Solid Waste Management Plan

IWTP	Industrial Wastewater Treatment Ponds
kV	kilovolt(s)
kW	kilowatt(s)
LED	light-emitting diode
L_{eq}	single equivalent sound level
L_{eq1H}	the continuous sound level that would contain the same acoustical energy for 1 hour as the fluctuating sound levels during the same period
LOA	Letter of Authorization
LOS	Level of Service
LP	Launch Pad
MAMU	Marbled Murrelet
MBTA	Migratory Bird Treaty Act
mi	mile(s)
MMCG	Marine Mammal Consulting Group
MMPA	Marine Mammal Protection Act
MMRP	Military Munitions Response Program
NAAQS	National Ambient Air Quality Standards
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NCI	Northern Channel Islands
ND	Negative Determination
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
nm	nautical mile(s)
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NO_x	nitrogen oxide
NOAA	National Oceanic and Atmospheric Administration
NOTAM	Notice to Air Missions
NOTMAR	Local Notice to Mariners
NRHP	National Register of Historic Places
O_3	ozone
OEL	Occupational Exposure Limit
OSHA	Occupational Safety and Health Administration
OWTS	Onsite Wastewater Treatment Systems
Phantom	Phantom Space Corporation
$PM_{2.5}$	particulate matter less than 2.5 microns
PM_{10}	particulate matter less than 10 microns
POC	point of contact
POLs	petroleum, oil, and lubricants
ppb	part(s) per billion
ppm	part(s) per million
PSD	Prevention of Significant Deterioration
psf	pound(s) per square foot
PWSA	Ports and Waterways Safety Act
RCRA	Resource Conservation and Recovery Act
ROI	region of influence
RP-1	rocket propellant 1
RWQCB	Regional Water Quality Control Board
SAIC	Science Applications International Corporation
SBCAG	Santa Barbara County Association of Governments
SBCAPCD	Santa Barbara County Air Pollution Control District
SE	State Endangered Species
SECDEF	Secretary of Defense
SHPO	State Historic Preservation Officer
SLC	Space Launch Complex
SLD 30	Space Launch Delta 30
SLD 30/CEI	Space Launch Delta 30, Installation Management Flight
SLD 30/CEIEC	Space Launch Delta 30, Installation Management Flight, Environmental Quality
SLD 30/SEL	Space Launch Delta 30, Launch Safety
SLM	sound level meter
SNPL	western snowy plover
SO_2	sulfur dioxide
SO_x	sulfur oxides
SSC	California State Species of Special Concern
SYBCI	Santa Ynez Band of Chumash Indians
TI	Traffic Index
tpy	tons per year
U.S.	United States
USAF	United States Air Force
USC	United States Code
USCG	United States Coast Guard
USEPA	U.S. Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USSF	United States Space Force
UTS	unarmored threespine stickleback
UXO	unexploded ordnance
VSFB	Vandenberg Space Force Base
V/C	volume-to-capacity
VOC	volatile organic compounds

1	VSMR	Vandenberg State Marine Reserve

1.0 Introduction

Space Launch Delta 30 (SLD 30), Vandenberg Space Force Base (VSFB or Base), California, prepared this Environmental Assessment (EA). This EA evaluates the potential environmental impacts associated with operating Phantom Space Corporation's (Phantom) Daytona-E and Laguna-E launch vehicles and constructing a new launch facility at Space Launch Complex 5 (SLC-5), a decommissioned launch site on VSFB. Per agreements between the United States Space Force (USSF) and the Federal Aviation Administration (FAA), the USSF will act as the lead agency for preparing and coordinating the EA and the FAA will act as a cooperating agency. The FAA's role is licensing commercial space launch operations and approving airspace closures for launch operations. Phantom would be required to obtain a license from the FAA prior to conducting launches from SLC-5 with commercial payloads. The FAA has no action related to constructing the new launch facility.

This EA was prepared to enable Phantom, USSF, FAA, and the public to understand the potential environmental impacts of the proposed Daytona-E and Laguna-E launch program. This EA was prepared in accordance with (IAW) the requirements of National Environmental Policy Act (NEPA) as amended (42 United States Code [USC] 4321 et seq.); the Council on Environmental Quality (CEQ) National Environmental Policy Act Implementing Regulations (40 Code of Federal Regulations [CFR] Parts 1500–1508) (2022); the Department of the Air Force's (DAF) Environmental Impact Analysis Process (32 CFR Part 989), and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*.

1.1. Background

SLD 30 supports the United States (U.S.) Government and commercial entities for low-cost and reliable access to space, to make continued space exploration, development, and use more accessible. The *2020 National Space Policy* guidelines (in part) are reflected in Table 1.1-1.

Table 1.1-1: National Space Policy Guidelines

National Space Policy Guidelines
✓ Encourage an innovative and entrepreneurial commercial space sector. ✓ Enhance operational efficiency, increase capacity, and reduce launch costs by investing in the modernization of space launch infrastructure. ✓ Support industry-led efforts to rapidly develop new and modernized launch systems and technologies necessary to assure and to sustain future reliable, resilient, and efficient access to space when sufficient U.S. commercial capabilities and services do not exist. ✓ Purchase and use commercial space capabilities and services to the maximum practical extent under existing law when such capabilities and services are available in the marketplace and meet U.S. Government requirements.

Source: U.S. Government (2020)

1.2. Purpose and Need

Phantom proposes to construct a new launch facility and operate the Daytona-E and Laguna-E launch program at SLC-5 on VSFB. The purpose of the Proposed Action is to address lack of

accessible U.S. enterprise access to space and to fulfill requirements of commercial and governmental entities in the small satellite orbital and suborbital market. Phantom's mission is to provide low-cost access to satellite technology by mass manufacturing launch vehicles, satellites, and space propulsion systems.

The Proposed Action is also consistent with Congress's grant of authority to the Secretary of Defense (SECDEF), pursuant to 10 USC Section 2276(a), Commercial Space Launch Cooperation, that SECDEF is permitted to take action to:

> (1) maximize the use of the capacity of the space transportation infrastructure of the Department of Defense (DOD) by the private sector in the U.S.;
>
> (2) maximize the effectiveness and efficiency of the space transportation infrastructure of the DOD;
>
> (3) reduce the cost of services provided by the DOD related to space transportation infrastructure at launch support facilities and space recovery support facilities;
>
> (4) encourage commercial space activities by enabling investment by covered entities in the space transportation infrastructure of the DOD; and
>
> (5) foster cooperation between the DOD and covered entities.

By increasing launch capacity at VSFB, the Proposed Action allows continued fulfillment of the *2020 National Space Policy* guidelines, including promoting a "robust commercial space industry and strengthen United States leadership as the country of choice for conducting commercial space activities." The Proposed Action ensures that U.S. space launch capability is not reduced or limited, and that the U.S. remains the leader in space launch technology.

The FAA forecasts that commercial launch operations will increase in the U.S. from an all-time high in 2021 of 64 launches, to up to 186 launches by just 2026. The space consulting company, Euroconsult, estimated that worldwide, 2,500 satellites will be launched per year between 2022 and 2031. Per BIS Research market reports, the global commercial space payload market is supposed to touch $56.32 billion by 2031, with a growth rate of 5.51 percent (%) during 2021-2031.

The Proposed Action is needed to fulfill the *2020 National Space Policy* (U.S. Government 2020) to reduce space transportation costs and ensure continued exploration, development, and space use are more accessible. Additionally, this Proposed Action would invest in modernizing launch infrastructure through resuming operations at the SLC-5 location, which has been unused since the National Aeronautics and Space Administration (NASA) Scout program ended in 1994. The Proposed Action supports SLD 30's vision to become support "unconstrained space launch and test event capacity from the DAF's base of choice" (VSFB 2023).

1.3. Project Location

VSFB occupies approximately 99,604 acres (ac) of central Santa Barbara County, California (Figure 1.3-1). The Santa Ynez River and State Highway (Hwy) 246 divide it into the north Base and south Base. SLC-5 is a decommissioned launch site, approximately 18 ac, located on south Base (Figure 1.3-1).

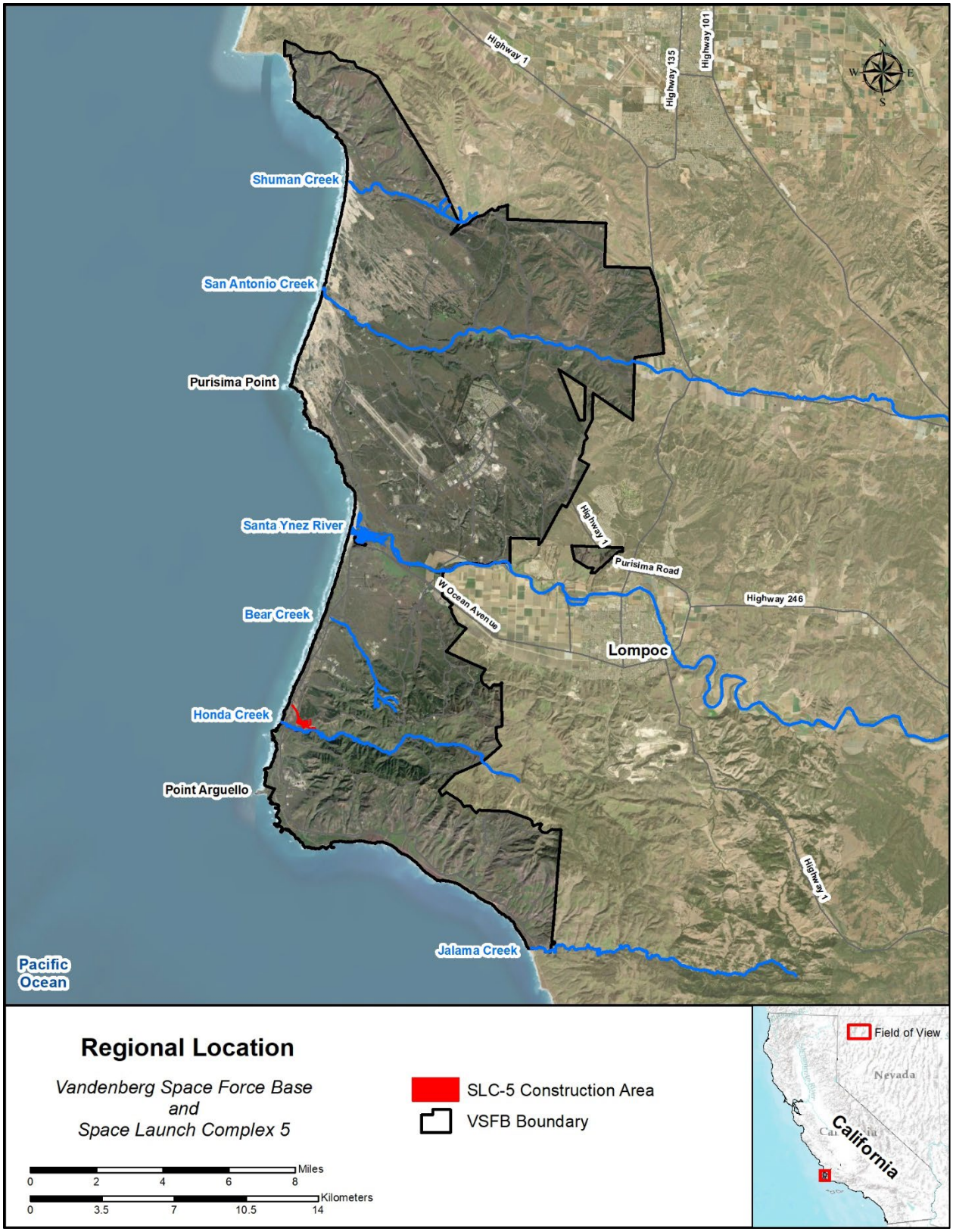

Figure 1.3-1: Regional Location of Proposed Action Area

1.4. Scope of the Environmental Assessment

The EA describes, in terms of a regional overview or a site-specific description, the potentially affected environment and potential environmental consequences of the action, and identifies reasonable alternatives to the Proposed Action, including the No Action Alternative. The EA also identifies Management measures to avoid, prevent, or minimize environmental impacts. The resources analyzed can be found in Table 1.4-1.

Table 1.4-1: Environmental Resources Analyzed

Environmental Resources Analyzed	
✓ Air Quality	✓ Sound (Airborne)
✓ Terrestrial Biological Resources	✓ Marine Biological Resources
✓ Water Resources	✓ Cultural Resources
✓ Department of Transportation (DOT) Act Section 4(f) Properties	✓ Recreation
✓ Transportation	✓ Human Health and Safety
✓ Hazardous Materials and Waste Management	✓ Solid Waste Management
✓ Coastal Zone Management	✓ Utilities
✓ Airspace	✓ Socioeconomics

1.5. Lead and Cooperating Agency Actions

Pursuant to agreements between the USSF and the FAA, the USSF is the lead agency for preparing and coordinating this EA (40 CFR Section 1501.7). The FAA and the United States Coast Guard (USCG) are cooperating agencies (40 CFR Section 1501.8). The DAF is responsible for conducting activities supporting commercial launch and reentry activity authorized by 10 USC Section 2276, Commercial Space Launch Cooperation, and Department of Defense Instruction (DODI) 3100.12, *Space Support*. In addition, as the owner and operator of VSFB, the DAF has authority over space-related operations, to include ground-based operations. If, after the public's EA review, the USSF determines that the Proposed Action would not individually or cumulatively result in significant impacts on the quality of the human environment, the USSF would issue a Finding of No Significant Impact (FONSI).

The FAA is a cooperating agency because of its role in licensing commercial space launch operations and approving airspace closures for launch operations. Congress, under the U.S. Commercial Space Launch Act (CSLA), 51 USC Subtitle V, Chapter 509, Sections 50901-50923, provided the DOT statutory direction 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] that 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." Within the DOT, the Secretary of Transportation's authority under the CSLA has been delegated to the FAA Office of Commercial Space Transportation. The FAA expects to receive a Vehicle Operator License application from Phantom for conducting Daytona-E and Laguna-E launch operations at SLC-5 in 2025. The FAA's

Federal Action includes: 1) issuing a Vehicle Operator License to Phantom, as well as potential future renewals or modifications to the Vehicle Operator License for operations that are within the scope analyzed in this EA; and 2) developing Letter(s) of Agreement (LOAs) with Phantom to outline notification procedures prior to, during, and after an operation, as well as procedures for issuing a Notice to Air Missions (NOTAM). The FAA intends to adopt this EA to support its environmental review when evaluating Phantom's Daytona-E license application(s) for operations at VSFB. The FAA will draw its own conclusions from the analysis presented in this EA and assume responsibility for its environmental decisions and any related mitigation measures. For the FAA to use this analysis to support its determination, the EA must meet the requirements of FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, which contains the FAA's policies and procedures for compliance with NEPA. Successfully completing the environmental review process does not guarantee that the FAA would issue a Vehicle Operator License to Phantom or issue LOAs.

The USCG is a cooperating agency because of their regulatory authority over waters subject to jurisdiction of the U.S. pursuant to the Ports and Waterways Safety Act (PWSA), Title 46 USC, Chapter 700, regulatory authority of U.S. and Foreign flag vessels as outlined in 33 and 46 CFR, and to review/advise SLD 30 on all launch and reentry site evaluation risk assessments, with focus on vessel navigation safety. USCG also supports SLD 30 with early warning communication to the maritime industry with Local Notice to Mariners (NOTMAR) as outlined in 33 CFR Subpart 72.01. SLD 30 and USCG District Eleven have entered into a Memorandum of Agreement (MOA; Appendix O) to assist with maritime safety and space operational review that have a maritime nexus. USCG District Eleven would utilize authorities authorized in the PWSA and CFR in evaluating Phantom and SLD 30 navigation risk assessments with launch and reentry activities associated with commercial and recreational vessels on the high seas off the California Coast. The USCG evaluates every launch and reentry activity for risk to waterway users and the environment under this process.

1.6. Intergovernmental Coordination and Interagency Consultation

IAW 32 CFR Section 989.14(l), SLD 30 will involve other federal agencies, state, Tribal, and local governments, and the public in EA preparation. In meeting this requirement, as well as meeting the requirements of Executive Order (EO) 12372, *Intergovernmental Review of Federal Programs*, SLD 30 notified and consulted with relevant federal and state agencies on the Proposed Action and alternatives to identify potential environmental issues and regulatory requirements associated with project implementation. The following discussion summarizes the agency completed coordination and consultations.

Under Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 USC Section 1531 et seq.), federal agencies are required to assess the potential effects of projects authorized, funded by, or carried out by federal agencies on federally listed threatened or endangered species. Section 7 consultations with the United States Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) are required for federal projects if such actions have the potential to affect listed species or designated critical habitat. SLD 30 prepared a Biological Assessment (BA) and initiated formal Section 7 consultation with the USFWS for potential adverse impacts of the Proposed Action on

the federally listed tidewater goby (TWG; *Eucyclogobius newberryi*), unarmored threespine stickleback (UTS; *Gasterosteus aculeatus williamsoni*), California red-legged frog (CRLF; *Rana draytonii*), California condor (*Gymnogyps californianus*), western snowy plover (SNPL; *Charadrius nivosus nivosus*), marbled murrelet (MAMU; *Brachyramphus marmoratus*), and southern sea otter (*Enhydra lutris nereis*). The USFWS completed the consultation and on 24 April 2023 issued a Biological Opinion (BO; 2022-0045260-S7; Appendix A).

SLD 30 also prepared a BA and initiated informal Section 7 consultation with NMFS for potential effects resulting from increasing the cumulative launch cadence at VSFB to 110 per year on ESA-listed species and designated critical habitat under NMFS jurisdiction (Appendix B). The BA addressed potential effects to ESA-listed fish, sea turtles, and marine mammals in the Proposed Action area resulting from various aspects of launch programs at VSFB, including the proposed Phantom launch program at SLC-5. NMFS completed the consultation and issued a Letter of Concurrence (LOC) on 20 January 2023 (WCRO-2023-00002; Appendix B).

Under the Marine Mammal Protection Act (MMPA) of 1972, NMFS issued the SLD 30 regulations (a "Final Rule") for taking marine mammals incidental to DAF activities at VSFB, including launches (NMFS 2019a), and a Letter of Authorization (LOA) (NMFS 2019b; Appendix B). The LOA allows specified launch programs to unintentionally take small numbers of marine mammals, limited to Level B harassment as defined in the MMPA. SLD 30 is required to comply with the conditions listed in the LOA and address NMFS concerns regarding marine mammals at VSFB and the Northern Channel Islands (NCI). The current LOA expires in April 2024. SLD 30 applied for renewal and expects to have a revised LOA by early April 2024.

The Proposed Action is a federal undertaking subject to compliance with Section 106 of the National Historic Preservation Act (NHPA) of 1966 as amended (54 USC Section 300101 et seq.). SLD 30 initiated consultation with the State Historic Preservation Officer (SHPO) under 36 CFR Part 800. SLD 30 determined that there would be no adverse effect to historic properties by the Proposed Action. The SHPO concurred on 17 May 2022 with SLD 30's determination of no adverse effect to historic properties (USAF_2022_0505_001; Appendix C). Native American traditional cultural properties are also protected by the NHPA of 1966, as amended. Per NHPA implementing regulations at 36 CFR Part 800, consultation with the Santa Ynez Band of the Chumash Indians is discussed below in Section 1.6 (Intergovernmental Coordination and Consultation).

The SLD 30 Commander appointed Christopher Ryan (SLD 30, Installation Management Flight, Environmental Conservation [SLD 30/CEIEA]) as the Installation Tribal Liaison Officer. Mr. Ryan designated Josh Smallwood, Base Archeologist, to represent the USSF in this tribal consultation. Mr. Smallwood carried out Native American consultation via email with Nakia Zavalla, the Santa Ynez Band of Chumash Indians' (SYBCI) tribal chairman's appointee to SLD 30 for Section 106 consultations. As the SYBCI is a federally recognized tribe, SLD 30 consulted with it on a government-to-government basis. On 25 April 2022, SLD 30 notified the SYBCI of the Proposed Action and requested tribal comments on the Proposed Action to initiate government-to-government consultation (Appendix C). The SYBCI responded on 26 May 2022 requesting a tribal monitor be present during ground disturbance in and near known prehistoric sites (Appendix C). The California SHPO responded with comments on 17 May 2022. The SHPO concurred with SLD 30's delineation of the Area of Potential Effect (APE), the determination of non-NRHP eligibility

of CA-SBA-2934, and the finding of no adverse effect on historic properties. During project activities, to deter vehicles or staff from entering the site temporary exclusionary fencing shall be installed along both sides of Honda Canyon Road where it crosses archaeological site CA-SBA-670. The Installation Cultural Resources Management Plan requires an archaeological monitor to be retained and present during earthmoving activities near known archaeological sites in the Project area, regardless of NRHP-eligibility.

Under the Coastal Zone Management Act (CZMA) of 1972 (16 USC Section 1451, et seq.), a federal action that may affect the coastal zone must be carried out in a manner that is consistent with state coastal zone management programs. The USSF determined that the Proposed Action is consistent to the maximum extent practicable with the California Coastal Management Plan (CCMP), pursuant to the requirements of the CZMA. Therefore, on 23 November 2022 the USSF requested California Coastal Commission (CCC) concurrence on a Consistency Determination (CD) for this Proposed Action. After review by the CCC, additional information was requested. The DAF worked with the CCC to provide the required details and resubmitted the CD (Appendix D) on 10 November 2023 and this project was presented at the CCC Public Hearing on 15 December 2023. The CCC concurred with DAF CD (CD-0010-22) and found the proposed project consistent to the maximum extent practicable with the enforceable policies of the CCMP on 20 December 2023 (Appendix D).

1.7. Public Notification and Review

Following the publication of a Notice of Availability (NOA) in the Lompoc Record and Santa Maria Times, the DAF made the Draft EA and FONSI available for public review and comment for 30 days. The DAF also distributed the Draft EA and FONSI per the current VSFB NEPA Distribution List (Appendix Q), including the State Clearinghouse. The Final EA will include a copy of the NOA, proofs of publication, proof of library deliveries, public comments, and responses to public comments.

2.0 Description of the Proposed Action and Alternatives

This chapter describes the Proposed Action (Preferred Alternative) and the No Action Alternative in detail, describes selection criteria used to identify and select alternatives, and summarizes alternatives that were considered but eliminated from further analysis. It also details the proposed construction activities and operation of the Daytona-E and Laguna-E launch vehicles at SLC-5 on VSFB to support commercial and government customers.

2.1. Selection Criteria

SLD 30 identified a range of reasonable alternatives on VSFB and other sites by evaluating the ability of each alternative to meet the purpose and need of the Proposed Action and their ability to meet selection criteria. The criteria for site selection alternatives are listed in Table 2.1-1.

Table 2.1-1: Alternative Sites Selection Criteria

Criteria
1. Direct orbital access to high-inclination, polar, and sun-synchronous orbits. 2. Existing and approved commercial or federal spaceport and proven launch location to meet an initial launch target date for Daytona-E in calendar year 2025, as well as support the projected launch cadence without substantial impacts to public beach access. 3. Ability to support a regular cadence of launch preparation and operations, including: a. Ability to accommodate multiple launch pads for near-simultaneous operations. b. Ability to configure site to optimize for the Daytona-E and Laguna-E vehicles and supporting systems. 4. Provides minimal disruption to Phantom operations, including: a. Phantom staff having unimpeded site access and use. b. Ability to pre-position ground support equipment (GSE) between launch operations.

2.2. Alternatives Considered and Eliminated from Further Analysis

IAW NEPA and DAF Environmental Impact Analysis Process Regulations (32 CFR Part 989), reasonable alternatives were considered for Phantom's launch program, but dismissed from detailed analysis as they did not meet the program's requirements. Phantom assessed several sites at VSFB and the Pacific Spaceport Complex (PSCA) at Kodiak Island, Alaska. Both locations are existing spaceports providing access to high-inclination, polar, and sun-synchronous orbits. At VSFB, Phantom evaluated SLC-8, SLC-5, Boat Dock, Sudden Flats, and Boathouse Flats. In addition, Phantom considered Launch Pad (LP)-1, LP-2, LP-3C, and LP-3E at PSCA. The Boat Dock, Sudden Flats, and Boathouse Flats at VSFB and LP-3E at PSCA have not previously or currently had active launch operations, causing uncertainty in their potential to support efficient launch operations. These uncertainties were partially related to the ability to extend Base utilities (e.g., water, electricity, gas, communications) to these sites since they had not previously been developed. Equally important, these sites had little to no prior studies to identify potential

constraints and limitations related to sensitive resources and unlikelihood of deconflicting operations or securing ability to support Phantom's launch cadence. For example, PSCA's annual maximum launch cadence is currently nine, which is less than one-fifth of Phantom's expected launch cadence. Furthermore, the nine launches are shared with government missions and other commercial companies, which would further reduce Phantom's launch operations. VSFB's Boat Dock is in close proximity to the Base's sole harbor location needed for delivery of launch vehicles and other hardware which would constrain the projected launch cadence. The Boat Dock, Sudden Flats, and Boathouse Flats locations are one-third closer to Jalama Beach than SLC-5. As such, approximately half of the most useful launch azimuths (80-91 degrees) would place Jalama Beach County Park into the flight safety hazard area and would require significant increase in beach closures. The operational conflicts and safety concerns failed to meet the timeline requirements under Criterion 1 and 2, above, and these sites were therefore eliminated from further consideration. Because a launch program had operated at SLC-5 until 1994, there are existing utilities at the site or nearby, and an existing body of studies and data on the site characteristics and natural resources in the area.

VSFB's SLC-8 and PSCA's LP-1, LP-2, and LP-3C are currently approved for launch operations. However, they are shared multi-user launch sites for commercial and government launch operators. As such, Phantom would only be able to temporarily use these pads. Doing so would considerably disrupt and logistically challenge Phantom operations and would not support a regular launch cadence under Criteria 3 and 4, above. Therefore, Phantom also eliminated these alternatives from further consideration, and only carried forward the Proposed Action and No Action Alternative for further evaluation.

2.3. Preferred Alternative (Proposed Action)

The Preferred Alternative includes constructing a new launch facility and operating the Daytona-E and Laguna-E launch program at SLC-5. The Preferred Alternative meets all of the selection criteria (Table 2.3-1). SLC-5 is a decommissioned launch site at a federal spaceport that is properly situated for launches.

Table 2.3-1: Preferred Alternative Selection Criteria

SLC-5 Capabilities/Characteristics	Criterion Met
VSFB provides direct orbital access to high-inclination, polar, and sun-synchronous orbits.	1
SLC-5 is a decommissioned launch site near existing utilities, road access, and support services on VSFB. Additionally, it is relatively flat and would require less grading than other sites due to prior site development.	2
SLC-5 can accommodate a multi-pad layout, vertical test facility, and support facilities.	3
Phantom would have exclusive use of SLC-5.	4

2.3.1. SLC-5 Construction and Infrastructure Improvements

NASA used the SLC-5 launch site between 1962 and 1994 to launch Scout space launch vehicles. At the Scout program's end in 1994, all SLC-5 facilities were deactivated and then demolished between 2009 and 2012. Required infrastructure improvements are discussed below.

2.3.1.1. Launch Pad & HIF Construction

Prior infrastructure supporting the Scout launch program at SLC-5 was demolished and removed; however, some additional demolition may be required if any remaining structures or materials are encountered during construction. The Proposed Action would include constructing two new concrete launch pads – SLC-5E and SLC-5W (Figures 2.3-1 and 2.3-2). Construction would be performed in two Phases. Phase I of construction would be divided into 2 subphases, Phase I-A and Phase I-B, each estimated to take no more than 45 days, beginning 2024 and continuing into 2025. Phase I-A, in total, would include constructing SLC-5W, the instrumentation pad, site security, roadways, and primary site utility connections (Figure 2.3-2). During Phase I-A, Phantom would also install a temporary building for stage and payload integration at the eventual site of the Horizontal Integration Facility (HIF). Phase I-B would include constructing the HIF. During Phase II in 2027, Phantom would construct SLC-5E, supporting roadways, and utility connections (Figure 2.3-3). Due to uncertainties of escalating costs of materials and timing electrical work with SLD 30 and other launch service providers to ensure no impact to mission operations, installing electrical utilities connecting SLC-5 to existing VSFB may be shifted from Phase I-A to Phase I-B or Phase II. In that case, Phantom would rely on a 533 bhp diesel powered generator as primary power up to the first 3 years of operations. Each pad would serve dual use as launch pads and Vertical Test Facilities and each would be approximately 1,500 square feet (ft^2) in area. An approximately 12-foot (ft) by 12-ft launch stool would be installed at each pad.

Construction during Phases I and II would require an estimated total of 40,000 cubic yards (CY) of excavation and cut/fill to bring the site to the desired grade and install the structures and supporting infrastructure. An approximately 12.5-ft-deep flame deflector would be constructed under each launch stool that curves from vertical to horizontal to redirect at least 150,000 pounds of thrust and has the ability to contain up to 10,000 gallons of water deluge. The deflector would have a reinforced concrete mat foundation sized for the engine thrust. The deflector itself would be reinforced concrete and have a short reinforced concrete tunnel that will project the exhaust away from Honda Canyon and the launch vehicle and exit into the water deluge catch basin. The deflector and tunnel will use a refractory concrete top layer to protect the reinforced concrete below. In total, an estimated 10,000 CY of concrete would be required for Phase I and II construction of SLC-5E and SLC-5W. An estimated 12,000 tons of asphalt would be necessary for improvements to Delphy Road. The 7,500-ft^2 HIF would provide a site for payload and stage integration and house up to four 55-gallon drums of rocket propellant 1 (RP-1) or Jet-A for engine flow tests and would require approximately 1,000 tons of steel and 10 tons of wood for its construction. The site would also contain an instrumentation pad located to the southwest of the HIF (Figure 2.3-1). Materials, supplies, and products needed for construction and operation would be purchased from local suppliers in the Central California region to the extent practicable, based on the availability and ability for those suppliers to meet Phantom's needs.

Site lighting would be required for the right of entry, roadways, parking areas, building exterior, and launch pads. The lighting would be pole-mounted, bug-friendly, T24 compliant light-emitting diode (LED) flood lights. Approximately 36 light poles would be installed around the perimeter and interior of SLC-5. The light poles would have a maximum height of 40 ft and be placed in holes dug down to approximately 20 ft below the surface. The lights would be designed with the minimum lumens needed to meet operational and security requirements and would be shielded to minimize stray light from entering Honda Canyon. A preliminary lighting plan and photometric model is shown in Figure 2.3-4. These fixtures would be supplied from a lighting panel in the HIF and provided with full astronomical clock and photocell control. Lighting on any temporary buildings or facilities during the phased construction (discussed above) would adhere to the same requirements.

The entire SLC-5 complex would be bound by perimeter security fencing generally comprised of 7-ft-tall chain link fence with 1-ft outriggers and 3-strand barbed wire.

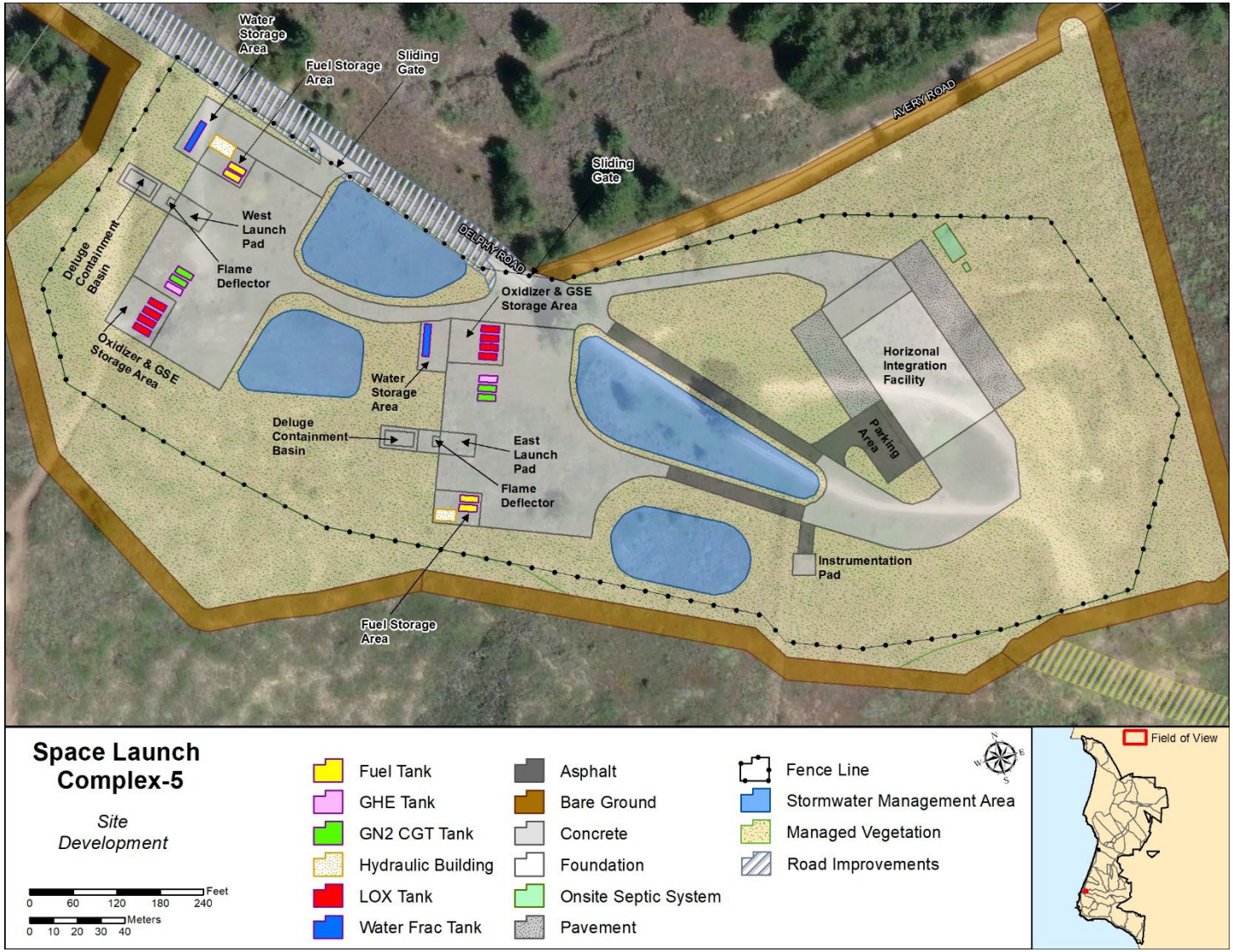

Figure 2.3-1: Conceptual Site Plan

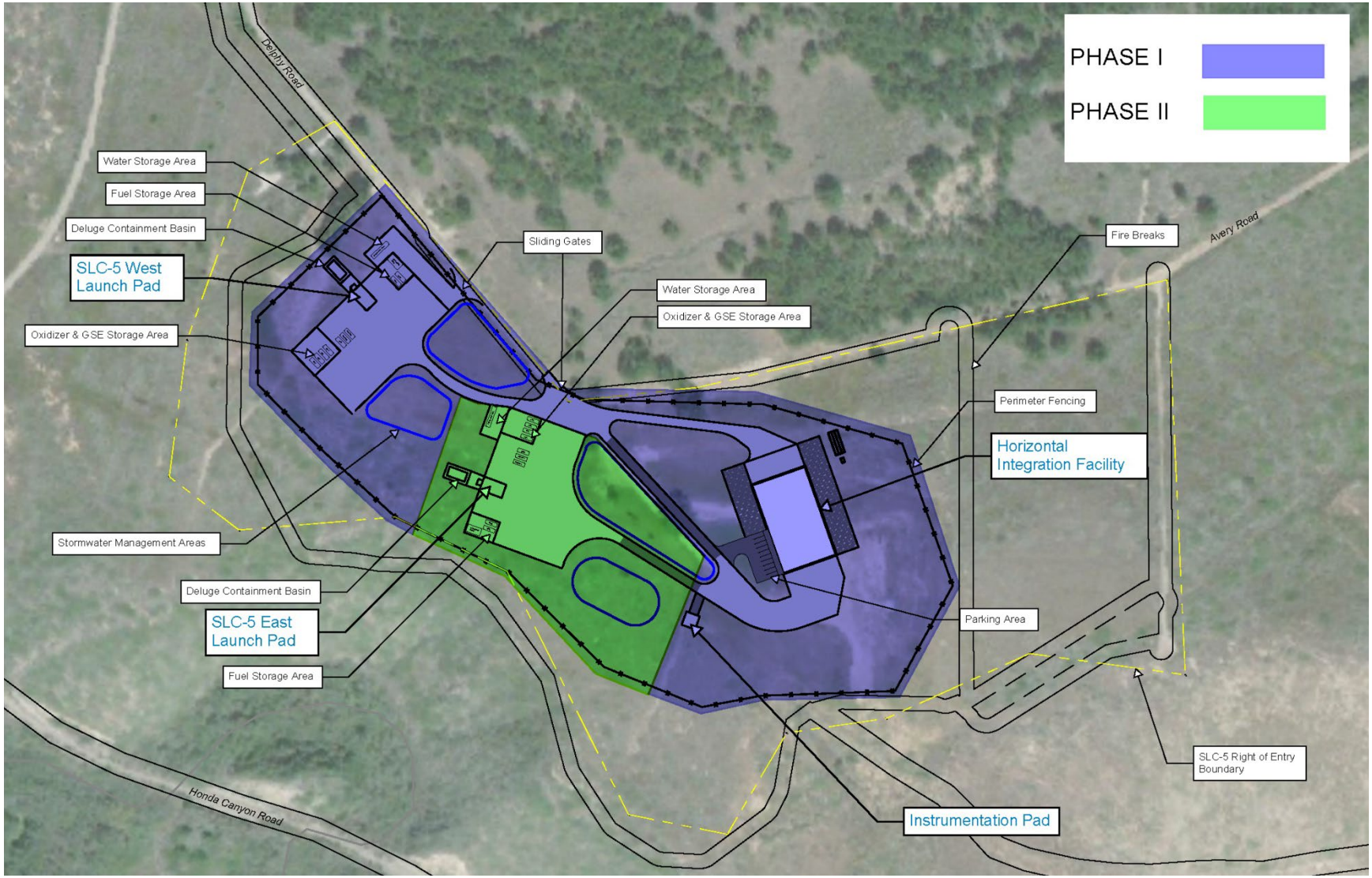

Figure 2.3-2: Construction Phases I and II (Note: Firebreaks and perimeter fencing in this figure are inaccurate; please refer to Figure 2.3-1 for realigned features)

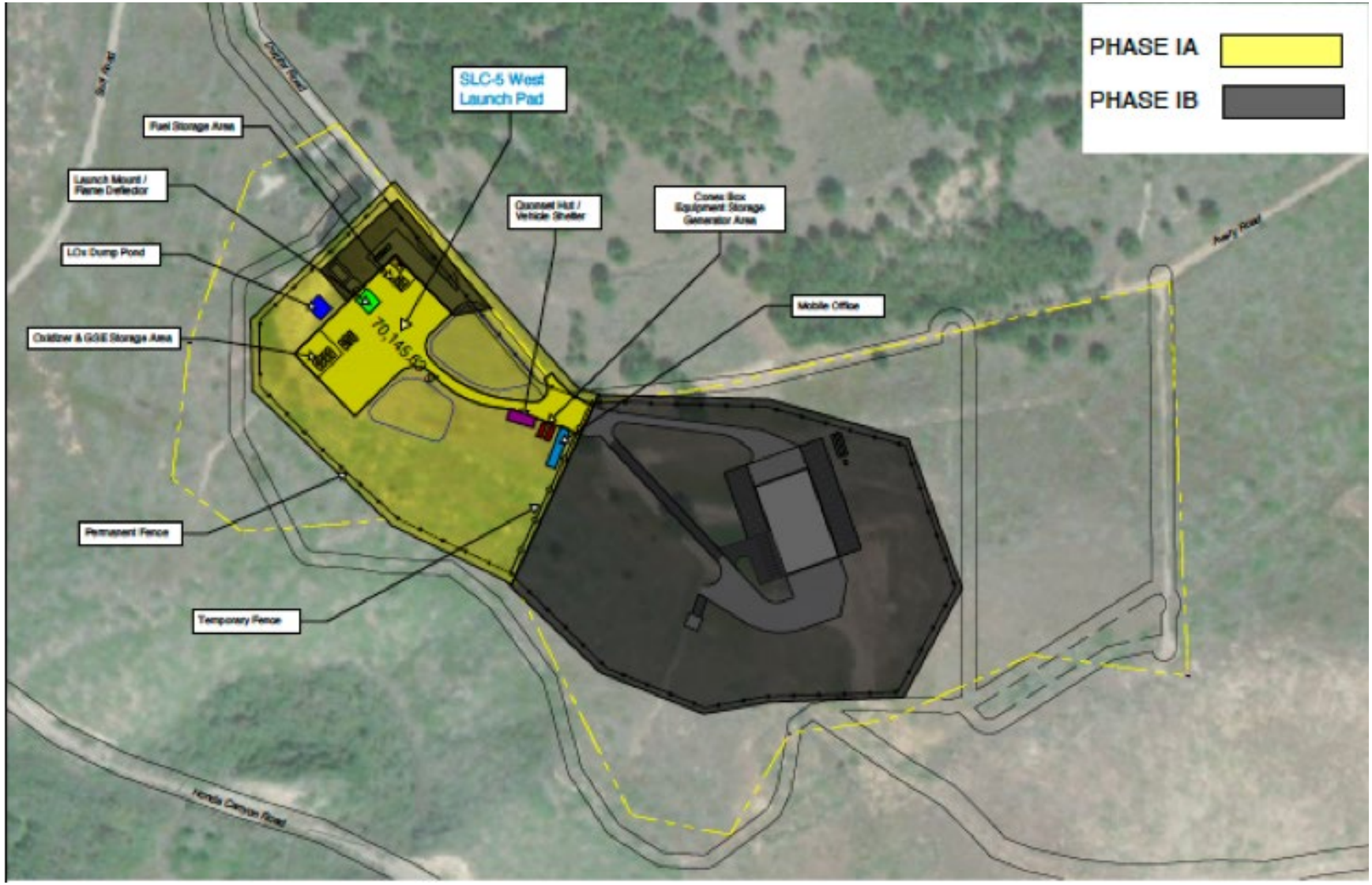

Figure 2.3-3: Construction Phases I-A and I-B (Note: Firebreaks and perimeter fencing in this figure are inaccurate; please refer to Figure 2.3-1 for realigned features)

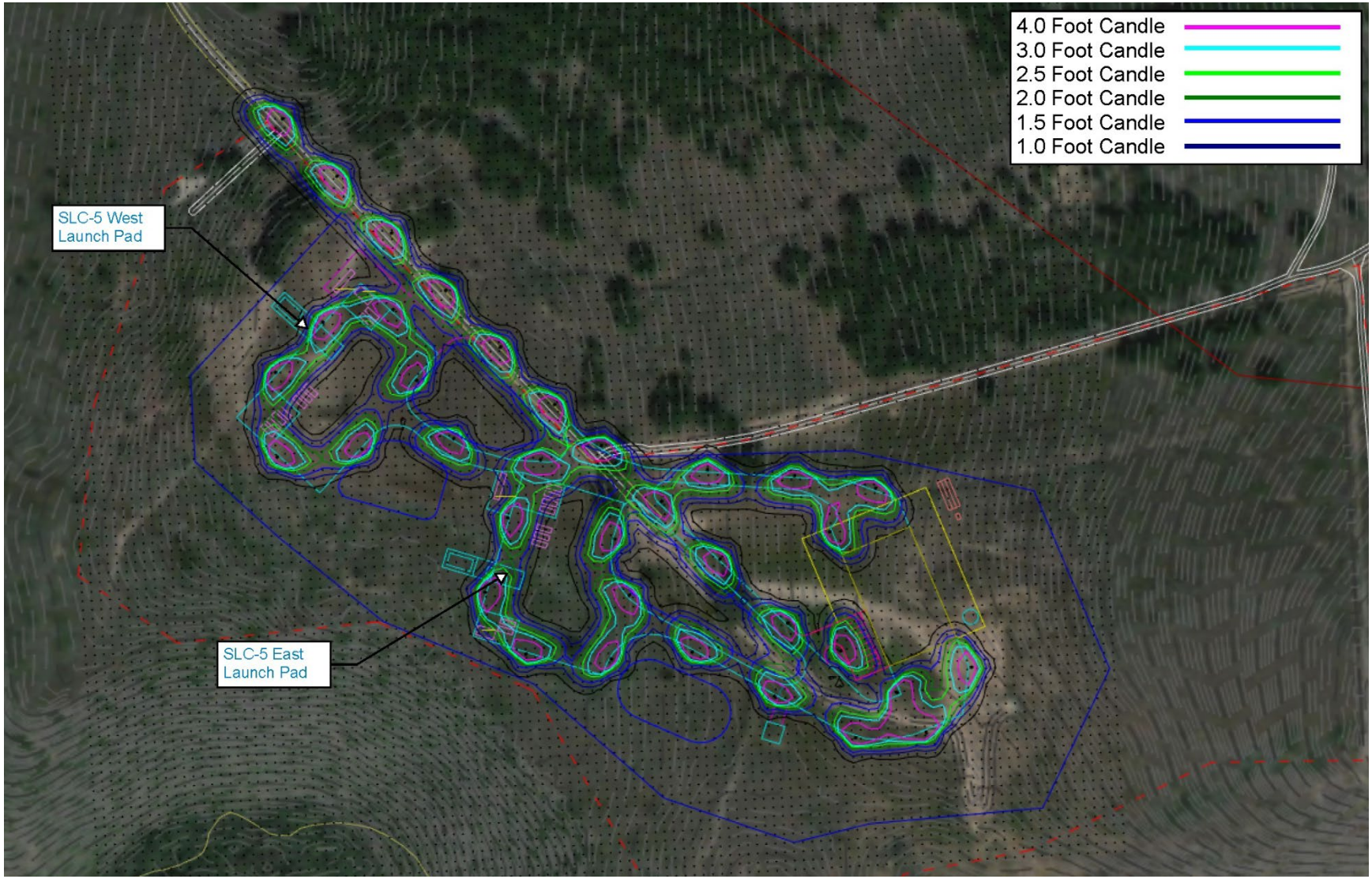

Figure 2.3-4: Preliminary Lighting Plan

2.3.1.2. Commodities

Initially, mobile 24,000 standard-cubic-foot tube bank trailers would supply gaseous helium (one tube trailer per pad) and gaseous nitrogen (GN2) (two tube trailers per pad) to on-site GSE during launch operations. However, once approaching full launch cadence at SLC-5 (anticipated in 2028), Phantom would install a connection line to VSFB's high-pressure GN2 line through the utility corridor following Delphy Road, but still maintain at least one mobile tube bank trailer for GN2 onsite. Both Daytona-E and Laguna E use LOX/RP-1 or LOX/Jet-A propellant. A kerosene (RP-1 or Jet-A) fuel storage area would be designated for placement of International Organization for Standardization (ISO) portable tanks. At each SLC-5W and SLC-5E, up to two 20-ft 5,500-gallon ISO tanks would be connected to a fuel transfer manifold. The fuel transfer manifold would include a 275-gallon-per-minute pump, isolation valves, and 4-inch line from the storage area to the pad. There would be up to approximately 20,100 gallons of kerosene (RP-1 or Jet-A) stored in portable ISO tanks at SLC-5. Fuel transfer manifolds would provide basic filtration and a means to de-tank the launch vehicle. LOX storage would be provided by up to six 20-ft portable ISO tanks at each pad, or a total of approximately 26,000 gallons of LOX per pad.

An ignitor fill module would support the ignition systems for the Daytona-E and Laguna-E launch vehicles and Phantom first and second stage engines. This module would either supply gaseous oxygen and hydrogen or triethylaluminum-triethylboron for ignition. After launch, on-site staff would return to the pad to inspect and safeguard the site and reconfigure GSE for storage. Initial activities would include purging lines and storing cart-based GSE systems.

Final integration and launch preparation require the use of solvents for cleaning electrical contacts and bonding surfaces, adhesives for joining and securing equipment and covers, and paints and other surface coatings to protect specialized parts. Because the component parts are manufactured offsite and arrive nearly ready for launch, the quantities of material used for assembling the parts are minimal. Paint, sealants, solvents, and adhesives would also be used for maintenance of SLC-5 infrastructure. Approximately 3 to 5 gallons of isopropyl alcohol (IPA) would be used during each Daytona launch and approximately 6 to 10 gallons of IPA during each Laguna launch.

2.3.1.3. Utilities

New electrical power, fiber communication lines, and water would be extended from existing sources to SLC-5. American Water Operations & Maintenance operates the water distribution and wastewater collection systems at VSFB under a DAF contract. VSFB receives electrical power from Pacific Gas and Electric (PG&E) Company via a substation in Orcutt, CA. Two 70-kilovolt (kV) circuits feed power to a USSF switching station located on Corral Road. VSFB maintains and operates nine government owned substations to support electrical needs on Base. These utilities would be installed within the footprint of Delphy Road and a 100-ft-wide utility corridor immediately south of the road (Figure 2.3-5). Electrical and fiber communication lines would either be buried or installed on poles within this utility corridor or the road to establish new service connections at the launch complex.

An on-site septic system with a septic tank and leach field would provide permanent sanitary sewer service for the HIF (Figure 2.3-1). The septic system would be designed IAW the regulations

set forth in the California Regional Water Quality Control Board (RWQCB) Onsite Wastewater Treatment Systems Manual (OWTS).

2.3.1.4. Stormwater Management

Stormwater would be directed to infiltration areas (Figure 2.3-1) to minimize or prevent any runoff from the site. Any stormwater that accumulates within the flame deflector or water deluge catch basin would be tested for any contamination. If contamination is encountered, the contents would be pumped out and disposed of per relevant state, Federal and local regulations. If the water is clean enough to go to grade, it would be discharged from the retention basin to an infiltration area or spray field. Discharge to grade would be conducted under appropriate permits (General Waiver for Specific Types of Discharges or stand-alone permit) under the Central Coast RWQCB and federal and state regulations.

2.3.1.5. Roads, Firebreaks, and Vegetation Management

Paved access roadways into and throughout the site would generally be 20-ft wide asphalt, concrete, and aggregate surfaced pavements. Connectivity would be provided between the HIF, both launch pads and their associated propellant storage areas. Delphy Road, which connects SLC-5 to Surf Road and Coast Road, is in fair condition, but would require repairs including repaving (Figure 2.3-5). Approximately 7,000 square yards of asphalt would be needed to improve Delphy Road and the access roads within SLC-5.

Firebreaks would be established along the western, southern, and eastern perimeter of SLC-5 (Figure 2.3-5). Avery and Ladd Roads to the north and northeast would serve as firebreaks and fire access roads, but would require repairs to meet fire safety requirements. All roads would require regular vegetation maintenance to enable emergency access for fire equipment. Vegetation would also be managed by routinely mowing within the SLC-5 fence line and surrounding firebreak. During initial site clearing for construction, woody vegetation would be removed using a masticator, chainsaws, or similar equipment.

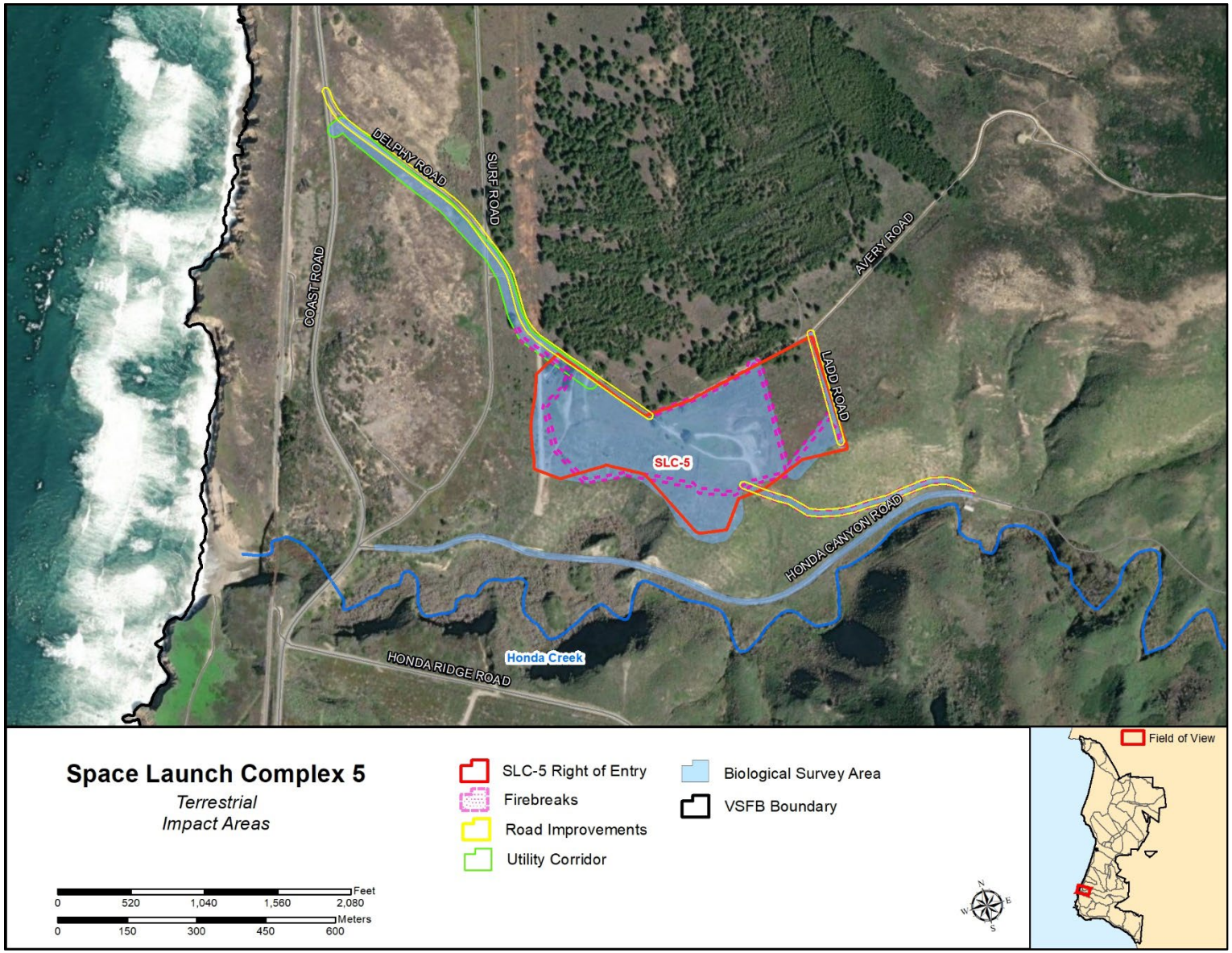

Figure 2.3-5: SLC-5 Construction and Ground Disturbance Areas

2.3.1.6. Estimated Equipment Needs

Each phase of construction would take about 45 to 60 days. Tables 2.3-2 and 2.3-3 list the equipment that would be used for the project's construction; Table 2.3-4 lists the equipment that would be used during launch operations. A portable 40-kilowatt (kW) generator would be used during construction and registered under California's Portable Equipment Registration Program.

Table 2.3-2: Estimated Equipment Usage During Phase I-A Construction (2024)

Equipment Description	Horsepower (bhp)	Estimated Hours of Use
Caterpillar D4 Dozer	130	150
Caterpillar 315C L Hydraulic Excavator	110	60
Caterpillar 950 Wheel Loader	130	100
Caterpillar 12H Motor Grader	145	100
Dynapace CA 252 Vibratory Drum Roller	125	80
Caterpillar 279C Multi-terrain Loader/Skid-steer	84	150
Mack GU713 Dump Truck	300	150
MWI Rotoflo RWP008 Dewatering Pump	150	60
Kenworth T880 Concrete Mixer Truck	405	80
Caterpillar AP300 Asphalt Paver	71	40
Link-Belt HTC 100-ton Hydraulic Truck Crane	450	100
Lull 944E-42 Telescoping Loader	110	80
Caterpillar 420E Backhoe Loader	101	100
Generator 40 kW	80	120
BOBCAT FRC60 with Masticator Attachment	74	8
Commercial Wood Chipper	25	8

Table 2.3-3: Estimated Equipment Usage During Phase I-B Construction (2025)

Equipment Description	Horsepower (bhp)	Estimated Hours of Use
Caterpillar D4 Dozer	130	150
Caterpillar 315C L Hydraulic Excavator	110	60
Caterpillar 950 Wheel Loader	130	100
Caterpillar 12H Motor Grader	145	100
Dynapace CA 252 Vibratory Drum Roller	125	80
Caterpillar 279C Multi-terrain Loader/Skid-steer	84	150
Mack GU713 Dump Truck	300	150
MWI Rotoflo RWP008 Dewatering Pump	150	60
Kenworth T880 Concrete Mixer Truck	405	80
Link-Belt HTC 100-ton Hydraulic Truck Crane	450	100
Lull 944E-42 Telescoping Loader	110	80
Caterpillar 420E Backhoe Loader	101	100
Generator 40 kW	80	120
BOBCAT FRC60 with Masticator Attachment	74	8
Commercial Wood Chipper	25	8

Table 2.3-4: Estimated Equipment Usage During Phase II Construction (2027)

Equipment Description	Horsepower (bhp)	Estimated Hours of Use
Caterpillar D4 Dozer	130	120
Caterpillar 315C L Hydraulic Excavator	110	80
Caterpillar 950 Wheel Loader	130	80
Caterpillar 12H Motor Grader	145	120
Dynapace CA 252 Vibratory Drum Roller	125	80
Caterpillar 279C Multi-terrain Loader/Skid-steer	84	100
Mack GU713 Dump Truck	300	160
MWI Rotoflo RWP008 Dewatering Pump	150	80
Kenworth T880 Concrete Mixer Truck	405	80
Caterpillar AP300 Asphalt Paver	71	25
Lull 944E-42 Telescoping Loader	110	80
Caterpillar 420E Backhoe Loader	101	80
Generator 40 kW	80	180
BOBCAT FRC60 with Masticator Attachment	74	8
Commercial Wood Chipper	25	8

2.3.2. Launch Program Operations

Phantom proposes to perform up to a combined total of 48 launches per year of the Daytona-E and the Laguna-E from SLC-5. In addition, Phantom would conduct up to 48 static fire engine tests annually.

Launch and static fire of the Laguna-E would require for each launch a combined total of 6,500 to 10,000 gallons of deluge water to be deposited into the flame bucket under the launch stool to reduce vibration. Approximately 2,100 to 3,400 gallons would be required for the Daytona-E for the same purpose. Phantom would design the pads at SLC-5E and SLC-5W so that no water would discharge into surrounding drainages. Immediately downstream of the flame deflector outlet, a concrete deluge containment basin would collect deluge runoff. The deluge wastewater would be disposed of or discharged to grade per federal and state regulations and the RWQCB General Waiver for Specific Types of Discharges (or stand-alone state discharge permit). After each launch or storm event, Phantom would inspect the contents of the basin for any contamination per the waiver/permit. If the water is clean enough to go to grade, Phantom would discharge the water from the retention basin to an infiltration area or spray field. If authorized by SLD 30, Phantom may use the Industrial Wastewater Treatment Ponds (IWTP) to dispose of the deluge waste water, if laboratory analysis indicates the water meets IWTP standards.

Launch trajectories will be unique to the vehicle configuration, mission, and environmental conditions but within a range of potential launch azimuths from 168° and 220°. SLD 30 Range Safety would individually review launch trajectories to determine what areas would be affected since the hazard risk analysis is unique to each vehicle, history of reliability, and mission trajectory. The USCG also reviews and advises SLD 30 on all launch and reentry site evaluation risk assessments with focus on vessel navigation safety. The USCG supports SLD 30 with early warning communication to the maritime industry with NOTMAR, as discussed in Section 1.5, to

assist with maritime safety and space operational review that have a maritime nexus. USCG District Eleven would evaluate Phantom and SLD 30 navigation risk assessments with launch and reentry activities associated with commercial and recreational vessels on the high seas off the California Coast. The USCG evaluates every launch and reentry activity for risk to waterway users and the environment under this process.

Sonic boom modeling was performed using PCBoom 4.99 for an array of potential trajectories and meteorological conditions (MSRS 2022). For both vehicles, the modeling predicted a sonic boom (overpressure of high energy impulsive sound) up to 1.5 pounds per square foot (psf) would be generated during ascent while the first-stage booster is supersonic. The overpressure would be directed at the Pacific Ocean south of Point Conception and south of the NCI and reach up to 1.5 psf over the open ocean (Figures 2.3-6 and 2.3-7).

The Launch Vehicle Acoustic Simulation Model (RUMBLE), a fully featured time-simulation model, was used to predict the location and magnitude of engine noise during launch and static fire engine tests (MSRS 2022). The FAA's Office of Environment and Energy approved using RUMBLE for this project on 1 April 2022. Engine noise produced during the launch events would impact the area between the Santa Ynez River and Sudden Ranch (Figures 2.3-8 and 2.3-9). Static fire engine tests would be conducted within several days prior to each launch. During static fire, when the vehicle is in a vertical position on the pad, engine noise would be focused along the coastline between SLC-4 and SLC-6 (Figures 2.3-10 and 2.3-11). Sonic boom and engine noise help define the region of influence (ROI) for the affected environment. As such, they are described here, and the effects of the expected sonic boom and launch noise are described in Chapter 4 (Environmental Consequences). Approved models do not depict sonic booms intersecting any portion of the mainland or the NCI.

The A-weighted Community Noise Equivalent Level (CNEL) [1] contours from 65 to 70 A-weighted decibels (dBA) are presented in Figures 2.3-12 and 2.3-13 (MSRS 2022). CNEL is a cumulative metric that accounts for all noise events in a 24-hour period. To account for increased sensitivity to noise at night, CNEL applies an additional 10 decibel (dB) adjustment to events during the acoustical nighttime period, defined as 10:00 PM to 7:00 AM, and a 4.8 dB adjustment to events during the acoustical evening period (7:00 PM to 10:00 PM) to account for decreased community noise during this period. For the Daytona and Laguna launch vehicles, the CNEL 65 dBA for launch and static fire events extend less than 1.2 miles (mi) and 1.8 mi, respectively from SLC-5 and are contained entirely within VSFB (Figures 2.3-12 and 2.3-13).

Post-launch activities would include depressurizing and emptying ground support systems of any commodities, departure of mobile fuel trailers, and any other portable equipment. If an additional launch is planned the propellants would be purged and Phantom would perform a series of inspections and checkouts to begin preparations for the next launch. After a successful launch of the Daytona-E or Laguna-E, the first and second stages would separate during Main Engine Cut Off. After separation, the first stage would fall to Earth into the "broad ocean area" of the Pacific Ocean approximately 230 to 660 nautical mile (nm) downrange and approximately 175 nm west, at the closest, from the Baja Peninsula coastline (Figure 2.3-14). The first stage

[1] CNEL may be used in lieu of Day-Night Average Sound Level (DNL) for FAA actions needing approval in California.

would break up upon atmospheric re-entry and there would be no residual propellant or explosion upon impact with the Pacific Ocean. The first stage primary structure is aluminum and will typically break up during re-entry or impact with the ocean surface and sink after impact. Fairings will be either aluminum or composite materials. The fairings will sink if metallic. Composite fairings may float for 8 to 12 hours unless they sustain major damage at impact. Wave action will deform the fairing until the composite materials delaminate and water can get into the honeycomb. At that point, they will sink. First stages and fairings are composed of inert materials that would not affect water quality or marine resources. If an anomalous situation where an expended booster does not break up upon atmospheric reentry and impacts the ocean's surface intact, a residual amount of propellant (RP-1 and LOX) would remain in the first stage upon impact (less than 1%). In this situation, there is a possibility the vehicle would experience an explosive event due to the mixing of remaining fuel. However, this represents an off-nominal, low probability, worst-case scenario and is not reasonably foreseeably and is not assessed for these reasons. The first stage will not be recovered. The remaining stage would deliver the payload into orbit.

The Proposed Action does not include altering the dimensions (shape and altitude) of the airspace or shipping lanes. USCG District Eleven has been granted specific regulatory authority to either restrict vessel movement, implement safety and warning zones, and provide early warning advisement, but all responsibility to limit risk to navigation safety is solely on the acting space party. USCG District Eleven will advise Phantom and SLD 30 when risk is outside of acceptable levels and the primary applicant will be responsible for minimizing risk with alternate strategies prior to formal publications. Federal government agencies, including the USCG, are responsible for ensuring maritime safety as required by applicable statutes and regulations such as the PWSA, 33 CFR Part 1 (General Provisions), 14 CFR Part 450 (Launch and Reentry License Requirements), and 40 CFR Section 229.3 (Transportation and Disposal of Vessels). To comply with the necessary notification requirements, SLD-30 would notify USCG of any upcoming launch operations to ensure safe launches on the high seas and navigable waters of the U.S., consistent with current procedures. Prior to Phantom launch activities (Section 2.2.1.1), SLD 30 and USCG District Eleven would review Phantom's trajectory IAW the MOA (Appendix O) to develop risk plots and other materials for 14 CFR Part 450 compliance, including: (1) operating area and impact locations, (2) maritime vessel risk assessment and Ec/Pc plots, and (3) all materials necessary to develop a NOTMAR. The USCG would be responsible for issuing NOTMARs that provide hazard area locations prior to each mission event with ocean impacts. A NOTMAR provides notice of temporary changes in conditions or hazards in navigable waterways with maritime traffic to assist in mitigating risks for dangers associated with waterway users. This tool provides both an established and reliable line of communication with the maritime public. The NOTMAR would include the dates and times of the operations and coordinates of the hazardous operation area.

All launch and reentry operations would comply with the necessary notification requirements, including issuance of Notice to Air Missions (NOTAMs), as defined in agreements required for a Vehicle Operator License issued by the FAA. Advance notice via NOTAMs assists general aviation pilots in scheduling around any temporary disruption of flight activities in the area of operation. A NOTAM provides notice of unanticipated or temporary changes to components of, or hazards in, the National Airspace System (NAS; FAA Order JO 7930.2S, Notices to Air Missions). The FAA

issues a NOTAM 24 to 72 hours prior to a launch or reentry activity in the airspace to notify pilots and other interested parties of temporary conditions. Advance notice via NOTAMs and the identification of Aircraft Hazard Areas would assist pilots in scheduling around any temporary disruption of flight activities in the area of operation. Launches and reentries would be infrequent, of short duration, and scheduled in advance to minimize interruption to air traffic.

To comply with the FAA's licensing requirements, Western Range operations, including SpaceX's launches from VSFB, follow the launch/reentry communication and coordination procedures stated in a Letter of Agreement (LOA) (dated 7 April 2020; Appendix P) between SLD 30 and the FAA. The LOA establishes responsibilities and procedures for Western Range operations within airspace common to the Oakland Center, Los Angeles Center, Santa Barbara Terminal Radar Approach Control Facility, Air Traffic Control System Command Center, and Central Altitude Reservation Function areas of jurisdiction. The LOA defines responsibilities and procedures applicable to operations, which require using Restricted Areas, Warning Areas, Air Traffic Controlled Assigned Airspace, and/or altitude reservations within Western Range airspace. Launches would be of short duration (several minutes) and scheduled in advance to minimize the interruption to airspace and waterways.

VSFB Range Safety monitors waterborne vessels in the affected area during launch operations. Although vessels are informed of the operations, there is no requirement for them to alter their routes or change their navigation speed. If vessels are obstructing a launch or reentry phase of the operations, the launch would be delayed or altered within VSFB launch policies. A background on airspace management, the study area, and existing conditions is included in Appendix P (Airspace).

The FAA analyzes the effects on NAS efficiency and capacity for each licensed launch or reentry operation. These analyses are documented in Airspace Management Plans, which are completed approximately 3–5 days prior to each launch. They help the FAA determine whether the proposed launch would result in an unacceptable limitation on air traffic. If that were the case, the FAA may need to work with the operator to identify appropriate mitigation strategies, such as shortening the requested launch window or shifting the launch time, if possible. The FAA currently shares data with launch and reentry operators to avoid operations during days with high seasonal aviation traffic volume. These analyses have concluded that the majority of commercial space launch operations result in minor or minimal impacts on the NAS. This is largely due to the relatively low aircraft traffic density in the oceanic regions where Phantom operations would occur and the ability of the FAA to manage the airspace for all users.

Phantom would submit a Flight Safety Data Package to the FAA before the launch or reentry. The package would include the launch/reentry trajectory and associated Aircraft Hazard Areas. These Aircraft Hazard Areas define the temporarily closed airspace that would be defined and published through a NOTAM before the launch/reentry. FAA Air Traffic Organization Space Operations Office uses the Aircraft Hazard Area information to produce an Airspace Management Plan, which describes the launch/reentry information and any associated impacts to the NAS. FAA controlled airspace may be restricted through the activation of airspace closures. The most common type of airspace closures are Temporary Flight Restrictions and altitude reservations. The FAA generally uses Temporary Flight Restrictions to protect airspace over land up to 12 nm

offshore and altitude reservations to protect oceanic airspace beyond 12 nm offshore. The NOTAM would establish a closure window that is intended to warn aircraft to keep out of a specific region throughout the time that a hazard may exist. The length of the window is primarily intended to account for the time needed for the operator to meet its mission objectives. The location and size of the closure area is defined to protect the public. For a launch or reentry, typically the keep-out must begin at the time of launch and ends when the mission has been completed, terminated, or cancelled. Airspace closures are immediately released once the mission has successfully cleared the area and no longer imposes a risk to the public. The actual duration of airspace closure is normally much less than the original planned closure, especially if the launch or reentry window is relatively long and the launch or reentry occurs at the beginning of the window. The FAA typically begins to clear airspace and reroute aircraft before a launch or reentry and directs aircraft back into the released airspace after the mission to recover to normal flow and volume.

The location and size of airspace closures for commercial space operations also vary with each mission type and are influenced by multiple factors, including vehicle hardware reliability. The size of airspace closures shrink as reliability is established with results and analysis from each launch. For the initial launch of a new launch vehicle, the hazard areas and associated airspace closures are bigger to account for the increased likelihood of a vehicle failure, relative to a mature rocket. Subsequent launches of that launch vehicle include smaller hazard areas compared to the initial launch. Thus, the airspace closure for the initial launches of the Daytona-E and Laguna-E would be much larger than subsequent launches are expected to be as reliability is established.

2.3.2.1. Payloads

Payloads and their associated materials/fuels/volumes are mission dependent but would be similar to current commercial and government payloads. General payload characteristics are included in Table 2.3-5.

Table 2.3-5: Summary of Envelope Payload Characteristics by Spacecraft Subsystems

Characteristic	Description
Structure	Unlimited: aluminum, beryllium, carbon resin composites, magnesium, titanium, and other materials unless specified as limited.
Propulsion [a, b]	Liquid propellant(s); 3,500 lbs combined hydrazine, monomethyl hydrazine and/or nitrogen tetroxide. Electric propulsion systems: 180 lbs xenon, argon, krypton, liquid caesium, iodine, bismuth, and/or hydrogen.
Communications	Various 10–100-Watt (radio frequency) transmitters Unlimited Solar cells; 5 kilowatt-hour (kW-hr) Nickel-Hydrogen (Ni-H2) or Lithium ion (Li-ion) battery, 300 Ampere-hour (A-hr) Lithium-Thionyl Chloride (LiSOCl), or 150 A-hr. Hydrogen, Nickel-Cadmium (NiCad), or Ni-H2 battery.
Power	Unlimited Solar cells; 5 kW-hr NiH2 or Lithium ion. Li-ion battery, 300 A-hr LiSOCl, or 150 A-hr. Hydrogen, NiCad, or Ni-H2 battery.

Science Instruments	10-kilowatt radar. American National Standards Institute safe lasers.
Other	DOT Class 1.4 Electro-Explosive Devices for mechanical systems deployment. Propulsion system exhaust and inert gas venting.
[a] Propellant limits are subject to range safety requirements. [b] Payloads may also include low toxicity green propellants.	

2.3.2.2. Estimated Equipment Needs

Initially, commodity deliveries via tanker truck would be made approximately 30 days prior to launch during initial lower cadence launch operations. Once launch rate increases to full cadence, likely by 2030, commodity deliveries would be expected to increase to twice a month. On-site launch preparation and operations would be nominally two to four weeks in duration, enabled by an on-site vehicle processing and Mission Management Team. Payloads and launch vehicle stages would be delivered via commercial truck transport and moved to the launch stool via the Transporter Erector Vehicle once integrated. A forklift and telehandler would be used to configure the GSE. Once launch operations become established, a team of approximately 25-30 permanent onsite staff and 10 temporary staff would be present during launches. A stationary 533 brake horsepower (bhp) generator would be kept on site during launch operations for emergency backup power. This generator would be used as an emergency back-up power source only. It would be run approximately once per week for 30 minutes to test its integrity.

Estimated annual equipment usage for launch operations at full cadence (48 launches per year) are shown in Table 2.3-6.

Table 2.3-6: Estimated Equipment Usage During Launch Operations at Full Cadence

Equipment Description	Horsepower (bhp)	Estimated Annual Hours of Use*
Tanker Trucks (commodity delivery)	≤ 300	384
Commercial Truck Transport (Phoenix > VSFB)	≤ 300	1,000
Transporter/Erector Vehicle (V8 diesel)	250	48
Caterpillar GP40N Class V Forklift (V6 gasoline)	250	250
Bobcat V519 Telehandler (diesel)	74	180
Generator (back-up for outages only)	533	50
Small Commodity Pumps	12	384

* Estimated annual usage at maximum launch cadence of 48 launches per year.

As discussed in Section 2.3.2, Phantom may rely on a 533 bhp generator as primary power for SLC-5 for the first three years of operations if the installation of electrical utilities connecting to existing VSFB circuits is delayed. Under this scenario, Phantom would still maintain a second 533 bhp generator as backup, as described above, but the 533 bhp generator used as primary power would operate 24 hours per day for up to three weeks during each launch campaign for the first three years of operation. During these initial three years, launch cadence would be low. Table 2.3-7 presents estimated annual generator usage for the first three years of operation under the scenario where a generator is used as primary power.

Table 2.3-7: Estimated Annual Hours of Use if Generator Used as Primary Power

Generator Description	Horsepower (bhp)	Estimated Annual Hours of Use*
2024		
Generator (primary power)	533	600
Generator (back-up for outages only)	533	50
2025		
Generator (primary power)	533	1,104
Generator (back-up for outages only)	533	50
2026		
Generator (primary power)	533	2,616
Generator (back-up for outages only)	533	50

* Estimated annual usage at maximum launch cadence of 48 launches per year.

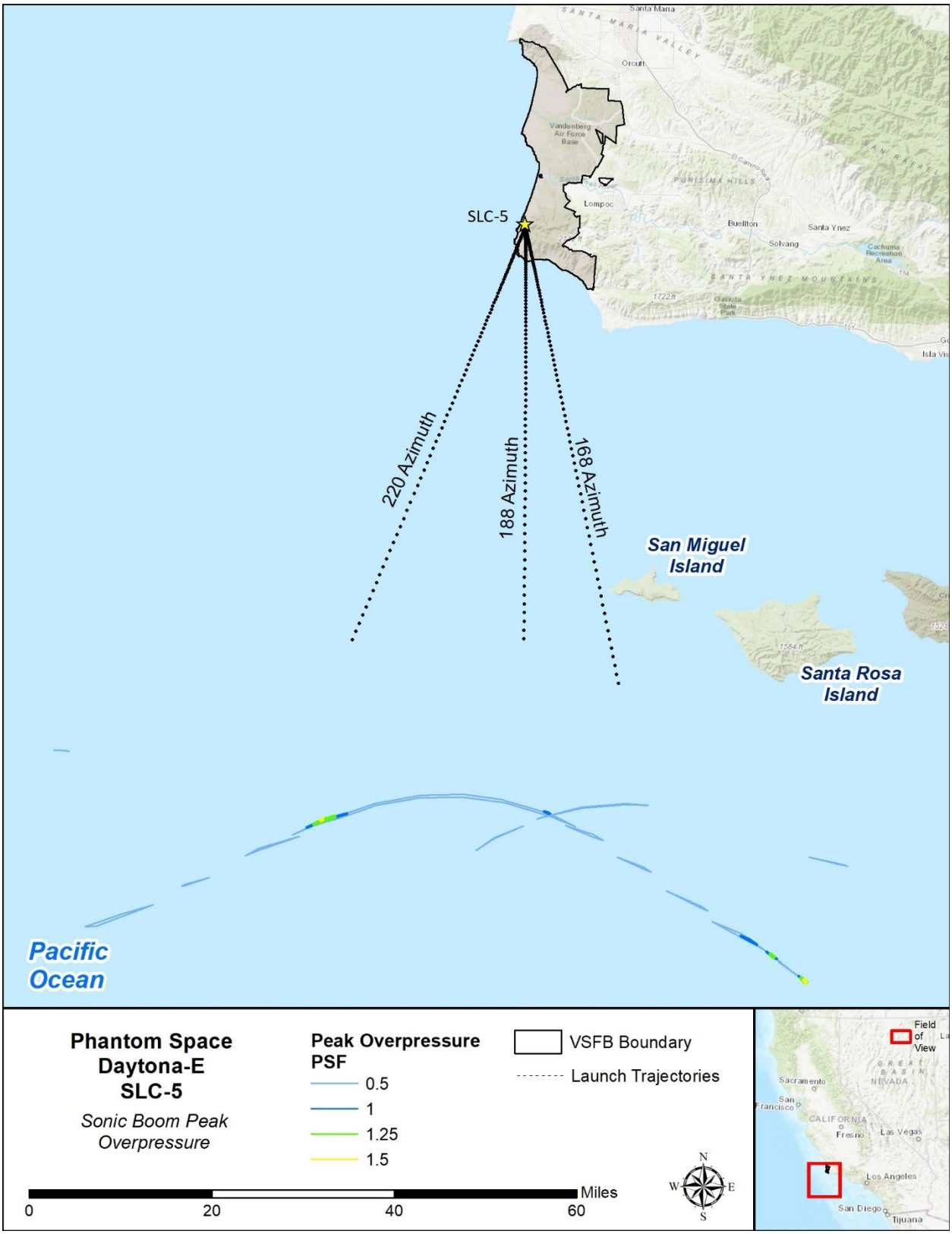

Figure 2.3-6: Predicted Sonic Boom Footprint for Daytona-E

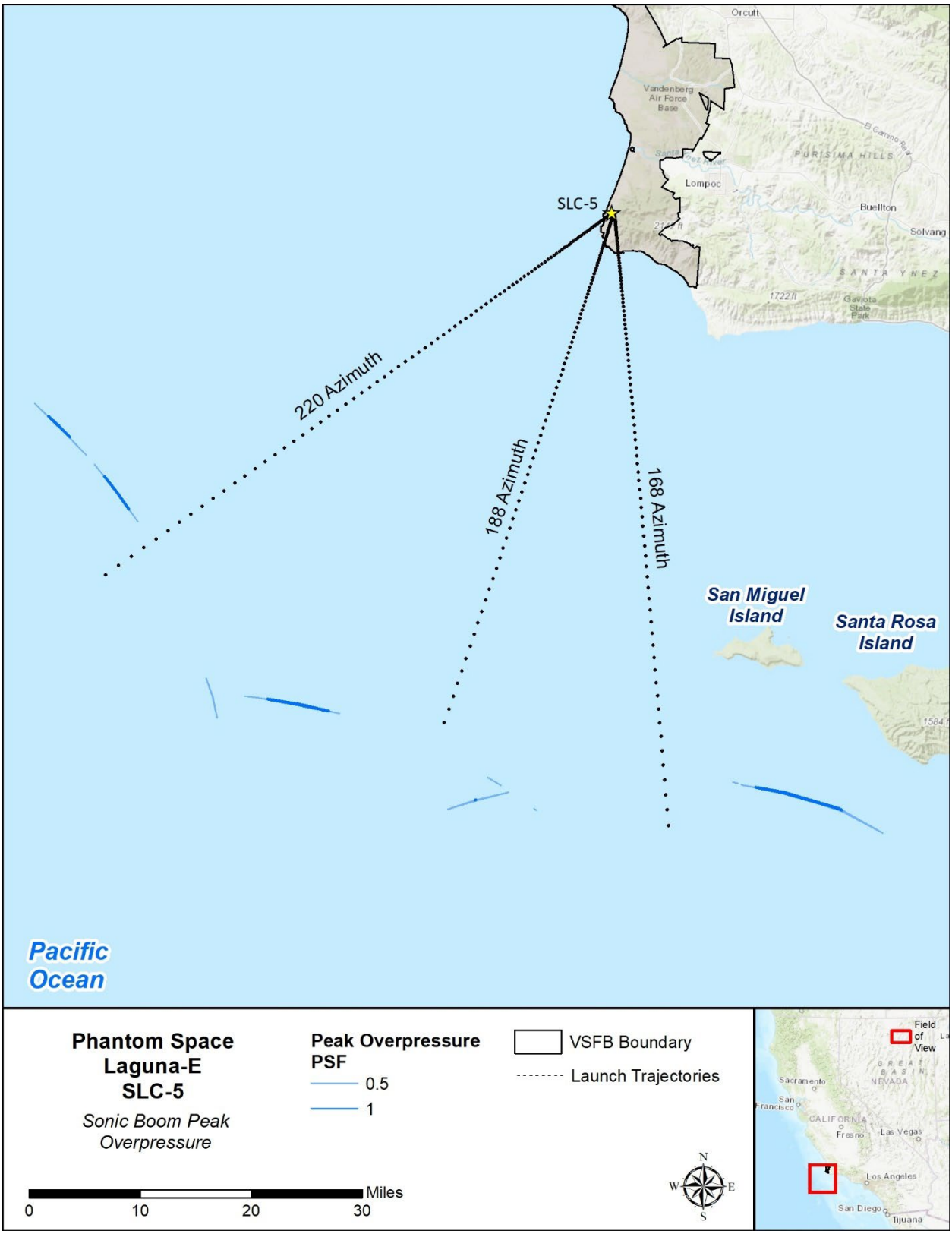

Figure 2.3-7: Predicted Sonic Boom Footprint for Laguna-E

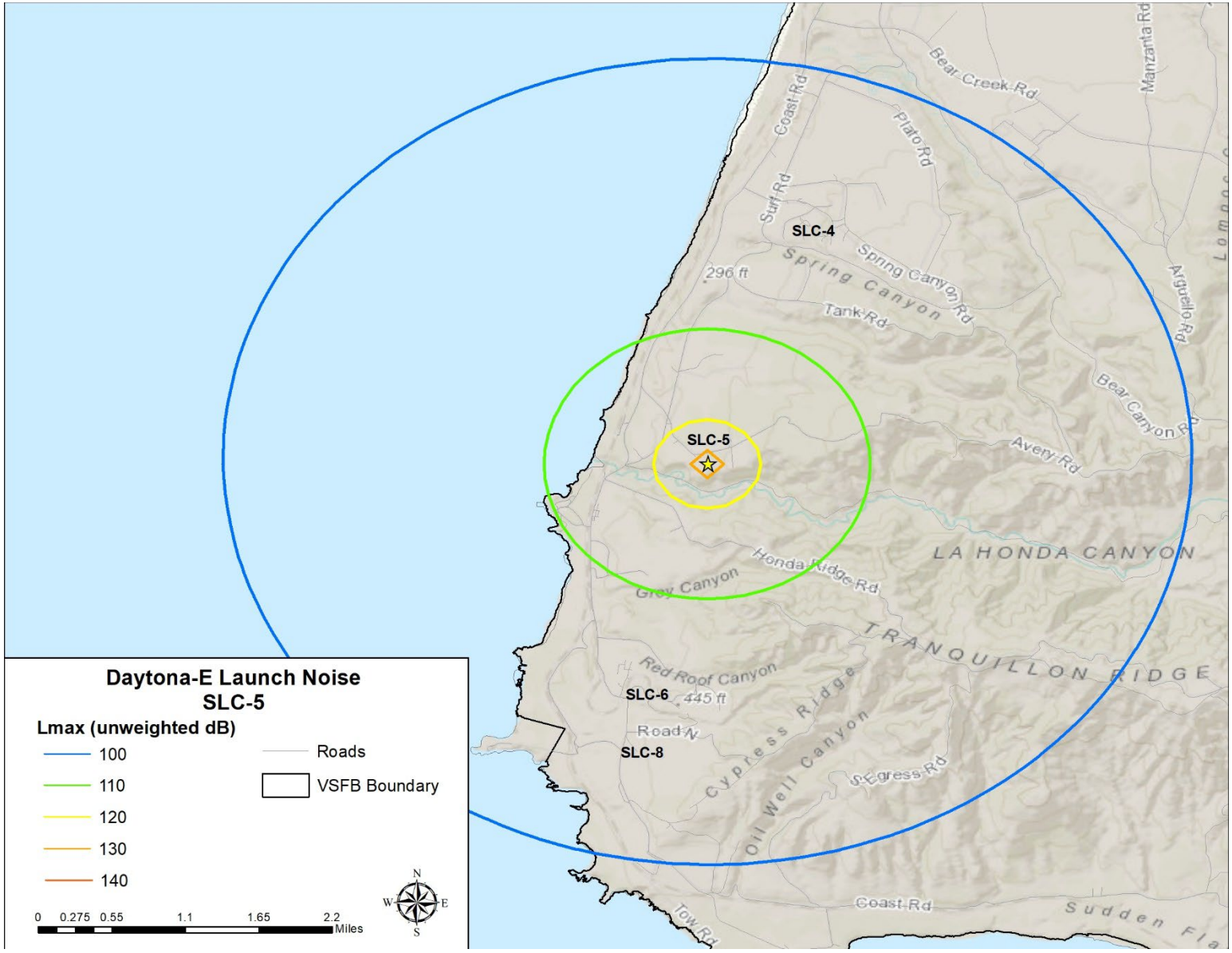

Figure 2.3-8: Maximum Engine Noise Distribution During Daytona-E Launch

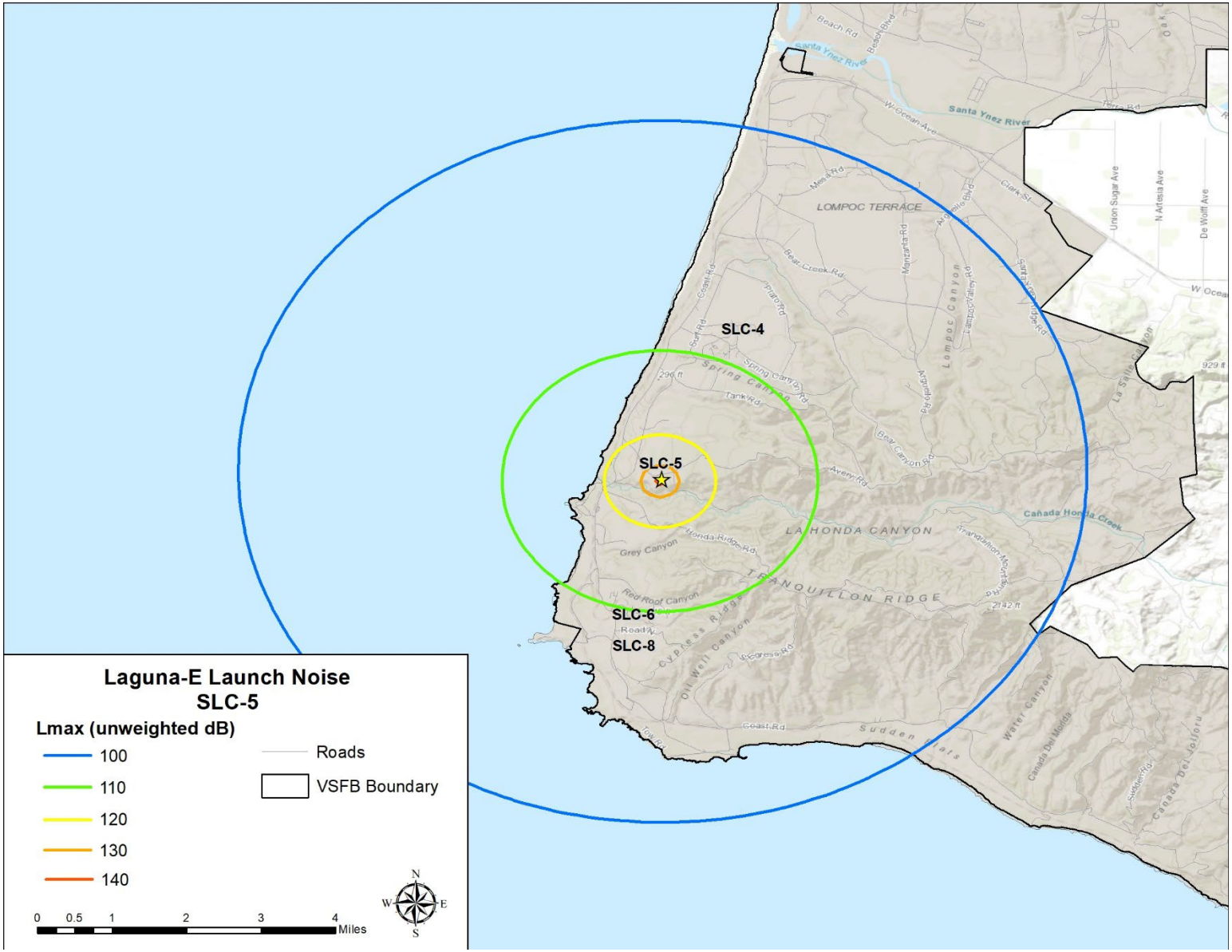

Figure 2.3-9: Maximum Engine Noise Distribution During Laguna-E Launch

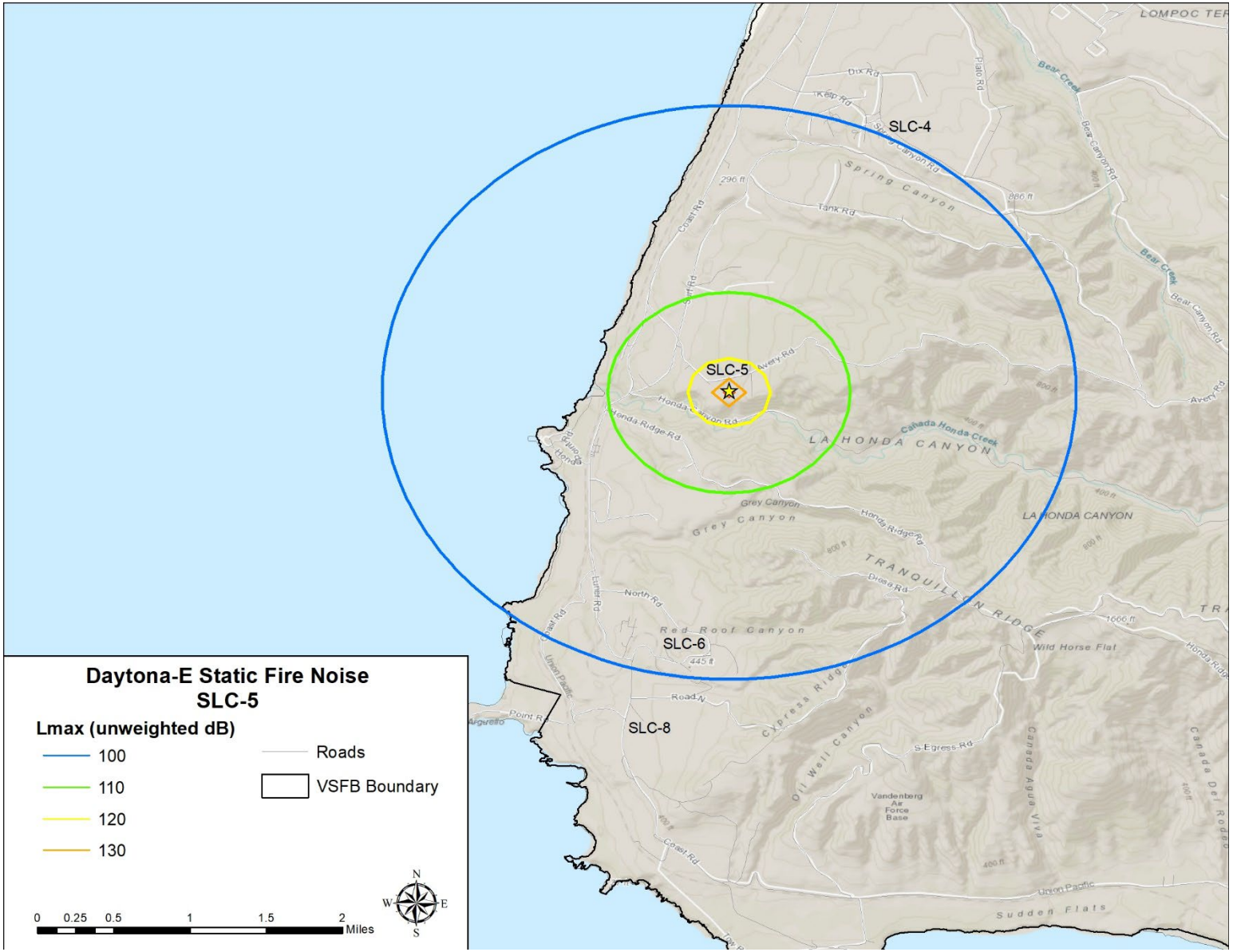

Figure 2.3-10: Maximum Engine Noise Distribution During Daytona-E Static Fire

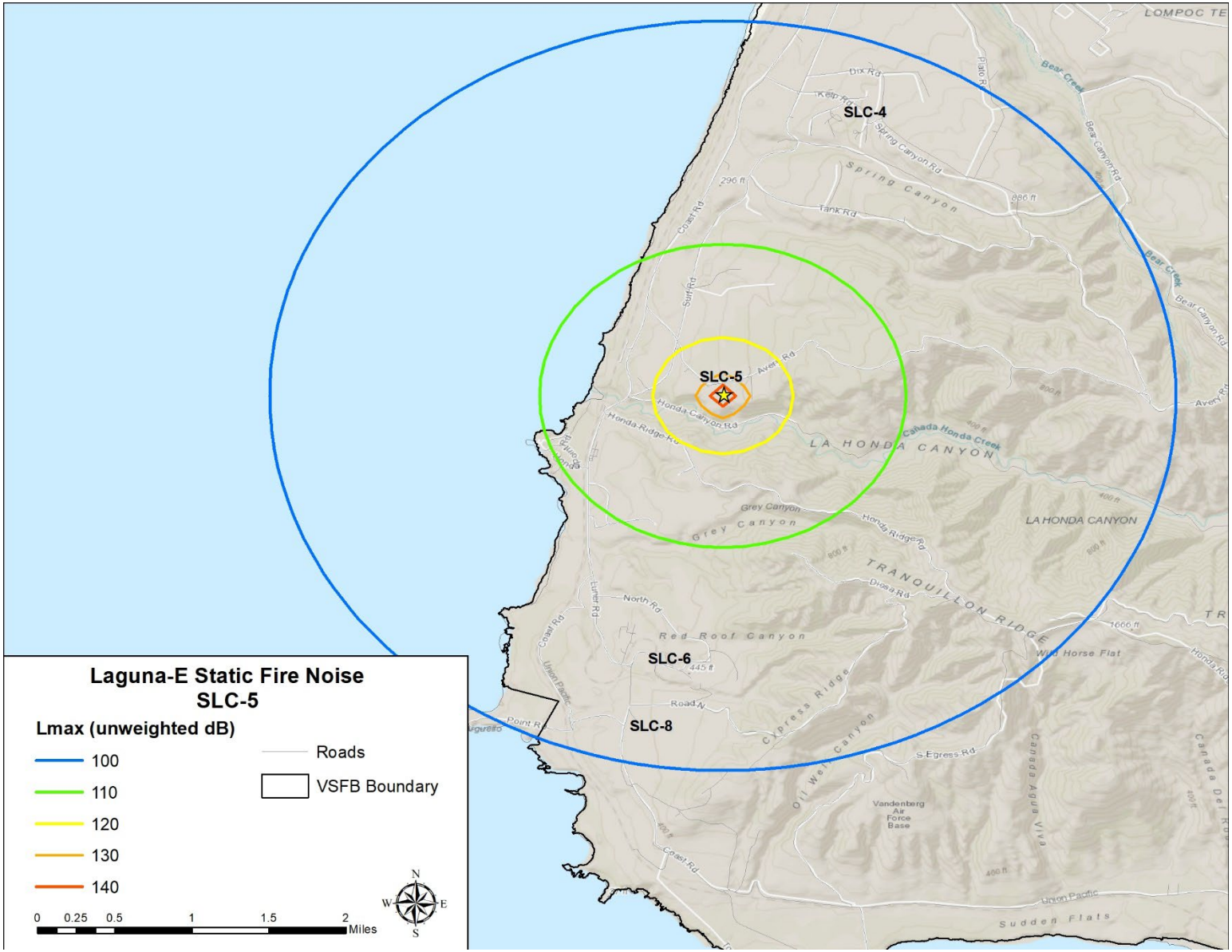

Figure 2.3-11: Maximum Engine Noise Distribution During Laguna-E Static Fire

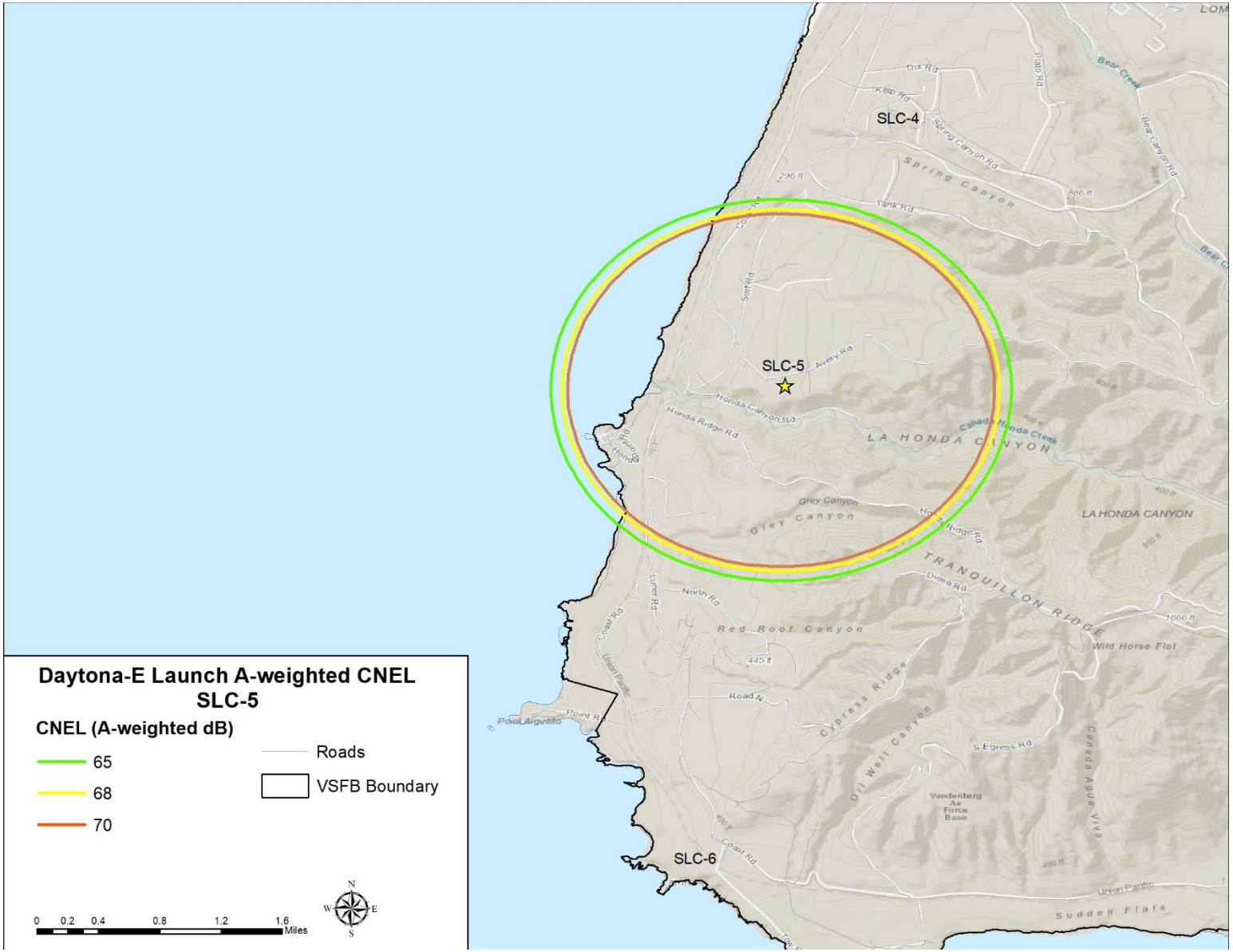

Figure 2.3-12: A-weighted Community Noise Equivalent Level during Daytona-E Launch

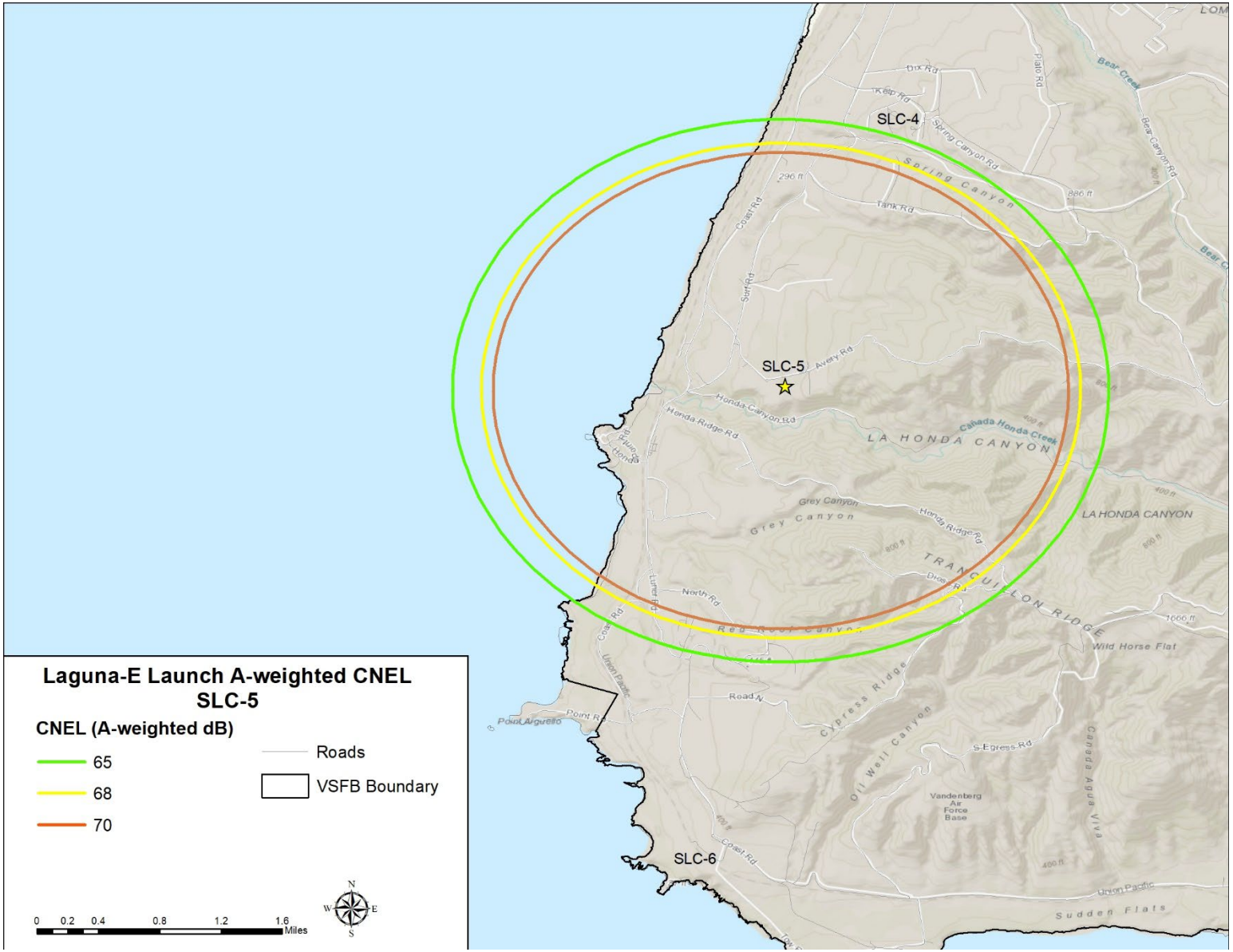

Figure 2.3-13: A-weighted Community Noise Equivalent Level during Laguna-E Launch

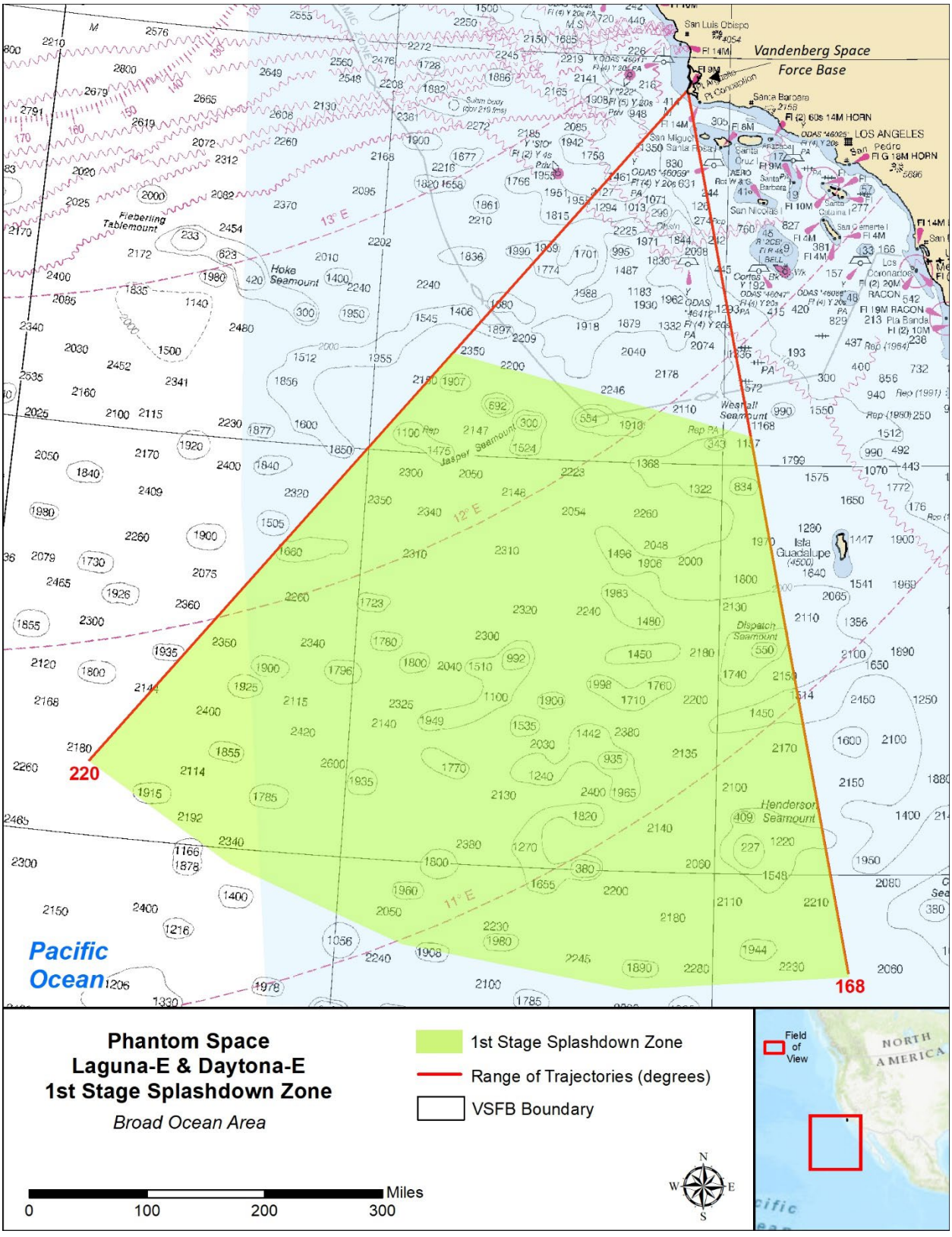

Figure 2.3-14: Daytona-E and Laguna-E First Stage Splashdown Zone in Broad Ocean Area

2.3.3. Environmental Protection Measures

Implementing the environmental protection measures (EPMs) outlined in Tables 2.3-7 through 2.3-19 would avoid or minimize potential adverse effects to various environmental resources while executing the Preferred Alternative. Qualified Phantom personnel or contractor staff would oversee fulfilling EPMs.

2.3.3.1. Air Quality

Because Santa Barbara County is a nonattainment area for suspended particulate matter less than or equal to 10 microns in diameter (PM_{10}; see Table F-2, Appendix F), the Santa Barbara County Air Pollution Control District (SBCAPCD) and California Air Resources Board (CARB) requires dust control measures for all construction projects involving earthmoving activities (Table 2.3-8), as applicable to the Proposed Action.

Table 2.3-8: Dust Control Measures

Air Quality – Dust Control Measures	
Measure	**Description/Purpose**
Water—preferably reclaimed—shall be applied at least twice daily to dirt roads, graded areas, and dirt stockpiles created during construction and demolition (C&D) activities.	Prevents excessive dust at the staging areas. Watering frequency would be increased whenever wind speed exceeds 15 miles per hour.
After completing construction/demolition activities, disturbed soil shall be treated by watering, revegetating, or spreading soil binders.	Prevents wind erosion of the soil.
All fine material transported off-site shall be either sufficiently watered or securely covered	Prevents excessive dust.
All haul trucks, if needed and if driving off of paved surfaces, would be required to exit the site.	Must exit via an access point where a gravel pad or grizzly has been installed.
Stockpiles of soil or other fine loose material shall be stabilized by watering or another appropriate method.	Prevents wind-blown fugitive dust.
On-site vehicle speeds shall be limited.	Speed limit of 15 miles per hour.
Ground disturbance shall be limited.	Limited to the smallest practical area and to the least amount of time.
Designated personnel shall monitor project activities.	Meant to ensure that excessive dust is not generated at demolition sites.
The Proposed Action shall comply with storm water management plans, including Best Management Practices (BMPs).	To reduce dust emissions.
Any portable equipment powered by an internal combustion engine with a rated horsepower of 50 bhp or greater used for this project shall be registered in the California State-wide Portable Equipment	Comply with State and local regulations.

Air Quality – Dust Control Measures	
Measure	**Description/Purpose**
Registration Program or have a valid SBCAPCD Permit to Operate.	
Earth moving shall comply with SBCAPCD Rule 345, Control of Fugitive Dust from C&D Activities.	Under Rule 345, construction, demolition, or earthmoving activities are prohibited from causing discharge of visible dust outside the property line and must utilize standard BMPs to minimize dust from truck hauling, track-out/carry-out from active construction sites, and demolition activities.
Off-road construction equipment shall comply with all Federal, State, and local regulations.	Comply with Federal, State, and local regulations.
Ultra-low sulfur diesel fuel (15 parts per million by volume) would be used for all diesel equipment.	Comply with State and local regulations.
CARB-developed idling regulations would be followed for trucks during loading, and unloading.	Comply with State and local regulations.

The following control measures listed in Table 2.3-9 may be implemented to decrease diesel emissions, as applicable.

Table 2.3-9: Control Measures to Decrease Diesel Emissions

Diesel Emissions Control Measures
✓ When feasible, the contractor may use equipment powered with Federally mandated "clean" diesel engines.
✓ The size of the engine in equipment and number of pieces of equipment operating simultaneously for the project should be minimized.
✓ Engines should be maintained in tune per manufacturer or operator's specification.
✓ U.S. Environmental Protection Agency (USEPA) or CARB-certified diesel catalytic converters, diesel oxidation catalysts, and diesel particulate filters may be installed on all diesel equipment.
✓ When practicable, diesel equipment should be replaced with electrical equipment.
✓ The construction period should be lengthened during smog season (May through October), to minimize the number of vehicles and equipment operating at the same time.
✓ Alternatively, fueled construction equipment, such as compressed natural gas, liquefied natural gas, or electric, should be used if feasible.

2.3.3.2. Terrestrial Biological Resources

The EPMs listed below would be implemented to avoid, minimize, or characterize the effects of the Proposed Action on terrestrial biological resources. These EPMs require various levels of biological competency from personnel completing specific tasks, as defined in Table 2.3-10.

Table 2.3-10: Biological Monitoring Qualifications

Biologist Level	Necessary Qualifications
Permitted Biologist	Biologist with a valid and current USFWS Section 10(a)(1)(A) Recovery Permit or specifically named as an approved biologist in a project-specific BO. The USSF will coordinate with the USFWS prior to assigning permitted biologists to this project
USFWS Approved Biologist	Biologist with the expertise to identify ESA listed species and species with similar appearance. The USSF will review and approve the resumes from each individual, and then submit them to the USFWS for review and approval no less than 15 days prior to the start of the Proposed Action. Each resume will list their experience and qualifications to conduct specific actions that could potentially affect listed species and their habitats. A USFWS approved biologist could train other biologists and personnel during surveys and project work; in some cases, a USFWS approved biologist could also provide on-site supervision of other biologists.
Qualified Biologist	Biologist trained to accurately identify specific federally listed species and their habitats by either a Permitted or USFWS Approved biologist. This person could perform basic project monitoring but would need to have oversight from a permitted or USFWS approved biologist. Oversight will require a permitted or USFWS approved biologist to be available for phone/email consultation during the surveys and to have the ability to visit during monitoring/survey activities if needed.

2.3.3.2.1. *General Measures*

The measures described in Table 2.3-11 would be implemented to minimize the potential impacts on terrestrial biological resources.

Table 2.3-11: General Measures

Terrestrial Biological General Measures
✓ Prior to initial site preparation a qualified biologist would survey the site and relocate any native wildlife that may be in harm's way. A qualified biologist would also be present during site preparation (e.g., clearing/grubbing, discing, mowing, etc.) to monitor for special status species. The biologist would attempt to capture and relocate any native wildlife found that is potentially in harm's way. Animals would be relocated to the nearest suitable habitat outside the Proposed Action Area.
✓ Disturbances shall be kept to the minimum extent necessary to accomplish project objectives.
✓ All excess materials excavated shall be removed and transported to a designated waste or fill site.
✓ All erosion control materials used would be from weed-free sources and, if left in place following project completion, constructed from 100% biodegradable erosion control materials (e.g., erosion blankets, wattles).
✓ All human-generated trash at the project site shall be disposed of in proper containers and removed from the work site and disposed of properly at the end of each workday with specific attention

Terrestrial Biological General Measures
concerning food waste. Proper waste disposal is deposition of material into a trash receptacle with a lid that will not blow open in the wind. Trash receptacles shall not be overfilled to the point that the lids do not fit properly. Large dumpsters can be maintained at staging areas for this purpose. All construction debris and trash shall be removed from the work areas upon completion of the project and disposed of at a designated waste or fill site.
✓ Equipment vehicles (dozers, mowers, etc.) shall be cleaned of weed seeds prior to use in the project area to prevent the introduction of weeds and be inspected by a qualified biological monitor to verify weed free status prior to use. Prior to site transport, any skid plates shall be removed and cleaned. Equipment should be cleaned of weed seeds daily especially wheels, undercarriages, and bumpers. Prior to leaving the project area, vehicles with caked-on soil or mud shall be cleaned with hand tools such as bristle brushes and brooms at a designated exit area; vehicles may subsequently be washed at an approved wash area. Vehicles with dry dusted soil (not caked-on soil or mud), prior to leaving a site at a designated exit area, shall be thoroughly brushed; vehicles may alternatively be air blasted on site.
✓ Fueling of equipment would be conducted in a pre-designated location within the staging area and spill containment materials would be placed around the equipment before refueling.
✓ A qualified biological monitor shall inspect any equipment left overnight prior to the start of work. Equipment would be checked for presence of special status species in the vicinity and for fluid leaks.
✓ Holes and trenches will not be left open overnight. Plywood sheets or steel plates may be used to cover holes or trenches or an escape ramps for wildlife would be installed if left open overnight. The biological monitor would inspect these locations before the resumption of work.
✓ If it is not practical to stage or operate project vehicles or equipment on paved or existing roadways and trails, vehicles and equipment would be staged and operated on non-native vegetation to the maximum extent practicable.
✓ Vegetation clearing would occur during daylight hours during periods where there is no rainfall.
✓ Phantom would provide a seeding and planting plan for approval from CEIEA. The planting/seed mix would be similar to surrounding native vegetation. Native seeds may be collected on site where vegetation is removed. Soil would be properly prepared to provide seed germination. Amendments may be necessary. Weed control would be conducted for one-year post-construction to achieve at least the same amount or more of pre-construction native plant cover. After one year, Phantom would provide a report with plant list and cover, then coordinate site inspection with CEIEA for approval. Approval is dependent upon amount of native plant cover achieved.

2.3.3.2.2. *Special Status Species*

The USSF and qualified Phantom personnel or contractor staff would ensure that all non-discretionary measures included in the USFWS BO issued for the Proposed Action (Appendix A), listed in Table 2.3-12 would be implemented during site preparation, construction, and operation of Phantom's launch program at SLC-5.

Table 2.3-12: Special Status Species Measures

General Measures
✓ Permitted or USFWS approved biologist(s) shall be responsible for delineating areas where special status species are located or concentrated, relocating special status species during construction activities, and inspecting equipment and equipment staging areas for cleanliness and gas and oil leaks. The USSF will require that contractors immediately address any unanticipated leaks or spills.
✓ Permitted or USFWS approved biologist(s) shall brief all project personnel prior to participating in construction activities. At a minimum, the training would include a description of the listed species and sensitive biological resources occurring in the area, the general and specific measures, and restrictions necessary to protect these resources during project implementation, the provisions of the ESA and the necessity of adhering to the provisions of the ESA, and the penalties associated with violations of the ESA.
✓ If vegetation clearing occurs during the nesting period for non-raptor species (15 February through 15 August) a qualified biologist would survey the area for nesting birds and delineate buffers around any nests that are found that are of sufficient size to prevent disturbance in order to reduce risk of nest abandonment.
✓ Prior to project operation the USSF will establish a pre-project baseline for hydrodynamic data within San Antonio Creek. During project operations the USSF will collect hydrodynamic data annually using consistent data collection methodologies for purposes of comparison against the established baseline. The USSF will use these data to ensure that the proposed project's water extraction is not measurably affecting flow rate or water level within San Antonio Creek.
Unarmored Threespine Stickleback and Tidewater Goby
✓ The USSF will implement erosion control measures wherever the potential for project-related sedimentation into Honda Creek exists.
California Red-legged Frog Measures
✓ Permitted or USFWS approved biologist(s) shall be present and monitor activities during construction at appropriate times when CRLF are likely to be encountered and required to be relocated.
✓ Prior to construction activities, a qualified biologist will conduct a training session for all construction personnel. At a minimum, the training will include a description of CRLF and its habitat, the specific CRLF measures implemented for the current project, and project boundaries.
✓ Pre-Project Surveys: permitted, USFWS approved, or qualified biologist(s) would conduct pre-project surveys for CRLF following these measures, as needed: o From 15 November to 31 March, biologist(s) would conduct a pre-construction survey of project areas within suitable aquatic, adjacent upland, or dispersal habitat (690 ft from aquatic habitat or other distance as determined by a USFWS approved biologist following adaptive habitat assessment procedures) immediately before the onset of all work activities. o From 1 April to 14 November, biologist(s) would conduct a pre-project survey of project areas within suitable aquatic or upland habitat (140 ft from aquatic habitat or other distance as determined by a USFWS approved biologist following adaptive habitat assessment procedures) to identify potential artificial water or shelter resources that may contain sheltering CRLF.

○ Biologist(s) would repeat surveys following any precipitation event greater than 0.2 inch (0.5 cm) during a 24-hour period. ○ Biologist(s) would monitor any initial ground disturbance or vegetation removal within suitable aquatic, adjacent upland, or dispersal habitat identified following the adaptive habitat assessment procedures. However, after the initial ground disturbance/vegetation removal is complete, no further monitoring would be required within these bare-dirt areas.
✓ During construction of the launch site, the following measures would be implemented: ○ The launch construction site would be encircled with minimum 3-ft-high silt fencing, anchored with metal T-posts, and buried along the bottom edge to inhibit terrestrial wildlife, including CRLF, from entering the site. A qualified biologist would inspect the fence daily and direct maintenance to ensure its efficacy. ○ All work would occur during daylight hours during periods when there is no rainfall. ○ If a trench, hole, or pipeline route is to remain open for an extended period with no activity, then personnel would cover it with plywood or metal sheets. ○ Precipitation Events: Construction activities would not occur until 24 hours after an actual precipitation event greater than 0.2-inch accumulating within a 24-hour period. ○ No overnight staging of equipment or supplies would occur within 0.10 mi of CRLF aquatic habitat in undeveloped areas, unless a designated staging area is identified, cleared for CRLF by a qualified biologist, and measures are implemented that would preclude CRLF from accessing the supplies or equipment (e.g., drift fence barrier installed). ○ A qualified biologist would survey the site, including any open holes or trenches, each day prior to initiation of work.
✓ CRLF Relocation: A USFWS approved biologist would conduct any CRLF relocation. If CRLF are found within the project area during pre-project surveys, daily monitoring where required, or at any other time, all construction activity within the vicinity of the CRLF occurrence (if any) would cease and the following measures would occur: ○ If the project site is large and if the USFWS approved biologist is satisfied that work in a different area of the project can continue with no threat to CRLF, then that work can continue after workers have received a briefing on the area to avoid. ○ Construction activities within the vicinity of the CRLF occurrence would not begin or resume until a USFWS approved biologist relocates the CRLF or contacts the USFWS for alternate guidance. ○ Using the Declining Amphibians Task Force Fieldwork Code of Practice (DAPTF 2019), the USFWS approved biologist would relocate all life stages of CRLF the shortest distance possible to a location that is (1) within the same drainage, (2) contains suitable aquatic/upland habitat, and (3) is outside of the project impact area
✓ Any water retention basins would be designed to exclude access by CRLF. If such exclusion is not possible, and water is present in retention basin overnight, the basin would be checked daily for CRLF by a qualified biologist prior to pumping. The pump would be screened with 1/8-inch mesh
✓ The deluge containment basins will be designed to minimize the amount of stormwater received into the basin.
✓ The Stormwater Management Areas will be designed to prevent the presence of standing water, other than immediately after a rainstorm, by using design features similar to a French drain.
✓ If the USSF cannot design water features to preclude CRLF entry, then the USSF will ensure SLC-5 water features, including deluge containment basins, passively or actively drain within 24 hours of a storm event to avoid the creation of an attractive nuisance.

✓ The pads at SLC-5 will be designed to prevent discharge of deluge water into surrounding drainages and will divert any overland flow to the deluge containment basins.
✓ The position of the flame buckets and deluge system will be designed to direct flames and associated steam to the north of SLC-5, away from Honda Canyon, to minimize potential impacts to CRLF.
✓ The USSF will attempt to reduce the potential for effects of frequent vibration on CRLF breeding success. Options may include implementing minimization measures or proactively designing systems to attenuate vibration to the maximum extent possible. In the event the USSF detects declines or physical abnormalities to the CRLF population within Honda Creek, then the Space Force will conduct vibration monitoring next to occupied breeding habitat during construction activities if they are still occurring. If declines or physical abnormalities are observed during operations, the USSF will conduct vibration monitoring to obtain experienced levels at least once during a launch event for each vehicle type within Honda Creek next to occupied breeding habitat.
✓ The USSF will conduct noise monitoring during construction at Honda Creek.
✓ In the event the USSF observes declines in the CRLF population within Honda Creek over the course of the project, the USSF will conduct water quality sampling in lower Honda Creek to ensure no project related biproducts (i.e., launch combustion residue, construction- and operations-related run-off, etc.) have entered the waterway in a manner not previously considered in this analysis. The USSF will design water quality sampling to reasonably detect potential project related biproducts and any resulting associated changes in aquatic habitat (i.e., salinity, pH, etc.). Sampling will consider and utilize the most recent applicable advances in water quality sampling technology. The plan will include at least one annual sampling event for 3 years of project operations with maps depicting sampling locations. The USSF will collect and clearly present data including any associated chemical and nutrient presence, dissolved oxygen, water temperature, turbidity, and any other pertinent observations regarding ecosystem condition for purposes of annual comparison.
✓ Artificial Lighting: o Except when necessary for safety or performance of launch operations, or maintenance, artificial lighting at SLC-5 would be minimized during the hours of darkness. o The lighting plan would be designed such that lights are directed away from Honda Canyon and would be shielded to reduce scatter into undeveloped areas. Lighting plan design would minimize illumination of Honda Canyon such that that lighting levels of 1-foot candle would not extend beyond the SLC-5 facility. The USSF will require that the lighting design includes use of the minimum number of lumens necessary to accomplish lighting requirements. This requirement will be accomplished through strategic placement of lights, and the use of shields, timers, and motion sensors wherever possible to minimize potential effects associated with novel persistent artificial light at night. o The USSF will reduce the effects of ultraviolet lighting on CRLF on all external permanent site lighting. To accomplish this, the USSF may choose lighting with either no ultraviolet emissions or equip fixtures with an ultraviolet filter on external permanent site lighting.
✓ CRLF Baseline and Launch Monitoring: o The USSF would conduct quarterly night surveys for CRLF and spring tadpole surveys of lower Honda Creek within the 120 dB L_{max} Laguna-E noise contour. The USSF will use existing CRLF protocol level survey data collected at lower Honda Creek between 2013 through 2023 prior to construction and launch operations to serve as an existing baseline in coordination with the USFWS. Comparison of post-launch operation data with the established baseline will allow the USSF to assess if there are any changes in CRLF habitat occupancy, breeding

behavior (calling), and breeding success (egg mass and tadpole densities) in lower Honda Creek as Phantom's launch and static fire tempo gradually increases over six years to reach full cadence. The following would be recorded and measured during the surveys:

- CRLF detection density (number of frogs per survey hour), following the same survey methods conducted previously at these sites and throughout VSFB.
- CRLF locations and breeding evidence (e.g., calling, egg masses).
- Environmental data during surveys (temperature, wind speed, humidity, and dewpoint) to determine if environmental factors are affecting CRLF detection or calling rates.
- Annual habitat assessments to measure flow rates, stream morphology, depths, and sediment to determine if any changes in CRLF metrics are associated with other environmental factors, such as drought.
- Locations and densities of co-occurring anurans.

- Bioacoustic monitoring would be conducted annually during CRLF breeding season (typically November through April, depending on rainfall) to characterize the baseline noise environment and determine if there are changes in calling behaviors as launch and static fire tempo gradually increase over six years. Passive bioacoustic recording would occur throughout the entirety of the breeding season using the Wildlife Acoustics Song-Meter 4 (or similar technology) with software that enables autodetection of CRLF calling. The USSF will place these passive noise recorders and environmental data loggers (temperature, relative humidity, dew point) at two suitable breeding locations in lower Honda Creek within the 120 dB L_{max} Laguna-E noise contour as well as at two suitable breeding locations in San Antonio Creek to serve as a control site. The USSF will use bioacoustic monitoring to characterize and analyze any impacts of launch and static fire events during the breeding season on calling behavior to assess whether Phantom's gradual increase in launch and static fire tempo affects CRLF calling frequency. The USSF will report on monitoring results within an annual report.
- The USSF will conduct monitoring to detect changes in calling frequency and declines in the abundance, distribution, or tadpole densities of CRLF. The USSF will utilize existing survey data for Honda Creek to establish the CRLF baseline. To address potential declining trends that may be a result of the proposed project, the specified threshold criteria is described below:
  - Annual protocol survey efforts conducted in the same area of Honda Creek document fewer adult frog detections than baseline average two years consecutively;
  - Egg mass or tadpole densities decrease by 15% from baseline average;
  - and/or surveys document average call-rate changes (decrease) with increasing disturbance level.
- If any of these threshold criteria are met and cannot confidently be attributed to other natural- or human-caused catastrophic factors, not related to the Proposed Action, that may eliminate or significantly degrade suitable habitat the USSF will mitigate for these impacts as discussed below. Examples of potential catastrophic scenarios include the following:
  - Fire, unrelated to project activities or launch operations, that directly impacts Honda Canyon and is demonstrated to degrade or eliminate breeding habitat.
  - Landslides or significant erosion events in Honda Canyon, unrelated to project activities or launch operations, that result in the elimination or degradation of CRLF breeding habitat.
  - Drought or climate impacts that quantifiably reduce available aquatic habitat further than what was available during existing baseline.

- Flash flood events during the breeding season that are more significant than what was experienced during the existing baseline.
- The USSF will review the supported cause of decline with the USFWS and reach agreement. If cause of declines is determined to be inconclusive, the USSF will implement proposed mitigation.
- The USSF will discontinue monitoring after concurrence from the USFWS if CRLF occupancy, calling frequency, or tadpole densities do not demonstrate adverse effects after three years of monitoring once Phantom has achieved full or near full tempo.

✓ CRLF Mitigation:

- The USSF would create new CRLF breeding habitat at a 2:1 ratio (habitat enhanced: habitat affected) for adverse effects to occupied CRLF habitat, as determined above, at the San Antonio Creek Oxbow Restoration Area, an established wetland mitigation site that is located outside of areas impacted by launch noise on VSFB (Figure 2.3-15). Historically occupied by riparian vegetation, restoration efforts would focus on enhancing this abandoned tract of agricultural land to improve San Antonio Creek and provide breeding habitat for CRLF.
- Restoration, which has already been conducted at this site for other projects, would be conducted in the "expansion area" (Figure 2.3-16), would involve digging a channel that reaches ground water and using the spoils to create a berm that would be planted with willows. This method is already being used at the site and has proven successful at creating deep water aquatic habitat, suitable for CRLF breeding, and riparian woodland that simulate naturally occurring high-flow channels.
- Actions taken within this area would include site preparation via herbicide application, plowing, container plant installation, seeding, willow pole planting (via water jet, hand-held power auger, or manually driving a steel rod into the ground), and watering via water truck. The mitigation actions for CRLF are included under an existing USFWS BO (2016-F-0103; USFWS 2018) and EA (U.S. Air Force 2019) and all applicable avoidance, minimization, and monitoring measures required under BO 2016-F-0103 and the EA would be implemented.

Western Snowy Plover Measures

✓ SNPL Monitoring:

- The USSF would augment the current SNPL monitoring program on VSFB by performing acoustic monitoring and geospatial analysis of nesting activity on South Surf Beach and a control site (Minuteman Beach) to assess potential adverse effects from Daytona-E and Laguna-E launch and static fire activities.
- The current Base-wide SNPL monitoring program estimates breeding effort, nest fates, and fledging success while recording patterns of habitat use through the season. This program would be augmented for the Proposed Action by placing sound level meters (SLMs) immediately inland of South Surf Beach within the Daytona-E and Laguna-E noise footprint and the control site to characterize the noise environment.
- Acoustic monitoring would begin during the first calendar year of Phantom launch operations and continue annually during the breeding season as Phantom's program gradually increases over six years to full cadence. Geospatial analysis would be performed annually to assess whether patterns of nesting activity, nest fates, or fledgling success are negatively impacted by noise from the Proposed Action as Phantom's launch and static fire tempo increases to full cadence.
- If the proposed project schedules 4 disturbance events over a 4-week period during the SNPL breeding season (1 March through 30 September), the USSF will use cameras to monitor at least 10% of the southernmost active SNPL nests located on Surf Beach to assess potential

novel effects that may result from frequent launching. The USSF will employ camera technology that is capable of long-term recording and time marking the moment of disturbance events. The USSF will review the nest video recordings as soon as possible. The USSF may discontinue nest camera monitoring if they observe no response within 2 years of full launch tempo.

- The USSF will rescue any SNPL eggs abandoned on Surf Beach during disturbance events. The USSF will develop and/or fund a program to incubate any rescued abandoned eggs and release fledglings.
- If geospatial analysis shows that a statistically significant decline (defined as a decline greater than the 95% confidence interval for baseline annual variation) in these variables over the past 10 years at South Surf Beach that continues over two consecutive years within the areas impacted by noise from the Daytona-E and Laguna-E and that is attributable to the Proposed Action, as opposed to natural- or human-caused catastrophic factors, the USSF would mitigate for this impact. Examples of potential catastrophic scenarios include the following:
  - Significantly higher levels of tidal activity, predation, etc. as compared with the existing baseline and demonstrable across remainder of base population.
  - Significant avian disease demonstrable across the recovery unit.
  - Separate work activities (i.e., restoration efforts) not related to project.
- The USSF will review the supported cause of decline with the USFWS and reach agreement. If cause of declines is determined to be inconclusive, the USSF will implement proposed mitigation.
- The USSF will discontinue monitoring after concurrence from the USFWS if they do not document adverse effects attributable to the proposed project after three years of monitoring once Phantom has reach full or near full tempo.

✓ SNPL Mitigation:

- The USSF would increase predator removal efforts to include the non-breeding season, particularly focusing on raven removal at and adjacent to VSFB beaches.
- Given that SLD 30 has already or will soon (under current planning) restore all available SNPL nesting habitat on Base, the biggest factor reducing nesting success is nest predation with significant impacts from ravens. The raven population, which is historically absent to rare in the region, has increased substantially over the past two decades to the species now being common due to human-related factors that have allowed their numbers to increase and range to expand. As documented, the raven population continues to increase each year. Offseason depredation would help reduce the population on Base prior to the breeding season which should increase nest success.

✓ Predator control actions would include trapping, shooting, and tracking SNPL predators from VSFB beaches and surrounding areas on Base. The mitigation actions for SNPL are permitted under an existing USFWS BO (8-8-12-F-11R; USFWS 2015) and all applicable avoidance, minimization, and monitoring measures required under BO 8-8-12-F-11R would be implemented. SLD 30/CEIEA also maintains a USFWS depredation permit.

California Condor Measures

✓ Prior to any launch, the USSF would determine if any condors are present by coordinating with Ventana Wildlife Society and USFWS personnel prior to launch. (Note: VSFB computers are unable to review the Service's "Daily Snapshot – California Condor Population" Google Earth imagery). The USSF would contact the USFWS if condors appear to be near or within the area affected by a launch from SLC-5. If nearby, qualified biologists would monitor condor movements in the vicinity

	of VSFB and coordinate with the USFWS to analyze data before, during, and after launch events to determine whether there was an effect on condor movement patterns.
✓	The USSF would coordinate with current USFWS personnel, including Arianna Punzalan, Supervisory Wildlife Biologist, USFWS California Condor Recovery Program, at arianna_punzalan@fws.gov or (805) 377-5471, Joseph Brandt, Wildlife Biologist, USFWS, at joseph_brandt@fws.gov, 805-677-3324, or 805-644-1766 extension 53324, or Steve Kirkland, California Condor Field Coordinator, USFWS California Condor Recovery Program, at steve_kirkland@fws.gov or 805-766-4630. The USSF will also coordinate with current Ventana Wildlife Society personnel, including Joe Burnett, joeburnett@ventanaws.org or 831-800-7424.

1

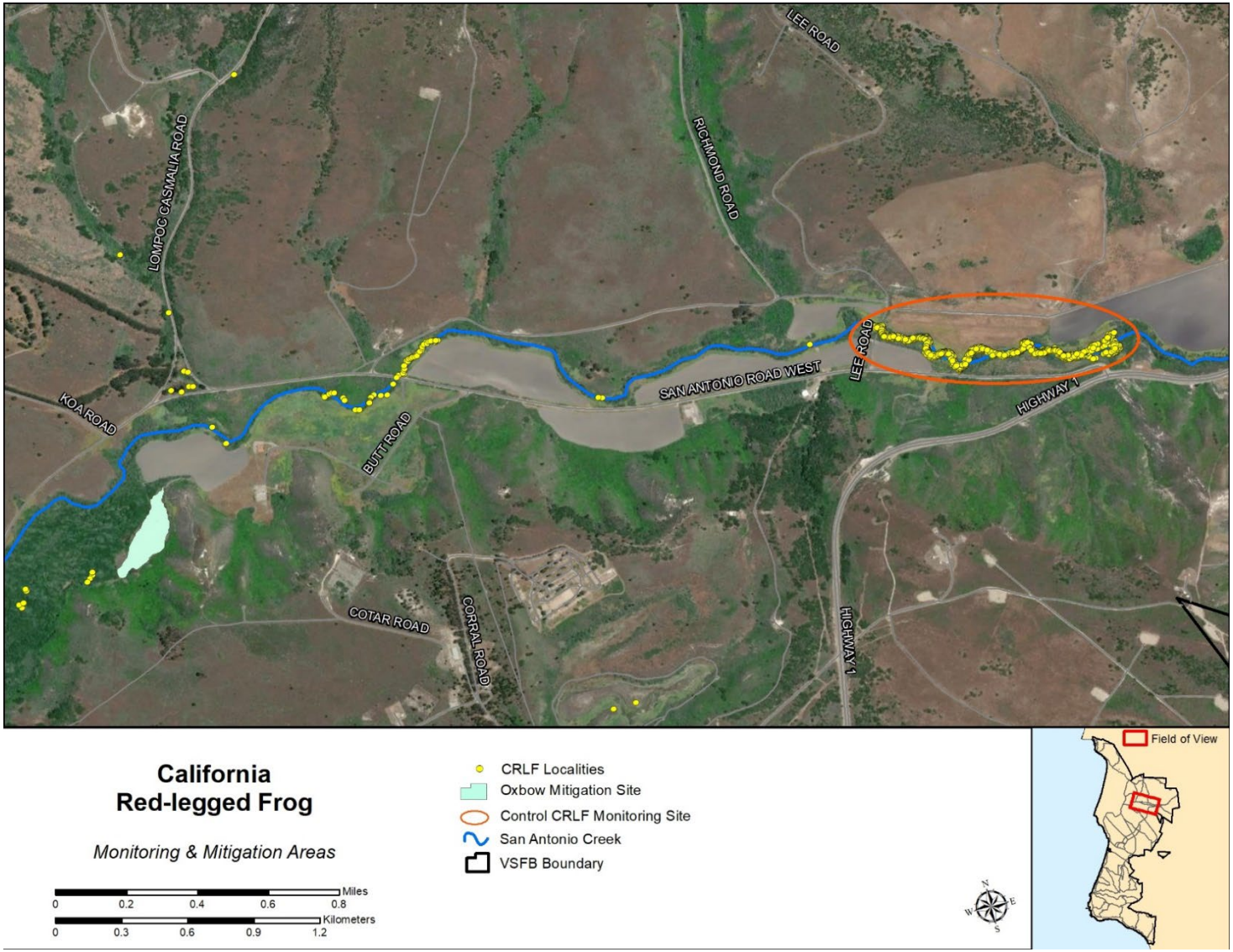

Figure 2.3-15: California red-legged frog Oxbow mitigation site and control monitoring location. (Note: the depicted distribution of CRLF localities is a factor of where prior survey efforts were performed, not actual occurrence.)

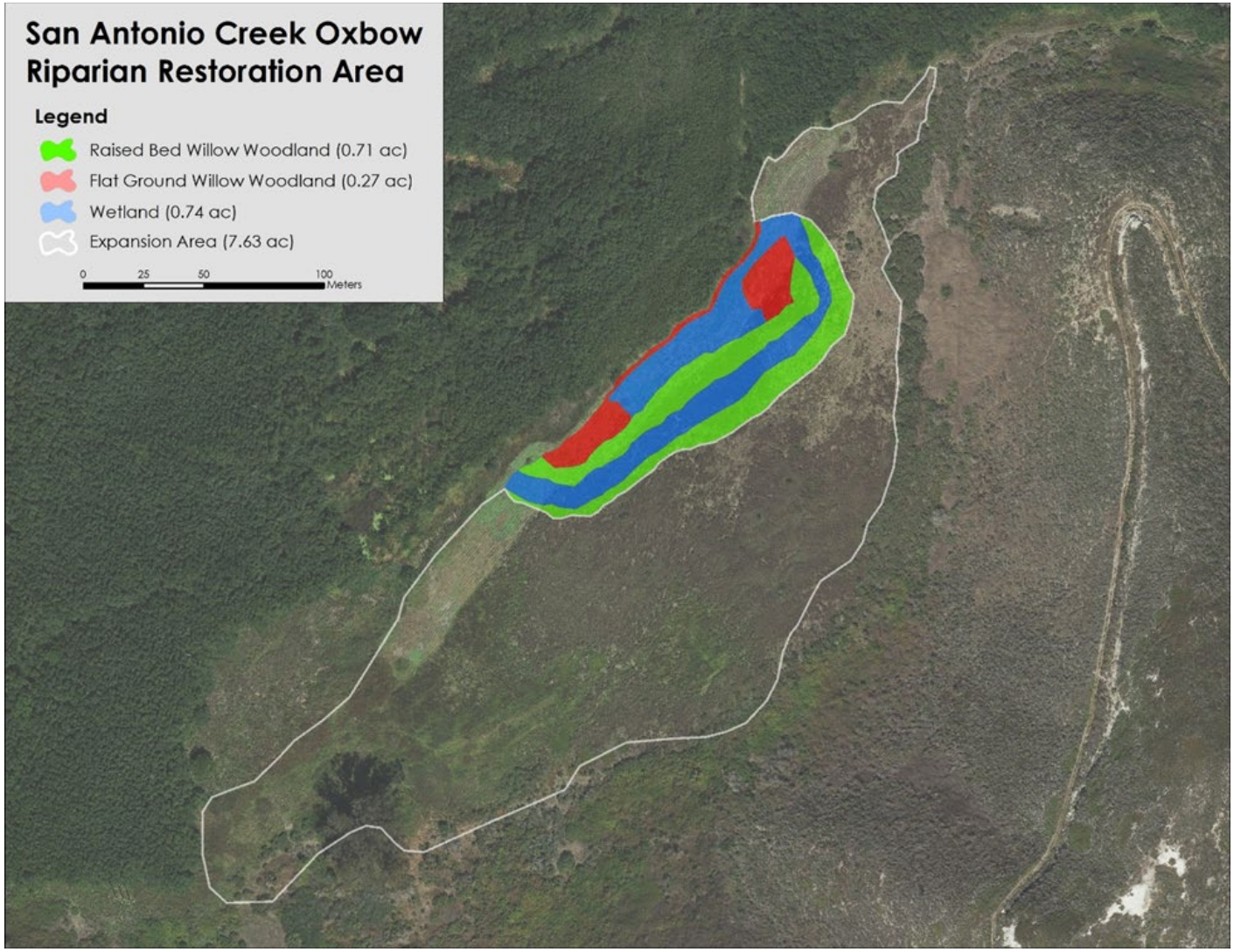

Figure 2.3-16: Current restoration efforts (blue, red, and green) and existing expansion area that would be restored at a 2:1 mitigation ratio

2.3.3.3. Marine Biological Resources

The USSF and qualified Phantom personnel or contractor staff would ensure that all applicable minimization, monitoring, and avoidance measures in SLD 30's LOA (Appendix B), listed in Table 2.3-13, would be implemented during operation of Phantom's launch program at SLC-5.

Table 2.3-13: Minimization, Monitoring, and Avoidance Measures

Minimization, Monitoring, and Avoidance Measures
✓ Sonic boom modeling would be completed prior to each launch to verify and estimate the overpressure levels and footprint.
✓ Between 1 January and 30 June, pinniped monitoring at south Base haulout locations would commence at least 72 hours prior to a launch event and continue until at least 48 hours after each event. Monitoring data collected would include multiple surveys each day that record the species, number of animals hauled out, general behavior, presence of pups, age class, and gender. Environmental conditions such as tide, wind speed, air temperature, and swell would also be recorded.

2.3.3.4. Water Resources

The following measures, as described in Table 2.3-14, would be implemented to minimize impacts on water resources and stormwater:

Table 2.3-14: Water Resources and Stormwater Measures

Water Resources and Stormwater Measures
✓ The site would be secured from potential erosion resulting from rain and wind events. Existing vegetation would be preserved to the extent feasible.
✓ Phantom would install hydroseed and erosion control measures on areas where temporary disturbances occur and any areas that may be prone to erosion. Phantom would use erosion control devices made from biodegradable materials and/or mulched native vegetation produced while clearing vegetation at the site. The hydroseed mix would be comprised of native plant species, developed in coordination with the 30 CES/CEI botanist.
✓ Vegetation removal on the steep slopes on the east side of the site would be avoided to the extent practicable, unless necessary for fire safety.
✓ All equipment would be properly maintained and free of leaks during operation, and all necessary repairs carried out with proper spill containment.
✓ Fueling equipment would only occur in pre-designated areas with spill containment materials placed around the equipment before refueling. Stationary equipment would be outfitted with drip pans and hydrocarbon absorbent pads.
✓ Adequate spill response supplies would be maintained at the site during construction and operation for immediate response and clean up of any fuel spills.
✓ Hazardous materials would be stored in proper containers, placed in proper containment facilities covered prior to rain events.
✓ Vehicles and equipment would only be washed within staging areas. Performing high-pressure washing of undercarriages and wheel wells shall be prohibited at the project site.
✓ Trash disposal containers would be covered at all times. Any trash that escapes from containers would be picked up at the end of each day.
✓ Portable toilets must be properly secured to prevent tipping in windy conditions.

✓ Phantom would enroll in RWQCB's General Waiver for Specific Types of Discharges (or other state discharge permit) prior to discharging any water out of the deluge water retention basin. Any deluge water that remains after launches or stormwater that accumulates within the basin would be tested for contamination. If contamination is encountered, the contents would be pumped out and disposed of per the waiver/permit and state and Federal regulations. If authorized by SLD 30/CEIEA, Phantom may use of the IWTP to dispose of the deluge waste water, if laboratory analysis indicates the water meets IWTP standards.
✓ Improvements to dirt roads would follow standard recommended practices to avoid and minimize erosion potential (e.g., Bloser et al. 2012) and would be inspected after rainstorms for indications of erosion, and repairs made promptly.
✓ Concrete curing compounds, concrete waste, and washout water would be properly managed to prevent pollution. Concrete washout water would be contained for evaporation.
✓ Phantom would design any septic system IAW the regulations set forth in the RWQCB OWTS Manual.

2.3.3.5. Cultural Resources

Phantom personnel or contractor staff would ensure the following measures, described in Table 2.3-15, would be implemented to minimize impacts on sensitive archaeological resources:

Table 2.3-15: Cultural Resources Measures

Cultural Resources Measures
✓ SLD 30/CEIEA requires archaeological and Native American monitoring during construction through or adjacent to any known archaeological site, regardless of a site's National Register of Historic Places (NRHP) eligibility. Archaeological and Native American monitors would be present during construction disturbance and vegetation clearing activities in and near known archeological sites.
✓ If previously undocumented cultural resources are discovered during maintenance activities, work would stop, and the procedures established in 36 CFR Part 800.13 and the VSFB Integrated Cultural Resources Management Plan shall be followed.

2.3.3.6. Transportation

Phantom personnel or contractor staff would ensure the following measures, described in Table 2.3-16, would be implemented to minimize impacts on transportation resources:

Table 2.3-16: Transportation Measures

Transportation Measures
✓ Employees may be encouraged to carpool and eat lunch on site.
✓ Truck trips should be scheduled during non-peak traffic hours to the greatest extent practicable.
✓ Phantom would coordinate with California DOT and California Highway Patrol when necessary for material transportation to the project site and for accessing the site through State Route (SR) 246.
✓ Warning signs, cones, and flaggers would be provided when necessary to warn roadway users of truck crossings on SR 246, and to control traffic flow if necessary.
✓ Construction equipment would not be parked along the shoulder of primary roadways during non-construction periods.

2.3.3.7. Human Health and Safety

Phantom personnel or contractor staff would ensure the following measures, described in Table 2.3-17, would be implemented to minimize the potential for adverse impacts on human health and safety:

Table 2.3-17: Human Health and Safety Measures

Human Health and Safety Measures
✓ Comply with Occupational Safety and Health Administration (OSHA), Air Force Occupational Safety and Health (AFOSH), California Division of Occupational Safety and Health regulations, and other recognized standards and applicable DAF regulations or instructions.
✓ Restrict general access to the proposed construction site through use of signs and fencing if feasible.
✓ Provide for the health and safety of workers and all subcontractors who may be exposed to operations or services. Submit a health and safety plan to VSFB and appoint a formally trained individual to act as safety officer who would be the point of contact (POC) on all problems involving job site safety.
✓ Coordinate with the Air Force Civil Engineer Center (AFCEC) Environmental Operations Division Mitigation, Monitoring, and Reporting Program manager and contact with the weapons safety specialist for information on SLD 30 policies on unexploded ordnance (UXO) safety for construction work at VSFB.
✓ Site-wide anomaly avoidance would be implemented since it is possible UXOs may be encountered outside of MMRP boundaries.
✓ Comply with all provisions and procedures prescribed for the control and safety of personnel and visitors to the job site.

2.3.3.8. Hazardous Materials and Waste Management

Phantom personnel or contractor staff would ensure the following measures, described in Table 2.3-18, would be implemented to minimize impacts on hazardous materials and waste management:

Table 2.3-18: Hazardous Materials and Waste Management Measures

Hazardous Materials and Waste Management Measures
✓ Proper disposal of hazardous waste would be accomplished through identification, characterization, sampling (if necessary), and analysis of wastes generated.
✓ All hazardous materials would be properly identified and used IAW manufacturer's specifications to avoid accidental exposure to or release of hazardous materials required to operate and maintain construction equipment.
✓ Hazardous materials would be procured through or approved by the Vandenberg Hazardous Materials Pharmacy (HazMart). Monthly usage of hazardous materials would be reported to the HazMart to meet legal reporting requirements.
✓ All equipment would be properly maintained and free of leaks during construction and maintenance activities. All necessary equipment maintenance and repairs would be performed in pre-designated controlled, paved areas to minimize risks from accidental spillage or release. Prior

to construction, a Spill Prevention Plan would be submitted to SLD 30 Environmental Compliance Section for approval.
✓ Phantom would ensure employees and contractor staff are trained in proper prevention and cleanup procedures.
✓ Phantom would store liquids, petroleum products, and hazardous materials in approved containers and drums and would ensure that any open containers are covered prior to rain events.
✓ Per 40 CFR Part 112, Spill Prevention, Control, and Countermeasure Plan, Phantom would place chemicals, drums, or bagged materials on a pallet and, when necessary, secondary containment.

2.3.3.9. Solid Waste Management

Solid waste would be minimized by strict compliance with SLD 30's Integrated Solid Waste Management Plan (ISWMP; DAF 2015). Phantom personnel or contractor staff would ensure the following measures, described in Table 2.3-19, would be implemented to further minimize the potential for adverse impacts associated with solid waste:

Table 2.3-19: Solid Waste Management Measures

Solid Waste Management Measure
✓ All materials that are disposed of off Base would be reported to the SLD 30, Installation Management Flight (SLD 30/CEI) Solid Waste Manager.

2.3.3.10. Utilities

Phantom personnel or contractor staff would ensure the following measures, described in Table 2.3-20, would be implemented to minimize impacts to the SLD 30 water supply:

Table 2.3-20: Water Supply Measures

Water Supply Measures
✓ Backflow prevention assemblies would be installed for water supply lines and fire suppression systems connected to the VSFB potable water distribution system to prevent cross-contamination and adverse impacts to the VSFB drinking water supply.
✓ Any activity requiring the connection to and the drawing of bulk water from the drinking water distribution system to support construction and repair projects shall require the approval and coordination of the Vandenberg Cross Connection Control and Backflow Prevention Program Manager.

2.3.3.11. Coastal Zone Management

Phantom personnel or contractor staff would ensure the following measures, described in Table 2.3-21, would be implemented to minimize impacts to Coastal Zone resources:

Table 2.3-21: Coastal Zone Resources Measures

Coastal Zone Resources Measures
✓ Phantom would provide contributions to the California Lost Fishing Gear Recovery Project to offset the impacts from unrecoverable debris (first stage, fairing, weather balloon, and radiosonde) if they are deposited in State or Federal waters. For every 1 pound of unrecoverable debris, Phantom

would make a compensatory donation of $10.00, which is sufficient to recover 1 pound of lost fishing gear.
✓ Phantom will establish a communication protocol with commercial and recreational fishing stakeholders in the region to share launch dates, times, changes, and launch updates.

2.4. No Action Alternative

The CEQ and DAF EIAP regulations require the inclusion of a No Action Alternative in an EA. The No Action Alternative serves as a baseline to evaluate the impacts of the Proposed Action. Under the No Action Alternative, Phantom would not implement the Daytona-E and Laguna-E launch program at SLC-5 at VSFB; therefore, the USSF would not be able to comply with *2020 National Space Policy* or meet mission requirements to promote national economic interests by promoting commercial investment and space use. The No Action Alternative would thus not meet the purpose of and need for the Proposed Action but is carried forward as a baseline analysis in this EA, as NEPA requires.

3.0 Affected Environment

This chapter describes the existing environment near and within the project area for The Preferred Alternative (Proposed Action) and the No Action Alternative. As stated in Chapter 1, this EA complies with FAA Order 1050.1F (the FAA's NEPA-implementing policies and procedures) so the FAA can easily adopt this EA and issue its own FONSI, if applicable. FAA Order 1050.1F, Paragraph 4-1, lists environmental impact categories (i.e., resource areas) which the FAA considers in its NEPA documents. The area considered for most resources was the immediate area of the proposed construction (SLC-5) and the areas potentially impacted by launch engine noise, sonic boom overpressure, and the overflight path. For some environmental resources, a wider regional area was evaluated. Table 3.0-1 lists justification for the resources that were not analyzed in detail.

Table 3.0-1: Resources Not Analyzed

Resource	Reason not Analyzed
Aesthetics	A former launch site (SLC-5) would be used for the proposed launch program. Proposed activities would be similar to launch activities that have been performed at this site and nearby launch sites on VSFB. The proposed activities would not result in impacts on visual resources.
Visual Effects, Light Emissions, and Visual Resources/Visual Character	The Proposed Action would not change the existing or planned use of VSFB and would conform to the existing designated land uses. Launch activities would not differ visually from those activities already occurring at VSFB. Therefore, this resource was considered but not analyzed in this EA, although the potential effects of artificial lighting on biological resources was analyzed in Section 4.3.
Land Use	The Proposed Action would not result in changing land use. Proposed launch activities would not differ in scope or nature from those that already occur in the vicinity of SLC-5 on south VSFB.
Environmental Justice and Protection of Children	The Proposed Action would occur on VSFB and primarily over open ocean away from populated areas. VSFB controls public access to the Base and therefore no public member would be present near the launch site during launch operations. The Proposed Action would not occur near any schools or childcare facilities on VSFB. Therefore, the Proposed Action does not have the potential for disproportionately high and adverse effects on minority or low-income populations or a disproportionate health or safety risk to children.
Farmlands	The Proposed Action would not convert prime agricultural land to other uses or result in a decrease in the land's productivity.
Natural Resources*	During construction and operation, the Proposed Action would minimally affect supplies of energy, water, asphalt, aggregate, and wood, and other natural resources in the region because the project either requires none to relatively small amounts of these resources or there are abundant suppliers available in the region. Therefore, the potential impacts to natural resources are considered but not analyzed in this EA.

Resource	Reason not Analyzed
Wild and Scenic Rivers	There are no rivers protected under the California Wild and Scenic Rivers Act within the affected environment. Therefore, this resource was considered but not analyzed in this EA.

* Per FAA Order 1050.1F, the FAA is required to consider the potential impacts on "natural resources and energy supply." Energy and water supply are discussed under "Utilities" in this EA. Water use under the Proposed Action is further discussed under "Water Resources" in this EA. In the context of FAA's NEPA impact assessment, the FAA must consider the amount of natural resources—such as water, asphalt, aggregate, and wood—a project would use in the construction, operation, and maintenance of a project.

3.1. Air Quality and Climate Change

The approach to the air quality and climate analysis under the Clean Air Act (CAA) and NEPA are discussed in Appendix F. The ROI for air quality includes the Study Area and adjoining land several miles inland, which may be downwind from emission sources associated with the Proposed Action, and includes Santa Barbara County. Currently, Santa Barbara County is in attainment for all National Ambient Air Quality Standards (NAAQS) according to the USEPA (2022).

With respect to launch emissions, the effect of the Proposed Action on regional air quality is considered under the mixing height (3,000 ft above ground level). Above this height, pollutants that are released generally do not mix with ground level emissions and do not have an effect on ground level concentrations in the local area. Per FAA-AEE-00-01, DTS-34 (Consideration of Air Quality Impacts by Airplane Operations at or Above 3,000 ft above ground level), emissions above 3,000 ft are not considered for local or regional air quality impacts. Therefore, emissions related to launch activities above the mixing height are outside of the ROI for air quality. Greenhouse gas (GHG) emissions from launches are considered at all altitudes for the GHG and climate analysis.

3.1.1. Criteria Pollutants

Air quality is defined by ambient air concentrations of specific pollutants determined by the USEPA to be of concern with respect to the health and welfare of the general public. Six major pollutants of concern, called "criteria pollutants," are carbon monoxide (CO), sulfur oxides (SO_x), nitrogen oxides (NO_x), ozone (O_3), suspended particulate matter less than or equal to 10 microns in diameter (PM_{10}), fine particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$), and lead (Pb). The USEPA has established NAAQS for these pollutants. An air quality standard defines the maximum amount of a pollutant averaged over a specified period of time that can be present in outdoor air without any harmful effects on people or the environment. Areas that violate a Federal air quality standard are designated as non-attainment areas.

3.1.2. Climate of the Study Area

The climate of the Pacific Ocean and adjacent land areas is influenced by surface water temperatures, water currents, and wind. Offshore climates are moderate and seldom have extreme seasonal variations because the ocean is slow to change temperature. Ocean currents influence climate by moving warm and cold water between regions. Adjacent land areas are affected by the wind that is cooled or warmed when blowing over these currents. The wind also moves evaporated moisture from the ocean to adjacent land areas and is a major source of rainfall.

The climate of coastal Southern California and adjacent offshore Pacific Ocean waters consists of warm, dry summers and cool, wet winters, mainly influenced by a semi-permanent high-pressure system (the Pacific High) in the eastern Pacific Ocean. This Pacific High maintains clear skies in Southern California for much of the year. When the Pacific High moves south during the winter, this pattern changes and low-pressure centers migrate into the region, bringing precipitation, falling mainly as rain in October-April. The predominant regional wind directions are westerly and west-southwesterly during all four seasons. Surface winds are typically from the north and west (onshore) during the day and from the east (offshore) at night.

3.1.3. Regional Setting

The CARB and SBCAPCD operate a network of ambient air monitoring stations throughout Santa Barbara County. These stations measure ambient concentrations of the pollutants and determine whether the ambient air quality meets the California Ambient Air Quality Standards (CAAQS) and the National Ambient Air Quality Standards (NAAQS). The nearest ambient monitoring station to the Proposed Action site is the Lompoc South H Street monitoring station, which measures all criteria pollutants. NAAQS and CAAQS for ozone (O_3) were not exceeded at the Lompoc South H Street monitoring station during the period from 2018 through 2020 (Table 3.1-1).

Table 3.1-1 presents a summary of ambient air quality measurements for Santa Barbara County during the period from 2019 to 2021 (CARB 2022). For Santa Barbara County, the 1-hour and 8-hour CAAQS for O_3 were exceeded multiple times between 2019 and 2021 (Table 3.1-1; SBCAPCD 2022). If emissions were to exceed a significance threshold, they and their potential consequences may be further analyzed to assess the likelihood of a significant impact on air quality. The nature and extent of such analysis would depend on the specific circumstances. The analysis could range from a more detailed and precise examination of the activities and equipment resulting in the greatest contribution to emissions, to air dispersion modeling analyses. Exceeding CAAQS standards may result in additional mitigation requirements, as described in Appendix F (Air Quality).

Table 3.1-1: Background Ambient Air Quality, Lompoc South H Street Monitoring Station (concentrations in ppm unless otherwise indicated)

Pollutant	Averaging Time	2020	2019	2018	CAAQS	NAAQS
Ozone	8 hour	0.033	0.033	0.042	0.070	0.070
	1 hour	0.039	0.041	0.044	0.09	-
PM_{10}	Annual Arithmetic Mean	N/A	16.3 µg/m^3	19.7 µg/m^3	20 µg/m^3	-
	24 hour	54.0 µg/m^3	80.0 µg/m^3	60.2 µg/m^3	50 µg/m^3	150 µg/m^3
$PM_{2.5}$	Annual Arithmetic Mean	N/A	4.6 µg/m^3	6.6 µg/m^3	12 µg/m^3	12.0 µg/m^3
	24 hour	18.8 µg/m^3	23.4 µg/m^3	40.6 µg/m^3	-	35 µg/m^3
NO_2	Annual	0.001	0.000	0.000	0.030	0.053
	1 hour	0.028	0.024	0.006	0.18	0.100
CO	8 hour	0.37	0.30	0.55	9.0	9
SO_2	Annual	0.000	0.000	0.000	-	0.030
	24 hour	0.001	0.000	0.001	0.04	0.14

Notes: CO = Carbon Monoxide, NO_2 = Nitrogen Dioxide, $PM_{2.5}$ = Particulate Matter less than 2.5 microns, PM_{10} = Particulate Matter less than 10 microns, ppm = part(s) per million, $\mu g/m^3$ = microgram(s) per cubic meter, N/A = not available from current website data, SO_2 = sulfur dioxide
Source: www.arb.ca.gov

Table 3.1-2: Summary of Santa Barbara County Ozone and Particulate Matter Standards Exceedances

Standard	Limit	2021		2020		2019	
		Days Exceeding	Max	Days Exceeding	Max	Days Exceeding	Max
Ozone 1-hour State Standard	94 ppb	--	--	4	103 ppb	--	--
Ozone 8-hour Federal Standard	70 ppb	1	71 ppb	6	86 ppb	1	72 ppb
Ozone 8-hour State Standard	70 pbb	1	72 ppb	6	86 ppb	1	72 ppb
Particulate Matter PM_{10} 24-hour State Standard	50 $\mu g/m^3$	1	76 $\mu g/m^3$	33	117 $\mu g/m^3$	17	137 $\mu g/m^3$
Particulate Matter PM_{10} 24-hour Federal Standard	154 $\mu g/m^3$	--	--	--	--	--	--
Particulate Matter $PM_{2.5}$ 24-hour Federal Standard	35 $\mu g/m^3$	--	--	10	88.4 $\mu g/m^3$	--	--

Notes: ppb = part(s) per billion; $\mu g/m^3$ = micrograms per cubic meter; PM_{10} = particulate matter less than 10 microns; $PM_{2.5}$ = particulate matter less than 2.5 microns

3.1.4. Greenhouse Gases and Climate

On a global scale, rising atmospheric GHG levels correspond to recent increases in the average global temperature and rises in adverse climate change impacts; however, the rise in global temperature and the climate change impacts is not attributable to any single action but is exacerbated by a series of actions. Therefore, applying the concept of proportionality to the projected net change in GHG emissions for each alternative enables a quantifiable and relative comparison amongst alternatives. Given climate change impacts are on a global scale and not attributable to any single action, the concept of proportionality also dictates that there is a de minimis (insignificant) level of projected net change in GHG emissions that are too trivial to warrant any further consideration. The DAF has adopted the Prevention of Significant Deterioration (PSD) 75,000 short tons per year (tpy) threshold for GHG (as carbon dioxide equivalents or CO_2e) as the GHG insignificant indicator for GHG assessments (AFCEC 2023).

A detailed discussion of GHG emissions, including their relation to the issue of global climate change, and associated guidance related to NEPA impact analysis, is included in Appendix F (Air Quality). For purposes of this document, the DAF insignificance indicator (threshold) of 68,000 metric tons (75,000 short tpy) of CO_2e emissions was used. The California Environmental Quality Act (CEQA) significance threshold for GHG emissions, as used by the SBCAPCD is 10,000 metric tpy of CO_2e; however, CEQA requirements are not applicable to Federal actions.

3.2. Noise

A detailed description of noise/sound, ambient sound guidance documents, Federal Interagency Committee on Urban Noise (1980) criteria, and USEPA noise standards is contained in Appendix G. The sound ROI includes noise-sensitive receptors and ambient noise levels in the area potentially affected by the Proposed Action. This discussion of noise includes the types or sources of noise and the associated sensitive receptors in the human environment. Noise in relation to biological resources and wildlife species is discussed in Section 3.3.

3.2.1. Sensitive Receptors

The Daytona-E and Laguna-E launch vehicles would be located at SLC-5 on south VSFB. The nearest noise sensitive areas are located in Lompoc, which include residential areas, hospitals, schools, parks, and libraries. However, these sensitive receptors are all located over 8.0 mi east of the project site. The next closest sensitive receptors are on North VSFB over 10 mi northeast. No sensitive receptors are located within the 100 dB noise contour for launches of either proposed vehicle.

3.2.2. Ambient Noise Conditions

Existing noise levels on VSFB are generally quite low due to the large areas of undeveloped landscape and relatively sparse noise sources. Background noise levels are primarily driven by wind noise, with louder noise levels found near industrial facilities and transportation routes. While rocket launches and aircraft overflights create louder intermittent noise levels, they do not generally impact hourly noise levels due to their short duration. On VSFB, general ambient 1-hour average sound level measurements range from around 35 to 60 dB (Thorson et al. 2001). Wind and wave noise are the primary drivers of ambient in-air noise levels.

Regularly occurring sources of instantaneous noise near the SLC-5 construction area include crashing ocean surf, which generates approximately 78 dBA (6.6 ft tall waves) and can be louder during high surf events (Bolina & Abom 2010). In fact, ambient sound levels were characterized at Surf Beach, approximately 5.3 mi north of the Proposed Action Area as 45.5 dBA Single Equivalent Sound Level (L_{eq}) at night (10:00 p.m. to 7:00 a.m.), 51.8 dBA L_{eq} during the day (7:00 a.m. to 5:00 p.m.), and 53.1 dBA L_{eq} during the evening (5:00 p.m. to 10:00 p.m.). Noise levels in the adjacent city of Lompoc to the northeast are primarily driven by transportation noise and regional aircraft activities. Depending on regional airport activity, DNLs are typically between 55 and 65 dBA (City of Lompoc 2004).

3.3. Terrestrial Biological Resources

Under Section 7 of the ESA of 1973, as amended (16 USC Section 1531 et seq.), federal agencies are required to assess effects of projects on species that are federally listed or proposed for listing based on the best scientific data available. Section 7 consultations with the USFWS and NMFS are required for federal projects that have the potential to directly or indirectly affect listed species or destroy or adversely modify critical habitat. It is also USSF policy to consider species listed by state agencies, and other federal special status species when evaluating the impacts of a project. In California, these include "fully protected" wildlife species, which are designated by the California Department of Fish and Wildlife (CDFW), per the California Fish and Game Code (FGC) Sections 3511, 4700, 5050, and 5515. Although not subject to the requirements of the California ESA, as a goal of its Integrated Natural Resource Management Plan, VSFB also protects and conserves species considered special status by the state when not in direct conflict with the military mission. VSFB is also subject to the requirements of the Migratory Bird Treaty Act of 1918 (MBTA; 16 USC Sections 703-712) as amended, which protects native migratory birds, including their eggs, active nests, and young.

The existing biological setting includes the regional setting of VSFB, the specific Proposed Action Area, and past and present disturbances in and near the SLC-5 site. Resources on VSFB are abundant and diverse compared to other areas of California because VSFB is within an ecological transition zone where the northern and southern ranges of many species overlap, and because the majority of the land within the Base boundaries has remained undeveloped. The ROI considered in this EA for biological resources encompasses the areas subject to noise and physical disturbance as part of the Proposed Action (Figures 3.3-1 through 3.3-6).

3.3.1. Methodology

Biological resources near the Proposed Action Area were characterized based on reviewing VSFB Geographic Information Systems (GIS) data, prior survey reports for the area, and available documents for the Proposed Action. In addition, MSRS conducted biological surveys which included characterization and mapping of vegetation communities within the portions of the Proposed Action Area subject to physical impacts. Surveys within the Proposed Action Area that would experience construction/physical impacts (construction area) were conducted in November 2019, March 2020, and August 2021. Complete lists of plant and wildlife species documented within the construction area can be found in Appendix H (Species Observed During Field Surveys). Potential occurrence of special status species (see Table 3.3-2) was determined based on the presence of suitable habitat or records of occurrence of the species. Sources accessed and reviewed to determine potential for occurrence included the California Natural Diversity Database (CDFW 2022) and existing local and regional references.

3.3.2. Vegetation Resources

Vegetation alliances were classified and mapped following the *Manual of California Vegetation Second Edition* (Sawyer et al. 2009). Figure 3.3-1 shows the vegetation (a mix of upland types) within the construction area, while Table 3.3-1 provides areas of each vegetation alliance. Descriptions of each vegetation alliance are provided in Appendix I. Section 4.3.1 provides estimates of permanent and temporary impacts.

Table 3.3-1: Vegetation Alliances Present Within the Construction Area and Vegetation Management Areas

Common Name	Alliance Name	Total
Annual Grassland	*Avena* spp. - *Bromus* spp. Herbaceous Semi-Natural Alliance	**1.45**
Arroyo Willow Thicket	*Salix lasiolepis* Shrubland Alliance	**0.35**
Australian Wattle Patch	*Acacia* spp. - *Grevillea* spp. - *Leptospermum laevigatum* Shrubland Semi-natural Alliance	**0.31**
Mixed Bush Lupine Scrub / Annual Grassland	mixed *Lupinus arboreus* Shrubland Alliance and *Avena* spp. - *Bromus* spp. Herbaceous Semi-Natural Alliance	**0.27**
Coyote Brush Scrub	*Baccharis pilularis* Alliance	**1.27**
Mixed Coyote Brush Scrub / Iceplant Mat	mixed *Baccharis pilularis* Alliance and *Mesembryanthemum* spp. - *Carpobrotus* spp. Herbaceous Semi-Natural Alliance	**6.73**
Fennel Patches	*Conium maculatum* - *Foeniculum vulgare* Herbaceous Semi-Natural Alliance	**0.07**
Iceplant Mat	*Mesembryanthemum* spp. - *Carpobrotus* spp. Herbaceous Semi-Natural Alliance	**4.12**
Mixed Iceplant Mat / Annual Grassland	Mixed *Mesembryanthemum* spp. - *Carpobrotus* spp. Herbaceous Semi-Natural Alliance and *Avena* spp. - *Bromus* spp. Herbaceous Semi-Natural Alliance	**0.12**
Lemonade Berry Scrub	*Rhus integrifolia* Shrubland Alliance	**0.84***
Mixed Lemonade Berry Scrub / Veldt Grass	mixed *Rhus integrifolia* Shrubland Alliance and *Ehrharta calycina*	**9.50**
Monterey Cypress & Pine Stand	*Hesperocyparis macrocarpa* - *Pinus radiata* Forest & Woodland Semi-Natural Alliance	**0.57**
Mock Heather Scrub	*Lupinus chamissonis* - *Ericameria ericoides* alliance	**0.07**
Needle Grass Grassland	*Nassella* spp. - *Melica* spp. Herbaceous Alliance	**1.10**
Poison Oak Scrub	*Toxicodendron diversilobum* Shrubland Alliance	**1.24**
Mixed Poison Oak Scrub / Iceplant Mat	mixed *Toxicodendron diversilobum* Shrubland Alliance and *Mesembryanthemum* spp. - *Carpobrotus* spp. Herbaceous Semi-Natural Alliance	**0.07**
Veldt Grass	*Ehrharta calycina* Undescribed Alliance	**4.41**
	Total Vegetation Permanent Impacts	**32.47**
Developed	Developed - Unvegetated	4.98
	Total Site Area	**37.45**

* 0.80 acres of lemonade berry scrub, trimmed along Honda Canyon Road (not removed); 0.04 acres of lemonade berry scrub removed within firebreak; however, CCC ecologist reviewed new vegetation survey information and determined that the area does not meet the definition of ESHA.

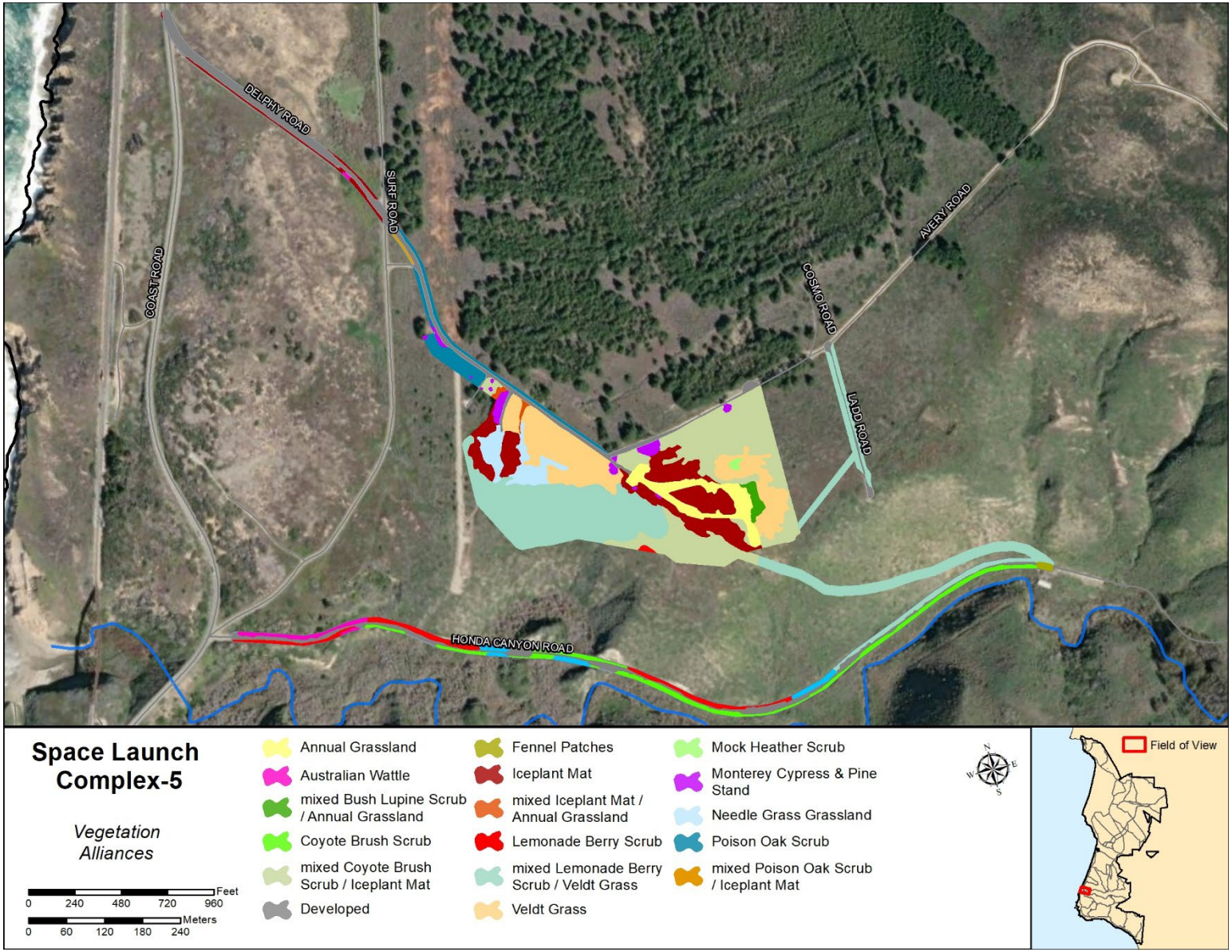

Figure 3.3-1: Vegetation Types within the Construction Area

3.3.3. General Wildlife Resources

Common bird species associated with the habitat at SLC-5 and adjacent areas include various birds associated with scrub habitat. Species such as white-crowned sparrow (*Zonotrichia leucophrys*), song sparrow (*Melospiza melodia*), Bewick's wren (*Thryomanes bewickii*) and Anna's hummingbird (*Calypte anna*) would be expected within the Proposed Action Area and were common during March 2021 biological surveys.

Amphibians that occur within the area subject to terrestrial impacts include the Baja California treefrog (*Pseudacris hypochondriaca*), Monterey ensatina (*Ensatina eschscholtzii*), and black-bellied slender salamander (*Batrachoseps nigriventris*). Reptile species observed during biological surveys include western fence lizard (*Sceloporus occidentalis*) and southern Pacific rattlesnake (*Crotalus oreganus helleri*).

Various mammal species are also expected to occur within or adjacent to the SLC-5 area, including brush rabbit (*Sylvilagus bachmani*), coyote (*Canis latrans*), and California ground squirrel (*Otospermophilus beecheyi*). Small mammals include various species such as kangaroo rat (*Dipodomys* spp.) and pocket gopher (*Thomomys bottae*). Honda Canyon and the adjacent construction area also provide foraging habitat for bats which may also utilize trees for roosting. Bat species documented in Honda Canyon include big brown bat (*Eptesicus fuscus*) and western red bat (*Lasiurus blossevillii*).

All species that were observed during field surveys or potentially occurring within the construction area are listed in Appendix H.

3.3.4. Special Status Species

Federal and state special status species occur or have the potential to occur within the Proposed Action Area and its vicinity. Potential occurrence within and nearby the Proposed Action Area was determined based on past documentation and on suitability of habitat and occurrence within the region of a particular species. Detailed information regarding the federally listed species status, life history, and occurrence within the action area is contained in Appendix I, including a description of species excluded from potential occurrence, and associated rationale. Table 3.3-2 lists the types of special status species that were considered in this EA. Federally listed, proposed listed, or candidate plant and wildlife species that are known to occur in the project area are listed in Table 3.3-3.

Table 3.3-2: Terrestrial Special Status Species Considered

Special-Status Biological Resources
✓ Plant and wildlife species that are federally listed, proposed for listing, or candidates for listing
✓ Plant and wildlife species that have been delisted
✓ Plant and wildlife species that are state listed or candidates for listing
✓ California fully protected species
✓ Wildlife species considered California Species of Special Concern by the CDFW
✓ Plant species listed as endangered, threatened, or rare by the state of California
✓ Golden eagles and bald eagles protected under the Bald and Golden Eagle Protection Act
✓ Federal Birds of Conservation Concern
✓ Winter roost locations for monarch butterflies protected under the Local Coastal Plan of Santa Barbara County

Table 3.3-3: Federal and State Special Status Species Occurrence Within the Proposed Action Area

Species	Status		Occurrence within the Proposed Action Area
	USFWS	CDFW	
Invertebrates			
Crotch bumble bee (*Bombus crotchii*)	-	SSC	Expected: may forage and nest in the construction area.
Monarch butterfly (*Danaus plexippus*)	Proposed	Special Animal*	Overwintering stands within noise footprint.
Fish			
Tidewater goby (*Eucyclogobius newberryi*)	FT	-	Historic occurrence in Honda Creek; but unlikely to be present.
Unarmored Threespine Stickleback (*Gasterosteus aculeatus*)	FE	SE	Historic introduction in Honda Creek; but extirpated.
Arroyo chub (*Gila orcuttii*)	-	SSC	Not present on Honda Creek; present on San Antonio Creek.
Amphibians			
California red-legged frog (*Rana draytonii*)	FT	SSC	Documented in Honda Creek. May be found in construction footprint due to proximity of aquatic habitat. Occurs within the noise footprint.

Species	Status		Occurrence within the Proposed Action Area
	USFWS	**CDFW**	
Reptiles			
Northern legless lizard (*Anniella pulchra*)	-	SSC	Assumed present within the construction footprint due to suitable habitat and adjacent CNDDB record.
Southwestern pond turtle (*Actinemys pallida*)	-	SSC	Documented in the upper reach of Honda Creek. May be found in construction area due to proximity of aquatic habitat.
Two-striped garter snake (*Thamnophis hammondii*)	-	SSC	Documented in Honda Creek. May be found in construction area due to proximity of aquatic habitat.
Birds			
Allen's hummingbird (*Selasphorus sasin*)	BCC	-	Likely: foraging habitat in the construction area; nesting habitat in the nearby riparian habitat of Honda Canyon.
Black oystercatcher (*Haematopus bachmani*)	BCC	-	Documented on sandy beaches and cliffs of VSFB shoreline within the noise footprint.
Black skimmer (*Rynchops niger*)	BCC	-	Documented on nearshore ocean within the noise footprint.
Brant (*Branta bernicla*)	-	SSC	Documented on nearshore ocean within the noise footprint
Burrowing owl (*Athene cunicularia*)	BCC	SSC	Likely: winters in burrows in grassland areas impacted by noise. Breeding on VSFB has not been documented in optimal breeding habitat on Base since 1984 (reflects a well-documented county-wide decline of the species). The construction area is poor breeding habitat and would only support temporary or opportunistic occurrence in the non-breeding season.
California brown pelican (*Pelecanus occidentalis californicus*)	-	Fully Protected	Documented in nearshore ocean waters and roosts on beaches and rocks within the noise footprint.

Species	Status		Occurrence within the Proposed Action Area
	USFWS	CDFW	
California condor (*Gymnogyps californianus*)	FE	SE	Unlikely: may stray into region on occasion. One documented brief occurrence on VSFB in 2017.
Costa's hummingbird (*Calypte costae*)	BCC	-	Likely: foraging habitat in the construction area. Nesting habitat in Honda Canyon and erosional wash habitat impacted by noise.
Golden eagle (*Aquila chrysaetos*)	BGEPA	Fully Protected	Likely: occasionally observed on VSFB in areas within the noise footprint.
Lawrence's goldfinch (*Spinus lawrencei*)	BCC	-	Likely: may forage and nest in construction area and areas within the noise footprint.
Loggerhead shrike (*Lanius ludovicianus*)	BCC	SSC Nesting	Likely: may forage and in the construction area and habitat within the noise footprint.
Long-billed curlew (*Numenius americanus*)	BCC	-	Documented on sandy beaches of VSFB shoreline within the noise footprint.
Marbled godwit (*Limosa fedoa*)	BCC	-	Documented on sandy beaches of VSFB shoreline within the noise footprint.
Marbled murrelet (*Brachyramphus marmoratus*)	FT	SE	Documented in offshore ocean waters within the noise footprint.
Northern harrier (*Circus hudsonius*)	-	SSC Nesting	Assumed present due to suitable foraging habitat in the construction area and likely to nest in grassland habitats within the noise footprint
Nuttall's woodpecker (*Dryobates nuttallii*)	BCC	-	Assumed present due to suitable nesting riparian habitat within the noise footprint.
Oak titmouse (*Baeolophus inornatus*)	BCC	-	Assumed present due to suitable nesting riparian habitat within the noise footprint.
Peregrine falcon (*Falco peregrinus anatum*)	BCC Nesting	Fully Protected Nesting	Documented foraging and nesting in coastal habitat within the noise footprint.
Short-billed dowitcher (*Limnodromus griseus*)	BCC	-	Documented on sandy beaches and rocky coastline of VSFB within the noise footprint.

Species	Status		Occurrence within the Proposed Action Area
	USFWS	CDFW	
Whimbrel (*Numenius phaeopus*)	BCC	-	Documented on sandy beaches and rocky coastline of VSFB within the noise footprint.
Western snowy plover (*Charadrius nivosus nivosus*)	FT; BCC	SSC Nesting	Documented on sandy beaches of VSFB within the noise footprint.
Willet (*Tringa semipalmata*)	BCC	-	Documented on sandy beaches of VSFB within the noise footprint.
White-tailed kite (*Elanus leucurus*)	-	Fully Protected Nesting	Assumed present due to suitable foraging habitat within the construction area and nesting habitat in riparian and non-native tree habitat within the noise footprint.
Yellow warbler (*Setophaga petechia*)	BCC	SSC Nesting	Assumed present due to suitable riparian habitat within the noise footprint.
Terrestrial Mammals			
Pallid bat (*Antrozous pallidus*)	-	SSC	Documented within the noise footprint.
Townsend's big-eared bat (*Corynorhinus townsendii*)	-	SSC	Documented within the noise footprint.
Spotted bat (*Euderma maculatum*)	-	SSC	Documented within the noise footprint.
Western red bat (*Lasiurus blossevillii*)	-	SSC	Documented within the noise footprint.
Western mastiff bat (*Eumops perotis californicus*)	-	SSC	Documented within the noise footprint.
San Diego desert woodrat (*Neotoma lepida intermedia*)	-	SSC	Documented within the noise footprint.
American badger (*Taxidea taxus*)	-	SSC	Assumed present due to suitable habitat within and adjacent to the construction area and nearby documented localities.

Notes: BGEPA = Bald and Golden Eagle Protection Act; FE = Federally Endangered Species; FT = Federally Threatened Species; SE = State Endangered Species; SSC = California State Species of Special Concern; BCC = Federal Bird Species of Conservation Concern

3.3.4.1. Tidewater Goby (Federally Listed Endangered Species)

Suitable habitat for TWG is found in Honda Creek and TWG were recorded in Honda Creek in 1995 (Lafferty et al. 1999). Surveys in 2008, 2015, and 2016 indicated that TWG were not present

(MSRS 2009, 2016, 2018). No TWG were observed while monitoring for culvert repairs on Honda Creek in 2022 (MSRS, unpubl. data). Between 2008 and 2022, Honda Creek has gone through multiple cycles of drying and rehydration, which would preclude occupancy by and persistence of fish. Although there are historical records, TWG are unlikely to be present in the Action Area. Critical habitat has been designated for TWG but does not include VSFB, since it is owned by the DOD and is exempted under section 4(a)(3) of the ESA.

3.3.4.2. Unarmored Threespine Stickleback (Federally Listed Endangered Species)

UTS have are found in San Antonio Creek from Barka Slough to the lagoon, mostly in the creek channel rather than the lagoon (MSRS 2009; Swift et al. 1997). UTS were introduced into Honda Creek in 1984 (MSRS 2009) but extensive aquatic surveys conducted in 2008, 2016, and 2017 did not detect any fish in Honda Creek (MSRS 2009, 2016, 2018). Between 2008 and 2022, Honda Creek has gone through multiple cycles of drying and rehydration, which would preclude occupancy by and persistence of fish. Although there are historical records, UTS are unlikely to be present in the Action Area. Critical habitat has not been finalized.

3.3.4.3. California Red-Legged Frog (Federally Listed Threatened Species)

CRLF have been documented in nearly all permanent streams and ponds on VSFB as well as most seasonally inundated wetland and riparian sites (Figures 3.3-2 and 3.3-3; Christopher 2002). CRLF have been consistently documented in Honda Creek, adjacent to SLC-5 (Christopher 2002; MSRS 2009, 2016, 2018, 2021a) and during SpaceX launch monitoring activities in January 2022 (MSRS in prep.). Due to the proximity of CRLF aquatic habitat, upland habitat in the Proposed Action Area is likely to support CRLF (Figure 3.3-3). The SLC-5 site is within 450 ft of occupied CRLF habitat within Honda Creek and portions of the Proposed Action Area encompassing Honda Canyon Road are within 50 ft of Honda Creek and support areas of dense vegetation that could provide shelter for upland active CRLF, especially during periods of wet weather. USFWS designated critical habitat for the species along the southeastern (Unit STB-4) and northeastern (Unit STB-2) perimeters of VSFB (see inset in Figure 3.3-2).

3.3.4.4. Marbled Murrelet (Federally Listed Threatened Species)

There have been three recorded sightings of MAMU off the coast in nearshore waters between the Santa Maria River and offshore of VSFB from on-land observation sites (eBird 2022). Impacts to MAMU may occur if individuals are within the offshore ocean area encompassed by the 100 dB L_{max} launch contour (Figure 3.3-6). MAMU has never been documented breeding on VSFB, nor is any old-growth coniferous forest present on VSFB or in the Action Area. There is no designated critical habitat for this species within or adjacent to the Action Area.

3.3.4.5. Western Snowy Plover (Federally Listed Threatened Species)

VSFB provides breeding and wintering habitat for SNPL (USFWS 2014; Robinette et al. 2016, 2021). The breeding population of SNPL on VSFB has been highly variable but relatively stable since 2007, with 235 adults and 472 nests initiated in 2021 (Robinette et al. 2021). The shoreline closer to SLC-5 is dominated by steep rocky cliffs and narrow beaches that are typically fully inundated at high tide, therefore no suitable nesting beaches for SNPL are present south of the

southern end of Surf Beach. The nearest documented SNPL nest to the SLC-5 was on Surf Beach, approximately 3.5 mi north of SLC-5 (Figures 3.3-8 and 3.3-9). VSFB was exempted from critical habitat designation under Section 4(a)(3) of the ESA. The nearest critical habitat is approximately 8 mi to the north on Santa Rosa Island which would not be impacted by noise (Figure 3.3-10).

3.3.4.6. California Condor (Federally Listed Endangered Species)

The California condor's current range is not within the Action Area. However, in March 2017, one immature, non-reproductive female was present on VSFB for a short period of time, departing on or about 22 April 2017. Given the wide-ranging nature of this species, individuals may occur on Base in the future. There is no critical habitat within or adjacent to the Action Area.

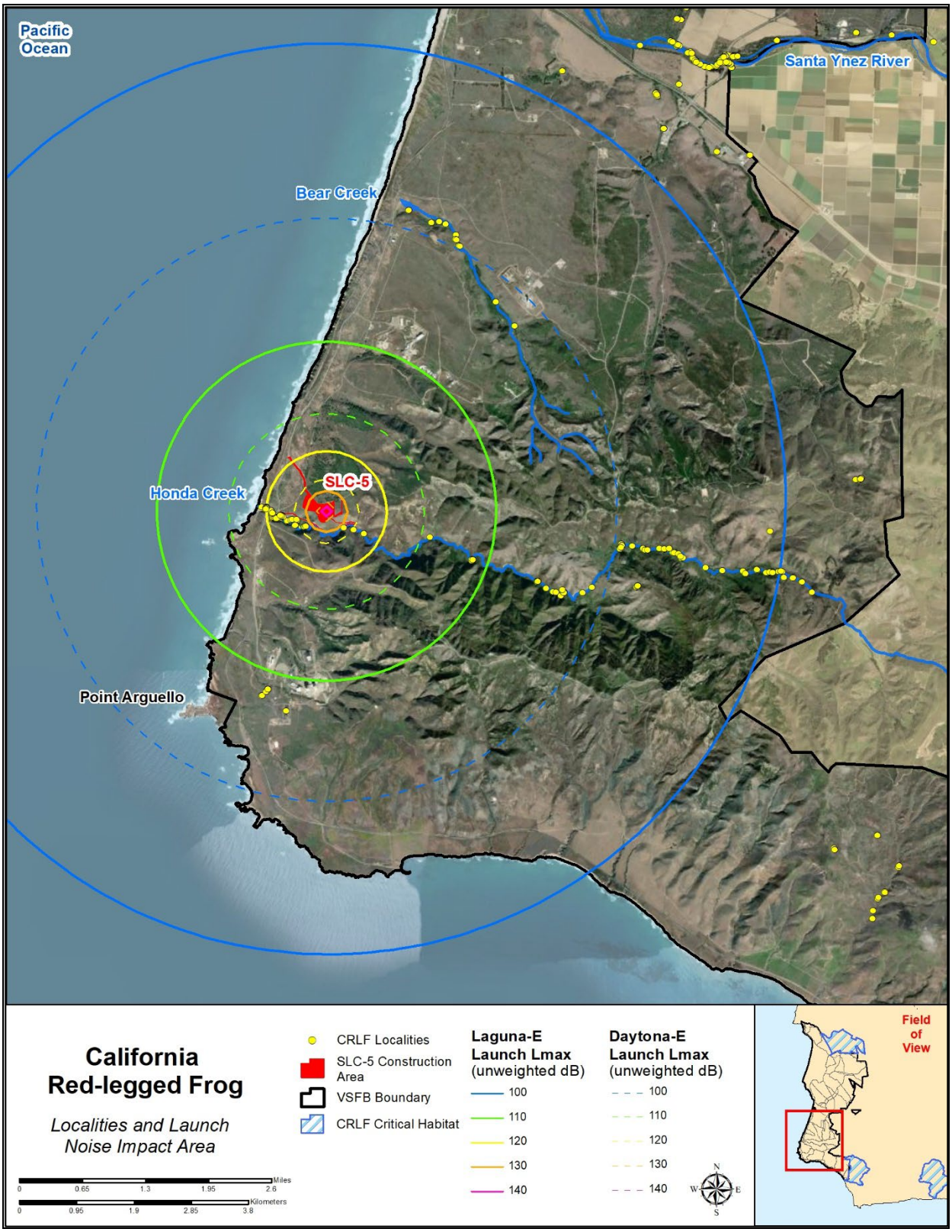

Figure 3.3-2: California red-legged frog localities, Critical Habitat (inset), and launch noise impact areas

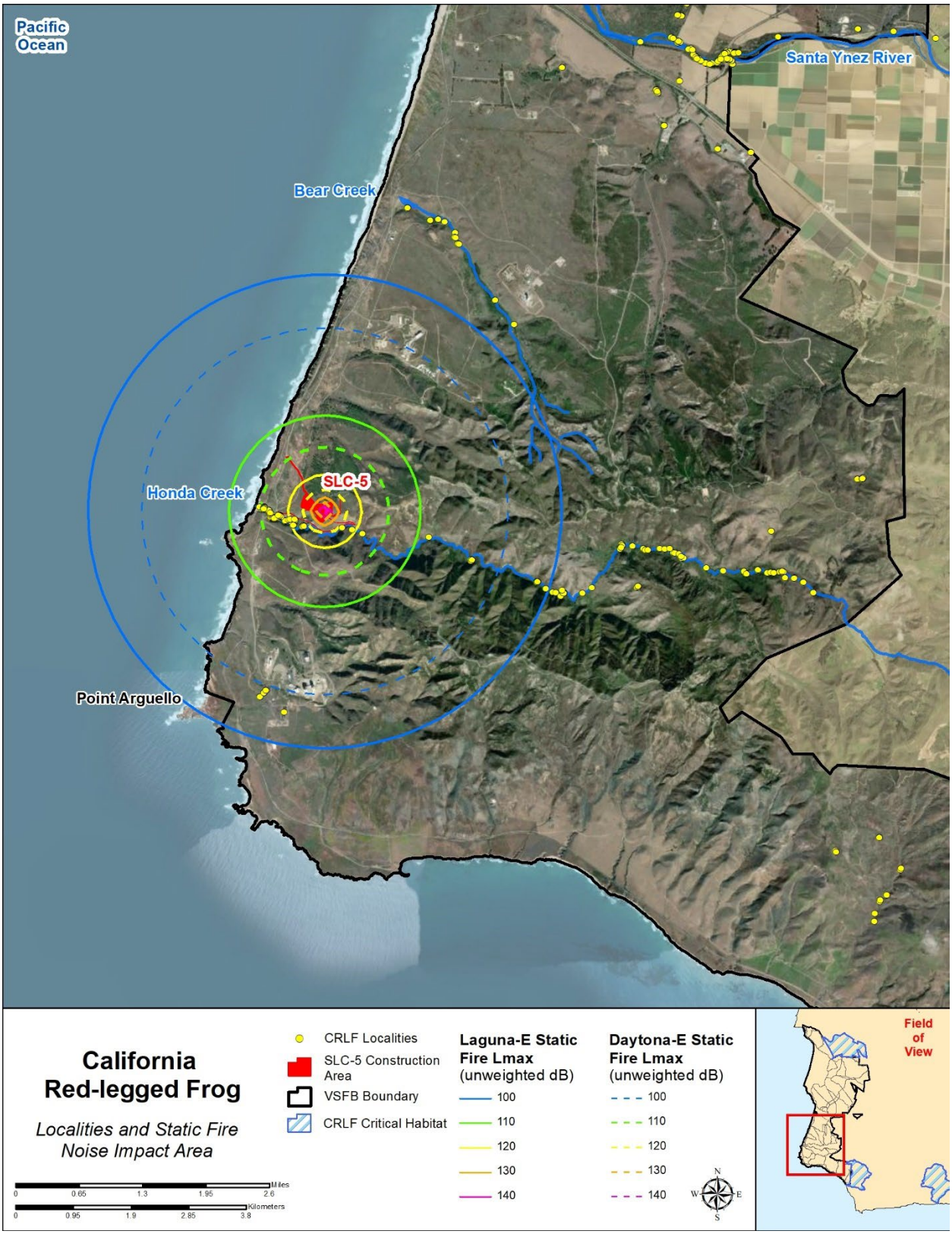

Figure 3.3-3: California red-legged frog localities, Critical Habitat (inset), and Laguna-E and Daytona-E static fire noise impact areas

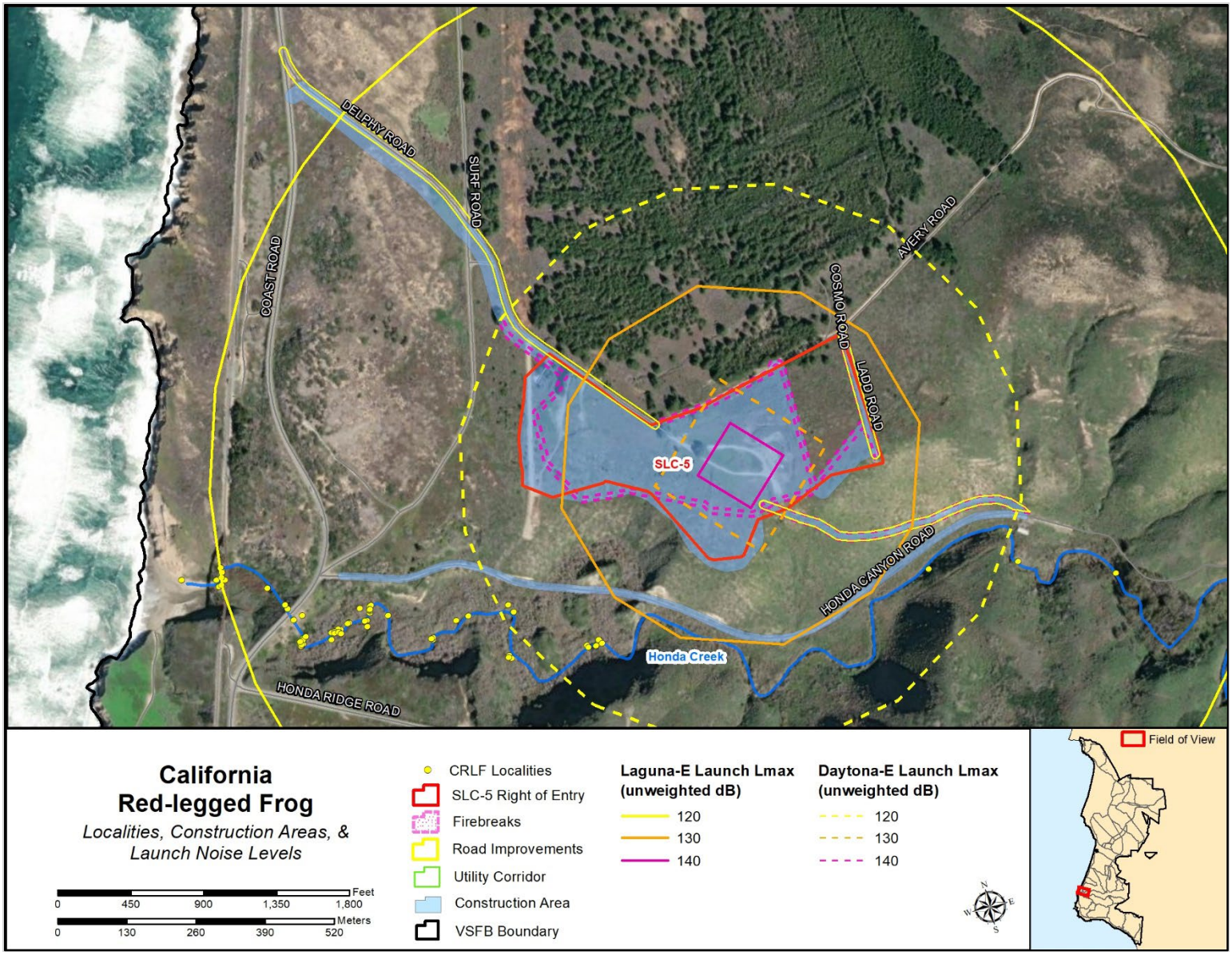

Figure 3.3-4: California red-legged frog localities and Laguna-E and Daytona-E launch noise levels in the vicinity of SLC-5

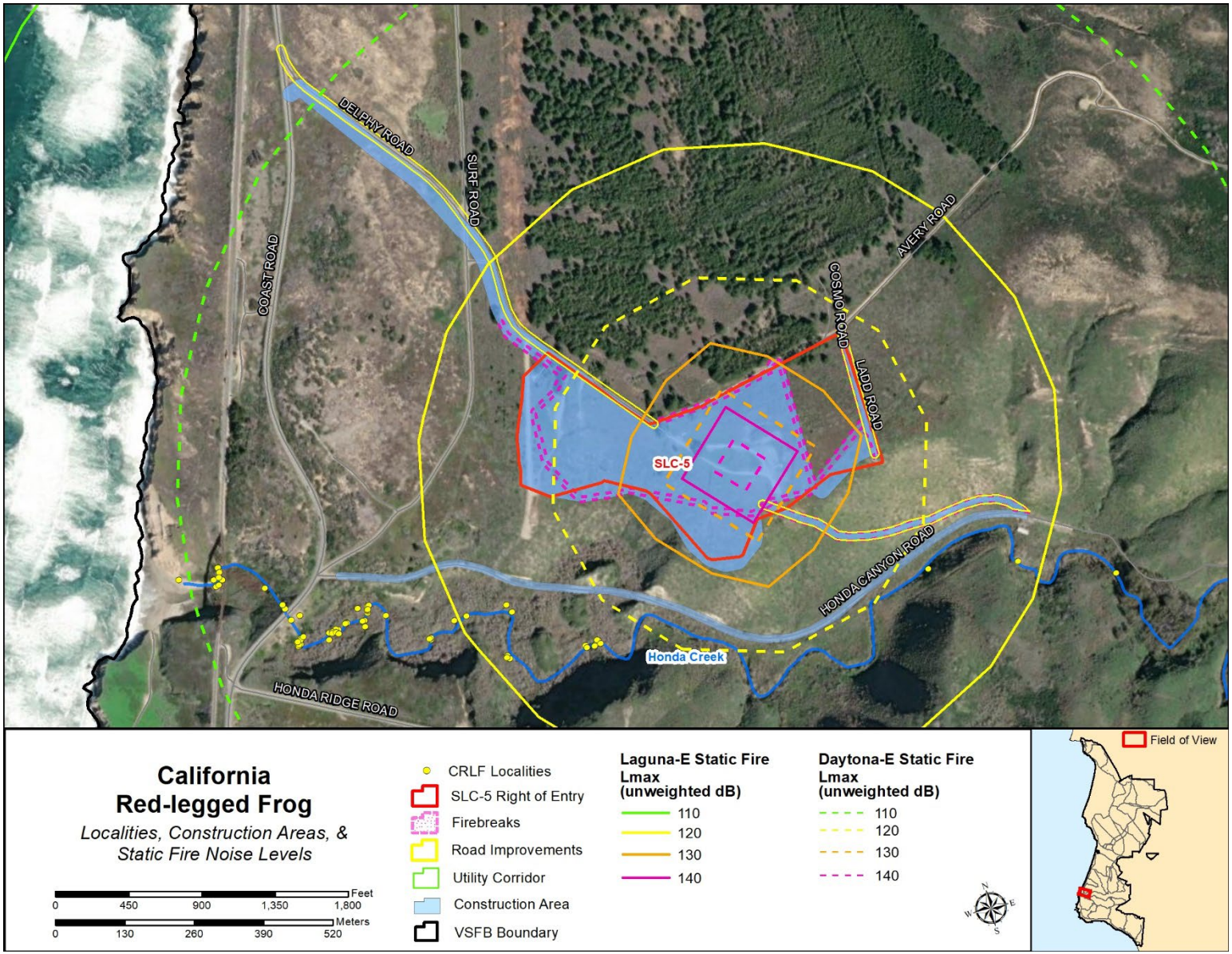

Figure 3.3-5: California red-legged frog localities and Laguna-E and Daytona-E static fire noise levels in the vicinity of SLC-5

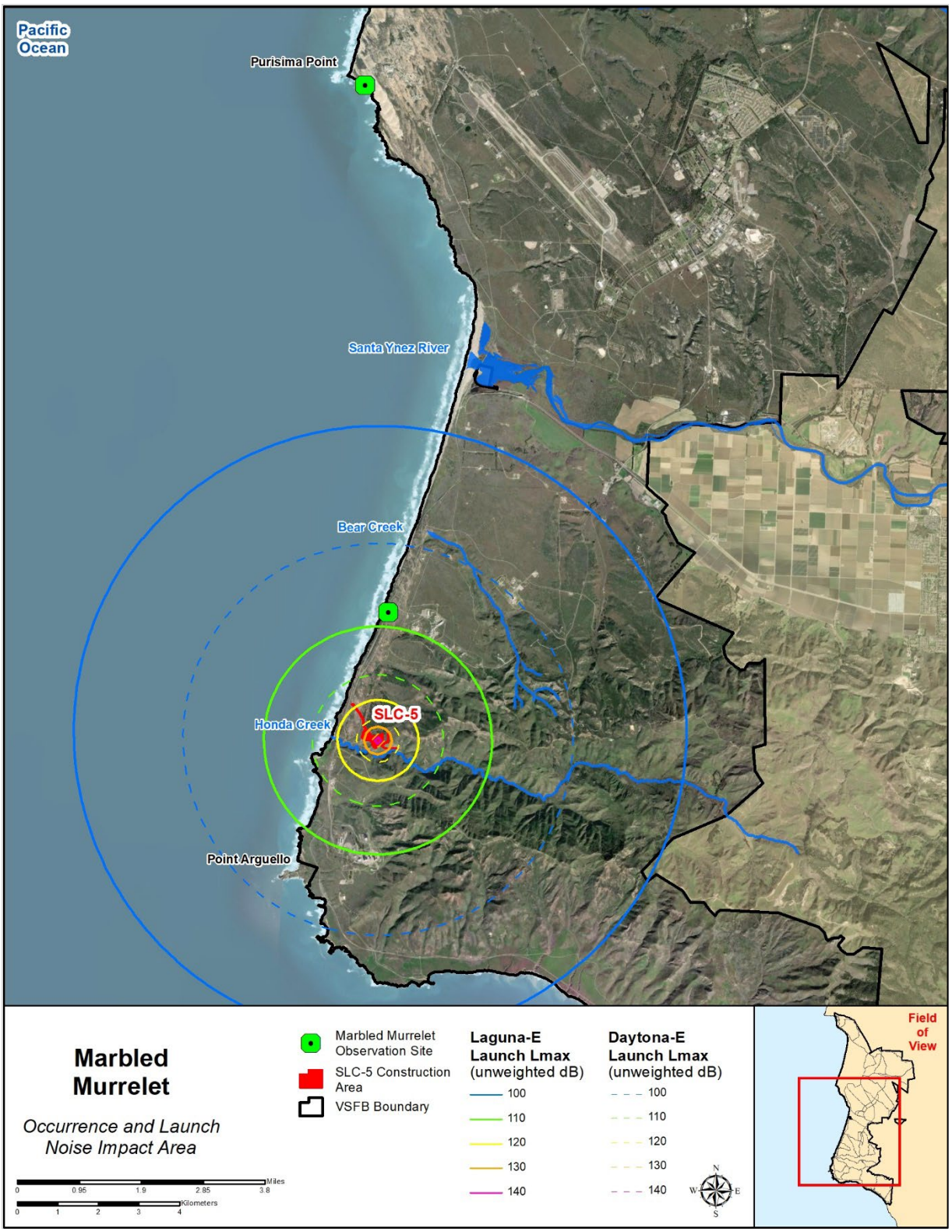

Figure 3.3-6: Marbled murrelet observation sites and Laguna-E and Daytona-E launch noise impact areas. (Source: eBird 2021; Note: birds were observed at an unrecorded distance offshore of these observation sites)

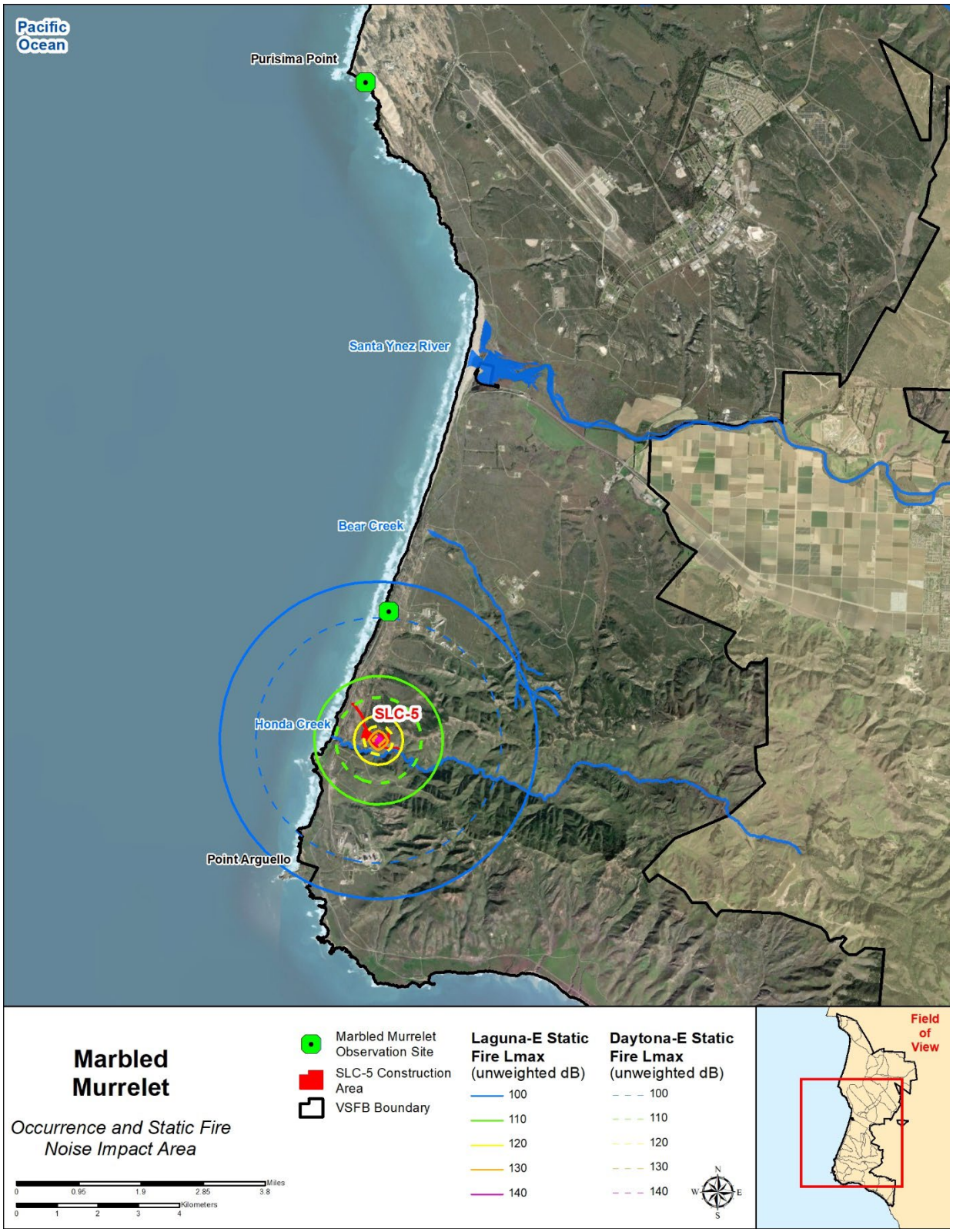

Figure 3.3-7: Marbled murrelet observation sites and Laguna-E and Daytona-E static fire noise impact areas. (Source: eBird 2021. Note: birds were observed at an unrecorded distance offshore of the observation sites shown in the figure.)

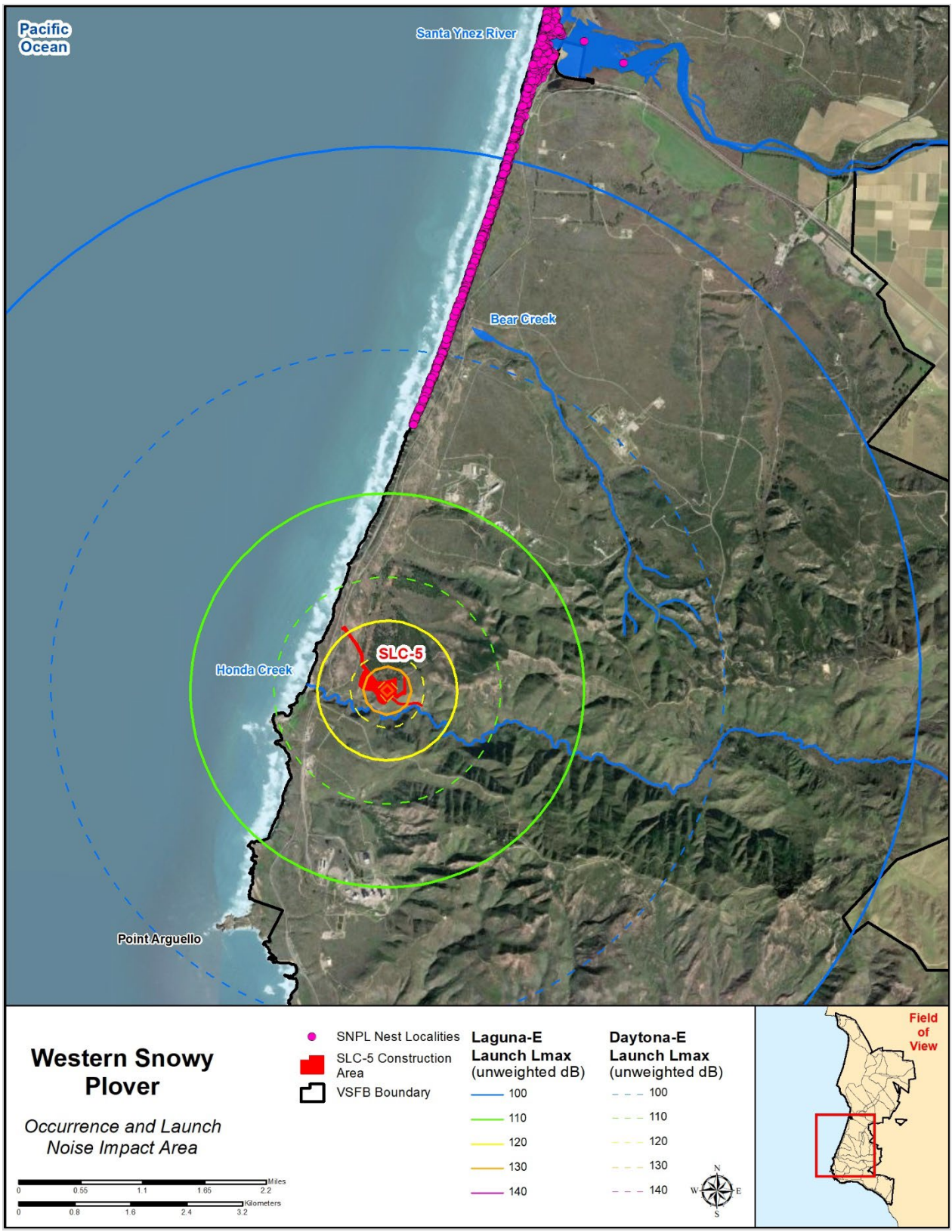

Figure 3.3-8: Western snowy plover nesting records and Laguna-E and Daytona-E launch noise impact areas

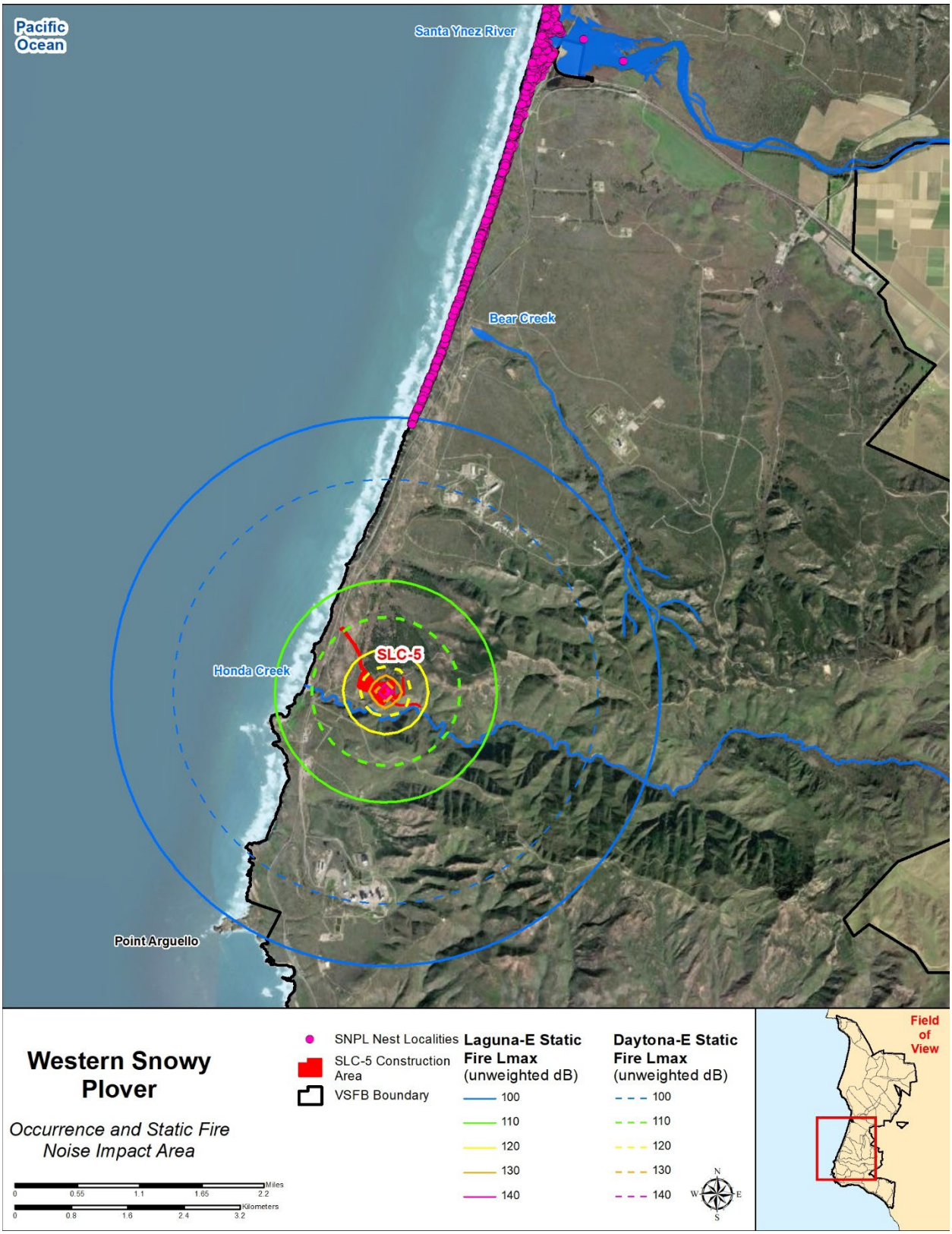

Figure 3.3-9: Western snowy plover nesting records and Laguna-E and Daytona-E static fire noise impact areas

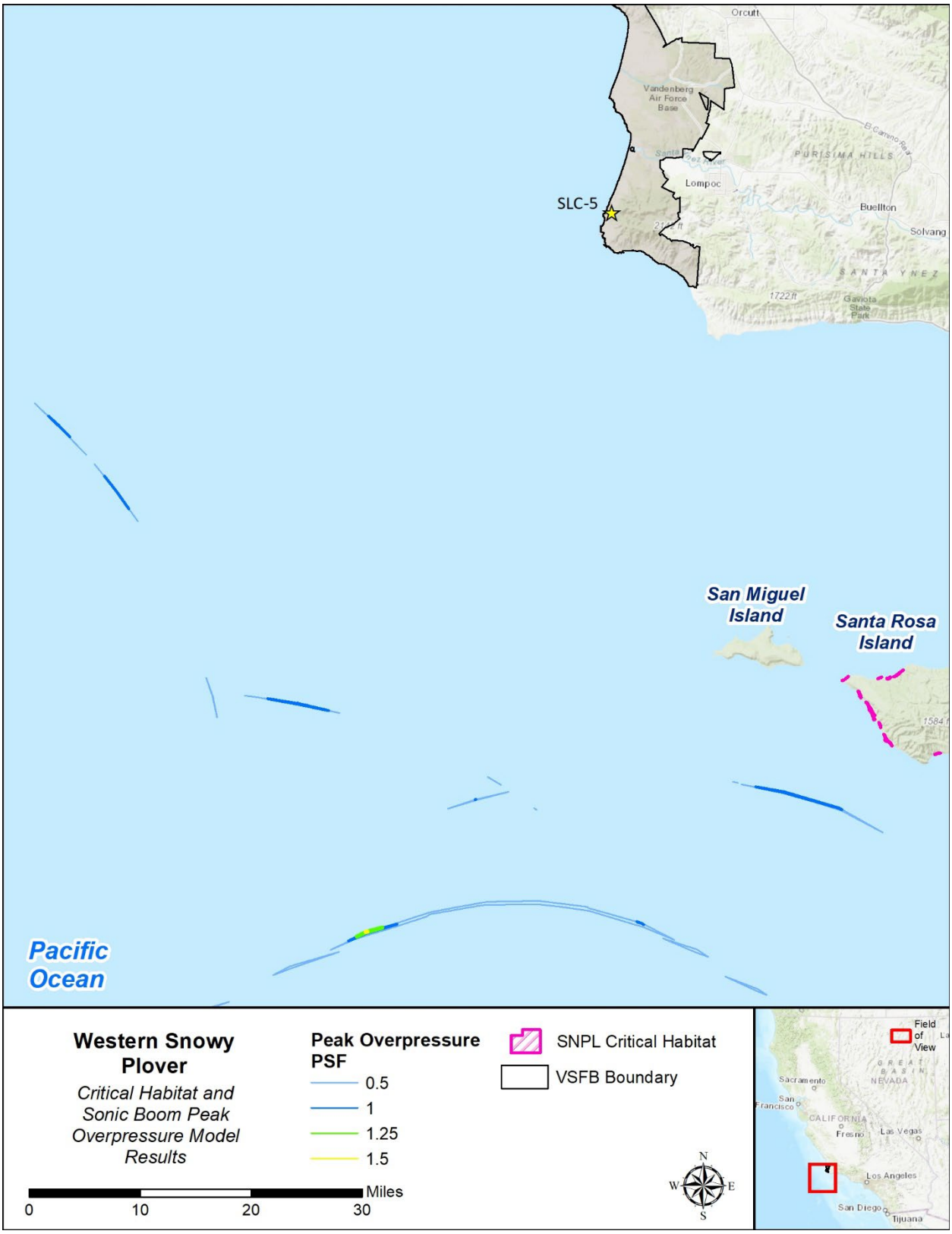

Figure 3.3-10: Designated Critical Habitat for the western snowy plover and sonic boom model results

3.4. Marine Biological Resources

The ROI for marine biological resources is primarily defined by the area impacted by noise and includes coastal areas and the waters offshore of SLC-5 and due south of VSFB within the area potentially impacted by sonic boom during launch (Figures 2.3-8 through 2.3-13). The ROI also includes the broad ocean area where first stages would be expended in the Pacific Ocean (Figure 2.3-14) where fish, sea turtle, and marine mammal species protected under the ESA or MMPA, and managed by NMFS, have the potential to occur (Tables 3.4-1 through 3.4-3). Detailed background information on ESA-listed fish, sea turtles, and marine mammals, including status and maps showing occurrence in the project area, can be found in Appendices B and J.

3.4.1. ESA-listed Fish Species

Table 3.4-1: ESA-listed Fish Species Occurrence Within the ROI

Species	Status	Presence in Action Area
Oceanic whitetip shark (*Carcharhinus longimanus*)	FT	Present in open ocean waters from Southern California to Peru.
Scalloped hammerhead shark (*Sphyrna lewini*)	FE	Present in coastal and semi-oceanic water in temperate and tropical regions.

Notes: FE = Federally Endangered Species; FT = Federally Threatened Species

3.4.1.1. Oceanic Whitetip Shark (Federally Listed Threatened Species)

Oceanic whitetips occur throughout the Central Pacific, including the eastern Pacific from Southern California to Peru and the Gulf of California. They are known to occur in Baja California and may be found in surface waters off the continental shelf (Baum et al. 2015) and are therefore expected to occur within the ROI. Critical habitat has not been designated for this species.

3.4.1.2. Scalloped Hammerhead Shark (Federally Listed Endangered Species)

Scalloped hammerhead sharks in the eastern Pacific Ocean range from the coast of southern California to Ecuador (Compagno 1984; Froese & Pauly 2016) and are therefore expected in the ROI. Critical habitat has not been designated for this species.

3.4.2. ESA-listed Sea Turtles

Table 3.4-2: ESA-listed Sea Turtle Species Occurrence Within the ROI

Species	Status	Presence in Action Area
Green sea turtle (*Chelonia mydas*)	FT	Present in offshore and nearshore subtropical waters.
Leatherback sea turtle (*Dermochelys coriacea*)	FE	Present in offshore and nearshore waters.
Olive ridley sea turtle (*Lepidochelys olivacea*)	FE	Present in offshore and nearshore waters.

Hawksbill sea turtle (*Eretmochelys imbricata*)	FE	Present in offshore and nearshore waters of Mexico.
Loggerhead turtle (*Caretta caretta*)	FE	Present in small numbers in offshore waters generally north of Point Conception

Notes: FE = Federally Endangered Species; FT = Federally Threatened Species

3.4.2.1. Green Sea Turtle (Federally Listed Threatened Species)

Green sea turtles are widely distributed in the subtropical coastal and ocean waters of southern Baja California, Mexico, and Central America (Cliffton et al. 1995; NMFS and USFWS 1998). The species is occasionally observed in ocean waters off southern California and northern Baja California (Stinson 1984) and is therefore within the ROI. Critical habitat has not been designated in the Pacific Ocean.

3.4.2.2. Loggerhead Turtle (Federally Listed Endangered Species)

Loggerhead turtles are found worldwide mainly in subtropical and temperate regions (Conant et al. 2009). In the eastern Pacific, the loggerheads primary range extends from offshore of Vancouver Island, south to Central America. The loggerhead turtle is known to occur at sea off of southern California, but does not nest on southern California beaches. There is no critical habitat designated for the North Pacific Ocean Distinct Population Segment (DPS).

3.4.2.3. Olive Ridley Sea Turtle (Federally Listed Endangered Species)

Most olive ridley turtles lead a primarily open ocean existence (NMFS and USFWS 1998b). Individuals occasionally occur in waters as far north as California (NMFS and USFWS 2007). Critical habitat has not been designated for the olive ridley turtle.

3.4.2.4. Hawksbill Sea Turtle (Federally Listed Endangered Species)

Water temperature in the southern California offshore waters is generally too low for hawksbills, and their occurrence offshore of California would be considered rare. They are more common in nearshore foraging grounds, including coral reefs and mangrove estuaries from Baja California to South America (NMFS and USFWS 2013). However, hatchlings utilize floating algal mats and drift lines in pelagic (open sea) habitat (NMFS and USFWS 2013) and therefore may be found in the ROI. Critical habitat has not been designated for the hawksbill in the Pacific Ocean.

3.4.2.5. Leatherback Sea Turtle (Federally Listed Endangered Species)

Leatherback sea turtles are regularly seen off the west coast of the U.S., with the greatest densities found in waters along Central California during summer and fall when sea surface temperatures are highest (Bailey et al. 2012). In 2012, NMFS designated critical habitat for the leatherback sea turtle in California waters from Point Arena to Point Arguello out to the 3,000-m isobath (77 FR 4169). The Primary Constituent Elements (PCEs) defining leatherback critical habitat are the occurrence of prey species, primarily Scyphomedusae, commonly known as jellies, of the order Semaeostomeae (Chrysaora, Aurelia, Phacellophora, and Cyanea), of sufficient condition, distribution, diversity, abundance, and density necessary to support individual as well as population growth, reproduction, and development of leatherbacks…" (50 CFR Part 226.207).

3.4.3. Marine Mammals

Table 3.4-2: Marine Mammals Within the ROI of the Proposed Action Area

Species	Status	Potential Occurrence within the Proposed Action Area
Cetaceans		
Blue whale (*Balaenoptera musculus*)	FE, MMPA	High densities in summer/fall; single individuals in winter/spring.
Fin whale (*Balaenoptera physalus*)	FE, MMPA	Higher densities in the summer and fall, present year-round.
Gray whale (*Eschrichtius robustus*)	FE, MMPA	Present during seasonal migration in the winter and spring.
Humpback whale (Mexico) (*Megaptera novaeangliae*)	FE, MMPA	Individuals present year-round with higher seasonal presence during the summer migrations from Mexico and Central America.
Humpback whale (Mexico) (*Megaptera novaeangliae*)	FT, MMPA	Individuals present year-round with higher seasonal presence during the summer migrations from Mexico and Central America.
Killer whale (*Orcinus orca*)	FE, MMPA	Occasionally present offshore of Central and Southern California.
Sei whale (*Balaenoptera borealis*)	FE, MMPA	Present year round with more likely presence in the winter and spring.
Sperm whale (*Physeter macrocephalus*)	FE, MMPA	Present year round with a preference for deep waters and the continental shelf break and slope.
Pinnipeds		
California sea lion – U.S. Stock (*Zalophus californianus*)	MMPA	Documented in coastal waters within the noise footprint.
Guadalupe fur seal	FT; MMPA	Primarily present at NCI and between 50 and 300 kilometers (km) offshore seasonally when not at rookeries in Mexican waters.
Northern elephant seal – California Breeding Stock (*Mirounga angustirostris*)	MMPA	Documented in coastal waters within the noise footprint.
Pacific harbor seal – California Stock (*Phoca vitulina richardii*)	MMPA	Documented in coastal waters within the noise footprint.
Southern sea otter (*Enhydra lutris nereis*)	FT, MMPA	Present along coast of California from Santa Barbara County and north; present along coast of San Nicolas Island.
Steller sea lion - Eastern U.S. Stock (*Eumetopias jubatus*)	MMPA	Documented in coastal waters within the noise footprint.

Notes: FE = Federally Endangered Species; FT = Federally Threatened Species; MMPA = Marine Mammal Protection Act, NCI = Northern Channel Islands

3.4.3.1. Blue Whale (Federally Listed Endangered Species)

The blue whale inhabits all oceans and typically occurs near the coast, over the continental shelf, though they are also found in oceanic waters. Relatively high densities of blue whales occur off Central and Southern California during the summer and fall (Becker et al. 2016). Blue whales in the eastern north Pacific migrate between higher latitude feeding grounds of the Gulf of Alaska and the Aleutian Islands to lower latitudes, including Southern California and Baja California, Mexico (Palacios et al. 2019). There is no designated critical habitat for this species.

3.4.3.2. Fin Whale (Federally Listed Endangered Species)

Fin whales have frequently been recorded in waters within Southern California and are present year-round (Mizroch et al. 2009). Sightings from surveys off Southern California from 2004 to 2013 show fin whales farther offshore in summer and fall and closer to shore in winter and spring (Douglas et al. 2014; Campbell et al. 2015). No critical habitat has been designated for the fin whale.

3.4.3.3. Western North Pacific Gray Whale (Federally Listed Endangered DPS)

Gray whales of the Western North Pacific DPS primarily occur in shallow waters over the U.S. West Coast, Russian, and Asian continental shelfs and are considered to be one of the most coastal of the great whales (Jefferson et al. 2008; Jones & Swartz 2009). The breeding grounds are in Baja California, Mexico. At least 12 members of the Western North Pacific DPS have been detected in waters off the Pacific Northwest (Weller & Brownell 2012; Mate 2013; Moore & Weller 2018). Although they generally remain mostly over the shelf during migration, some gray whales may be found in more offshore waters to the west of San Clemente Island and the Channel Islands (Guazzo et al. 2019). There has been no designated critical habitat for the Western North Pacific gray whale DPS.

3.4.3.4. Humpback Whale, Mexico Distinct Population Segment (Federally Listed Threatened DPS) and Central American Distinct Population Segment - (Federally Listed Endangered DPS)

Breeding and calving areas for the Mexico DPS and for the Central America DPS are both located within the ROI. While most humpback whale sightings are in nearshore and continental shelf waters, humpback whales frequently travel through deep oceanic waters during migration (Dohl et al. 1983; Forney & Barlow 1998; Campbell et al. 2015). Humpback whales migrating from breeding grounds in Central America to feeding grounds at higher latitudes cross the Action Area.

Critical habitat overlaps the Action Area. Region/Unit 17 extends from 36° 00' to 34° 30' north latitude. Within those north and south boundaries, Region/Unit 17 begins at the 98-ft depth contour out to the 12,139-ft depth contour. The essential feature for the Central America DPS is "Prey species, primarily euphausiids (Thysanoessa, Euphausia, Nyctiphanes, and Nematoscelis) and small pelagic schooling fish, such as Pacific sardine (*Sardinops sagax*), northern anchovy (*Engraulis mordax*), and Pacific herring (*Clupea pallasii*), of sufficient quality, abundance, and accessibility within humpback whale feeding areas to support feeding and population growth

(NMFS 2019c). The Mexico DPS is very similar, but adds capelin (*Mallotus villosus*), juvenile walleye pollock (*Gadus chalcogrammus*), and Pacific sand lance (*Ammodytes personatus*) to the essential prey species lists.

3.4.3.5. Killer Whale (Federally Listed Endangered DPS)

Southern Resident killer whales occur mainly along the outer coast and inland waters of Washington and British Columbia, Canada. In recent years, the population has shifted and expanded its range south as far as central California (Cogan 2015; Dahlheim et al. 2008). Satellite-tag locations found that 95% of Southern Resident killer whales were within 18 nm of shore, and 50% were within 5 nm of shore (Hanson et al. 2018; Hanson et al. 2017). No recovery activities would occur within 12 nm of islands; therefore, relatively few killer whales are expected to occur in areas where these activities would be conducted.

NMFS amended and expanded the critical habitat designation for Southern Resident killer whales to include nearshore waters along the coasts of Washington, Oregon, and California in 2021. The elements of critical habitat essential for conservation of the Southern Resident killer whale are: (1) water quality to support growth and development; (2) prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth; and (3) passage conditions to allow for migration, resting, and foraging. The amended critical habitat designation extends along the entire Oregon coastline but is outside the ROI.

3.4.3.6. Sei Whale (Federally Listed Endangered Species)

Sei whales are encountered during the summer off California and the North America coast from approximately the Mexican border to Vancouver Island, Canada (Masaki 1976; Horwood 2009; Smultea et al. 2010). Sei whales are expected to be present in offshore waters in the ROI. There is no designated critical habitat for this species.

3.4.3.7. Sperm Whale (Federally Listed Endangered Species)

Sperm whales are found year-round in California waters, but their abundance is temporally variable, most likely due to the availability of prey species (Forney & Barlow 1993; Smultea 2014). They tend to prefer deep waters and the continental shelf break and slope (Barlow 1995; Barlow & Forney 2007). There is no designated critical habitat for this species.

3.4.3.8. Southern Sea Otter (Federally Listed Threatened Species)

Southern sea otters occur regularly off the coast of VSFB, with animals concentrated in the kelp beds offshore of Purisima Point on north VSFB and Sudden Flats on south VSFB. The inshore habitat off of Sudden Flats supports expansive kelp beds and a relatively high density of otters. Transitory otters occasionally move along the coast between offshore of SLC-5. There is no designated critical habitat for this species.

3.4.3.9. California Sea Lion

California sea lions are common offshore of VSFB and haul out sporadically on rocks and beaches along the coastline of VSFB. They occasionally haul out on south VSFB, but rarely pup on the VSFB coastline (USAF 2021). They are the most abundant pinniped species in the Channel Islands (Lowry et al. 2017a). SMI is the northern extent of the species' breeding range hosting one of the largest breeding colonies of the species in the Channel Islands (Melin et al. 2010; Lowry et al. 2017b).

3.4.3.10. Steller Sea Lion

North Rocky Point was used in April and May 2012 by Steller sea lions (Marine Mammal Consulting Group and Science Applications International Corporation [MMCG and SAIC] 2012). This was the first time they had been reported at VSFB over the past two decades. Since 2012, Steller sea lions have been observed infrequently in routine monthly surveys, with as many as 16 individuals recorded (MMCG & SAIC 2012). Steller sea lions once had two small rookeries on SMI, but these were abandoned after the 1982–1983 El Niño event (DeLong & Melin 2000; Lowry 2002); however, occasional juvenile and adult males have been detected since then.

3.4.3.11. Pacific Harbor Seal

Pacific harbor seals congregate on multiple rocky haulout sites along the VSFB coastline, including Point Conception. Most haulout sites are located between the Boat House and South Rocky Point, where most of the pupping on VSFB occurs (USSF 2021). Pups are generally present in the region from March through July. Harbor seals also haul out, breed, and pup in isolated beaches and coves throughout the coast of SMI (Lowry et al. 2017a).

3.4.3.12. Northern Elephant Seal

Northern elephant seals haul out on rocks and beaches along the coastline of VSFB (USSF 2021). Pupping was observed on south VSFB in January 2017 for the first time in more than 40 years and every year since then. Northern elephant seals also breed and pup at the rookeries found at Point Bennett and Cardwell Point on SMI (Lowry 2002). Northern elephant seals are abundant at the NCI from December to March (Lowry et al. 2017a).

3.4.3.13. Northern Fur Seal

The California stock of Northern fur seal is not considered depleted under the MMPA (Carretta et al. 2020). Animals from the California stock may remain in or near SMI throughout the year but, after the breeding season in November (Melin et al. 2012; Lowry et al. 2017a; Zeppelin et al. 2019). The abundance of northern fur seals at SMI has increased steadily over the past four decades, except for two severe declines associated with El Niño-southern Oscillation events in 1993 and 1998 (Carretta et al. 2020). Live northern fur seals have not been observed at any VSFB haulout location (USSF 2021).

3.4.3.14. Guadalupe Fur Seal (Federally Listed Endangered Species)

Guadalupe fur seals are most common at their primary breeding ground of Guadalupe Island, Mexico (Melin & DeLong 1999). Satellite tracking data have demonstrated movements into the

offshore waters between 50 and 300 km from the U.S. West Coast (Norris & Elorriaga-Verplancken 2020). Therefore, the seals are expected to occur in both deeper waters of the open ocean and coastal waters within the project area. The species has occasionally been observed at SMI since the mid-1960s and in the late 1990s, a pup was born on SMI. In NMFS aerial surveys between 2011 and 2015, Guadalupe fur seals were not observed on any of the Channel Islands other than at SMI (Lowry et al. 2017b; Burke 2017; NMFS 2020). Guadalupe fur seals have not been observed at any VSFB haulout locations (USSF 2021).

3.4.4. Marine Reserves

Under the National Marine Sanctuaries Act, the NOAA established national marine sanctuaries for marine areas with special conservation, recreational, ecological, historical, cultural, archaeological, scientific, educational, or aesthetic qualities. The Channel Islands National Marine Sanctuary (CINMS) is a collection of marine reserves and marine sanctuaries located at the Channel Islands approximately 40 mi south of SLC-5. CINMS regulations listed in 15 CFR Parts 922.71–922.74. Section 922.72(a)(1) prohibits taking any marine mammal, sea turtle, or seabird within or above the CINMS, except as authorized by the MMPA, ESA, MBTA, or any regulation promulgated under the MMPA, ESA, or MBTA. Sonic boom created by Daytona-E or Laguna-E launches are not expected to exceed 1.5 psf nor are they expected to impact the CINMS (Figures 2.3-6 and 2.3-7); therefore, CINMS is not considered further in this EA.

The coastline from Purisima Point to just south of Point Arguello has been designated as the Vandenberg State Marine Reserve (VSMR) pursuant to the Marine Managed Areas Improvement Act. The VSMR management objectives include providing for complete protection of a diverse area containing shallow hard and soft habitats, kelp beds, and associated marine life. Launches of the Daytona-E and Laguna-E would produce engine noise less than 120 dB L_{max} within the VSMR.

3.5. Water Resources

VSFB encompasses portions of two major and four minor drainage basins. San Antonio Creek and the Santa Ynez River represent the major basins, while Shuman Creek, Bear Creek, Honda Creek, and Jalama Creek comprise the minor basins on VSFB. The ROI for water resources includes the lower portion of Honda Creek, San Antonio Creek, and a portion of the Pacific Ocean, referred to as the "broad ocean area" where first stages would be expended (Figure 2.3-14). Honda Creek is almost entirely on VSFB property, originating at the west end of the Santa Ynez Mountains, north of Tranquillon Ridge and draining a catchment of 1,436 ac (USEPA 2020). San Antonio Creek drains an area of approximately 154 mi^2 flowing westward and discharging into the Pacific Ocean. Groundwater from the San Antonio Creek basin supplies water for irrigation, domestic, industrial, and municipal purposes through pumping. A detailed description of the regulatory setting is contained in Appendix K (Water Resources).

3.5.1. Surface Water

A description of surface water resources, including the Honda Creek and San Antonio Creek watersheds, associated flow rates, and habitat, is contained in Appendix K. Rate of flow in both watersheds is seasonal, with higher flows during the rainy season from November to May and

lower flow during the rest of the year when precipitation is infrequent. Mean rainfall for the region, measured at Surf from 1927 through 2021, is 11.2 inches (28.4 cm; County of Santa Barbara Public Works 2022).

3.5.2. Groundwater

A detailed description of groundwater resources, including basins, subbasins, and supply, is contained in Appendix K. VSFB includes parts of two major groundwater basins, and at least two subbasins. Most of the northern third of the Base is within the San Antonio Creek Basin, while most of the southern two thirds of the Base is within the Santa Ynez River Basin and associated Lompoc Terrace and Cañada Honda Subbasins (USSF 2021). The Proposed Action is within the Cañada Honda Subbasin, and its associated subbasin is also thus predominantly on VSFB property.

VSFB has two sources of drinking water; during normal operating conditions, the primary source comes from the State Water Project and the secondary source comes from four groundwater wells located on VSFB property. The VSFB wells are typically only used to augment State Water supplies and become the primary source during emergency repair or annual maintenance shutdowns on the State Water Project system. Over the past twenty years there have been several persistent drought periods affecting State Water Project supplies and VSFB has had to rely on its groundwater wells for extended periods to meet supply demands.

3.5.3. Waters of the U.S., Waters of the State, and Wetlands

Honda Creek is a perennial blueline waterway located immediately south of the Proposed Action Area and contains jurisdictional waters and wetlands protected under federal and state laws (MSRS 2021b). A recent jurisdictional delineation found no Waters of the U.S., Waters of the State, jurisdictional wetlands, or non-jurisdictional waters within the construction area (MSRS 2021c). Jurisdictional waters may be impacted in the event of an explosion on the pad or shortly after liftoff; however, this represents an off-nominal, worst-case scenario. In the event of an anomaly, Phantom would implement a Mishap and Emergency Response Plan, which would be prepared as required under 14 CFR Part 450. Therefore, jurisdictional waters, including wetlands, are not carried forward for analysis in this EA.

3.5.4. Floodplains

The canyon carved by Honda Creek is a narrow, steep-sided cut running westward through south VSFB, roughly coinciding with the Cañada Honda fault. Because the canyon is narrow and steep, the floodplain is highly constricted. It widens slightly just upstream of the culverts where the creek winds through dense arroyo willow groves. EO 11988 requires federal agencies to reduce the risk of flood loss, minimize the impact of flood on human safety, and to restore and preserve the natural and beneficial values served by floodplains and evaluate alternatives prior to proceeding with federal actions that may affect floodplains. The FAA significance threshold is whether the Proposed Action would cause notable adverse impacts on natural and beneficial floodplain values. The Proposed Action would not occur within the 100-year or 500-year floodplain (Figure 3.5-1). Therefore, the Proposed Action is not subject to EO 11988 (*Floodplains*

Management) and 13690 (*Establishing a Federal Flood Risk Management Standard…,* reinstated by EO 14030) and is not carried forward for analysis.

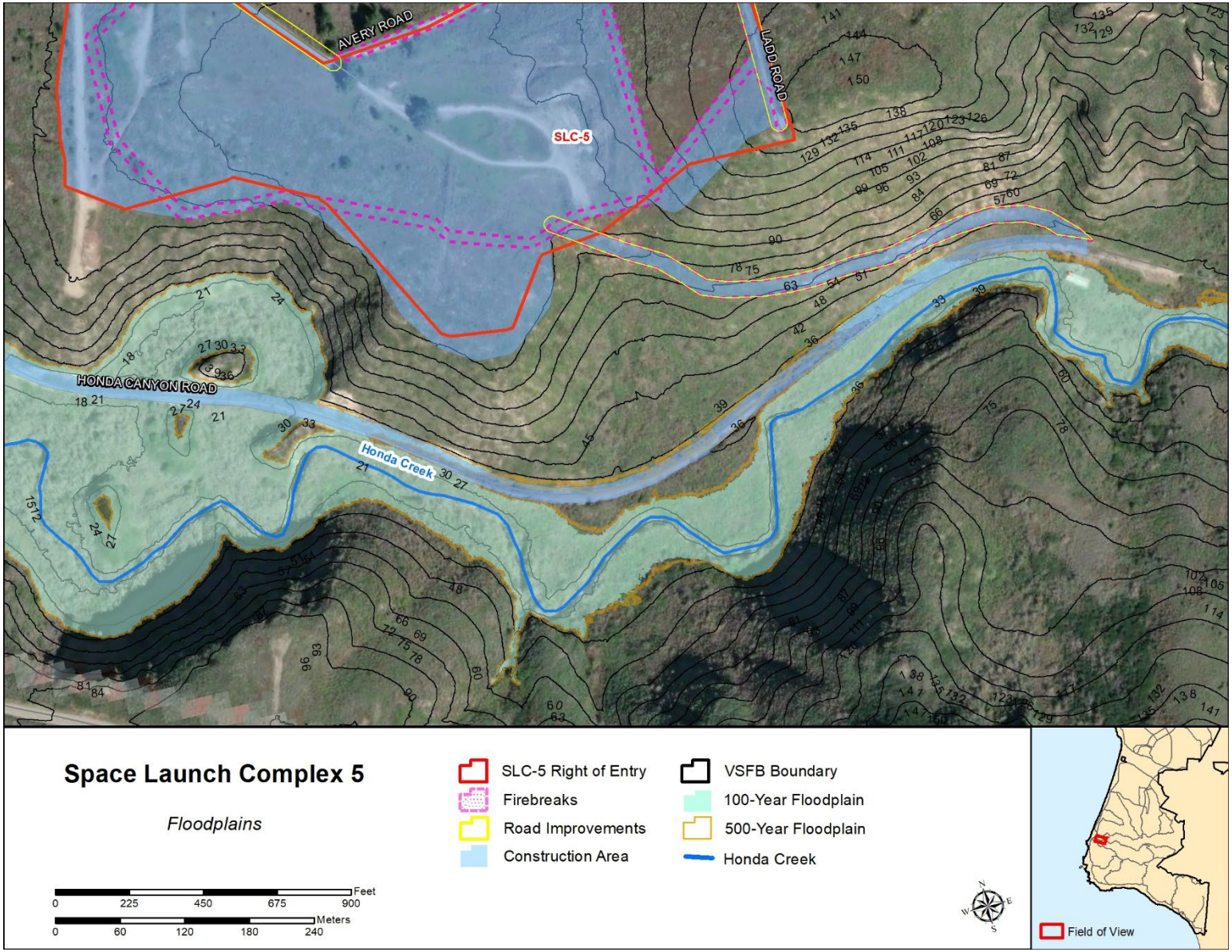

Figure 3.5-1: Honda Creek Floodplains

3.6. Cultural Resources

Cultural resources are districts, buildings, sites, structures, areas of traditional use, or objects with historical, architectural, archeological, cultural, or of scientific importance. They include archeological resources (both prehistoric and historic), historic architectural resources (physical properties, structures, or built items), and traditional cultural properties (those important to living Native Americans for religious, spiritual, ancestral, or traditional reasons).

The NHPA establishes national policy for protecting significant cultural resources that are defined as "historic properties." The term "historic property" refers to any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in the NRHP (36 CFR Part 800.16).

The ROI for cultural resources includes VSFB's regional setting and the specific Proposed Action Area, including the cultural resources located therein. These cultural resources within the project area are discussed below, and a cultural setting and history detailed description is contained in Appendix L (Cultural Resources).

The Proposed Action would involve ground-disturbing activities to construct SLC-5 and associated infrastructure for operating the Daytona-E and Laguna-E launch programs. SLC-5 was demolished to bare earth around 2012, except for access roads that still connect the site to Coast Road, a main thoroughfare. In addition, noise and vibration produced during launch events could potentially impact historic properties - specifically, wood or adobe buildings not built to withstand concussive forces, and rock resources such as rock cairns, rock shelters, or rock art. When defining the Area of Potential Effects (APE) for these impacts, the FAA uses the 120 dB L_{max} noise contour to define the APE for engine noise, because Fenton and Methold (2016) showed no material effect to buildings below 120 dB. The FAA uses the 2 psf overpressure contour to define the APE for areas exposed to a sonic boom, based on Haber and Nakaki (1989) who found damage to buildings to be unlikely below 2 psf.

The APE for the Proposed Action therefore includes a nearly 3,200-ft radius around the proposed launch facility for noise vibration levels above 120 dB L_{max} (Figures 2.3-8 and 2.3-9) and a sonic boom arc that would produce ground-level vibrations of 2 psf or greater over open ocean (Figures 2.3-6 and 2.3-7). Although the Proposed Action includes launching both the Daytona-E and Laguna-E vehicles, the Laguna-E would produce more noise and vibration than the Daytona-E. Therefore, the Laguna-E noise study results are used for this analysis and to define the APE.

3.6.1. Cultural Resources within the Project Area

SLD 30 conducted Section 106 studies for the Proposed Action that included background research, surface survey, subsurface survey excavations, and excavation to identify and assess the Proposed Action's potential effects to cultural resources. SLD 30 defined the Area of Direct Impact (ADI) for ground disturbing activities as the footprint for all foreseeable project-related ground-disturbing activities, including launch pads and related infrastructure; the utility corridor; and roads, firebreaks, and vegetation management areas. SLD 30 defined the APE as the ADI plus the entirety of any cultural resources it contains or intersects. In addition to the facility component of the APE described above, the APE for the Proposed Action also includes a nearly

3,200-foot radius around the proposed launch facility for noise vibration levels above 120 dB as well as a sonic boom arc that would occur during launches and produce ground-level vibrations of 2 psf or greater over open ocean. Together, these comprise the launch component of the APE. The results are reported by Morrison et al. (2022) and are the basis for the following summary.

3.6.1.1. Background Research

SLD 30 completed a cultural resources records and literature search that included reviewing resource records, reports, and site condition assessments, and examining GIS and USGS topographic maps.

Background research indicated that the entire study area has been previously surveyed for cultural resources. Four archaeological sites (CA-SBA-538, -670, -2230, and -2934) are recorded within the facility component of the APE. A detailed description of these sites is presented in Appendix L. In addition, three previously recorded isolated artifacts and one newly discovered isolated artifact are present within or immediately adjacent to the ADI; see Appendix L for a brief description of each artifact.

Background research confirmed that no historic buildings, or rock cairn, rock shelter, or rock art resources, are within the 120 dB L_{max} Laguna-E launch noise contour. One structure, the Honda Trestle, is within the 120-dB L_{max} Laguna-E launch noise contour. Like military or launch support facilities, the Honda Trestle was built to withstand concussive forces; thus, this structure does not have the potential to be adversely affected by rocket engine noise. Similarly, the Anza Trail (CA-SBA-3804) is within the launch noise contour but does not have any physical manifestation and therefore does not have the potential to be affected by rocket engine noise. Additionally, the 2 psf sonic boom arc would not occur over VSFB. Thus, neither the Anza Trail nor the Honda Trestle are included in the APE. Rather, the focus of the Section 106 study was the ADI and APE related to the area of physical impacts (the facility component of the APE).

Background research identified 38 previous investigations within the APE (Table 3.6-1). Table 3.6-2 lists cultural resources that are either recorded or mapped within the Study Area, and their NRHP status. Cultural resources within the facility component of the APE are summarized in Appendix L.

Table 3.6-1: Previous Cultural Resource Investigations Within the Study Area

Author(s)/Year (in chronological order)	VAFB Report No.	Report Title	Site(s) (CA-SBA)
Spanne and Glassow (1974)	1974-01	*Air Force Space Transportation System, Vandenberg AFB, Santa Barbara County, California, Testing and Evaluation of Archaeological Sites: A Preliminary Report*	-538, -670
Spanne (1974)	1974-02	*Archaeological Survey of Vandenberg Air Force Base, Santa Barbara County, California 1971–1973*	-538, -670
Glassow et al. (1976)	1976-01	*Evaluation of Archaeological Sites on Vandenberg Air Force Base, Santa Barbara County, California*	-538, -670
Spanne (1980)	1980-06	*An Archaeological Evaluation of a Cable Trench at CA-Sba-670 and CA-Sba-1144 Honda Canyon, Vandenberg Air Force Base, Santa Barbara County, California*	-670
Stone and Glassow (1980)	1980-11	*Analysis of a Telephone Cable Trench, Sba-670, Sba-1144, Vandenberg Air Force Base, Santa Barbara County, California*	-670
Glassow (1981)	1981-10	*Preliminary Report, Archaeological Data Recovery Program in Relation to Space Shuttle Development, Vandenberg Air Force Base, California*	-670
Neff (1982)	1982-05	*Final Report, Vandenberg Air Force Base, California, 1982 Fuels Management Program, Cultural Resources Survey/Evaluation*	-538
U.S. Air Force Flight Test Center (1983)	1983-11	*An Archaeological Survey of Proposed Road and Minuteman Launch Facility Modifications for the Peacekeeper in Minuteman Silos Testing Program, Vandenberg Air Force Base, California*	-670
Schilz (1985)	1985-03	*Archaeological Survey, Testing, and Evaluation: STS Power Plant No. 6 Natural Gas Pipeline, Vandenberg Air Force Base, Santa Barbara County, California*	-670
Gibson (1985)	1985-07	*Results of Archaeological Testing at Sba-212 and Sba-1145, Vandenberg Air Force Base, California*	-670
Harmsworth Associates (1987)	1987-14	*Preliminary Case Report in Support of the U.S. Air Force No Effect Determination, Gaseous Nitrogen Pipeline Project*	-670
Bergin (1988a)	1988-03	*Documentation in Support of U.S. Air Force No Adverse Effect Determination for Affected Historic Properties: Natural Gas Pipeline Project, Space Transportation System Project, Vandenberg Air Force Base, California*	-670
Bergin (1988b)	1988-04	*A Research Design and Treatment Plan for Historic Properties Affected by Installation of the Space Transport System Natural Gas Pipeline, Vandenberg Air Force Base, Santa Barbara County, California*	-670
Moore et al. (1988)	1988-05	*The Testing and Evaluation of Fourteen Archaeological Sites on South Vandenberg Air Force Base, Santa Barbara County, California*	-670
Ferraro et al. (1988)	1988-12	*Survey, Testing, and Evaluation of Fourteen Sites for the STS Power Plant No. 6 Natural Gas Pipeline Project, Santa Barbara County, California*	-670
Bergin and King (1989)	1989-12	*The Survey and Inventory of Archaeological Properties for the Backbone Fiber-Optic Transmission System Project, Vandenberg Air Force Base, Santa Barbara County, California*	-670
King et al. (1990)	1990-06	*Space Transportation System Natural Gas Pipeline and SLC-4 Security Fence Treatment Programs, Vandenberg Air Force Base, California*	-670
Schmidt and Bergin (1990)	1990-18	*The Testing and Evaluation of Five Archaeological Sites for the Space Launch Complex 4 Power Systems Upgrade, Vandenberg SFB, Santa Barbara County, California*	-2230
Glassow (1990)	1990-21	*Archaeological Investigations on Vandenberg Air Force Base in Connection with the Development of Space Transportation System Facilities*	-670
Environmental Solutions (1990a)	1990-22	*Documentation in Support of U.S. Air Force No Adverse Effect Determination for Phase II Backbone Fiber-Optic Transmission System, Vandenberg Air Force Base, Santa Barbara County, California*	-670
Dames & Moore (1994)	1994-25	*Draft Evaluation of the National Register of Historic Places Eligibility: The Anza Trail*	-3804
National Park Service (1994)	VAFBR-USDI07	*Draft Environmental Impact Statement: Juan Bautista de Anza National Historic Trail, Arizona and California, Comprehensive Management and Use Plan*	-3804

Table 3.6-1 (continued): Previous Cultural Resource Investigations Within the Study Area

Author(s)/Year (in chronological order)	VAFB Report No.	Report Title	Site(s) (CA-SBA)
Garate (1994)	VAFBR-JUANB01	*Juan Bautista de Anza, National Historic Trail. Booklet and Map*	-3804
National Park Service (1996a)	VAFBR-USDI08	*Final Environmental Impact Statement: Juan Bautista de Anza National Historic Trail, Arizona and California Comprehensive Management and Use Plan and Environmental Impact Statement*	-3804
Woodman et al. (1995)	1995-12	*Final Report, Archaeological Survey and Evaluation of the Honda Beach Site, Sba 530*	-670
Wilcoxon (1998)	1998-10	*VAFB Specific Site Revisit Project, Brief Summary. August 3–26, 1998 Inclusive*	-2230
Lebow (2000)	2000-12	*Collection and Management of Radiocarbon Data during Fiscal Year 2000, Vandenberg Air Force Base, Santa Barbara County, California*	-670
Lebow (2002)	—	*Archaeological Studies Supporting an Evaluation of the Anza Trail, Vandenberg Air Force Base, Santa Barbara County, California*	-3804
National Park Service (2003)	- VAFBR-USDOI 002	*The Juan Bautista de Anza National Historic Trail Arizona-California Comprehensive Management and Use Plan*	-3804
Lebow et al. (2003)	2003-11	*Archaeological Studies for the SLC 4 to SLC 6 Waterline Replacement Project, Vandenberg Air Force Base, Santa Barbara, California*	-670, -2230
Lebow (2004)	2004-01	*Archaeological Studies for the Encapsulated Payload Transfer Route, Vandenberg Air Force Base, Santa Barbara County, California*	-670, -2230
Bradley (2005)	2005-08	*Final National Register of Historic Places Evaluation of Eligibility for the Anza Trail, Vandenberg Air Force Base, Santa Barbara County, California*	-3804
Lebow et al. (2011)	2010-08	*Land-Use Strategies in Upper Honda Canyon: Middle and Late Holocene Adaptations at CA-SBA-215, CA-SBA-657, and CA SBA-658, Archaeological Investigations on South Vandenberg Air Force Base for the Tranquillon Mountain Road Project, Santa Barbara County*	-670
Enright and Lebow (2011)	2011-02	*Archaeological Studies in Support of the N1, N3, and N6 Feeder Lines, Vandenberg Air Force Base, Santa Barbara County, California*	-670
Peterson and Ryan (2011)	2011-04	*Identification of Historic Properties and Assessment of Adverse Effects: N1, N3, N6 Feeder Lines Replacement Project, Vandenberg Air Force Base, Santa Barbara County, California*	-538, -670, -2230
Loetzerich (2019)	2019-06	*Identification of Historic Properties and Assessment of Effects: Repair and Replacement of SL-2 and ML/KL Powerlines Project, Vandenberg Air Force Base, Santa Barbara County, California*	-670, -2230
Bienenfeld et al. (2019)	2019-07	*Archaeological Investigations Supporting Section 106 and 110 Compliance for the South Loop 2 and ML/KL Electrical Lines Replacement Project, Vandenberg Air Force Base, Santa Barbara County, California*	-670, -2230
Gerber et al. (2022)	N/A	*Cultural Resource Investigations Supporting Section 106 Compliance for the UPRR Honda Trestle Replacement Project Vandenberg Space Force Base, Santa Barbara County, California*	-670, -3804, Honda Trestle

Table 3.6-2: Cultural Resources within the Study Area

Site No.	Description	Site Type[a]	NRHP Status[b]
CA-SBA-538	Lithic scatter	Location (chipping station)	Determined Ineligibly (6Y) (USAF 1140418A)
CA-SBA-670	Low to moderate density shell midden and lithic scatter, with a cluster of fire-cracked rock	Long-term residence	Determined eligible (2S2) Keeper Letter E.O. 11593)
CA-SBA-2230	Flaked stone and ground stone scatter	Location (chipping station)	Determined Ineligibly (6Y) (USAF 1140418A)
CA-SBA-2930	Sparse lithic scatter with five flakes and a tabular fragment	Location (chipping station)	Unevaluated (7R)
VAFB-ISO-258	Secondary flake	Isolated artifact	N/A
VAFB-ISO-259	Battered cobble	Isolated artifact	N/A
VAFB-ISO-700	Care	Isolated artifact	N/A

a – Site types defined by Lebow and Moratto (2005)
b – California Historical Resource Status codes (current as of 1 March 2020), 6Y = Determined ineligible by consensus through Section 106 process – not evaluated; 2S2 = Individual property determined eligible by a consensus through Section 106 process. 7R = Identified in reconnaissance level survey or in an APE, not evaluated.

3.6.1.2. Section 106 Studies Conducted for the Proposed Action

In May of 2021, SLD 30 performed a surface survey within the facility component of the ADI. Surface survey found one isolated artifact (VAFB-ISO-1049) near the Proposed Action Area but outside the APE. Additionally, SLD 30 completed subsurface survey of the ADI except the areas where demolition of the previous SLC-5 facility, prior grading, and/or very steep topography precluded the presence of intact sites. SLD 30 also tested to evaluate the eligibility of CA-SBA-2934; check for subsurface deposits near isolated artifact VAFB-ISO-1049; and check for subsurface deposits at three previously identified isolate locations near the Proposed Action Area but outside the APE (VAFB-ISO-258, -259, and -700). In consultation with VSFB cultural resources personnel, no testing was performed in the portion of NRHP-eligible CA-SBA-670 within the ADI because proposed activities within this site would be limited to clearing vegetation from the existing pavement.

Surface and subsurface surveys identified no previously unrecorded archaeological sites and one new isolated artifact. The subsurface survey revealed that, likely due to ground disturbance associated with the demolition of SLC-5, CA SBA-2934 is no longer present. Subsurface testing also confirmed that all of the isolated artifacts are truly isolated and not part of archaeological sites. In summary, testing for the Proposed Action did not yield any archaeological materials.

3.7. Department of Transportation Act Section 4(f) Properties

Section 4(f) of the U.S. DOT Act of 1966 (now codified at 49 USC Section 303) protects significant publicly owned parks, recreational areas, wildlife and waterfowl refuges, and public and private historic sites listed or eligible for listing on the NRHP. Section 4(f) provides that the Secretary of Transportation may approve a transportation program or project requiring the use of publicly

owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance, or land of a historic site of national, State, or local significance, only if there is no feasible and prudent alternative to the use of such land and the program or project includes all possible planning to minimize harm resulting from the use.

Procedural requirements for complying with Section 4(f) are set forth in DOT Order 5610.1C, *Procedures for Considering Environmental Impacts*. The FAA also uses Federal Highway Administration (FHWA) regulations (23 CFR Part 774) and FHWA guidance (e.g., Section 4(f) Policy Paper) when assessing potential impacts on Section 4(f) properties. These requirements are not binding on the FAA; however, the FAA may use them as guidance to the extent relevant to FAA projects.

The ROI for Section 4(f) is defined as areas potentially affected by launch noise, downrange noise generated by launch vehicle sonic booms, and areas within potential debris impact corridors associated with launch trajectories. SLD 30 used the larger of the two launch vehicles (Laguna-E) for noise modeling for the sake of conservative analysis. SLD 30 identified five Section 4(f) properties that might be subject to temporary closure or during launch operations. These properties include Wall Beach, Surf Beach, County of Santa Barbara Ocean Beach Park, and Jalama Beach County Park. These properties are outside of the area that would receive launch noise exceeding 100 dB L_{max} (Figure 3.7-1). Proposed launches at SLC-5 would not require closures at any of these beach or park areas except for Jalama Beach County Park.

Jalama Beach County Park offers various recreation options and camping with peak attendance in summer and holidays. Since 1979, an evacuation and closure agreement has been in place between USSF and Santa Barbara County (Appendix M). This agreement includes evacuating Jalama Beach County Park if launch activities have been determined by SLD 30 Range Safety to have certain health and safety risks. Phantom's proposed launches will comply with these procedures. Closures are communicated at least 72 hours' prior to closure and can be evacuated for a maximum of 48 hours. The length and frequency of temporary closures are mission dependent and determined by USSF Range Safety; however, typical closures last between 5 to 8 hours. Road blocks would be erected approximately three hours prior to launch and would be released approximately two hours after a successful launch. If a launch were to be scrubbed after road blocks have been erected, an additional closure would be required.

Peak overpressure of sonic booms generated by the Daytona-E and Laguna-E launch vehicles during ascent would be a maximum of approximately 1.5 psf and impact the Pacific Ocean south of Channel Islands National Park (CINP; Figure 3.7-2). CINP would not be impacted by sonic boom or closed during launch or static fire events. There are no services, such as food or gear stores or rental shops on these five islands. Activities on the islands include hiking, camping, snorkeling, kayaking, whale watching, birdwatching, and taking photographs, among others.

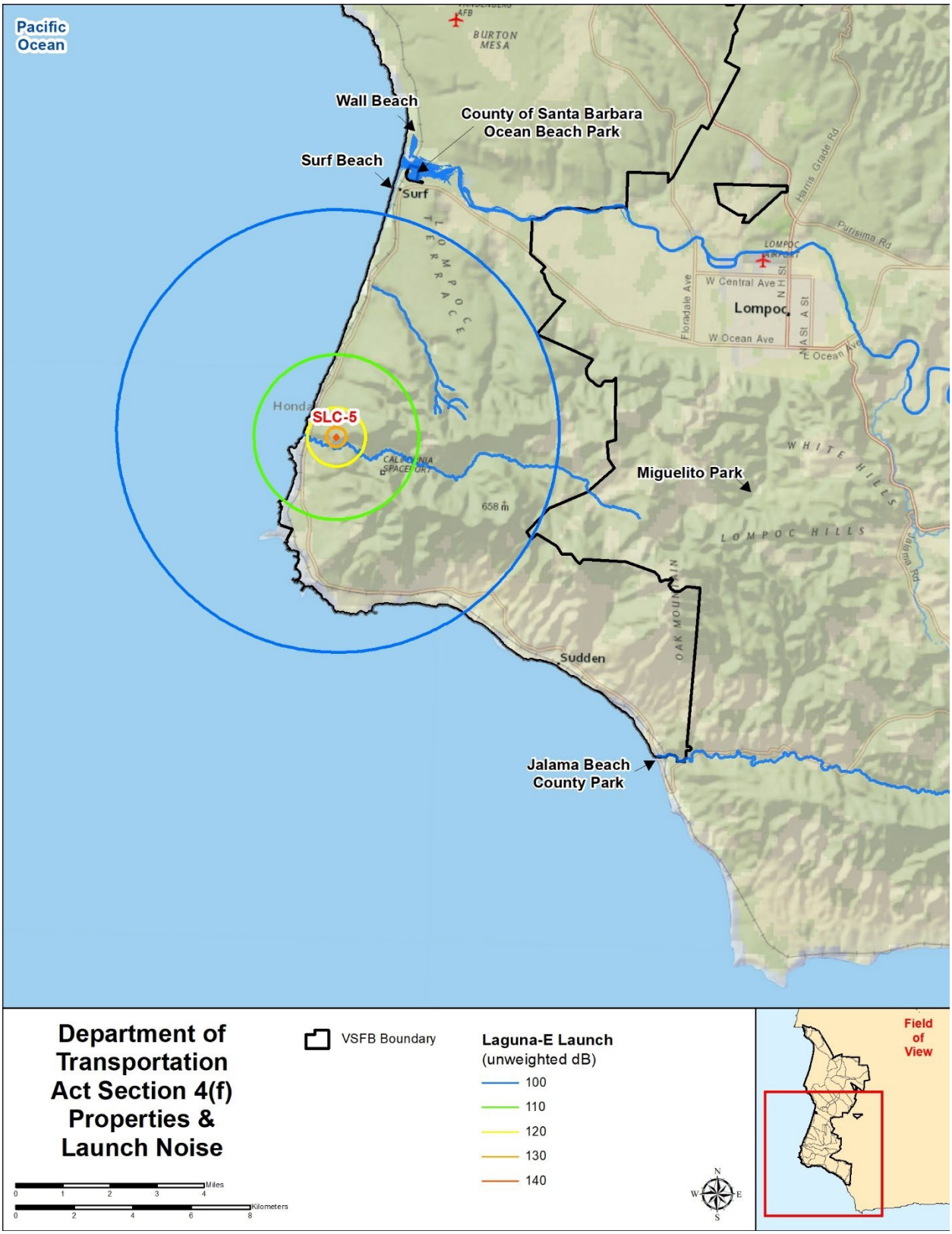

Figure 3.7-1: Potential Department of Transportation Act Section 4(f) Properties and Launch Sound Pressure Levels

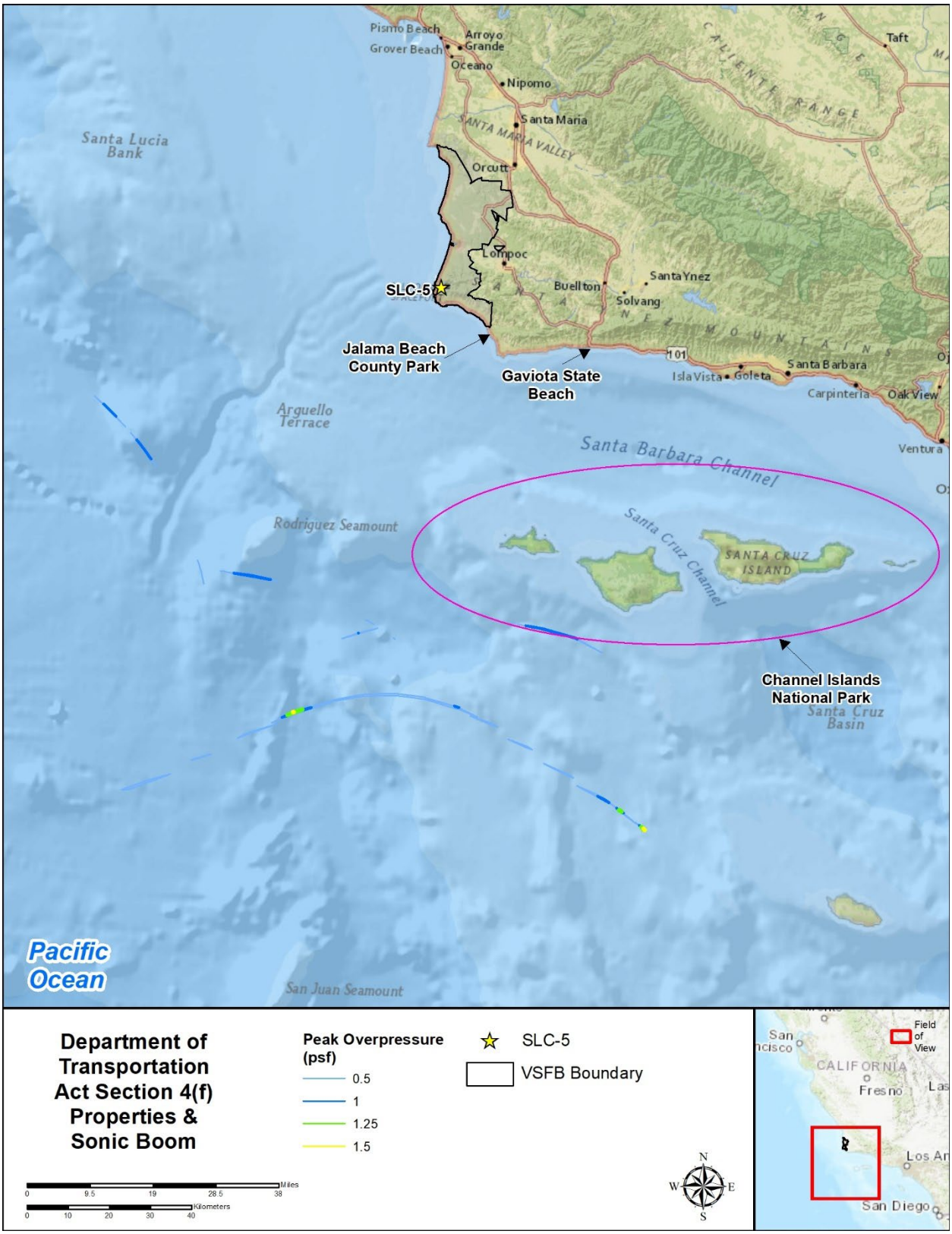

Figure 3.7-2: Potential Department of Transportation Act Section 4(f) Properties and Sonic Boom

3.8. Transportation

For this EA's purpose, the ROI for transportation would be the combined railway, highway, arterial, and local roads that provide service to VSFB, the surrounding area, and the Proposed Action Area, including maritime traffic in the Pacific Ocean broad ocean area. Existing roadway conditions are evaluated based on roadway capacity and traffic volume. The capacity reflects the network's ability to serve the traffic demand of a roadway and depends on the roadway width, number of lanes, intersection control, and other physical factors. Roadway capacity is the ability of the road network to serve traffic demand, which is dependent on factors such as roadway width, number of lanes, intersection control, and other physical factors. Traffic volumes are reported as average daily traffic (ADT), which represents the number of vehicles averaged over a daily period. Roadway performance is generally expressed in terms of Level of Service (LOS). Table 3.8-1 shows the LOS scale ranges from A to F, with each level defined by a range of volume-to-capacity (V/C) ratios. LOS A, B, and C are considered good operating conditions with minor to tolerable delays experienced by motorists. LOS D represents below-average conditions. LOS E reflects a roadway at maximum capacity, and LOS F represents traffic congestion. Most roads on VSFB operate at a LOS between A and C.

Table 3.8-1: Level of Service Scale

LOS Level	Condition
A	Traffic flows at or above the posted speed limit and all motorists have complete mobility between lanes.
B	Traffic is slightly more congested than LOS A, but speed remains the same. Some restrictions to maneuverability; motorists may drive side by side, limiting lane changes.
C	More congestion than LOS B. The ability to pass or change lanes is not always assured. This level is the target for most urban and rural highways. Roads at this level are efficiently close to capacity, and posted speed is maintained.
D	Speeds are somewhat reduced; motorists are restricted by other vehicles. This level is equivalent to a functional urban highway during commuting hours and is a common goal for urban streets during peak hours.
E	Traffic flow becomes irregular and speed varies rapidly without reaching posted limits. LOS E represents a road at or approaching its designated capacity.
F	Lowest measure of efficiency. Traffic flow is forced, with all vehicles restricted by those in front; frequent slowing is required. Level F represents a road in a constant traffic jam.

Source: Institute of Transportation Engineers 1982

VSFB is located approximately 5 mi west of the city of Lompoc. As shown in Figure 3.8-1, the main access route to VSFB is Hwy 101, a coastal four-lane divided freeway connecting Northern California to Southern California. The VSFB connections to Hwy 101 are Hwy 1, SR 135, and SR 246. Hwy 1, a north-south highway, traverses VSFB and provides access to Santa Maria to the northeast, and Santa Barbara to the southeast. When used with Hwy 101, SR 246, an east-west highway, provides access to Lompoc to the east, and Santa Barbara to the southeast. SR 135 and SR 246 are mostly two-lane undivided highways with four-lane rural expressway portions. Near VSFB, the LOS for Hwy 101 is "D", Hwy 1 is "C" or lower, SR 135 is "D", and SR 246 is "D" (USAF 2014).

VSFB is a federal military installation. Parts of VSFB can be accessed only by authorized military personnel and their families, Base civilian employees with approved identification, visitors with pre-approved authorization, and authorized contractors. There is no public access to roadways within the Proposed Action Area. The Proposed Action Area is located within south VSFB and is accessible by paved roads from the South Base Gate (Figure 3.8-1). Project personnel and equipment would access the location by entering VSFB through the Solvang Gate from West Ocean Avenue, travel south on Arguello Road, west on Bear Creek Road, south on Coast Road, and to the destination on Delphy Road. There are no readily accessible alternate routes to SLC-5, although Avery Road would be a suitable egress road to the east during emergencies.

On VSFB, roads are classified as highway (primary), local (secondary), and patrol (tertiary) (USAF 2014). Primary roads serve large volumes of traffic, are divided, and are the main circulation routes on VSFB. The primary roads on south base include Arguello Road, Bear Creek Road, and Coast Road, all of which would be used to access SLC-5 (Figure 3.8-1). Secondary roads, including Surf Road and Delphy Road, provide for traffic movement between primary roads and access roads. All paved roads on South VSFB are rated for loads of at least 20 tons and include ample turning radii. LOS on VSFB roads is generally "A" (USAF 2014). The Solvang Gate on South VSFB operates at LOS A, while the Lompoc Gate, where trucks are required to enter for inspection, operates at LOS A through F (Transportation Engineering Agency 2021).

The Union Pacific Railroad (UPRR) operates a railway line that runs through VSFB and under the proposed flight paths of the Daytona-E and Laguna-E launch vehicles. Up to 12 freight trains travel through VSFB daily (Envicom Corporation 2012). In addition to the Amtrak Surfliner and Coast Starlight passenger lines utilize the railway on VSFB 6 times per day (Amtrak 2022).

Various marine vessels utilize the broad ocean area in the Pacific Ocean (Figure 2.3-14). In 2020, of the 815 identified vessels using the broad ocean area, only 0.5% were passenger vessels (NOAA Office of Coastal Management 2023). The vast majority (95%) of vessels using the area were cargo ships and tankers (NOAA Office of Coastal Management 2023). SLD 30 and USCG District Eleven would review each Phantom trajectory IAW the MOA (Appendix O) to develop risk plots and other materials for 14 CFR Part 450 compliance, including: (1) operating area and impact locations, (2) maritime vessel risk assessment and Ec/Pc plots, and (3) all materials necessary to develop a NOTMAR. The USCG would be responsible for issuing NOTMARs that provide hazard area locations before each mission event with ocean impacts. A NOTMAR provides notice of temporary changes in conditions or hazards in navigable waterways with maritime traffic to assist in mitigating risks for dangers associated with waterway users. This tool provides both an established and reliable line of communication with the maritime public. The NOTMAR would include the operations dates and times and coordinates of the hazardous operation area.

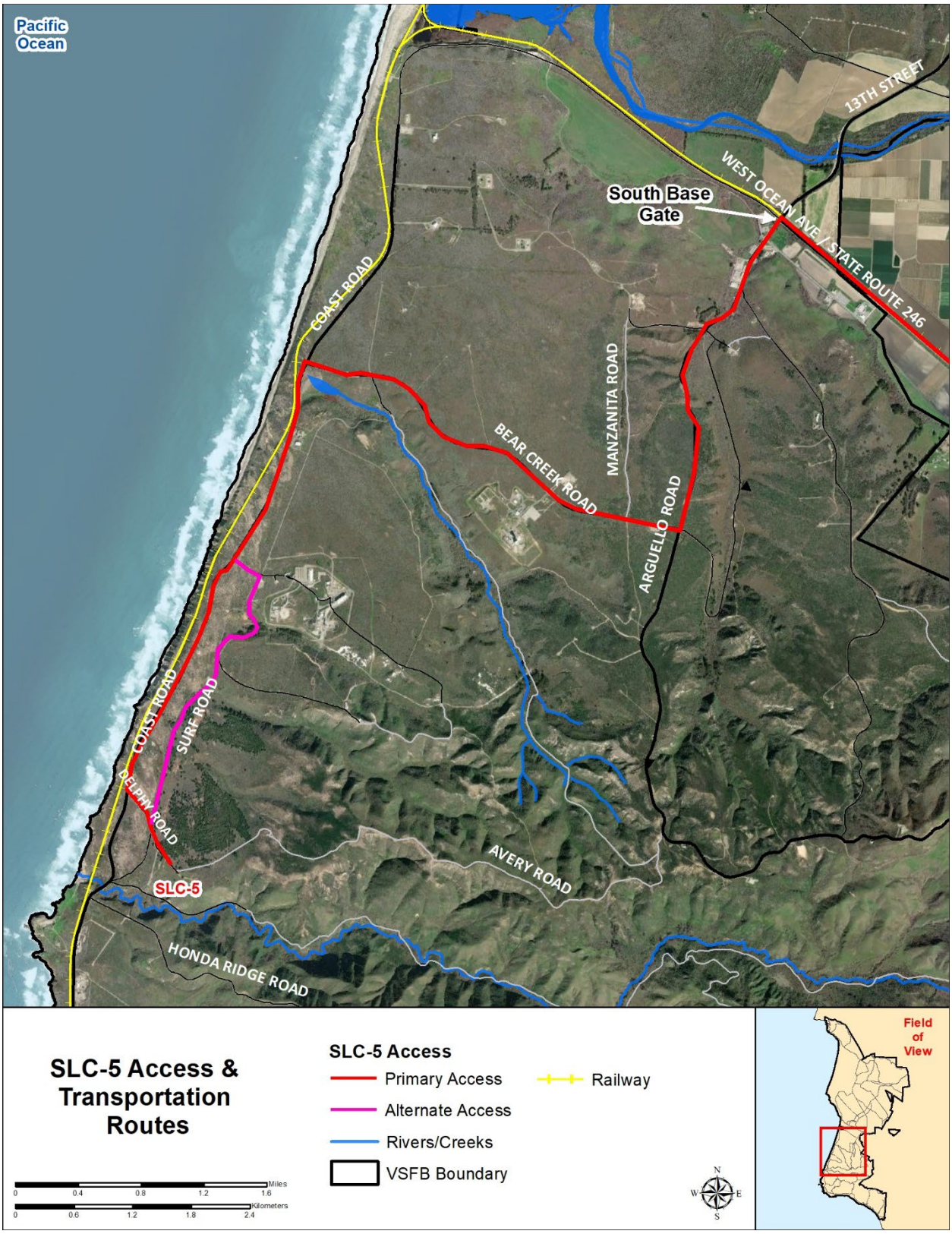

Figure 3.8-1: Main Access and Transportation Routes Associated with the Proposed Action

3.9. Recreation

The ROI for recreational resources includes all areas where activities associated with the Proposed Action may impact recreation. The USSF controls access to VSFB and on-Base recreation areas. Public access to VSFB and nearby SLC-5 is not permitted. DOD civilians, active duty, and retired personnel, their dependents, and approved contractors may participate in outdoor activities on VSFB, such as camping, picnicking, sunbathing, hiking, bird watching, nature photography, fishing, and hunting. The closest public access beaches include Jalama Beach County Park, Surf Beach, and County of Santa Barbara Ocean Beach Park. These sites are popular for picnicking, surfing, whale watching, bird watching, nature photography, and fishing. Closure of these parks resulting from launches at SLC-5 are not expected, except for Jalama Beach County Park. Since 1979, an evacuation and closure agreement has been in place between USSF and Santa Barbara County (Appendix M). This agreement includes evacuating Jalama Beach County Park for launch activities that SLD 30 Range Safety has determined have certain health and safety risks. Phantom's proposed launches will comply with these procedures.

Recreational and commercial boating and fishing occurs offshore of VSFB, but impacts on offshore activities are unlikely other than the brief avoidance areas established from launch trajectories and debris impact corridors. To comply with the necessary notification requirements, SLD 30 would notify USCG of any upcoming launch operations to ensure safe launches over the high seas and navigable waters of the U.S., consistent with current procedures. SLD 30 and USCG District Eleven would review each Phantom trajectory IAW the MOA (Appendix O) to develop risk plots and other materials for 14 CFR Part 450 compliance, including: (1) operating area and impact locations, (2) maritime vessel risk assessment and Ec/Pc plots, and (3) all materials necessary to develop a NOTMAR. The USCG would be responsible for issuing NOTMARs that provide hazard area locations before each mission event with ocean impacts. A NOTMAR provides notice of temporary changes in conditions or hazards in navigable waterways with maritime traffic to assist in mitigating risks for dangers associated with waterway users. This tool provides both an established and reliable line of communication with the maritime public. The NOTMAR would include the operations dates and times and coordinates of the hazardous operation area. Section 3.10 details additional public safety protocols.

3.10. Human Health and Safety

The ROI for Human Health and Safety resources includes all areas where activities associated with the Proposed Action may impact human health and safety. This includes the construction area at SLC-5 and all areas potentially impacted during launch operations. All VSFB activities are subject to Federal OSHA, AFOSH, or California OSHA regulations and procedures requirements. SLC-5 is a federal exclusive jurisdiction area; however, commercial entities may also comply with California OSHA and/or AFOSH requirements.

The affected environment for Human Health and Safety includes all established regulations to minimize or eliminate potential risk to the general public and personnel involved in the proposed project. The Proposed Action would involve construction activities where workers would potentially be exposed to conditions that could adversely impact their health and safety. The ROI of these potential impacts is the Proposed Action area and surrounding vicinity.

Hazards associated with some past and present mission activities and operations on VSFB can limit locations where projects can be sited to ensure the health and safety of workers. Hazard zones and areas have been established on VSFB to protect workers from various hazards; a description of these zones and areas is contained in Chapter 6 (Glossary). Because of the existence of these zones and areas, personnel installing and operating launch features at SLC-5 may be exposed to hazardous materials and hazardous waste.

In addition to these more obvious risks to human health and safety, the following physical features may be present nearby the Proposed Action and may adversely impact site personnel's health and safety:

- Physical hazards, including road traffic, confined spaces, holes and ditches, uneven terrain, sharp or protruding objects, slippery soils or mud, unstable ground, and falling equipment/objects (e.g., nuts, bolts, equipment, boxes, containers, and other miscellaneous light-construction tools and materials)
- Biological hazards such as animals and plants (ticks, black widow spiders, rattlesnakes, and poison oak) and disease vectors (ticks, rodents, and common contagions)

3.10.1. SLC-5 Modification & Launch Activities

Phantom and its contractor(s) would be responsible for industrial hygiene and ground safety during SLC-5 construction and launch operations. Industrial hygiene responsibilities include monitoring exposure to workplace chemicals, radiation, and physical hazards; hearing and respiratory protection; medical monitoring of workers subject to chemical exposures; and overseeing all hazardous or potentially hazardous operations. Additional precautions would be taken to provide personnel guidance and appropriate countermeasures on infectious disease containment, planning, and emergency response procedures. Ground safety responsibilities include protection from hazardous situations and hazardous materials.

Because of conditions detailed in Section 3.11, persons participating in Phantom construction activities at SLC-5 may potentially be exposed to the following hazardous materials and hazardous waste:

- Hazardous materials, primarily petroleum, oil, and lubricants (POLs), would be used to operate heavy equipment during C&D activities under the Proposed Action. Unexpected releases of these POLs would generate hazardous waste.

DOT-certified commercial transporters would convey hazardous material used in or resulting from the Proposed Action. Transporting these materials is discussed in Section 3.11.

3.10.2. General Public and On-Base Personnel Safety

The SLD 30 Safety Office is responsible for ensuring launch support personnel and the general public are safe from all launch operations and potential emergency public health risks as defined in Air Force Instruction (AFI) 91-202 (U.S. Air Force Mishap Prevention Program), DODI 6055.17, and 6200.03. AFI 10-2501 and AFI 10-2519 provide further guidance for USSF emergency management readiness and response to public health and safety issues. The SLD 30 Safety Office personnel would assess proposed mission profiles to ensure public safety criteria are met. Their

evaluation would assess hazards associated with debris, toxics, and blast distant focusing overpressure for a normal launch. All launch, high-risk offshore, and airspace areas would be controlled and monitored to ensure public safety during launch operations. Launch day meteorological conditions would also be accounted for to ensure compliance with acceptable risk criteria.

3.10.3. Debris Impact Corridors

All VSFB launch programs are required to establish debris impact corridors as a part of their program's safety review in case of a launch anomaly that requires flight termination (14 USC Section 504, 14 CRF Part 450.147). When any launch, including a commercial launch, is scheduled to take place from VSFB, the SLD 30, Launch Safety (SLD 30/SEL) notifies the 2nd Range Operations Squadron (2 ROPS) of the associated hazard areas. Phantom would perform a debris analysis for the Daytona-E and Laguna-E before launching. SLD 30/SEL would review and approve these analyses prior to authorizing any launch activities. Impact debris corridors would be established off the Santa Barbara County coast between Point Sal and Point Conception to meet security requirements and reduce hazards to persons and property during launch activities. Based on a mission's specific trajectory, specific debris impact areas would be determined for each launch. Once SLD 30/SEL notifies the 2 ROPS of hazard areas, 2 ROPS notifies the FAA so that appropriate airspace restrictions are in place during launches.

In addition, SLD 30 and USCG District Eleven would review each Phantom trajectory IAW the MOA (Appendix O) to develop risk plots and other materials for 14 CFR Part 450 compliance, including: (1) operating area and impact locations, (2) maritime vessel risk assessment and Ec/Pc plots, and (3) all materials necessary to develop a NOTMAR. The USCG would be responsible for issuing NOTMARs that provide hazard area locations before each mission event with ocean impacts. A NOTMAR provides notice of temporary changes in conditions or hazards in navigable waterways with maritime traffic to assist in mitigating risks for dangers associated with waterway users. This tool provides both an established and reliable line of communication with the maritime public. The NOTMAR would include the operations dates and times and coordinates of the hazardous operation area. The USCG issues a NOTMARs 30 days before launches from VSFB that defines the times and locations of *avoidance areas* related to launch activities. Local NOTMARs are broadcast via radio, posted in harbors along the coast, and published weekly by the USCG.

Offshore oil rigs located west of 120 degrees 15 minutes longitude also have evacuation or shelter-in-place procedures in place for use during launch operations. The 2 ROPS notifies the Bureau of Safety and Environmental Enforcement to notify oil rig personnel of launch operations.

On south VSFB, the Union Pacific Railroad track passes approximately 0.6 mi west of the launch facility, and would be overflown by the launch vehicles. To reduce potential risk to people and property, railroad schedules and close coordination between train engineers and VSFB personnel would ensure that trains are never overflown. SLD 30/SEL defines appropriate railroad mile markers to 2 ROPS, who coordinates with the Manager Road Operations to ensure trains are kept clear of debris area.

3.10.4. Security and Anti-Terrorism

Site security requirements, including those for security lighting and intrusion detection, are part of the requirements integral to launch program safety and detailed in DOD Manual 5220.22-M. *Minimum Antiterrorism Standards for Buildings* 4-010-01 was issued in July 2022 under the authority of DOD Instruction 2000.16, Antiterrorism Standards. This guidance requires DOD components to adopt and adhere to common definitions, criteria, and minimum construction standards for building to mitigate vulnerabilities and terrorist threats. Modifications to SLC-5 made by Phantom would be required to meet these construction standards.

3.10.5. Existing Noise Environment

For a detailed description of noise as it relates to the Proposed Action, please see Section 3.2.3and Appendix G. In addition to the information provided in that section, on VSFB, general ambient L_{eq1H} (the continuous sound level that would contain the same acoustical energy for 1 hour as the fluctuating sound levels during the same period) measurements have been found to range from around 35 to 60 dB (Thorson et al. 2001). Activities associated with construction would occur during the daytime and would generate relatively continuous noise. Noise associated with launch and static fire events would be short term (seconds to minutes).

3.11. Hazardous Materials and Waste Management

The ROI for hazardous materials and waste management resources includes all construction areas and all areas potentially impacted during launch operations, where activities associated with the Proposed Action may be impacted by using hazardous materials and generating hazardous waste.

Hazardous materials and wastes are those substances defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; 42 USC Chapter 103), as amended by the Superfund Amendments and Reauthorization Act (26 USC Section 9507); the Environmental Health Standards for the Management of Hazardous Waste (California Code of Regulations [CCR] Title 22); the Toxic Substances Control Act (15 USC Sections 2601–2671); the Solid Waste Disposal Act (42 USC Section 6903), as amended by the Resource Conservation and Recovery Act (RCRA; 42 USC Sections 6901-6992); and as defined in Title 8 CCR Section 5161. In addition, federal and state OSHA regulations govern protecting workplace personnel. In general, the definitions within the citations include substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health and welfare, to workers, or to the environment.

3.11.1. Hazardous Materials at VSFB

Hazardous materials are compounds with the potential to harm human health and the environment through improper use, treatment, transportation, storage, or disposal in commercial, military, and industrial applications. They are harmful to life due to their concentrations and amounts, or physical and chemical attributes. Component hazardous materials, or hazardous constituents, are defined as hazardous materials with low concentrations that will not cause acute adverse effects. Hazardous constituents are present in propellants,

batteries, fuels, hydraulic fluids, and munitions, and may harm human and environmental health through water, soil, or air contact.

Operations at VSFB and associated properties require military personnel and on-Base contractors to use hazardous chemicals in varying quantities throughout the Base. Using hazardous material on VSFB is regulated by the Hazardous Materials Management Process (HMMP; DAF 2020), per Air Force Manual (AFMAN) 32-7002, *Environmental Compliance and Pollution Prevention*, and 40 CFR Part 112, *Spill Prevention, Control, and Countermeasure Plan.* Emergency response procedures for hazardous materials spills are established in SLD 30's Installation Management Plan (SLD 30 Plan 10-2). Phantom would be responsible for preparing its own Emergency Response Plan per the SLD 30 Installation Management Plan. This Plan would ensure that adequate and appropriate guidance, policies, and protocols regarding hazardous material incidents and associated emergency response are available to and followed by all installation personnel and commercial entities. For a spill, Phantom would also be responsible for completing a Community Awareness and Emergency Response reporting form per local Santa Barbara County hazardous material and hazardous waste spill reporting requirements.

3.11.1.1. Hazardous Materials Transportation Safety

Hazardous materials such as propellants, ordnance, chemicals, and other hazardous material payload components must be transported to and on VSFB per DOT regulations for interstate and intrastate shipment of hazardous materials (Title 49 CFR Parts 100–199).

3.11.2. Hazardous Waste at VSFB

Hazardous wastes contain hazardous materials that may exist as any state of matter, which may cause, or significantly contribute to, an increase in the likelihood of mortality or serious illness. Substantial human and environmental risks may be present when hazardous waste is improperly used, stored, transported, or disposed.

Hazardous waste at VSFB complies with RCRA Subtitle C (40 CFR Parts 260-273) and with California Hazardous Waste Control Laws as administered by the California Environmental Protection Agency Department of Toxic Substances Control (22 CCR Section 66260.10; 8 CCR Section 5192). These regulations require that hazardous wastes be handled, stored, transported, disposed of, or recycled according to defined procedures. The SLD 30 Hazardous Waste Management Plan (HWMP; SLD 30 Plan 32-7043-A; DAF 2022) details hazardous waste packaging, turn-in, transportation, storage, recordkeeping, and emergency procedures. Phantom would be required to follow all federal, state, and local laws regulating generating, storing, transporting, and disposing hazardous waste. Phantom would also be required to obtain a USEPA Generator identification number to manage and dispose hazardous waste generated from its site operations.

3.11.2.1. Toxic Release Contingency Plans and Toxic Hazard Corridors

Toxic hazard assessments would be required for the Proposed Action to determine program-specific toxic material used for launches, payloads, GSE, and at facilities. SLD 30 has detailed procedures in place to control using toxic gases. SLD 30 maintains 30 Space Wing Instruction 91-106, Toxic Hazard Assessments, which defines control measures and procedures for conducting

operations involving toxic fuels. SLD 30/SEL runs atmospheric and dispersion computer models to predict toxic hazard corridors (THCs) for nominal and aborted launches, as well as for spills or releases of toxic materials from storage tanks or that occur during loading or unloading propellants for the Daytona-E and Laguna-E launch vehicles. 2 ROPS uses THCs to reduce the risk of exposure of launch personnel and the general public to toxic materials, including toxic gases. Dispersion modeling would be run for nominal and abort scenarios before each launch. If the model predicts THCs over populated areas, the launch would be delayed until meteorological conditions allowed for the launch to occur without this risk.

3.11.2.2. Exposure Criteria

AFMAN 48-146, *Occupational and Environmental Health Program Management*, [published December 2022] defines the Occupational Exposure Limit (OEL) as, "[T]he most conservative limit between the OSHA PEL or ACGIH TLV unless a specific OEL is designated by the BE Associate Corps Chief on the BE Hive and EOSH Service Center." Unless directed by higher authority, the SLD 30 Medical Group Bioenvironmental Engineering Chief would determine the OEL for chemicals estimated to pose the most significant health concerns to the public and launch facility workers. The exposure criteria are factored into the exposure prediction and risk management models, and the launch commit decisions SLD 30/SEL uses.

3.11.3. Environmental Restoration Program at VSFB

In 1975, DOD facilities began implementing the Installation Restoration Program (IRP). The IRP was established under the Defense Environmental Restoration Program (ERP) to identify, characterize, and restore hazardous substance release sites, and provide a method of management under Section 211 of CERCLA. The ERP is comprised of three programs: IRP, Military Munitions Response Program (MMRP), and building demolition and debris removal (AFI 32-7020). Once areas and constituents have been identified, the IRP is tasked to remove or monitor the hazards in an environmentally responsible manner. IRP sites are remediated through the Federal Facilities Site Remediation Agreement, a working agreement between the USSF and the RWQCB Central Coast Region and the Department of Toxic Substances Control Region 3. In addition to IRP sites, there are identified Areas of Concern (AOC), where potential hazardous material releases are suspected; and Areas of Interest (AOI), defined as areas with the potential for use or presence of a hazardous substance. To ensure the health and safety of personnel on VSFB, an analysis of MMRP and IRP sites, including IRP AOCs and AOIs, within the Proposed Action area was performed.

Four IRP sites (AOC-188B, AOC-188C, AOC-188D, and AOI-183) are located within the SLC-5 Right of Entry area defined on Figure 3.11-1. These sites are described in Appendix N (Hazardous Materials), along with their closure history. Four additional IRP sites are located in Honda Canyon (Figure 3.11-1). AOC-188A itself includes AOI-065 and AOI-71. These sites are located on the north bank, above the creek bed (Figure 3.11-1). LF-7, a former landfill site, is within Honda Canyon and overlaps the creek bed (Figure 3.11-1). These sites, along with their closure history, are also described in Appendix N. Since all AOCs and AOIs within the ROI have been closed, they are not carried forward for analysis.

3.11.4. Military Munitions Response Program

The MMRP was established to address UXO, discarded military munitions, and munitions constituents located on current and former defense sites (10 USC Section 2710). These sites are separate from operational ranges or munitions storage facilities. SLC-5 site borders and slightly overlaps Site TM817B (Figure 3.11-2). Surface clearance is required in this site for proposed road improvements along Ladd Road within the SLC-5 Right of Entry boundary; however, site-wide anomaly avoidance would be implemented since it is possible UXOs may be encountered outside of MMRP boundaries. Anomaly avoidance and construction support would be implemented according to DESR6055.09_AFMAN 91-201, Edition 1 (published 13 January 2019, updated 9 March 2022).

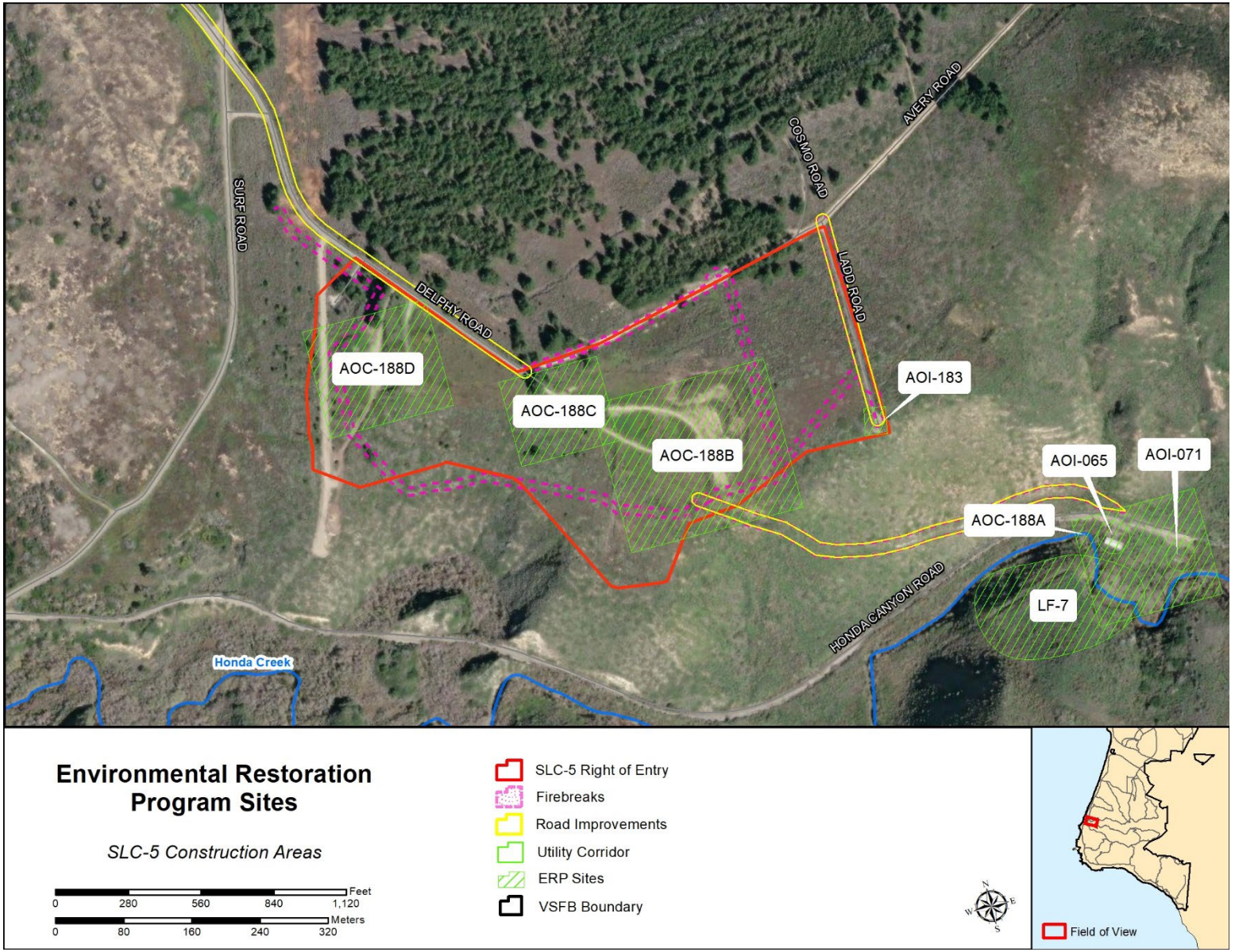

Figure 3.11-1: IRP Sites in the Vicinity of SLC-5

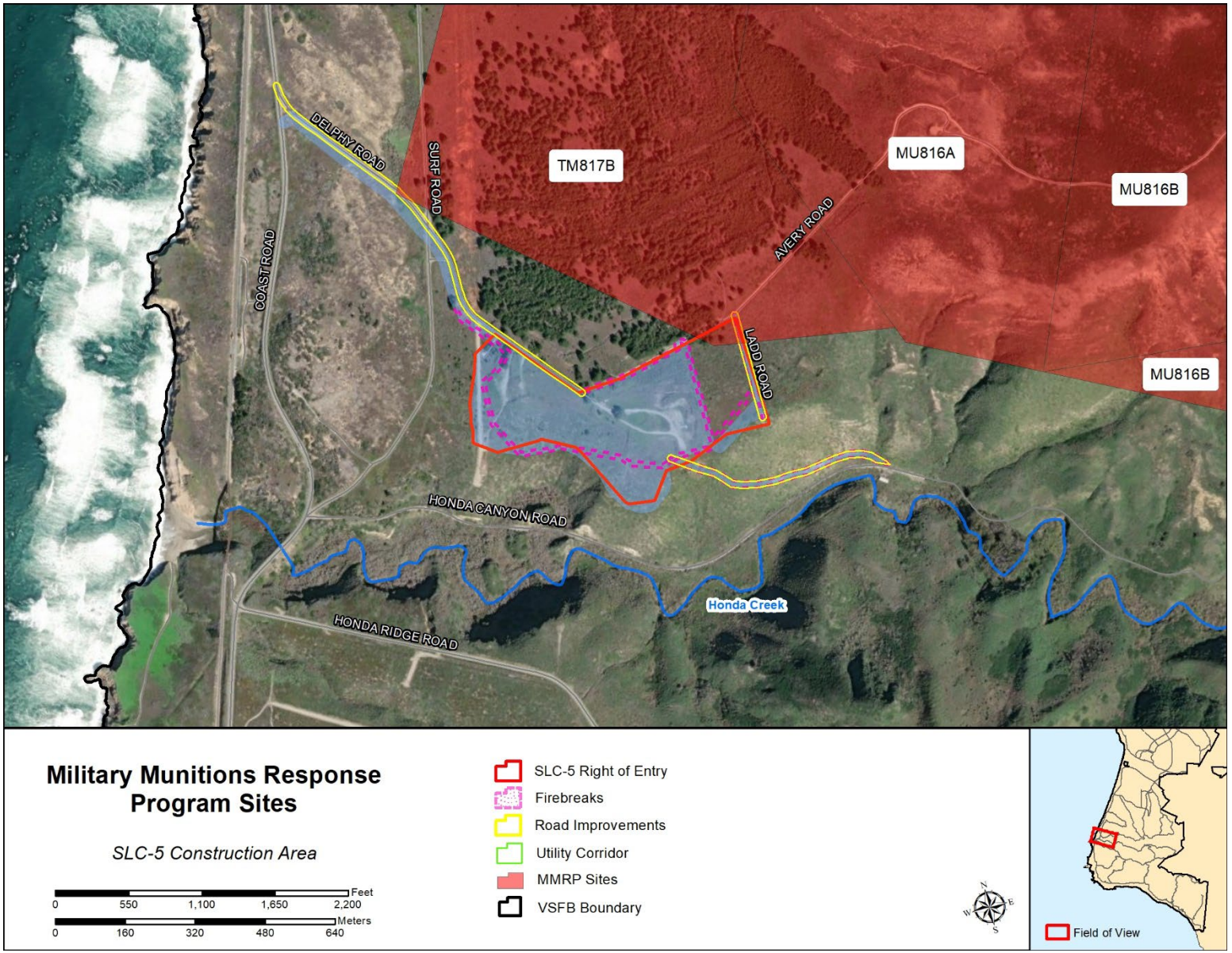

Figure 3.11-2: MMRP Areas in the Vicinity of SLC-5

3.12. Solid Waste Management

The ROI for solid waste management is VSFB. The regulatory environment for solid waste management establishes control of construction debris and promotes pollution prevention associated with the Proposed Action.

Solid waste is generally defined as any discarded material that is not characterized by other specific regulatory requirements detailed in the RCRA (40 CFR Part 261.2). Solid waste is subject to corrective action under RCRA (42 USC Section 6901 et seq.). The regulatory environment for solid waste management reflects comprehensive federal, state, and local approaches to minimize waste generation and increase reuse and recycling.

Solid waste management on VSFB is directed by DODI 4715.23, *Integrated Recycling and Solid Waste Management*, and implemented in SLD 30's ISWMP (DAF 2015). AFMAN 32-7002, *Environmental Compliance and Pollution Prevention*, details requirements and programs that installations must comply with to successfully divert as much solid waste as economically feasible. The SLD 30 ISWMP requires source segregation of recyclable materials to the greatest extent possible.

In 1989, the *California Integrated Waste Management Act* (Assembly Bill 939) has a policy goal of a 50% reduction of the quantity of solid waste disposed of in California landfills from a 1990 baseline, to be accomplished by 1 January 2000. To bolster the positive effects of AB 939, the Mandatory Commercial Recycling Regulation (Assembly Bill 341) became law in 2012 and has a policy goal of CalRecycle to increase statewide solid waste diversions to 75% by 2020.

The DOD Strategic Sustainability and Performance Plan listed a solid waste diversion goal of 50% and a C&D debris diversion rate of 60%. The USSF is committed to achieving these goals.

3.12.1. Construction Debris

The State of California passed Senate Bill 1374 on 12 September 2002, amending the Public Resources Code, Section 42912, which addresses the issue of C&D debris, diversion requirements, and the development of a model ordinance to be implemented by local jurisdictions (e.g., Santa Barbara County). Santa Barbara County Code of Ordinances stipulates that 50% of C&D debris must be recycled (Ord. No. 4689, Section 1). EO 13693 Section 3(j)(iii) mandates the diversion of at least 50% of non-hazardous C&D materials and debris by Federal agencies.

3.12.2. Pollution Prevention

The Pollution Prevention Act of 1990 (42 USC Sections 13101-13109) focused the national approach to environmental protection toward pollution prevention (P2). Implementing the USAF *Environmental Management System* (EMS; DODI 4715.17) carries P2 a step further toward mission sustainability principles. The P2 program is detailed in the SLD 30 HMMP and is aimed at achieving SLD 30 EMS objectives and targets, through documented practices, procedures, and operational requirements. SLD 30 implements EMS and its associated P2 program elements by following the P2 hierarchy:

- Reduce (source reduction to prevent the creation of wastes)

- Reuse (keep item or material for its intended purpose)
- Recycle (use item or material for some other beneficial purpose)
- Disposal (in an environmentally compliant manner, only as a last resort)

3.13. Coastal Zone Management

California Coastal Act of 1976 (CCA) Section 30008 defines the authority of the CCMP. The CCMP enforces the CZMA and other federal laws that are related to planning or managing California coastal resources. The CCA defines the coastal zone as the water extending seaward to the outer limits of the state's jurisdiction; land extending inland approximately 1,000 yards from the mean high tide line; or land in significant coastal estuarine, habitat, and recreational areas, extending inland to the first major ridgeline paralleling the sea or 5 mi from the mean high tide line of the sea, whichever is less (Div. 20 P.R.C. CCA, 1976 part 30103). Federally controlled lands are not part of the coastal zone (15 CFR Section 923.33); however, under 15 CFR and DAF implementing regulations (AFMAN 32-7003, Environmental Conservation), SLD 30 is required to prepare a Federal CD for any activity regardless of location, that is likely to affect any land, water, or natural resource of a coastal zone in the reasonably foreseeable future.

Per the CZMA of 1972, Federal activity in, or affecting, a coastal resource or use requires the Federal entity to prepare either a negative determination (ND; no affect to a coastal resource or use) or a CD (affect to a coastal resource or use, but the activity is consistent to the maximum extent practicable). The USSF is responsible for making either a ND or CD for its activities occurring within the state coastal zone or having effects on it. The CCC reviews federally authorized projects for consistency with the California CZMA.

The project launch site (SLC-5) is located within VSFB's boundary and owned by the DOD. Although the CZMA coastal zone definition excludes federal lands from the coastal zone, actions on DOD lands that may affect resources within the coastal zone must be reviewed for consistency with the CCMP. The proposed Phantom space launch program may affect coastal use or resources within the coastal zone and therefore are subject to CCA provisions. Although FAA licenses are not subject to certification for consistency with the CCMP, as a matter of policy, the FAA will not issue a license, permit, or authorization to an applicant unless the applicant's proposed action meets the consistency requirements of the state's coastal management program.

3.14. Utilities

The ROI for utilities includes the SLC-5 complex and south VSFB utilities (e.g., communications, electricity, domestic water supply, and wastewater). These utilities would be extended from their current location to SLC-5 through the utility corridor shown in Figure 2.3-5. Facility lighting would be required at SLC-5 to meet launch and security requirements (Figure 2.3-4). The affected environment for utilities summarizes the utility systems available in the project area and nearby.

3.14.1. Electrical

VSFB receives electrical power from Pacific Gas and Electric Company via a substation in Orcutt, California. Two 70-kV circuits feed power to a USSF switching station located on Corral Road. From there, VSFB develops two transmission loops (53 mi) and 45 distribution circuits (250 mi), at 12 kV on steel, concrete, and wood poles and through underground ductwork. VSFB maintains and operates nine government owned substations, typically comprised of a fenced switchyard and a concrete masonry unit switch house on a single site.

As noted in Section 2.3.1.3, electrical infrastructure would be installed, in trenches or above ground, within the footprint of Delphy Road or within a 100-ft-wide utility corridor immediately south of Delphy Road (Figure 2.3-5). If the installation of electrical utilities connecting to existing VSFB circuits is delayed, Phantom may rely on a 533 bhp generator for electricity during up to the first three years of operations. A stationary 533 bhp generator would be kept on site during launch operations for emergency backup power. This generator would be used as an emergency back-up power source only. It would be run once every two weeks for 30 minutes to test its integrity,

3.14.2. Communications

New communication lines (fiber optic cables) are typically installed along electrical lines and would be installed in trenches or on utility poles. Like any new electrical infrastructure, communication lines would be installed within the footprint of Delphy Road or within 100-ft-wide utility corridor immediately south of the road.

3.14.3. Water Supply

The Government Accountability Office (GAO) identified VSFB as vulnerable to water-scarcity issues in 2019 (GAO 2019). VSFB has two sources of drinking water; during normal operating conditions, the primary source comes from the State Water Project and the secondary source comes from four groundwater wells located on VSFB property. The VSFB wells are typically only used to augment State Water supplies and become the primary source during emergency repair or annual maintenance shutdowns on the State Water Project system. Over the past twenty years there have been several persistent drought periods affecting State Water Project supplies and VSFB has had to rely on its groundwater wells for extended periods to meet supply demands. Groundwater is treated prior to its usage as potable water. Annual VSFB water use over the past three years (2019 through 2021) has averaged 910,500,000 gallons (2,794 acre-feet [ac-ft]) per year.

A combined total of 2,100 to 10,000 gallons (0.006 to 0.03 ac-ft) of potable water would be used in the deluge water system for each launch/static fire, depending on which launch vehicle is used and mission-specific requirements. At maximum cadence of 48 launches and static fire per year, the annual usage for deluge would range between 100,800 to 480,000 gallons (0.31 to 1.47 ac-ft). In addition, a maximum of 72,000 gallons (0.22 ac-ft) per year would be required to support the personnel and operational activities at SLC-5. Therefore, at maximum cadence, the Proposed Action would use up to 552,000 gallons (1.69 ac-ft) of water per year. Annual VSFB water use over the past three years (2019 through 2021) has averaged 910,500,000 gallons (2,794 ac-ft) per

year. Phantom's proposed use of up to 1.69 ac-ft per year would represent approximately 0.06% of the total annual water usage and is within the normal fluctuation and water demand of VSFB. A permanent potable water service would be required for SLC-5. The reliability and condition of the smaller service lines are unknown and may likely not suit the potable demands for the proposed infrastructure. Therefore, an extension from Delphy Road would be required for the Proposed Action. This would consist of installing a 4-inch ductile iron pipe extension along Delphy Road using the utility corridor shown in Figure 2.3-5.

3.14.4. Wastewater Treatment

OWTS are useful and necessary structures that allow habitation at locations that are removed from centralized wastewater treatment systems. When properly sited, designed, operated, and maintained, OWTS treat domestic wastewater to reduce its polluting impact on the environment. The HIF would require permanent sanitary sewer service which would be comprised of an on-site septic system consisting of a septic tank and leach field. The septic system would be designed with the regulations set forth in the RWQCB OWTS manual. Specifically, the septic system would comply with provisions set forth for Tier 1 – Low Risk New or Replacement OWTS.

3.15. Socioeconomics

Socioeconomic resources include the population, income, employment, and housing conditions of a community or affected environment. VSFB has a large effect on population and employment in northern Santa Barbara County, which encompasses Vandenberg Village, the City of Lompoc, the unincorporated area north of Lompoc, the Santa Maria Valley, and portions of the Santa Ynez Valley. The full economic impact of VSFB on the surrounding communities and the state of California is significant (over $1.75 billion/year). VSFB directly contributes more than $500 million each year to the economies of Santa Barbara County and California and is the largest employer in Santa Barbara County (6,800 employees as of 2014), including 2,924 military personnel, 1,143 civil servants, and 2,822 non-appropriated fund, contractor, and private business personnel (U.S. Air Force 2020).

In 2019, the U.S. Census Bureau estimated the Santa Barbara County population at 444,829 people. Santa Maria and Lompoc, with 106,224 and 43,232 residents respectively (U.S. Census Bureau 2019), are the first and third largest cities in the County (California Department of Finance 2022). The Bureau of Labor Statistics reported August 2021 results for the Santa Barbara-Santa Maria area of 208,600 total civilians employed. Of those employed, there were approximately 184,800 non-agricultural wage and salary employments. The August 2021 unemployment rate of the area was approximately 5.5 percent, below the state average of 7.5 percent and above national average of 5.2 percent (Bureau of Labor Statistics 2021).

4.0 Environmental Consequences

This chapter presents the results of the analysis of potential environmental effects of implementing The Preferred Alternative and the No Action Alternative as described in Chapter 2 (Description of the Proposed Action and Alternatives). For each environmental component, anticipated impacts are assessed considering short- and long-term effects.

The FAA uses thresholds that serve as specific indicators of significant impact for some resource areas. FAA actions that would result in impacts at or above these thresholds require preparing an Environmental Impact Statement (EIS), unless impacts can be reduced below threshold levels. The FAA has not defined significance thresholds for all resource areas; however, the FAA has identified factors that should be considered in evaluating the significance of potential environmental impacts (FAA Order 1050.1F, Paragraph 4-3.3). The FAA's significance thresholds are considered in assessing potential environmental consequences of launch operations in this EA because the FAA plans to adopt this EA to support its environmental review of Phantom's license application.

4.1. Air Quality and Climate Change

Potential impacts on air quality and climate from the Proposed Action would be associated with the following activities:

- Construction of SLC-5W and SLC-5E and associated utilities and infrastructure.
- Daytona-E and Laguna-E launch and static fire activities conducted at SLC-5.

Emissions are estimated for each of the above operations based on established emission factors and conservative operational assumptions.

Per DAF guidance and FAA Order 1050.1F, air quality impacts would be significant if the action would cause pollutant concentrations to exceed one or more of the NAAQS, as established by the USEPA under the CAA, for any of the time periods analyzed, or to increase the frequency or severity of any such existing violations. In attainment areas, if the estimated emissions are less than the insignificance indicators, then the emissions are considered by the DAF not to have significant impacts.

GHGs occur in the atmosphere both naturally and as a result of human activities, such as the burning of fossil fuels and land use change. GHGs produced by fossil-fuel combustion are primarily carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). GHGs are non-hazardous to health at normal ambient concentrations; however, GHGs absorb infrared radiation in the atmosphere, and an increase in emissions of these gases is the primary cause of warming of the climatic system. Emissions of GHGs are typically quantified and regulated in units of CO_2e, which takes into account the global warming potential (GWP) of each GHG. The GWP is the measure of a particular GHG's ability to absorb solar radiation as well as its residence time within the atmosphere. There are no applicable ambient air quality standards for GHGs under the CAA.

Climate change is the variation in the Earth's climate (including temperature, precipitation, humidity, wind, and other meteorological variables) over time. Climate change is driven by accumulation of GHGs in the atmosphere due to the increased consumption of fossil fuels (e.g.

coal, petroleum, and natural gas) since the early beginnings of the industrial age and accelerating in the mid- to late-20th century. The GHGs produced by fossil-fuel combustion are CO_2, CH_4, and N_2O. While the FAA has not established a significance threshold of GHGs for climate change, the DAF has established an insignificance indicator (threshold) of 75,000 short tpy (68,000 metric tpy) for GHG and associated climate change effects.

Since Santa Barbara County violates the state standard for PM_{10}, standard dust control measures (see Section 2.3.3.1) are required for all discretionary construction activities, regardless of the significance of the fugitive dust impacts, based on the policies in the 1979 Air Quality Attainment Plan.

4.1.1. Preferred Alternative (Proposed Action)

With the exception of launch activities, emissions were calculated using the USAF Air Conformity Applicability Model (ACAM). ACAM does not provide functionality for launch activities; inputs and emissions factors for launch activity calculations were gathered from Phantom Space's *Laguna Trajectory File* (Phantom Space 2022) and *Daytona Trajectory File* (Phantom Space 2022), Chapter 2.0 of this document, and from the *Environmental Assessment for SpaceX Falcon Launches at Kennedy Space Center and Cape Canaveral Air Force Station*, February 2020. Emission estimates were also calculated using the California Emissions Estimator Model, which are presented in Appendix F. Detailed reports of all calculations can be found in Appendix F.

4.1.1.1. SLC-5 Construction

Section 2.3.1 describes the construction activities and facility improvements at SLC-5. The emissions associated with this portion of the Proposed Action, including clearing, trenching, worker commutes, and construction vehicles were calculated using ACAM, as mentioned above. The results of the ACAM model are presented in the "Construction" activity rows of Table 4.1-1.

4.1.1.2. Launch Program Operations

Launch activities include the combined maximum annual total of 48 launches and 48 static fire operations of the Daytona-E and Laguna-E at SLC-5, assumed to be split evenly between the two vehicles at full tempo. See Section 2.3.2 for detailed information on these activities and launch tempo from 2025 to 2030. The emissions associated with launch activities–including launches and static fires–were calculated using known methods and established emissions factors mentioned above (FAA 2009). The results of this analysis are separated by year and launch vehicle type, and presented in Table 4.1-1.

Launch operations include delivering, integrating, and erecting the launch vehicles, worker commutes, operating the command center for launches, and static fire operations. The emissions associated with launch operations, including all activities mentioned above, were calculated using ACAM. The results of the ACAM model are presented in the "Launch Operations" rows of Table 4.1-1.

A 533-horsepower generator may be used for primary power during the initial three years of operation supporting a maximum of eight launches total. If used for primary power, this generator would be run continuously for three weeks during each launch operation. A second 533 bhp generator would be on-site to use in case of a power outage. The backup generator

would be run for a total of 50 hours annually to ensure its integrity. Emissions estimates for this generator specifically were separated from other emissions estimates and are presented in the Generators rows of Table 4.1-1. While not a requirement of NEPA, SBCAPCD requires a Health Risk Assessment (HRA) to be completed for generators that would be onsite for more than 12 months. The Proposed Action includes use of diesel fired generators that would be onsite greater than 12 months during operations phases. HRA's were completed and included in Appendix F.

4.1.1.3. Airspace Impacts

Airspace closures associated with commercial space operations could result in additional aircraft emissions mainly from aircraft being re-routed and expending more fuel. Minimal, if any, additional emissions would be generated from aircraft departure delays because the FAA has rarely, if ever, received reportable departure delays associated with launches at VSFB. Under the Proposed Action, airspace-related impacts could increase up to a maximum of 48 times per year, estimated by 2030. Any delays in aircraft departures from affected airports would be short-term. Therefore, these emissions increases are not expected to result in an exceedance of a NAAQS for any criteria pollutant. Emissions from aircraft being re-routed would occur above 3,000 ft (the mixing layer) and thus would not affect ambient air quality. Therefore, airspace closures associated with commercial space operations are not expected to result in significant air quality impacts.

4.1.1.4. Summary of Impacts on Air Quality and Climate

Table 4.1-1 summarizes the potential impacts on air quality from the Proposed Action for each year the Proposed Action would take place. Based on the analysis described in the sections above, insignificance thresholds (250 tons per year for all criteria air pollutants; except lead which is 25 tons per year) will not be exceeded as a result of the Proposed Action. Therefore, the Proposed Action would not have any significant impact on Air Quality.

Table 4.1-1: Emission Totals by Activity

Activity Phase	Activity Quantity	Estimated Emissions (Tons)						
		CO	NOx	VOC[1]	SOx	$PM_{2.5}$	PM_{10}	Pb
2024 – Construction Phase I-A & Daytona Launch Activities								
Construction	-	0.458	0.433	0.074	0.001	0.012	0.013	0.000
Launch Operations	1	0.012	0.012	0.003	0.001	0.001	0.001	0.000
Generator	-	0.435	1.546	0.056	0.013	0.060	0.060	0.000
Daytona Launch	1	0.000	0.325	0.000	0.000	0.000	0.000	0.000
2024 Total		**0.905**	**2.316**	**0.133**	**0.015**	**0.072**	**0.074**	**0.000**
Screening Threshold		**250**	**250**	**250**	**250**	**250**	**250**	**25**
Below Threshold?		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
2025 – Construction Phase I-B & Daytona Launch Activities								
Construction	-	0.432	0.269	0.069	0.001	0.010	0.010	0.000

Launch Operations	2	0.024	0.024	0.006	0.001	0.002	0.002	0.000
Generator	-	0.435	1.546	0.056	0.013	0.060	0.060	0.000
Daytona Launches	2	0.000	0.650	0.000	0.000	0.000	0.000	0.000
2025 Total		**0.891**	**2.489**	**0.130**	**0.015**	**0.071**	**0.071**	**0.000**
Screening Threshold		**250**	**250**	**250**	**250**	**250**	**250**	**25**
Below Threshold?		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
2026 – Construction Phase II & Daytona Launch Activities								
Construction	-	0.241	0.224	0.037	0.001	0.015	0.015	0.000
Launch Operations	5	0.060	0.060	0.015	0.003	0.004	0.004	0.000
Generator	-	0.435	1.546	0.056	0.013	0.060	0.060	0.000
Daytona Launches	5	0.000	1.625	0.000	0.000	0.000	0.000	0.000
2026 Total		**0.736**	**3.455**	**0.108**	**0.016**	**0.079**	**0.079**	**0.000**
Screening Threshold		**250**	**250**	**250**	**250**	**250**	**250**	**25**
Below Threshold?		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
2027 – Daytona Launch Activities								
Launch Operations	12	0.144	0.143	0.036	0.007	0.010	0.010	0.000
Daytona Launches	12	0.000	3.900	0.000	0.000	0.000	0.000	0.000
Generator	-	0.435	1.546	0.056	0.013	0.060	0.060	0.000
2027 Total		**0.579**	**5.589**	**0.091**	**0.020**	**0.070**	**0.070**	**0.000**
Screening Threshold		**250**	**250**	**250**	**250**	**250**	**250**	**25**
Below Threshold?		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
2028 – Daytona & Laguna Launch Activities								
Launch Operations	24	0.287	0.287	0.071	0.013	0.020	0.020	0.000
Daytona Launches	12	0.000	3.900	0.000	0.000	0.000	0.000	0.000
Laguna Launches	12	0.000	1.277	0.000	0.000	0.000	0.000	0.000
Generator	-	0.435	1.546	0.056	0.013	0.060	0.060	0.000
2028 Total		**0.722**	**7.010**	**0.127**	**0.026**	**0.080**	**0.080**	**0.000**
Screening Threshold		**250**	**250**	**250**	**250**	**250**	**250**	**25**
Below Threshold?		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
2029 – Daytona & Laguna Launch Activities								
Launch Operations	48	0.574	0.573	0.143	0.026	0.040	0.040	0.000
Daytona Launches	24	0.000	7.799	0.000	0.000	0.000	0.000	0.000

Laguna Launches	24	0.000	2.554	0.000	0.000	0.000	0.000	0.000
Generator	-	0.435	1.546	0.056	0.013	0.060	0.060	0.000
2029 Total		**1.009**	**12.472**	**0.199**	**0.039**	**0.100**	**0.100**	**0.000**
Screening Threshold		**250**	**250**	**250**	**250**	**250**	**250**	**25**
Below Threshold?		**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

1: At the time of analysis, ROC emissions factors were not available for the activities analyzed in this table. VOC emissions factors were instead used as a surrogate and reported in this table (see Section 3.1.2).
Notes: Values report as 0.000 are less than 0.0005 units; Screening Thresholds are 100 tons per year for all emissions reported; and Appendix F contains detailed calculations for the values reported above. CO = Carbon Monoxide; NOx = Nitrogen Oxides; VOC = volatile organic compounds; SO_x = Sulfur Oxides; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; Pb = Lead

4.1.1.5. Greenhouse Gases and Climate

GHG emissions from the Proposed Action would be associated with the following activities, with annual emission thresholds presented in Table 4.1-2.

- Using construction equipment for site modifications, electrical line installation, and vegetation removal for the firebreak.
- Using 533 bhp diesel generator would provide primary and standby power contingent upon power outages or higher-than-expected electricity demand.
- Emissions associated with the launch activities of the launch vehicles.

Overall, the Proposed Action is not expected to exceed the annual CO_2e threshold, defined as 68,000 metric tpy of CO_2e (75,000 tpy) throughout all years of the Proposed Action. All annual GHG emissions are below the insignificance threshold; therefore, there will be no significant impact associated with GHG and climate change. Therefore, the Proposed Action's GHG emissions would not have a significant adverse environmental impact on GHG emissions or climate change.

Table 4.1-2: Annual Greenhouse Gas Emissions

Year	Metric Tons	Insignificance Threshold	Below Threshold?
2024	533.94	**68,000**	**Yes**
2025	877.90	**68,000**	**Yes**
2026	1,876.58	**68,000**	**Yes**
2027	4,254.35	**68,000**	**Yes**
2028	5,652.91	**68,000**	**Yes**
2029	11,222.51	**68,000**	**Yes**

Note: Appendix F contains detailed calculations for the values reported above.

Airspace closures associated with launches could result in temporarily grounding aircraft at any affected airports and re-routing enroute flights on established alternate flight paths. The FAA has rarely, if ever, received reportable departure delays associated with launches. Aircraft could be temporarily grounded if airspace above or around the airport is closed. Ground delays are also used under some circumstances to avoid airborne reroutes.

Airspace closures associated with launches would result in additional aircraft emissions, including CO_2 (a GHG), primarily from aircraft being re-routed and subsequently expending additional fuel. However, emissions from aircraft being re-routed would occur above 3,000 ft (the mixing layer) where NAAQS would not be applicable; therefore, no impact to air quality would occur from aircraft re-routing from airspace closures. The number of aircraft that would be impacted per launch is not expected to produce additional GHG emissions that would have a notable impact on climate.

Regarding potential departure delays, airspace-related impacts could increase up to a maximum of 48 times per year; however, only a negligible amount of emissions would be generated from any aircraft departure delays associated with launches. Therefore, any air emissions increase from departure delays are not expected to result in an exceedance of a NAAQS for any criteria pollutant and airspace closures associated with launches are not expected to result in significant air quality or climate-related impacts.

The FAA has not established a significance threshold for climate, nor has the FAA identified specific factors to consider in making a significance determination for GHG emissions[2]. The scientific community is continuing efforts to better understand the impact of aviation emissions on the global atmosphere. The FAA is leading and participating in a number of initiatives intended

[2] On January 9, 2023, CEQ published interim guidance for assessing greenhouse gas (GHG) emissions and climate change impacts in documents prepared for compliance with NEPA, *National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change; Notice of Interim Guidance; Request for Comments* (88 FR 1196). CEQ's guidance provided that agencies "are to apply the Guidance in the NEPA review for all new, proposed actions" and "Agencies should exercise judgment when considering whether to apply this guidance to the extent practicable to an on-going NEPA process." Development of this EA began prior to the publication of the 2023 interim guidance and therefore the EA was written in compliance with the December 18, 2014 CEQ *Revised Draft Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in NEPA Reviews*.

to clarify the role that commercial aviation plays in GHG emissions and climate. The FAA, with support from the U.S. Global Change Research Program and its participating federal agencies, has developed the Aviation Climate Change Research Initiative in an effort to advance scientific understanding of regional and global climate impacts of aircraft emissions.

4.1.2. No Action Alternative

Under the No Action Alternative, construction of SLC-5, launches from SLC-5, or static fires would not occur resulting in no change on air quality or GHG emissions from the Proposed Action as implemented.

4.2. Sound (Airborne)

Per FAA Order 1050.1F, noise impacts would be significant if the action would increase noise by DNL 1.5 dB or more for a noise-sensitive area that is exposed to noise at or above the DNL 65 dB noise exposure level, or that will be exposed at or above the DNL 65 dB level due to a DNL 1.5 dB or greater increase, when compared to the No Action Alternative for the same timeframe. For example, an increase from DNL 65.5 dB to 67 dB is considered a significant impact, as is an increase from DNL 63.5 dB to 65 dB. The CNEL may be used in lieu of DNL for FAA actions in California.

4.2.1. Preferred Alternative (Proposed Action)

4.2.1.1. SLC-5 Construction

Construction of SLC-5 and associated infrastructure would involve using diesel-powered heavy equipment for tasks, including excavation, filling, delivering materials, mixing and pouring cement and asphalt, trenching, and erecting structures. Construction equipment (e.g., excavators, tractors, and trucks) could generate temporary noise levels between 82 and 88 dBA at a distance of 50 ft. Based on data for typical noise ranges (Washington State Department of Transportation 2012), materials-handling equipment (concrete mixers) could generate noise levels ranging from 75 to 85 dBA at 50 ft. In general, noise levels generated from non-pile driving construction activities are expected to range from 75 to 88 dBA at 50 ft (Table 4.2.1).

These construction activities are far removed from any human sensitive receptors. As described in Appendix G, sound levels decay with increasing distance. Within 1,500 ft, the received level of construction activities would be below 60 dB. Noise from the construction activities would be entirely restricted to within the VSFB boundary. Therefore, construction activities at SLC-5 would not represent a notable degradation of the acoustic environment.

Table 4.2-1: Anticipated Construction Equipment Used and Typical Sound Levels

Equipment Description	Impact Device?	Actual Measured Average L_{max} at 50 feet	Approximate Received L_{max} at 300 feet
Compactor (ground)	No	83	67
Concrete Mixer Truck	No	79	63
Dump Truck	No	76	60
Excavator	No	81	65
Grader	No	89	73
Paver	No	77	61
Pickup Truck	No	75	59
Roller	No	80	64
Loader	No	84	68

Note: L_{max} = maximum sound level
Source: (Washington State Department of Transportation 2012)

4.2.1.2. Launch Program Operations

Phantom proposes to conduct a combined total of up to 48 launches and 48 static fire operations of the Daytona-E and Laguna-E launch vehicle at SLC-5 per year. Engine noise would be produced during each launch and static fire event. Noise from the Laguna-E would impact the area between the Santa Ynez River and Sudden Ranch (Figure 2.3-9). The Daytona-E would impact a much smaller area, between Bear Creek and Oil Well Canyon (Figure 2.3-8). During static fire, engine noise levels of both vehicles would primarily impact areas between SLC-4 and SLC-8 (Figures 2.3-10 and 2.3-11). Rocket launch noise would extend further than noise from static fire. In both cases, noise above 100 dB L_{max} would be almost entirely restricted to within the VSFB boundary.

Although sound propagates away from the source, received level decreases as the distance from the source increases. Without accounting for atmospheric conditions, terrain, or vegetation, for each doubling of distance from the source, the sound level attenuates (or drops off) at a rate of 6 dBA. As a result, noise from static firing or launches would be audible outside buildings. However, at the closest human sensitive receptors in Lompoc and North VSFB, approximately 8.0 mi and 10.0 mi away, respectively, the received noise level is expected to be less than 60 dB, equivalent to the sound level of a normal conversation.

Figures 2.3-12 and 2.3-13 present the A-weighted CNEL contours. As described in Chapter 2 (Description of the Proposed Action and Alternatives), CNEL is a cumulative metric that accounts for all noise events in a 24-hour period. For the Daytona-E, the CNEL 65 dBA contours for launch extends approximately 1.2 mi from SLC-5 (Figure 2.3-12). The 65 dBA CNEL contour for Laguna-E launch, the loudest of the noise generating activities proposed, reaches approximately 1.8 mi from SLC-5, and is entirely within the VSFB boundary (Figure 2.3-13). In locations such as Lompoc, normal CNELs vary between 55 dB and 65 dB. Given the distance to the sensitive receptors from SLC-5, the acoustic energy received at the sensitive receptor locations would not be sufficient to increase the CNELs. Although the noise from the firing event may be audible, it would not increase the CNELs at these locations and would not be considered a degradation of the acoustic environment.

Lastly, during ascent, a sonic boom (overpressure of high energy impulsive sound) up to approximately 1.5 psf is predicted to be generated while the first-stage booster is supersonic (Figures 2.3-6 and 2.3-7). The overpressure would be directed at the Pacific Ocean south of Point Conception and south of the NCI. No model results predicted that sonic booms would impact the NCI. Thus, noise impacts resulting from the sonic boom overpressure would not result in impacts on the NCI.

Given the distance to human sensitive receptors and the small amount of acoustic energy that would reach a sensitive receptor, the Proposed Action would not result in significant impacts related to noise and noise-compatible land use.

Airspace closures associated with launches could result in temporarily grounding aircraft at affected airports and re-routing of en-route flights on established alternate flight paths. The FAA has rarely, if ever, received reportable departure delays associated with launches. Aircraft could be temporarily grounded if airspace above or around the airport is closed. Ground delays are also used under some circumstances to avoid airborne reroutes. If aircraft were grounded, noise levels at the airport could temporarily increase as the planes sit idle. Also, depending on the altitude at which aircraft approach an airport, there could be temporary increases in noise levels in communities around the airports. However, aircraft would travel on existing routes and flight paths that are used on a daily basis to account for weather and other temporary restrictions. Re-routing associated with launch-related closures represents a small fraction of the total amount of re-routing that occurs for all other reasons in any given year. Any incremental increases in noise levels at individual airports would only last the duration of the airspace closure on a periodic basis and are not expected to meaningfully change existing DNL at the affected airports and surrounding areas. Therefore, airspace closures due to launches are not expected to result in significant noise impacts. Advancements in airspace management are expected to further reduce the number of aircraft that would contribute to noise at the affected airports and surrounding areas.

4.2.2. No Action Alternative

Under the No Action Alternative, construction of SLC-5, launches from SLC-5, or static fires would not occur resulting in no impacts on the noise environment.

4.3. Terrestrial Biological Resources

Factors considered in determining if implementing an alternative may result in significant impacts on biological resources include the extent or degree to which implementing an alternative would result in the following:

- unmitigable loss of important quantities of declining vegetation communities (including wetlands) that are considered rare;
- impacts on special status species; or
- altering regionally and locally important wildlife corridors that would severely and permanently limit their use.

Per FAA Order 1050.1F, impacts would be significant if the USFWS or NMFS determines that the action would be likely to jeopardize the continued existence of a federally listed threatened or

endangered species or would result in destroying or adversely modifying federally designated critical habitat.

Impacts on biological resources would occur if special status species or their habitats would be affected directly or indirectly by project-related activities. These impacts can be short- or long-term impacts. For example, short-term or temporary impacts can be from noise and dust during activities related to site access and water diversion and long-term impacts can be from the lost habitat supporting wildlife populations.

Potential impacts on biological resources as a result of the Proposed Action include the following:

- Permanent loss of habitat from construction related activities;
- Loss of individuals due to crushing or physical injury;
- Abandonment of breeding or roosting sites due to project-related noise; and
- Disruption of foraging or roosting activities from project-related noise.

4.3.1. Vegetation Resources

4.3.1.1. Preferred Alternative (Proposed Action)

As discussed in Section 3.3.3, native vegetation occurs within the Proposed Action Area. Portions of the Proposed Action Area would be permanently or temporarily disturbed as a result of constructing the launch pads, HIF, and associated infrastructure, as well as improving access roads, establishing firebreaks, and managing vegetation to reduce fire risk within the facility. Table 4.3-1 provides estimates of permanent and temporary impacts to vegetation types that occur within the Proposed Action Area.

Although SLC-5 was previously developed, native vegetation types, some of which are heavily mixed with non-native species, have re-established in some areas since the site was deactivated and demolished between 2009 and 2012. A total of 32.5 ac of predominantly vegetated habitat (native and non-native) would be permanently impacted by the Proposed Action (Table 4.3-1).

Existing native vegetation would be preserved to the extent feasible while meeting construction and fire safety requirements. Additionally, native vegetation would be allowed to re-establish in areas where temporary impacts occur because Phantom would apply an appropriate native hydroseed mix in coordination with the SLD 30/CEI botanist. There is also an abundance of native vegetation on VSFB outside of the Proposed Action Area. The small fraction of native vegetation loss from implementing the Proposed Action would be insignificant; therefore, the Proposed Action would not have a significant impact on vegetation resources.

Table 4.3-1: Impacts on Vegetation Types (red = non-native; black = primarily native)

Common Name	Alliance Name	Acres		
		Previously Developed	New Development	Total
Annual Grassland	*Avena* spp. - *Bromus* spp. Herbaceous Semi-Natural Alliance	1.45		**1.45**
Australian Wattle Patch	*Acacia* spp. - *Grevillea* spp. - *Leptospermum laevigatum* Shrubland Semi-natural Alliance	0.01	0.02	**0.02**
Mixed Bush Lupine Scrub / Annual Grassland	mixed *Lupinus arboreus* Shrubland Alliance and *Avena* spp. - *Bromus* spp. Herbaceous Semi-Natural Alliance	0.27		**0.27**
Mixed Coyote Brush Scrub / Iceplant Mat	mixed *Baccharis pilularis* Alliance and *Mesembryanthemum* spp. - *Carpobrotus* spp. Herbaceous Semi-Natural Alliance	3.02	4.84	**7.87**
Iceplant Mat	*Mesembryanthemum* spp. - *Carpobrotus* spp. Herbaceous Semi-Natural Alliance	3.85	0.27	**4.12**
Mixed Iceplant Mat / Annual Grassland	Mixed *Mesembryanthemum* spp. - *Carpobrotus* spp. Herbaceous Semi-Natural Alliance and *Avena* spp. - *Bromus* spp. Herbaceous Semi-Natural Alliance	0.12		**0.12**
Lemonade Berry Scrub	*Rhus integrifolia* Shrubland Alliance	0.14	3.15	**3.29**
Mixed Lemonade Berry Scrub / Veldt Grass	mixed *Rhus integrifolia* Shrubland Alliance and *Ehrharta calycina*	2.26	6.68	**8.94**
Monterey Cypress & Pine Stand	*Hesperocyparis macrocarpa* - *Pinus radiata* Forest & Woodland Semi-Natural Alliance	0.46	0.11	**0.57**
Mock Heather Scrub	*Lupinus chamissonis* - *Ericameria ericoides* alliance	0.07		**0.07**
Needle Grass Grassland	*Nassella* spp. - *Melica* spp. Herbaceous Alliance		0.02	**1.10**
Poison Oak Scrub	*Toxicodendron diversilobum* Shrubland Alliance	0.57	0.67	**1.24**
Mixed Poison Oak Scrub / Iceplant Mat	mixed *Toxicodendron diversilobum* Shrubland Alliance and *Mesembryanthemum* spp. - *Carpobrotus* spp. Herbaceous Semi-Natural Alliance	1.08	0.07	**0.07**
Veldt Grass	*Ehrharta calycina* Undescribed Alliance	4.32	0.09	**4.41**
Total Vegetation Permanent Impacts		**17.61**	**15.92**	**33.54**
Developed	Developed - Unvegetated	2.71	0.34	**3.05**
Total Site Area		**20.32**	**16.26**	**36.59**

4.3.1.2. No Action Alternative

Under the No Action Alternative, construction of SLC-5, launches from SLC-5, or static fires would not occur resulting in no impacts on vegetation resources.

4.3.2. General Wildlife Resources

4.3.2.1. Preferred Alternative (Proposed Action)

4.3.2.1.1. *Physical Impacts*

During construction of SLC-5 and the associated infrastructure, Phantom would remove vegetation by discing, mowing, masticating, grading, and/or hand removal. These activities would have potential adverse effects on wildlife species if they are inadvertently injured or killed by equipment or workers. A total of 25.8 ac of predominantly vegetated habitat (native and non-native) would be disced or mowed during the Proposed Action.

If practicable, vegetation clearing would occur outside of bird nesting season (15 February through 15 August). If vegetation clearing occurs during nesting season, a qualified biologist would survey the area for nesting birds prior to vegetation clearing activities to prevent active nests from being damaged or chicks injured or killed. Additional EPMs described in Section 2.3.3.2

would be implemented to further avoid and minimize impacts on wildlife resources. As a result, potential impacts on wildlife species as a result of vegetation management would be less than significant.

4.3.2.1.2. *Noise Impacts*

Constructing the SLC-5 facility, associated utilities, and road improvements, and clearing vegetation would generate noise and disturbance that could result in temporary impacts on wildlife species. Temporary disturbances due to noise and human presence related to these activities could disrupt foraging and roosting activities or cause wildlife species to avoid the work areas. Wildlife species would experience some level of noise disturbance during the day; however, construction activities would be temporary and only create noise above ambient levels over a relatively small area. Individuals would experience temporary behavioral disruption and likely move to adjacent suitable habitat until the noise disturbance ceases. A qualified biological monitor would oversee activities to ensure implementation of EPMs designed to minimize and avoid impacts on native wildlife species (Section 2.3.3.2). If vegetation clearing occurs during nesting season, a qualified biologist would survey the area for nesting birds and delineate buffers around nests to prevent disturbance from noise. As a result, potential impacts on wildlife species resulting from noise associated with construction and vegetation management would be less than significant.

Temporary disturbances to terrestrial wildlife species within the Action Area would also occur during the launch and static fire events from noise caused by the firing and flight of the vehicles. Wildlife responses to noise can be behavioral or physiological – ranging from mild, such as an increase in heart rate, to more damaging effects on metabolism and hormone balance. Because responses to noise are species specific, exact predictions of the effects on each species are unreliable without data pertaining to those species or similar species.

During launches and static firings, noise levels up to 140 dB L_{max} would be produced at SLC-5. Although exact predictions cannot be made, these noises are expected to elicit a startle response in terrestrial wildlife species with developed hearing abilities. Potentially, wildlife hearing thresholds could shift either permanently or temporarily in wildlife if they are active on the surface close to SLC-5 during launch and static fire events. Exceptionally little sound is transmitted between the air-water interface; thus, in-air sound would not have a significant effect on submerged animals (Godin 2008). Likewise, wildlife present below the ground surface would be insulated from noise impacts. Because the affected area is relatively small and the launch and static fire events are temporary, behavioral disruptions and potential hearing threshold shifts would not have population-level impacts and therefore would not have a significant effect on wildlife resources.

4.3.2.2. No Action Alternative

Under the No Action Alternative, construction of SLC-5, launches from SLC-5, or static fires would not occur resulting in no impacts on wildlife resources.

4.3.3. Special Status Species

Special status species occur or potentially occur within or near the Proposed Action Area and its associated activities that may be adversely affected. Table 4.3-2 summarizes potential project-related impacts on special status wildlife species. Physical disturbances associated with the Proposed Action are not within designated or proposed critical habitat for any species.

Table 4.3-2: Potential Impacts on Special Status Species Observed Within Proposed Action Area

Species	Status		Potential Impacts
	Federal	State	
Plants			
La Purisima manzanita (*Arctostaphylos purissima*)	-	CNPS 1B.1	Direct physical impacts
Buck brush (*Ceanothus cuneatus*)	-	CNPS 4.2	Direct physical impacts
Invertebrates			
Crotch's bumblebee (*Bombus crotchii*)	-	SSC	Direct physical impacts, and loss of habitat
Fish			
Tidewater goby (*Eucyclogobius newberryi*)	FT	-	Degradation of habitat from water use, and disturbance due to noise
Unarmored Threespine Stickleback (*Gasterosteus aculeatus*)	FE	SE	Degradation of habitat from water use, and disturbance due to noise
Arroyo chub (*Gila orcuttii*)	-	SSC	Degradation of habitat from water use, and disturbance due to noise
Amphibians			
California red-legged frog (*Rana draytonii*)	FT	SSC	Direct physical impacts and disturbance due to noise
Reptiles			
Southwestern pond turtle (*Actinemys pallida*)	-	SSC	Direct physical impacts and disturbance due to noise.
Two-striped garter snake (*Thamnophis hammondii*)	-	SSC	Direct physical impacts.
Birds			
Allen's hummingbird (*Selasphorus sasin*)	BCC		Disturbance due to noise
Black oystercatcher (*Haematopus bachmani*)	BCC	-	Disturbance due to noise
Black skimmer (*Rynchops niger*)	BCC	-	Disturbance due to noise

Species	Status		Potential Impacts
	Federal	State	
Brant (*Branta bernicla*)	-	SSC	Disturbance due to noise
Burrowing owl (*Athene cunicularia*)	BCC	SSC	Disturbance due to noise
California brown pelican (*Pelecanus occidentalis californicus*)	-	Fully Protected	Disturbance due to noise
California condor (*Gymnogyps californianus*)	FE	SE	Disturbance due to noise
Costa's hummingbird (*Calypte costae*)	BCC		Disturbance due to noise
Golden eagle (*Aquila chrysaetos*)	BGEPA	Fully Protected	Disturbance due to noise
Lawrence's goldfinch (*Spinus lawrencei*)	BCC		Disturbance due to noise
Loggerhead shrike (*Lanius ludovicianus*)	BCC	SSC Nesting	Disturbance due to noise
Long-billed curlew (*Numenius americanus*)	BCC	-	Disturbance due to noise
Marbled godwit (*Limosa fedoa*)	BCC	-	Disturbance due to noise
Marbled murrelet (*Brachyramphus marmoratus*)	FT	SE	Disturbance due to noise
Northern harrier (*Circus hudsonius*)		SSC Nesting	Disturbance due to noise
Nuttall's woodpecker (*Dryobates nuttallii*)	BCC		Disturbance due to noise
Oak titmouse (*Baeolophus inornatus*)	BCC		Disturbance due to noise
Peregrine falcon (*Falco peregrinus anatum*)	BCC Nesting	Fully Protected Nesting	Disturbance due to noise
Short-billed dowitcher (*Limnodromus griseus*)	BCC	-	Disturbance due to noise
Whimbrel (*Numenius phaeopus*)	BCC	-	Disturbance due to noise
Western snowy plover (*Charadrius nivosus nivosus*)	FT; BCC	SSC Nesting	Disturbance due to noise
Willet (*Tringa semipalmata*)	BCC	-	Disturbance due to noise

Species	Status		Potential Impacts
	Federal	State	
White-tailed kite (*Elanus leucurus*)		Fully Protected Nesting	Disturbance due to noise
Yellow warbler (*Setophaga petechia*)	BCC	SSC Nesting	Disturbance due to noise
Terrestrial Mammals			
Pallid bat (*Antrozous pallidus*)		SSC	Disturbance due to noise
Townsend's big-eared bat (*Corynorhinus townsendii*)		SSC	Disturbance due to noise
Spotted bat (*Euderma maculatum*)		SSC	Disturbance due to noise
Western red bat (*Lasiurus blossevillii*)		SSC	Disturbance due to noise
Western mastiff bat (*Eumops perotis californicus*)		SSC	Disturbance due to noise
San Diego desert woodrat (*Neotoma lepida intermedia*)		SSC	Disturbance due to noise
American badger (*Taxidea taxus*)		SSC	Disturbance due to noise

Notes: CNPS = California Native Plant Society; BGEPA = BGEPA = Bald and Golden Eagle Protection Act; FE = Federally Endangered Species; FT = Federally Threatened Species; SE = State Endangered Species; SSC = California State Species of Special Concern; BCC = Federal Bird of Conservation Concern

4.3.3.1. Preferred Alternative (Proposed Action)

4.3.3.1.1. *Tidewater Goby (Federally Listed Endangered Species)*

Physical Impacts

The SLC-5 launch pads would be designed to direct any ejected steam or water and flame produced during launch away from Honda Canyon, thereby avoiding any potential impacts to Honda Creek, where suitable, but currently unoccupied TWG habitat is located. Therefore, the Proposed Action would not have any direct physical impacts on TWG.

Noise Impacts

To evaluate the worst-case scenario, noise from the louder of the two proposed vehicles, the Laguna-E, was analyzed for potential impacts to TWG. During up to 48 launch events per year, engine noise produced by the Laguna-E would reach 130 dB L_{max} at potential TWG habitat in Honda Creek. Static fire events would similarly reach up to 130 dB L_{max} at this location. As described in Appendix A, TWG are unlikely to be present during the proposed launch and static

fire activities. If present, in-air sound would not cause more than a temporary behavioral disruption to fish in Honda Creek.

Water Use

As noted in Sections 3.14.4 and 3.5.3, at maximum cadence, the Proposed Action would use up to 552,000 gallons (1.69 ac-ft) of water per year, drawing on supply from the San Antonio Creek Basin. As described in Appendix A, 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**.**

Conclusion

Because of the low likelihood of TWG presence in Honda Creek and the minimal transfer of in-air noise into underwater noise, and the negligible increase in water extraction from the San Antonio Creek Basin, the anticipated level of disturbance from the Proposed Action would be discountable. Therefore, the USSF has determined that the Proposed Action *may affect but is not likely to adversely affect* the TWG. The USSF completed Section 7 consultation with the USFWS for potential impacts on TWG and will implement all applicable minimization, monitoring, and avoidance measures in the BO (Appendix A) and in Section 2.3.3.2. Therefore, impacts would not be significant.

4.3.3.1.2. *Unarmored Threespine Stickleback (Federally Listed Endangered Species)*

Physical and Noise Impacts

Although the UTS was introduced into Honda Creek, south of SLC-5, in 1984, extensive surveys conducted in 2008, 2016, and 2017 did not detect any fish in the creek (MSRS 2009, 2016, 2018). Between 2008 and 2022, Honda Creek has gone through multiple cycles of drying and rehydration, which would preclude occupancy by and persistence of fish. In addition, the SLC-5 launch pads would be designed to direct any ejected steam or water and flame produced during launch away from Honda Canyon, thereby avoiding any potential impacts to Honda Creek. UTS in San Antonio Creek would be outside areas where launch noise would occur. Therefore, the Proposed Action would not have any direct physical or noise impacts on UTS.

Water Use

As noted in Sections 3.14.4 and 3.5.3, at maximum cadence, the Proposed Action would use up to 552,000 gallons (1.69 ac-ft) of water per year, drawing on supply from the San Antonio Creek Basin. As described in Appendix A, 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**.**

Conclusion

The increase in water extraction from the San Antonio Creek Basin under the Proposed Action would be discountable. Therefore, the USSF has determined that the Proposed Action *may affect but is not likely to adversely affect* the UTS. The USSF completed Section 7 consultation with the USFWS for potential impacts on UTS and would implement all applicable minimization,

monitoring, and avoidance measures in the BO (Appendix A) and in Section 2.3.3.2. Therefore, impacts would not be significant.

4.3.3.1.3. *California Red-legged Frog (Federally Listed Threatened Species)*

Physical Impacts

Direct impacts on post-metamorphic CRLF, including injury and mortality, may inadvertently occur during removal of vegetation, site grading and contouring, construction, firebreak and fire access road establishment, and site maintenance from the operation of heavy equipment, machinery, and vehicles. CRLF that may disperse through the project area could become entrapped in any holes or trenches left open overnight. However, open holes and trenches would be covered overnight and the risk of impacts on CRLF would be reduced because biologists would monitor construction activities and search for animals trapped in open holes and trenches. Any CRLF detected within the construction area would be captured and relocated to nearby suitable habitat. In addition, when any demolition, contouring, or construction is occurring at SLC-5, the active construction areas would be surrounded by exclusion fence. A USFWS approved biologist would be present to monitor vegetation-clearing activities and move any CRLF encountered to the nearest suitable habitat out of harm's way. Regardless, post-metamorphic frogs may be injured or killed during construction and vegetation clearing activities. The risk of introducing or spreading chytrid fungus would be reduced by requiring implementation of the DAPTF Fieldwork Code of Practice (DAPTF 2019).

During launches, ejected steam, deluge water, and flames may injure or kill CRLF that are near the launch pad or exhaust ducts at time of launch. However, the launch pads would be designed to direct any ejected steam or water and flame away from Honda Canyon, therefore avoiding any potential impacts to Honda Canyon, where CRLF are known to breed and the most likely area for them to occur year-round. Additionally, the exhaust ducts would be maintained free of water between launches and deluge water would only be added for 20-seconds (T-10 seconds to T+10 seconds). Any ejected water would be captured in a retention basin. Retained water would be tested for hydrocarbon contamination in the hours or days following each launch. If the resulting values are compliant with the Vandenberg HWMP (DAF 2020), the water would be drained to grade. Otherwise, water would be pumped and properly disposed of as wastewater. Any water retention basins would be designed to exclude access by CRLF. If such exclusion is not possible, and water is present in retention basin overnight, the basin would be checked daily for CRLF prior to pumping. Active vegetation management around the proposed launch pads and basins would significantly reduce the likelihood of CRLF being present near the pads during launch events.

Noise Impacts

To evaluate the worst-case scenario, noise from the louder of the two proposed vehicles, the Laguna-E, was analyzed for potential impacts to CRLF. At maximum launch cadence, areas known to be occupied by CRLF in Honda Creek would experience launch noise events lasting less than one minute up to 48 times per year reaching levels up to 130 dB L_{max} during Laguna-E launches and approximately 125 dB L_{max} during Daytona-E launches (Figures 3.3-2 and 3.3-4). A maximum of 48 static fire events each year would cause brief (< 30 seconds) noise events reaching up to

approximately 125 dB L_{max} for Laguna-E and up to approximately 120 dB L_{max} for Daytona-E in Honda Canyon (Figures 3.3-3 and 3.3-5). The estimates of received maximum noise levels in portions of Honda Creek are conservative since the modeling assumes a flat landscape and the northern bluff of Honda Canyon would attenuate sound during initial vehicle liftoff and static fire events. Additionally, the position of the flame buckets and deluge system were designed to direct flame away from Honda Canyon; therefore, less noise energy would be directed to Honda Canyon than the model results predict. Engine noise would reach as high as 144 dB L_{max} in upland CRLF dispersal habitat on SLC-5 during these launch and static fire events; these levels are unlikely to result in even temporary hearing damage for CRLF that may be present. In addition, due to vegetation management in the immediate vicinity of launch vehicle launch sites, the likelihood of CRLF being present in terrestrial environments exposed to these noise levels would be very low and few individuals would be impacted.

Detailed background information regarding literature reviewed in determining the effects of noise on CRLF, and the associated derivation of a hearing curve, is contained in Appendix A. A full discussion of maximum noise level estimates, modeling assumptions, and factors in determining the amount of noise energy that would be perceived by CRLF is contained in Appendix A. Also included is a description of data used to produce graphical depictions of a mean Ranidae hearing sensitivity curve, associated noise weighting function, and launch peak noise estimates.

CRLF in Honda Creek would likely exhibit a startle response to vibrations and visual disturbance during launch and static fire, 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 past exposure to similar noise. Regardless, the reaction is expected to be the same – the frog's behavior would likely 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 CRLF behaviors including foraging, calling, and mating (during the breeding season). However, frogs tend to return to normal behavior quickly after being disturbed. USFWS-permitted biologists working on VSFB and elsewhere in CRLF occupied habitat have routinely observed species resuming their normal call-rest patterns after disrupting individuals during frog surveys (A. Abela, M. Ball, and J. LaBonte, pers. obs.). CRLF would, therefore, be expected to resume normal activities quickly once the disturbance from launch or static fire noise has ended and any behavioral response to individual noise events would be short term (minutes).

None of the studies described in Appendices A and I are directly comparable to the noise impacts of the Proposed Action, which is likely to be minimally perceptible in the hearing range of CRLF but presumed to cause vibrations that would be sensed, non-sustained (less than one minute duration), and comparatively infrequent (combined maximum of 96 noise events per year at full launch tempo versus the available literature, which examines sustained traffic noise and multiple daily airplane flights). Additionally, there are no thresholds in the literature that quantify what level of noise or frequency of disturbance would elicit stress hormone responses, impacts to breeding and reproduction, or negative population level effects. While these studies show effects on behavior and physiology that could have impacts on fitness and populations, none of them present direct evidence of population impacts so the long-term effects of chronic exposure to anthropogenic noise on populations is unknown for these species.

Over the past five years, VSFB has supported an average of 4.4 rocket launches per year with a maximum of 7 launches in both 2017 and 2018; however, several new launch programs have recently or will soon be initiated. Of these, those that will have noise impacts on Honda Creek of at least 100 dB L_{max} include SpaceX Falcon 9 (SLC-4) and Northrup Grumman Minotaur (SLC-8), which have completed the NEPA approval process, and ULA Vulcan (SLC-3), Blue Origin New Glenn (SLC-9), Relativity Terran 1 (SLC-11), Phantom Daytona-E (SLC-8), and the Proposed Action, which are projected to receive NEPA approval over the next several years. If all of these programs, including the Proposed Action, achieve full launch tempo (estimated in 2028 to 2030), a combined total of up to 157 noise events of at least 100 dB L_{max} would impact Honda Creek each year as a result of launch and static fire. Although this type of disturbance is not directly comparable to those available from the scientific literature, it is reasonably likely that in addition to being startled by these launch events, as launch tempo increases on VSFB, the frequency of disturbance could potentially result in chronic levels of stress hormone responses in CRLF at Honda Creek, impacts to habitat occupancy, reduced breeding, and lower immunity in individuals. These in turn could reduce reproduction success, survival, and fitness, and cause individuals to leave the area, resulting in population level effects at Honda Creek.

The USSF would implement a monitoring program (see Section 2.3.3.2.2) to track CRLF habitat occupancy, breeding behaviors, and tadpole densities in Lower Honda Creek (the area to receive the highest noise levels) as the frequency of launch and static fire under the Proposed Action gradually increases. As full tempo under the Proposed Action and the launch programs listed above would not reach maturity until 2028 to 2030, the USSF would be able to assess incremental changes in the acoustic environment at Lower Honda Creek through the use of passive bioacoustic recorders and analyze these data to assess any associated impacts on the CRLF population. If CRLF occupancy, calling frequency, or tadpole densities decline from baseline by 15% or more, the 15% decline from baseline is maintained for two consecutive years, and the decline is attributed to an increase in Phantom's launch and static fire operations, SLD 30 would offset for these impacts by creating new CRLF breeding habitat at the San Antonio Creek Oxbow Restoration Area, an established wetland mitigation site that is located outside of areas currently impacted by launch noise on VSFB. Historically occupied by riparian vegetation, restoration efforts would focus on enhancing this abandoned tract of agricultural land to improve San Antonio Creek and provide breeding habitat for CRLF and thus offset any population level impacts at Honda Creek within an area that is not impacted by launch noise.

Artificial Lighting Impacts

Previous studies, discussed in Appendix A, show that the effects of artificial lighting on anurans are inconsistent and appear to vary by species and life stage. Artificial lights have been shown to reduce calling frequency, which may negatively impact breeding and populations, make them more vulnerable to parasites and pollution, reduce breeding activity, and cause changes in energy metabolism. Coupled, these changes have the potential to impact reproduction and overall fitness in species exposed to artificial light at night.

If facility lighting associated with the Proposed Action results in an increased presence of artificial light in the Honda Creek riparian corridor CRLF are likely to be adversely impacted. However, except when necessary for safety or performance of launch operations, artificial lighting at the

SLC-5 facility would be minimized during the hours of darkness. In addition, modeling of the preliminary lighting plan shows that lighting levels of 1-foot candle would not extend beyond the SLC-5 facility (Figure 4.3-1).

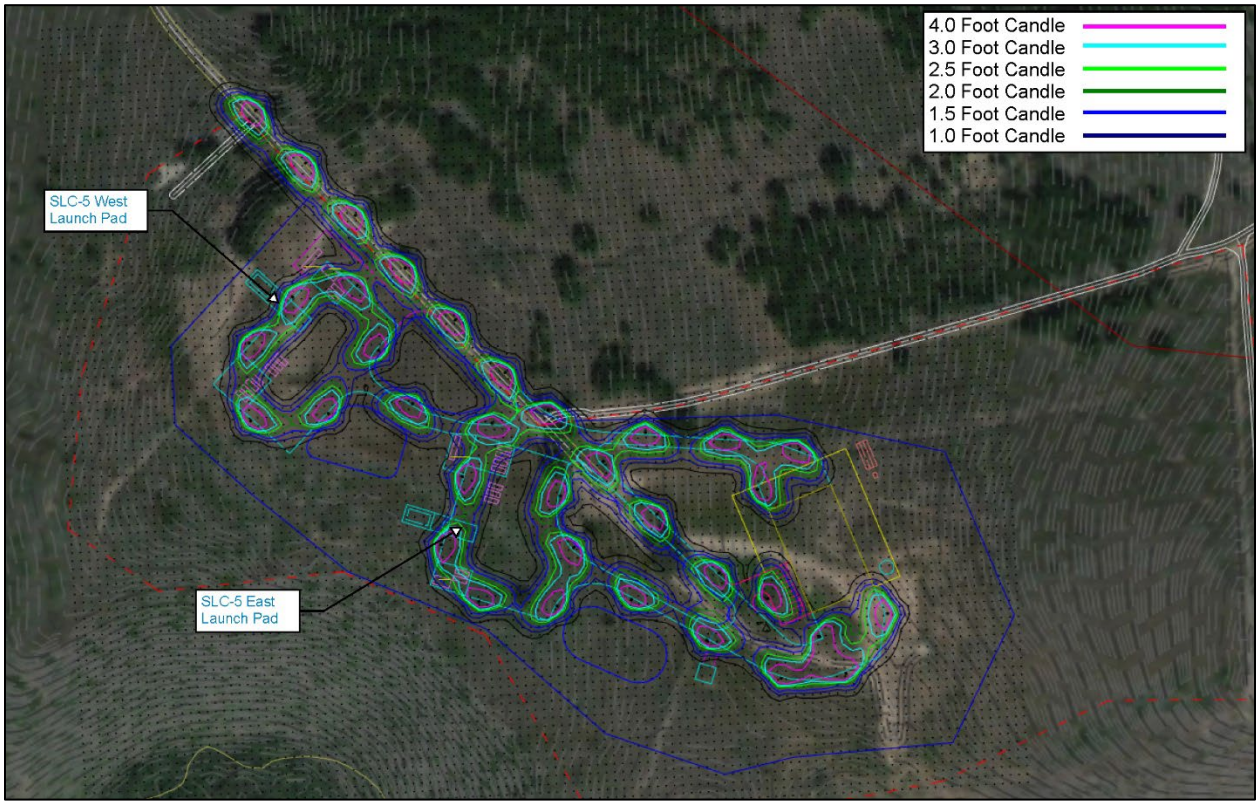

Figure 4.3-1: Modeling of light intensity at SLC-5 based on the preliminary lighting plan

Habitat Impacts

The Proposed Action would not have any physical impacts to CRLF aquatic habitat. The Proposed Action may, however, result in a degradation in the quality of CRLF aquatic habitat in Honda Creek through exposure to artificial light at night, noise, and vibration during static fire and launch events. As noted above and in Section 2.3.1, artificial lighting at the project site would be minimized during the hours of darkness, except when necessary for safety, security, or performance of launch operations, and, to the maximum extent practicable, lights would be placed and designed to minimize illumination of Honda Canyon. In addition, the lighting plan would be designed such that lights are directed away from Honda Canyon and would be shielded to reduce scatter into undeveloped areas. Design details are not currently available, but would be required to minimize illumination of Honda Canyon such that that lighting levels of 1-foot candle would not extend beyond the SLC-5 facility.

Construction of SLC-5 and the associated firebreaks, fire access road maintenance, and utility corridor would result in impacts to approximately 37.8 ac of suitable CRLF upland dispersal habitat (Note: total excludes existing paved roads).

Water Use

As noted in Sections 3.14.4 and 3.5.3, at maximum cadence, the Proposed Action would use up to 552,000 gallons (1.69 ac-ft) of water per year, drawing on supply from the San Antonio Creek Basin. As described in Appendix A, 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.

Conclusion

The USSF has determined that noise, artificial lighting, potential physical impacts, and the negligible increase in water extraction from the San Antonio Creek Basin *may affect, and are likely to adversely affect*, CRLF. The USSF completed Section 7 consultation with the USFWS for potential impacts on CRLF and would implement all applicable minimization, monitoring, and avoidance measures in the BO (Appendix A) and in Section 2.3.3.2. Therefore, effects on CRLF will not be significant.

4.3.3.1.4. *Marbled Murrelet (Federally Listed Threatened Species)*

Physical and Habitat Impacts

No ground disturbing activities or vegetation management activities would occur within or near MAMU habitat; therefore, these actions would have no effect on MAMU. The potential effects of noise are discussed below.

Noise and Visual Disturbance

To evaluate the worst-case scenario, noise from the louder of the two proposed vehicles, the Laguna-E, was analyzed for potential impacts to MAMU. This species has occasionally been observed between the late summer through winter foraging off the coast of south VSFB (eBird 2021). Although unlikely, if MAMU were present immediately off the coast during a Laguna-E launch event, they would experience engine noise of less than 120 dB L_{max} (Figure 3.3-6). During static fire events, noise directly off the coast of SLC-5 would be less than 115 dB L_{max} (Figure 3.3-7). Noise levels during Daytona-E launches and static fire events would be less than those produced by the Laguna-E. Additionally, the majority of MAMU are found approximately 984 to 6,561 ft from shore (Strachan et al. 1995) where noise levels would decrease to as low as 110 dB L_{max}. MAMU do not nest on VSFB so exposure to noise impacts would be limited to foraging adults.

Based on limited data available regarding MAMU's response to noise and visual disturbances (Appendix A), the dominant response of MAMU to approach by boats is to dive and resurface a short distance away. MAMU are, therefore, expected to exhibit a startle response that would cause birds to dive and resurface, but they are expected to return to normal behavior soon after each launch or static fire event has been completed.

Conclusion

Because MAMU would be unlikely to be present during a launch or static fire event, and the expected impact would be a temporary behavioral reaction in response to noise, the Proposed Action would have a discountable effect on MAMU. Therefore, the USSF has determined that the

Proposed Action *may affect, but is not likely to adversely affect*, the MAMU. The USSF completed Section 7 consultation with the USFWS for potential impacts on MAMU and would implement all applicable minimization, monitoring, and avoidance measures in the BO (Appendix A) and in Section 2.3.3.2. Therefore, impacts would not be significant.

4.3.3.1.5. *Western Snowy Plover (Federally Listed Threatened Species)*

Physical and Habitat Impacts

No ground disturbing activities or vegetation management activities would occur within or near SNPL habitat; therefore, these actions would have no effect on SNPL. The potential effects of noise are discussed below.

Noise and Visual Disturbance

To evaluate the worst-case scenario, noise from the louder of the two proposed vehicles, the Laguna-E, was analyzed for potential impacts to SNPL. SNPL at South Surf Beach would be exposed to levels between 100 and 108 dB L_{max} during Laguna-E launches and between approximately 100 and 104 dB L_{max} during Daytona-E launches (Figure 3.3-8) and less than 100 dB L_{max} during static fire events (Figure 3.3-9). Launch noise events would last less than one minute and static fire noise would last less than 30 seconds.

Determining the amount of noise energy that overlaps with the hearing sensitivity of SNPL is critical to understanding the potential effects that the noise disturbances will have. With the lack of SNPL-specific audiograms or other data on this species hearing sensitivity, a weighted noise function for SNPL based on call frequency was deduced. In Appendix A the background on developing the weighted noise function is provided, as well as narrative and graphical descriptions of SNPL call frequency, and analogous species' hearing sensitivity curve and weighting function. The weighting function was applied to a timewave form recording of the June 2022 Falcon 9 SARah-1 launch, resulting in a peak level of approximately 60 dB L_{max} (Appendix A). In comparison to human hearing sensitivity, 60 dBA is equivalent to the noise level of typical conversation. The very low incidence of behavioral responses to launch noise and lack of evidence of changes in SNPL abundance, nesting behavior, and distribution on VSFB beaches in response to launches is likely because SNPL perceive very little of the noise produced by rocket engine noise.

Historical data from monitoring efforts documenting SNPL responses to noise impacts are described in detail in Appendix A. Most recently, SNPL were monitored for the 18 June 2022 Falcon 9 SARah-1 mission with boost-back and first stage recovery at SLC-4 (Robinette & Rice 2022). There were no differences in overall bird abundance or nest attendance before and after the launch and landing. Video footage showed that the incubating adults reacted to both the launch and the sonic boom produced by the return flight of the first stage, with more intense reactions to the sonic boom. Scientific literature, described in Appendix A, shows that the effects of frequent noise disturbance on bird species varies greatly. None of the scientific literature studies are directly comparable to the noise impacts of the Proposed Action, and there are no relevant studies on rocket launch effects on birds. Launch engine noise and sonic booms are acute, non-sustained, and unpredictable; they are most similar to aircraft noise disturbance, yet relatively much less frequent.

SLD 30 would augment the existing SNPL monitoring program on Base, which records habitat use, nesting efforts, nest fates, fledgling survival, and population size through each breeding season, with geospatial analysis of SNPL nesting and the noise environment, (see Section 2.3.3 and Appendix A). SLMs would be deployed immediately inland of South Surf Beach and a control site to characterize the noise environment during the breeding season within the Daytona-E and Laguna-E noise 100 dB L_{max} footprint. Geospatial analysis would be performed annually as Phantom's launch tempo gradually increases over six years to full cadence to assess whether patterns of nesting activity, nest fates, or fledgling success are negatively impacted by noise from the Proposed Action or other launch programs on VSFB. If geospatial analysis shows that a statistically significant decline in breeding effort or nest success over two consecutive years is attributable to the Proposed Action, SLD 30 would offset this impact by increasing predator removal efforts on Base to include the non-breeding season, particularly focusing on raven removal at and adjacent to VSFB beaches.

Conclusion

The USSF has determined that the Proposed Action *may affect, and is likely to adversely affect*, the SNPL on VSFB. The USSF completed Section 7 consultation with the USFWS for potential impacts on SNPL and would implement all applicable minimization, monitoring, and avoidance measures in the BO (Appendix A) and in Section 2.3.3.2. Potential effects to SNPL would therefore be less than significant.

4.3.3.1.6. *California Condor (Federally Listed Endangered Species)*

Physical and Habitat Impacts

The Proposed Action Area is outside the normal range of the species and the species is not known to breed within the Proposed Action Area; therefore, physical impacts to habitat associated with the Proposed Action would have no effect on California condor. The potential effects of noise are discussed below.

Noise and Visual Disturbance

It has been difficult to analyze the effect human disturbance could have on California condors. Generally, California condors are less tolerant of human disturbances near nesting sites than at roosting sites. The species is described as being "keenly aware of intruders" and may be alarmed by loud noises from distances greater than 1.6 mi. In addition, the greater the disturbance in either noise level or frequency, the less likely the condor would be to nest nearby. As such, USFWS typically requires isolating roosting and nesting sites from human intrusion (USFWS 1996). Noise from a launch coupled with visual disturbance could cause a startle response and disrupt behavior if a condor is within the Proposed Action Area.

Although launch noise and visual disturbance may cause a startle response and disrupt behavior, the likelihood of a condor being present during these activities is extremely low and, therefore, the effect of the Proposed Action would be discountable.

Conclusion

The overall likelihood of a California condor occurring within the Proposed Action Area during a launch or static fire event is extremely unlikely, hence, discountable. Therefore, the USSF has

determined that Proposed Action *may affect, but is not likely to adversely affect*, the California condor. The USSF completed Section 7 consultation with the USFWS for potential impacts on California condor and would implement all applicable minimization, monitoring, and avoidance measures in the BO (Appendix A) and in Section 2.3.3.2. Therefore, the Proposed Action would not result in significant impacts on the California condor. The USSF would coordinate with the USFWS and Ventana Wildlife Society to monitor condor presence prior to launches.

4.3.3.1.7. *Migratory Birds*

Physical Impacts

The Proposed Action requires removal and routine mowing of vegetation which would result in loss of existing breeding and roosting habitat for migratory birds. However, given the abundance of nearby suitable habitat this adverse impact would be less than significant. In addition, conducting initial vegetation management during the non-nesting season for avian species (September–February) would prevent losing eggs or young. If vegetation clearing occurs during nesting season (March–August), a qualified biologist would survey the area for nesting birds and delineate buffers around nests to prevent nests from being damaged or loss of chicks or eggs. Therefore, direct impacts on migratory birds nesting within the Vegetation Management Area are unlikely.

Noise and Visual Disturbance

Noise and visual disturbance associated with the Proposed Action may disturb breeding migratory birds. Disturbances to breeding birds include abandonment of breeding sites, egg breakage by "panicked" adults, physical damage or injury to the eggs or chicks due to heating and cooling from exposure, and increased vulnerability to predation during periods of nest abandonment. Chicks may also panic and leave the nest prematurely resulting in potential injury or death. Impact severity would depend on the activity-related disturbance timing and noise exposure level (i.e., proximity of the breeding birds to SLC-5). If disturbance occurs after nesting has already been initiated, project-related noise could adversely impact reproductive success.

Noise associated with the Proposed Action may also cause threshold shifts in hearing sensitivity to birds. This would be most likely to occur to birds breeding on or in close proximity to SLC-5. However, vegetation management around SLC-5 would eliminate most nesting habitat within the area to receive the highest sound levels.

Conclusion

The EPMs outlined in Section 2.3.3.2.2 should serve to avoid or minimize potential adverse effects on migratory birds during implementing the Proposed Action. Therefore, the Proposed Action would not have a significant effect on migratory birds.

4.3.3.2. No Action Alternative

Under the No Action Alternative, construction of SLC-5, launches from SLC-5, or static fires would not occur resulting in no impacts on special status species.

4.4. Marine Biological Resources

4.4.1. Preferred Alternative (Proposed Action)

4.4.1.1. ESA-listed Fish

This section evaluates how, and to what degree, the Proposed Action potentially impacts ESA-listed fish (oceanic whitetip shark and scalloped hammerhead shark) occurring within the ROI. The stressors considered for the ESA-listed fish are physical disturbance and impacts by fallen objects and ingestion of expended materials.

Physical Disturbance and Impacts by Fallen Objects

If debris from expended materials struck a fish, it could result in injury or death. Once within the water column, disturbance or strike from an item falling through the water is possible, but its velocity would be greatly reduced (reducing the potential for serious injury) and the falling object could potentially be avoided by marine species once detected. A very low possibility exists that an ESA-listed fish would be at or just under the surface in the impact area at the time of splashdown, but population-level impacts would not occur. In addition, ESA-listed fish species occur in very low densities throughout the proposed landing area (U.S. Department of the Navy 2017), therefore, the probability of a strike would be very unlikely and discountable.

Ingestion

Expended materials may pose an ingestion stressor to ESA-listed fish. Ingestion of expended materials by fish could occur at or just below the surface, in the water column, or at the seafloor depending on the size and buoyancy of the expended object and the feeding behavior of the fish. Floating material is more likely to be eaten by fish that feed at or just under the water's surface (e.g., ocean sunfish, basking sharks, or flying fish), while materials that sink to the seafloor present a higher risk to bottom-feeding fish (e.g., rockfishes, skates, and flatfishes). Expended materials would sink rapidly and settle on the ocean floor, typically far from shore at depths greater than the ESA-listed species discussed herein are expected to occur. Because the degradation of these materials would be very slow and the presence of the ESA-listed fish species at these depths is unlikely the risk of ingestion of expended materials by ESA-listed fish would be very low and discountable.

Conclusion

The potential for physical disturbance and potential strike and ingestion of expended materials as a result of the Proposed Action would be discountable. The USSF has determined that the Proposed Action may affect, but is not likely to adversely affect the ESA-listed fish. The USSF completed Section 7 consultation with the NMFS for potential impacts on ESA-listed fish species on 20 January 2023 (Appendix B) and would implement all applicable minimization, monitoring, and avoidance measures in the BO. Potential effects to ESA-listed fish would therefore be less than significant.

4.4.1.2. ESA-listed Sea Turtles

This section evaluates how, and to what degree, the Proposed Action potentially impacts ESA-listed sea turtles (green, loggerhead, olive ridley, hawksbill, and leatherback) occurring within the ROI. The stressors considered for the ESA-listed sea turtles are physical disturbance and impacts by fallen objects and ingestion of expended materials.

Physical Disturbance and Impacts by Fallen Objects

If debris from expended materials struck a sea turtle, it could result in injury or death. Once within the water column, disturbance or strike from an item falling through the water is possible, but its velocity would be greatly reduced (reducing the potential for serious injury) and the falling object could potentially be avoided by marine species once detected. A low possibility exists that a sea turtle would be at or just under the surface in the impact area at the time of splashdown, but population-level impacts would not occur. In addition, ESA-listed sea turtles occur in very low densities throughout the proposed landing area (U.S. Department of the Navy 2017), therefore, the probability of a strike would be very unlikely and discountable.

Ingestion

Expended materials may pose an ingestion stressor to ESA-listed sea turtles. Ingestion of expended materials by turtles could occur at or just below the surface, in the water column, or at the seafloor depending on the size and buoyancy of the expended object and the feeding behavior of the turtle. Floating material is more likely to be eaten by a turtle that is feeding at or just under the water's surface. Expended materials would sink rapidly and settle on the ocean floor, typically far from shore at depths greater than the ESA-listed species discussed herein are expected to occur. Because the degradation of these materials would be very slow and the presence of the ESA-listed sea turtle species at these depths is unlikely the risk of ingestion of expended materials by ESA-listed sea turtles would be very low and discountable.

Conclusion

The potential for physical disturbance and potential strike and ingestion of expended materials as a result of the Proposed Action would be discountable. The USSF has determined that the Proposed Action may affect, but is not likely to adversely affect the ESA-listed sea turtles. The USSF completed Section 7 consultation with the NMFS for potential impacts on ESA-listed sea turtle species on 20 January 2023 (Appendix B) and would implement all applicable minimization, monitoring, and avoidance measures in the BO. Potential effects to ESA-listed sea turtles would therefore be less than significant.

4.4.1.3. MMPA-protected and ESA-listed Cetaceans

Physical Disturbance and Impacts by Fallen Objects

If debris from expended materials struck a cetacean, it could result in injury or death. Once within the water column, disturbance or strike from an item falling through the water is possible, but its velocity would be greatly reduced (reducing the potential for serious injury) and the falling object could potentially be avoided by marine species once detected. A very low possibility exists that a whale would be at or just under the surface in the impact area at the time of splashdown, but

population-level impacts would not occur. In addition, whales occur in very low densities throughout the proposed landing area (U.S. Department of the Navy 2017), therefore, the probability of a strike would be very unlikely and discountable.

Noise

NMFS has previously determined that noise produced during launch activities (i.e., rocket engine noise, sonic booms) only has the potential to result in harassment of marine mammals that are hauled out of the water (NMFS 2019a). Cetaceans spend their entire lives in the water and spend most of their time (>90% for most species) entirely submerged below the surface. Additionally, when at the surface, cetacean bodies are almost entirely below the water's surface, with only the blowhole exposed to allow breathing. This minimizes in-air noise exposure, both natural and anthropogenic, essentially 100% of the time because their ears are nearly always below the water's surface. As a result, the likelihood of the specified activities resulting in the harassment of any cetacean is so low that it is discountable.

Conclusion

Physical disturbance and potential strike, risk of entanglement, and noise impacts as a result of the Proposed Action would be discountable and would not result in harassment of cetaceans protected under the MMPA. The USSF has determined that the Proposed Action may affect, but is not likely to adversely affect the ESA-listed cetaceans. The USSF completed Section 7 consultation with the NMFS for potential impacts on ESA-listed cetaceans on 20 January 2023 (Appendix B) and would implement all applicable minimization, monitoring, and avoidance measures in the BO. Potential effects to MMPA-protected and ESA-listed cetaceans would therefore be less than significant.

4.4.1.4. MMPA-protected Pinnipeds

Noise and visual disturbance can cause variable levels of disturbance to pinnipeds that may be hauled out within the areas of exposure, depending on the species exposed and the noise level. 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 affects 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.

Under the MMPA, NMFS issued a Final Rule for taking marine mammals incidental to VSFB launches (NMFS 2019a), and a LOA (NMFS 2019b; Appendix B). The current LOA expires in April 2024. SLD 30 applied for renewal and expects to have a revised LOA by early April 2024. The LOA allows launch programs to unintentionally take small numbers of marine mammals during launches. The USSF is required to comply with the LOA listed conditions and address NMFS

concerns regarding marine mammals at VSFB. Under the current LOA, monitoring of marine mammals at VSFB is required during launches between 1 January and 31 July.

Given the authorizations and EPMs in place (Section 2.3.3.3), including the required monitoring, the Proposed Action would not result in significant impacts on MMPA protected pinnipeds.

4.4.1.5. Guadalupe Fur Seal

Noise Impacts

Sonic boom modeling of the planned trajectories does not predict that sonic booms will impact the NCI. If there were noise impacts on NCI, noise and visual disturbance can cause variable levels of disturbance to pinnipeds that may be hauled out within the areas of exposure, depending on the species exposed and the level of the sonic boom. Typical reactions range from no response to raising head and moving from a resting position to flushing to water. Behavioral reactions to noise can be dependent on relevance and association to other stimuli, with competing stimuli tending to suppress behavioral reactions. A more detailed discussion of behavioral reactions of Guadalupe fur seals is contained in Appendix B. In general, Guadalupe fur seals are relatively insensitive to disturbance, occur in low numbers at SMI in isolated locations, and are adept at jumping into the water in the event that they do flee from a disturbance (Harris 2015).

Conclusion

Noise resulting from the Proposed Action is not expected to impact the NCI; however, if it does it would not cause more than a temporary startle-response in Guadalupe fur seals. Therefore, USSF determined that the Proposed Action may affect, but is not likely to adversely affect the Guadalupe fur seal. The USSF completed Section 7 consultation with the NMFS for potential impacts on Guadalupe fur seals on 20 January 2023 (Appendix B) and would implement all applicable minimization, monitoring, and avoidance measures in the BO and the EPMs included in Table 2.2-8. Potential effects to Guadalupe fur seals would therefore be less than significant.

4.4.1.6. Southern Sea Otter (Federally Listed Threatened Species)

Noise and Visual Disturbance

Areas present directly offshore of SLC-5 during a Laguna-E launch would receive noise levels of less than 120 dB L_{max} and visual disturbance as the rocket lifts off (Figure 4.4-1). During static fire noise directly off the coast of SLC-5 would be less than 115 dB L_{max} and there would be no associated visual disturbance (Figure 4.4-2). Otters are only occasionally observed along the coast between Purisima Point and Point Arguello transiting through the area between suitable habitat to the north and south. Beginning at the Boat Dock and continuing south along Sudden Flats, the inshore habitat supports expansive kelp beds and a relatively high density of otters (Figure 4.4-1). Noise levels during a Laguna-E launch would reach between 100 and 110 dB L_{max} in these areas (Figure 4.4-1).

Exceptionally little sound is transmitted between the air-water interface; thus, in-air sound would not have a significant effect on submerged animals (Godin 2008). In addition, according to Ghoul & Reichmuth (2014), “Under water, hearing sensitivity [of sea otters] was significantly reduced when compared to sea lions and other pinniped species, demonstrating that sea otter hearing is

primarily adapted to receive airborne sounds." This study suggested that sea otters are less efficient than other marine carnivores at extracting noise from ambient noise (Ghoul & Reichmuth 2014). Therefore, the potential impact of underwater noise caused by in-air sound would be discountable.

Extensive launch monitoring has been conducted for sea otters on both north and south VSFB, with pre- and post-launch counts and observations conducted at rafting sites immediately south of Purisima Point for numerous Delta II launches from SLC-2 and one Taurus launch from Launch Facility-576E and at the rafting sites off of Sudden Flats for two Delta IV launches from SLC-6. No abnormal behavior, mortality, or injury of effects on the population has ever been documented for sea otter as a result of launch-related noise and visual disturbance (see Appendix B for more details).

As noted in Appendix A, most of the sonic boom energy is less than 250 hertz (Hz), well below the region of best sensitivity of the sea otter (2–22.6 kilohertz). While the sea otter would likely hear the sonic boom, it would only be responding to acoustic energy that is above 250 Hz and total sound levels much less than 135 dB. As the sonic boom increases in pressure, it is likely that more energy would be detected by the sea otter, most notably in frequencies higher than 250 Hz. A sonic boom spectrum and sea otter hearing sensitivity curve is presented in Appendix A, along with an audiogram used to derive an auditory weighting function. The otter weighting function was applied to a timewave form recording of the June 2022 Falcon 9 SARah-1 launch and resulted in a peak level of approximately 70 dB L_{max} (see Appendix A), which by comparison to human hearing sensitivity is equivalent to the sound level of a household washing machine.

Otters have also been shown to quickly acclimate to disturbances from boats, people, and harassment devices (air horns). A summary of studies related to sea otters and disturbance can be referenced in Appendix A. Extensive launch monitoring of sea otters on VSFB has shown that disturbance from rockets is not a primary driver of sea otter behavior or use of the habitat along Sudden Flats and has not had any apparent long-term consequences on populations, potentially indicating that this population has acclimated to launch activities. Therefore, any impacts as a result of noise or visual disturbance are expected to be limited to minor behavioral disruption and insignificant.

Conclusion

Because there is very little overlap in the hearing sensitivity of otters and noise produced during rocket launches, otters would perceive very little noise during launch activities and the USSF has determined that impacts to southern sea otters would be insignificant as a result of the Proposed Action, including the collective effects of increased launch activities at VSFB. Therefore, the USSF has determined that the Proposed Action *may affect, but is not likely to adversely affect*, the southern sea otter. The USSF completed Section 7 consultation with the USFWS for potential impacts on southern sea otters and would implement all applicable minimization, monitoring, and avoidance measures in the BO (Appendix A) and in Section 2.3.3.2. Therefore, impacts would not be significant.

4.4.1.7. Vandenberg State Marine Reserve

The CDFW and DAF established a Memorandum of Understanding. Within the VSMR, no take of living marine resources is permitted except take incidental to the mission critical activities of VSFB. Those activities include ones that are important for supporting and defending U.S. launch, range, expeditionary, exercise, test, training, and installation operations, including, but not limited to, space-launch vehicles. Impacts on marine resources within the VSMR would be temporary and limited to launch noise. Therefore, the Proposed Action would not result in significant impacts on VSMR.

4.4.2. No Action Alternative

Under the No Action Alternative, construction of SLC-5, launches from SLC-5, or static fires would not occur resulting in no impacts on sensitive marine biological resources.

4.5. Water Resources

Factors considered in determining if implementing an alternative may have significant adverse impacts on water resources include the extent or degree to which implementing an alternative would cause substantial flooding or erosion; substantially reduce surface water quality of creeks, rivers, streams, lakes, or the ocean; substantially reduce surface or groundwater quality or quantity; or result in a net loss of wetland area or habitat value.

The FAA has established the following significance thresholds for water resources:

- **Surface Waters** – The action would:
  - Exceed water quality standards established by Federal, State, local, and tribal regulatory agencies; or
  - Contaminate public drinking water supply such that public health may be adversely affected.
- **Groundwater** – The action would:
  - Exceed groundwater quality standards established by Federal, State, local, and tribal regulatory agencies; or
  - Contaminate an aquifer used for public water supply such that public health may be adversely affected.
- **Floodplains** – The action would cause notable adverse impacts on natural and beneficial floodplain values. Natural and beneficial floodplain values are defined in Paragraph 4.k of DOT Order 5650.2, *Floodplain Management and Protection*.

4.5.1. Preferred Alternative (Proposed Action)

4.5.1.1. Surface Water

Honda Creek

Under The Preferred Alternative (Proposed Action), constructing the SLC-5 launch site, installing utilities, establishing firebreaks, and making improvements to access roads would disturb soils, remove vegetation, increase impermeable surfaces at VSFB, and increase the potential for hazardous materials to be spilled or released. The EPMs, described in Sections 2.3.3.4 and 2.3.3.8

would avoid and minimize impacts on surface waters from construction activities at SLC-5. In addition, road improvements would follow standard recommended practices to avoid and minimize erosion potential (e.g., Bloser et al. 2012), dirt access roads would be inspected after rainstorms for indications of erosion, and repairs made promptly. Therefore, construction of SLC-5 and associated infrastructure would not have a significant effect on surface water at or near Honda Creek.

The proposed launch activities at SLC-5 would create exhaust clouds; however, there are no solid fuels proposed, the design of the deflector would direct exhaust away from Honda Canyon, and emissions are not expected to have any effect on surface waters. Phantom would enroll in RWQCB's General Waiver for Specific Types of Discharges (or other state discharge permit) prior to discharging any water out of the deluge water retention basin. Any deluge water that remains after launches or stormwater that accumulates within the basin would be tested for contamination. If contamination is encountered, the contents would be pumped out and disposed of per the waiver/permit and state and Federal regulations. If the water is clean enough to go to grade, it would be discharged from the retention basin to an infiltration area or spray field. If authorized by SLD 30/CEIEA, Phantom may use the IWTP to dispose of the deluge waste water, if laboratory analysis indicates the water meets IWTP standards. The Proposed Action is also exempt from the need for coverage under the NPDES Construction General Permit because discharge to Waters of the U.S. during construction is not expected based on project design and implementation of EPMs discussed in Section 2.3.3.4. Therefore, impacts to surface water in or near Honda Creek under the Proposed Action would not be significant.

San Antonio Creek

As noted in Sections 3.14.4 and 3.5.3, at maximum cadence, the Proposed Action would use up to 552,000 gallons (1.69 ac-ft) of water per year, drawing on supply from the San Antonio Creek Basin. Annual VSFB water use over the past three years (2019 through 2021) has averaged 910,500,000 gallons (2,794 ac-ft) per year. Phantom's proposed use of up to 1.69 ac-ft per year would represent approximately 0.06% of the total annual water usage on VSFB. Water is treated and transported to south Base users through a supply line which requires routine maintenance, partly due to relatively few users on this part of VSFB. As a critical part of that maintenance, VSFB flushes the supply line periodically to maintain water quality by removing sediment, mineralization, and discolored water. This practice also improves the carrying capacity of the lines and helps identify any failing pipes or connections. SLD 30 currently flushes the water supply line on south VSFB annually. The volume of water that needs to be flushed is dependent on the amount of active water use, since supply lines that are used frequently do not build up sediments or mineralization as quickly. American Water, the contractor managing and maintaining VSFB's water lines, determined that the proposed water usage at SLC-5 would be entirely offset by the compensatory reduction in the volume of water discharged to grade and therefore have no effect on water extraction from the San Antonio Creek Groundwater Basin (C. Mathews, American Water Operations Manager, pers. comm. 28 September 2023). Therefore, the Proposed Action's water usage would have no effect on the San Antonio Creek Groundwater Basin.

Broad Ocean Area

The first stage boosters and payload fairings will separate and fall into the broad ocean area (Figure 2.3-14). First stages will typically break up during re-entry or impact with the ocean surface and sink after impact. Fairings will sink if metallic; composite fairings may float for a period of time unless they sustain major damage at impact. First stages and fairings are composed of inert materials that would not affect water quality.

A residual amount of propellent will remain in the first stage upon impact (less than 1%). RP-1 and Jet-A are classified as Type 1 "Very Light Oil", which is characterized as having low viscosity, low specific gravity, and highly volatile (USFWS 1998). Due to its high volatility, Type 1 oil evaporates quickly when exposed to the air, and would completely dissipate within one to two days in the water. Clean-up following a spill of very light oil is usually not necessary or not possible, particularly with such a small quantity of oil that would enter the ocean (USFWS 1998). Since Type 1 oil is lighter than water and almost completely immiscible (i.e., very little will dissolve into the water column), it would stay on top of the water surface. Due to its low viscosity, it would rapidly spread into a very thin layer (several hundred nanometers) on the surface of water and would continue to spread as a function of sea surface, wind, current, and wave conditions. This spreading rapidly would reduce its concentration on the water surface and exposes more surface area of the fuel to the atmosphere, thus increasing evaporation rate. Although it would require one to two days for the propellant to completely dissipate, over 90% of its mass would evaporate within the first seven minutes and 99% of its mass would evaporate within the first hour (Fingas 2013; U.S. Air Force 2016). For adverse ocean conditions (e.g., large swells, large waves) and weather conditions (e.g., fog, rain, high winds), the propellant would be volatilized more rapidly due to increased agitation and thus dissipate even more quickly and further reduce the likelihood of exposure if it impacts intact. Given the relatively small volume of propellant that would be expended (between 270 and 1,100 pounds) and rapid evaporation, impacts to surface water in the broad ocean area under the Proposed Action would not be significant.

4.5.1.2. Groundwater

Honda Creek

Construction of the SLC-5 launch site and associated utilities would not require substantial excavation activities or require the use of footings that would interact with groundwater. Any remaining deluge water after launches and stormwater that is collected in the deluge basin would be managed per the RWQCB's General Waiver for Specific Types of Discharges enrollment conditions (or other state discharge permit). Any deluge water that remains after launches or stormwater that accumulates within the basin would be tested for contamination. If contamination is encountered, the contents would be pumped out and disposed of per the waiver/permit and state and Federal regulations. If the water is clean enough to go to grade, it would be discharged from the retention basin to an infiltration area or spray field. If authorized by SLD 30/CEIEA, Phantom may use the IWTP to dispose of the deluge waste water, if laboratory analysis indicates the water meets IWTP standards. During operation of SLC-5, accidental discharge of pollutants could occur; however, proper handling of hazardous materials and waste management (as described in Section 4.11) would reduce or eliminate potential contaminated runoff that could infiltrate groundwater. In addition, implementing EPMs to protect water

resources (Section 2.3.3.4) would further help protect groundwater resources. Therefore, the Proposed Action would not have significant impacts on groundwater in the Honda Creek Basin.

San Antonio Creek

As noted in Sections 3.14.4 and 3.5.3, at maximum cadence, the Proposed Action would use up to 552,000 gallons (1.69 ac-ft) of water per year, drawing on supply from the San Antonio Creek Basin.

Annual VSFB water use over the past three years (2019 through 2021) has averaged 910,500,000 gallons (2,794 ac-ft) per year. Phantom's proposed use of up to 1.69 ac-ft per year would represent approximately 0.06% of the total annual water usage on VSFB. The Proposed Action's water usage would therefore be negligible and not contribute in any measurable way to the collective effects of water extraction requirements for all operations on VSFB. Therefore, impacts to groundwater in the San Antonio Creek Basin under the Proposed Action would not be significant.

4.5.2. No Action Alternative

Under the No Action Alternative, construction of SLC-5, launches from SLC-5, or static fires would not occur resulting in no impacts on water resources.

4.6. Cultural Resources

The Proposed Action is subject to NHPA Section 106 compliance and AFMAN 32-7003. Section 106 compliance also satisfies federal agencies' NEPA responsibilities to consider potential project-related effects on cultural resources. The NHPA, Section 106, requires federal agencies to consider the effects of proposed federal undertakings on historic properties that are listed in or eligible for listing in the NRHP. If a cultural resource is listed in, or eligible for, the NRHP it is considered a "historic property" for purposes of Section 106 and is significant. Compliance with Section 106 requires the federal agency to determine either that the undertaking would have no effect, no adverse effect, or an adverse effect to historic properties (that is, to significant cultural resources). The Section 106 implementing regulations (36 CFR Part 800) prescribe the process for making these determinations. The FAA has not established a significance threshold for cultural resources.

Cultural resources would be adversely affected if the Proposed Action would cause loss of the value or characteristics that qualify the resource for listing on the NRHP, or if the Proposed Action substantially alters the natural environment or access to it in such a way that traditional cultural or religious activities are restricted. The Proposed Action would comply with all relevant authorities governing cultural resources, including Section 106 of the NHPA and AFMAN 32-7003. To comply with Section 106 of the NHPA and 36 CFR Part 800, SLD 30 consulted with the California SHPO, the SYBCI, and other interested parties regarding the project. The SHPO concurred with SLD 30's APE definition, its determination that CA-SBA-2934 is not eligible for NRHP inclusion, and a finding of no adverse effect on 17 May 2022 (Appendix C). The SYBCI responded on 26 May 2022 requesting a tribal monitor be present during ground disturbance in and near known prehistoric sites (Appendix C).

SLD 30 requires archaeological and Native American monitoring during construction through or adjacent to any known archaeological site, regardless of a site's NRHP eligibility. Archaeological and Native American monitoring is also typically required in areas where buried sites are possible. If previously undocumented cultural resources are discovered during construction activities, the extent and significance of the discovery would be initially assessed by a qualified archaeologist. Recommendations for appropriate treatment of the discovery would be developed in consultation with the SLD 30/CEIEA cultural resources manager and the appropriate Native American representative(s).

Morrison et al. (2022) includes a detailed cultural resources study completed for the Proposed Action to support USSF and FAA compliance with Section 106 of the NHPA. The following discussion of environmental consequences is based on that report.

4.6.1. Preferred Alternative (Proposed Action)

The ADI for The Preferred Alternative (Proposed Action) consists of the footprint for all foreseeable project-related ground-disturbing activities to construct and maintain the launch facility, including launch pads and related infrastructure; the utility corridor; and roads, firebreaks, and vegetation management areas. The facility component of the APE is the ADI plus the entirety of any cultural resources it contains or intersects.

Within the facility portion of the ADI, SLD 30 conducted background research, pedestrian survey, and presence/absence testing, including excavation of 94 shovel test pits within the proposed pad, utility corridor, road improvement areas, and firebreak and vegetation management areas, to assess the potential effects of the Proposed Action on historic resources (Morrison et al. 2022). Briefly, the results indicate that no historic properties are present within the facility ADI. The following section discusses the consequences of the Proposed Action on cultural resources based on the results of that work.

The APE for the Proposed Action also includes a nearly 3,200-ft radius around the proposed launch facility for noise vibration levels above 120 dB L_{max} as well as a sonic boom arc that would occur during launches and produce ground-level vibrations of 2 psf or greater over open ocean. As noted in Section 3.6 there are no historic properties within the launch portion of the APE with the potential to be affected by engine noise or vibration.

4.6.1.1. CA-SBA-538

CA-SBA-538 was previously determined ineligible for the NRHP and thus is not a historic property.

4.6.1.2. CA-SBA-670

The Proposed Action would require improvements to existing roads to provide improved fire safety and access. NRHP-eligible site CA-SBA-670 is bisected by Honda Canyon Road, which provides access to the launch site. However, the portion of Honda Canyon Road within CA SBA-670 would not require improvements, and the proposed activities within the site would be limited to removal of vegetation from the existing paved road segment. Based on this information and discussions with SLD 30/CEIEA cultural resources personnel, no testing was performed at this site. However, based on prior excavation results along the south side of Honda Canyon Road just east of the intersection of Coast, Surf, and Honda Canyon Roads, intact buried deposits

associated with CA-SBA-670 could exist along Honda Canyon Road. Placement of protective fencing along the road through the site would prevent accidental incursion into these deposits. By implementing this measure, activities associated with the Proposed Action would have no adverse effect on a historic property.

4.6.1.3. CA-SBA-2230

CA-SBA-2230 was previously determined ineligible for the NRHP and thus is not a historic property.

4.6.1.4. CA-SBA-2934

SLD 30 excavated five shovel test pits within the recorded CA-SBA-2934 site location to test for the presence of subsurface deposits. Excavators observed disturbed soils to 100 cm below the ground surface. No cultural materials were encountered in any of the shovel test pits. Based on this work, the site appears to have been destroyed during construction and/or demolition of SLC-5 and SLD 30 recommended that the site is not a historic property.

4.6.1.5. Isolated Artifacts

SLD 30 excavated three shovel test pits at the locations of three previously recorded isolated artifacts and one newly discovered isolated artifact. Subsurface testing confirmed that all of the isolated artifacts are truly isolated and not surface manifestations of archaeological sites.

4.6.2. No Action Alternative

Under the No Action Alternative, construction of SLC-5, launches from SLC-5, or static fires would not occur resulting in no impacts on existing historic properties.

4.7. Department of Transportation Act Section 4(f) Properties

Impacts on Section 4(f) properties would be significant if the FAA's proposed action of issuing a license to Phantom involves more than a minimal physical *use* of a Section 4(f) resource or constitutes a *constructive use* based on an FAA determination that the project would substantially impair the Section 4(f) resource. The concept of *constructive use* is that a project that does not physically use land in a park, for example, may still, by means of noise, air pollution, water pollution, or other impacts, dissipate its aesthetic value, harm its wildlife, restrict its access, and take it in every practical sense. *Constructive use* occurs when the impacts of a project on a Section 4(f) property are so severe that the activities, features, or attributes that qualify the property for protection under Section 4(f) are substantially impaired. Substantial impairment occurs only when the protected activities, features, or attributes of the Section 4(f) property that contribute to its significance or enjoyment are substantially diminished. This means that the value of the Section 4(f) property, in terms of its prior significance and enjoyment, is substantially reduced or lost. For example, noise would need to be at levels high enough to have negative consequences of a substantial nature that amount to a taking of a park or portion of a park for transportation purposes.

4.7.1. Preferred Alternative (Proposed Action)

The Proposed Action does not include any construction activities within, or actual physical taking of, a Section 4(f) property through the purchase of land or a permanent easement, physical occupation of a portion or all of Section 4(f) property, or alteration of structures or facilities on Section 4(f) property.

Launches at SLC-5 would only necessitate occasional evacuation of one Section 4(f) property identified in Section 3.7, Jalama Beach County Park. SLD 30 Range Safety would individually review launch trajectories for each mission to determine what areas would be affected since the hazard risk analysis is unique to each vehicle, history of reliability, and mission trajectory. If necessary for the safety of park visitors, the County Parks Department and the County Sheriff currently close the parks upon request from SLD 30 and under agreement between DAF and Santa Barbara County (Appendix M). The Proposed Action would comply with these procedures. Given the formal evacuation agreement in place and the temporary nature of the closures, and that the Proposed Action would not result in increasing the annual number of closures of Jalama Beach County Park, implementation of the Preferred Alternative would not substantially diminish the protected activities, features, or attributes of any Section 4(f) properties and therefore would not result in substantial impairment of the properties.

All potential Section 4(f) properties in the ROI would experience sound levels less than 100 dB L_{max} during a launch. Launches would potentially create a sonic boom up to 1.5 psf over the Pacific Ocean but would not impact the CINP (Figures 3.7-1 and 3.7-2). Both launch noise and sonic booms are classified as short-duration events. Given the short duration of increased sound levels during a launch and the small area impacted, the FAA has preliminarily determined that noise generated during launches would not substantially diminish the protected activities, features, or attributes of any of the potential Section 4(f) properties and therefore would not result in a *constructive use* of any potential Section 4(f) property. Additionally, given the history of beach and park closures for launches at VSFB, the formal evacuation agreement in place, and the temporary nature of the closures, the FAA has preliminarily determined that the Proposed Action would not substantially diminish the protected activities, features, or attributes of any of the potential Section 4(f) properties and therefore would not result in a *constructive use* of any Section 4(f) property. Thus, the FAA's proposed action of issuing Phantom a license would not result in significant DOT Act Section 4(f) impacts. The FAA will make a final determination based on any public input received during the draft EA comment period.

4.7.2. No Action Alternative

Under the No Action Alternative, construction of SLC-5, launches from SLC-5, or static fires would not occur resulting in no impacts on Section 4(f) properties.

4.8. Transportation

Impacts on vehicle transportation on roadways would be significant if:

- The traffic demands of a primary road could no longer be met due to project traffic;
- Project traffic on primary or secondary road would create an unsafe situation or require a new traffic signal or major revisions to an existing traffic signal; or

- The project causes potential safety problems on a road due to limiting design features of the road or existing use of the road that would be incompatible with substantial increases in traffic, including project or cumulative traffic. Examples of limiting design features are narrow width, roadside ditches, sharp curves, poor sight distance, and inadequate pavement structure. Examples of incompatible use are numerous heavy trucks on rural roads used by farm equipment, livestock, or horseback riding, or on residential roads with heavy pedestrian or recreational use.

The DAF and FAA have not defined significance thresholds for railway and maritime transportation. Impacts to these types of transportation were assessed with respect to the anticipated frequency and length of disruptions and delays.

4.8.1. Preferred Alternative (Proposed Action)

Construction workers, equipment, and operational personnel would likely use SR 246 to reach the Solvang Gate to enter South VSFB and proceed to SLC-5 via Arguello Road, then west on Bear Creek Road, and south on Coast Road to Delphy Road (Figure 3.8-1). Oversized trucks, including those transporting launch vehicle components, and delivery vehicles would enter through the Lompoc Gate on North VSFB for inspection. After inspection these vehicles would likely proceed along California Boulevard to Utah Avenue, and take 13th Street south to the Solvang Gate to enter South VSFB before proceeding to SLC-5 via Arguello Road, west on Bear Creek Road, and south on Coast Road to Delphy Road. Construction vehicles and oversize trucks would likely access SR 246 from Hwy 101 in Buellton.

Under the Proposed Action, increases to traffic would occur during construction due to the transportation of building materials, heavy construction equipment, and commuting by construction workers in personal vehicles. During each phase of construction, the estimated number of one-way vehicle trips on roads per day are presented in Table 4.8-1.

Truck trips on roads and highways in the vicinity of the base would be coordinated with CalTrans and the California Highway Patrol to ensure authorization of truck travel routes. Parking for construction vehicles would be at designated areas within or adjacent to the proposed project area. The LOS currently experienced on roadways that would be affected under the Proposed Action is excellent to functional (“A” to “C” on-base and “C” to “D” off-base). The increase in daily traffic during construction would be minimal relative to existing traffic and would be unlikely to affect the LOS of the roadways. VSFB is the largest employer in Santa Barbara County and has a population of over 18,000 (military, family members, contractors, and civilian employees), many of which commute to the base on a daily basis. Even if all the estimated vehicle trips for each phase shown in Table 4.8-1 were to occur on the same day, less than 100 additional one-way trips would be required per day under the Proposed Action. Relative to the total number of trips that occur daily to and from VSFB, this would not be a significant increase. No adverse impacts to road capacity or unsafe roadway conditions would occur, and the transportation EPMs in Section 2.3.3.6 would be implemented. Therefore, impacts to vehicle transportation on roadways from the Proposed Action would not be significant.

Table 4.8-1: Estimated Number of Vehicle Trips per Phase Under the Proposed Action.

Phase	Type	Duration (days)	# One-way Trips/Day	Total Trips
Phase IA (2024)	Worker Commutes	45 - 60	30	1,350 – 1,800
	Vendor Deliveries	45 - 60	1[1]	45 - 60
	Deliver/Remove Heavy Equipment	2[2]	30	60
Phase IB (2025)	Worker Commutes	45 - 60	30	1,350 – 1,800
	Vendor Deliveries	45 - 60	1[1]	45 - 60
	Deliver/Remove Heavy Equipment	2[2]	30	60
Phase II (2027)	Worker Commutes	45 - 60	30	1,350 – 1,800
	Vendor Deliveries	45 - 60	1[1]	45 - 60
	Deliver/Remove Heavy Equipment	2[2]	30	60
Annual Operations[3] (2025 and beyond)	Permanent Staff Commutes	260[4]	60	15,600
	Launch Support Staff	192[5]	20	3,840
	Commodity Deliveries	48	2	96
	Truck Transport (launch vehicle)	48	2	96

Notes: [1] Average of one trip per day; [2] Delivery and removal of all heavy equipment will not likely occur on the same day; [3] Estimates shown for operations at maximum cadence of 48 launches per year; however, transportation requirements would increase gradually as the program develops; [4] Typical number of business days per year; [5] Assumed 4 days on site per person per launch.

Increased vehicle activity affects the integrity of roadway sections by increasing the flexures of the pavement. The design life for asphalt pavement, generally selected as either 10 or 20 years, drives engineering specifications for the road based upon the strength of the base soil and the Traffic Index (TI) for the design life. The TI is calculated based upon the number of truck trips that are expected during the design life of the pavement. The theory states that the pavement, during its lifetime, can tolerate a finite number of flexures due to loaded trucks. If the number of truck trips is increased, the life of the pavement is shortened. For example, if a 20-year design were based upon an Annual Average Daily Traffic of 1,000 trucks for 20 years and the volume increases to 2,000 ADT, the structural life of the pavement would be reduced to 10 years. While the current condition of the pavement on all of the affected roads is fair to good, added project-related vehicle traffic could cause faster-than-estimated deterioration of the pavement surface and require additional maintenance. Although an adverse effect, it would not be considered significant given that the number of vehicle trips per day anticipated from the Proposed Action would not be high.

Trains that would pass through a launch vehicle flight path from VSFB are temporarily stopped at safety hold points during launches to reduce potential risk to people and property. SLD 30 2 ROPS/DON, notifies a dedicated UPRR POC of launch date, times, and location of train hold points typically 10 days prior to launch. At approximately 3 days prior to launch, UPRR POC provides 2 ROPS/DON a schedule of impacted trains and in collaboration discuss if the trains must hold or can continue through. At 3 hours prior to launch, 2 ROPS/DON establishes phone communication with the UPRR POC to provide updates to the train schedule. After a launch has been completed

2 ROPS/DON notifies the UPRR POC that trains may continue on the route. The UPRR POC is on standby during each launch for any notifications needed in the event of launch anomaly that may impact the railroad track system. UPRR attempts to adjust schedules to avoid train delays due to launches; however, launch windows are typically minimal (typically instantaneous or several minutes) and during longer launch delays 2 ROPS/DON communicates with the UPRR POC to allow trains to move through the affected area; thereby minimizing potential impacts to train schedules.

The USCG would issue a NOTMAR defining the hazard area in the Pacific Ocean for launch events. The avoidance area would be temporary and last only as long as necessary for the launch activity has been completed (typically one to two hours). Because the impacts to marine transportation would be infrequent and temporary and only apply to a relatively small portion of the broad ocean area, the Proposed Action would not have a significant effect on marine transportation.

Therefore, the Proposed Action would not create any significant impacts to transportation during construction or operation of SLC-5 under the Preferred Alternative. In addition, the recommended EPMs, described in Section 2.3.3.6 would further reduce the potential for adverse effects on transportation.

4.8.2. No Action Alternative

Under the No Action Alternative, construction of SLC-5, launches from SLC-5, or static fires would not occur resulting in no impacts on existing transportation resources.

4.9. Recreation

Numerous recreational areas are found within the ROI for the Proposed Action. Current VSFB launch functions observe well-established public health and safety and recreational management protocols that have been effectively followed for decades (Section 3.10). Impacts on recreation would be considered significant if severe or permanent restrictions and/or damage were to affect outdoor recreational land and/or activities.

4.9.1. Preferred Alternative (Proposed Action)

Closures to recreation areas would not occur during construction activities at SLC-5, and only necessitate the occasional closure of Jalama Beach County Park for launches under The Preferred Alternative. SLD 30 has prepared evacuation plans for launch anomalies. SLD 30 Range Safety would individually review launch trajectories to determine what areas would be affected since the hazard risk analysis is unique to each vehicle, history of reliability, and mission trajectory and determine if closing Jalama Beach County Park is necessary. Since 1979, an evacuation and closure agreement has been in place between USSF and Santa Barbara County (Appendix M). The agreement recently expired; however, it is extended on a month-to-month basis. The agreement includes closing public access to Jalama Beach County Park during launches. Under this agreement, the USSF must provide notice of a launch at least 72 hours prior to the closure, and the closure is not to exceed 48 hours. Phantom's proposed launches would comply with the closure agreement. These closures would be infrequent and would only last as long as necessary to assure the public are safe during a launch (approximately six to eight hours). The notice will state a hazardous operation will occur. Accordingly, the Preferred Alternative would not

substantially diminish the protected activities, features, or attributes of recreational properties identified in Section 3.9. Additionally, as discussed in Section 1.5, the USCG would issue a NOTMAR defining the hazard area for launch events. The avoidance area would be temporary and last only as long as necessary for the launch activity to be completed (typically one to two hours). Because the impacts to recreation resources would be infrequent and temporary and relatively few recreational vessels utilize the broad ocean area (approximately 1% of the 815 identified vessels using the broad ocean area in 2020 were pleasure craft; NOAA Office of Coastal Management 2023), the Proposed Action would not have a significant impact on recreation resources.

4.9.2. No Action Alternative

Under the No Action Alternative, construction of SLC-5, launches from SLC-5, or static fires would not occur resulting in no impacts on recreational resources.

4.10. Human Health and Safety

An impact to Human Health and Safety would be considered significant if it were to create a potential public health hazard or to involve the improper use, production, or disposal of materials that pose a hazard to people in the affected area. An impact would also be considered significant if project activities were to pose a serious risk of fire, especially wildland fires, or were to involve potential obstruction of emergency response or evacuation routes in and around the project area.

4.10.1. Preferred Alternative (Proposed Action)

4.10.1.1. SLC-5 Construction Activities

Modifications to SLC-5 would expose construction workers to hazards associated with construction activities. Between 1962 and 1994, NASA used the current location of SLC-5 for a series of launches. Since the cessation of NASA's Scout vehicle launch program, all facilities at SLC-5 were deactivated and demolished. Construction workers would be exposed to hazards typical of decommissioned, cleared, and overgrown industrial locations. Potential hazards include the potential for trips, slips, falls, and vehicular accidents. Other potential biological hazards include spider and snake bites, disease vectors, and attacks from wild animals. Because of the above conditions, the potential exists for persons participating in construction activities to become exposed to hazardous materials and hazardous waste. Health and safety guidelines that would be followed in the handling and transportation of hazardous materials and waste are described in Section 3.11.

To minimize potential adverse impacts from biological hazards and physical hazards (such as from rocky and slippery surfaces), 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 these potential hazards. Daily safety briefings would be conducted and workers would be expected to comply with federal OSHA and Air Force Occupational and Environmental Safety regulations. Phantom would coordinate with SLD 30/SEL to ensure SLD 30 policies on UXO safety for construction work are incorporated into the site safety plan. The safety program would include coordinating with the AFCEC/Environmental Management Operations MMRP manager

and contacting the SLD 30 Weapons Safety Office. Site security requirements detailed in Section 3.10 would be implemented with any facility modifications.

While complying with industrial and ground safety procedures detailed above and in Section 3.10 and EPMs described in Section 2.3.3.7 there would be no significant impacts to Safety and Occupational Health from the construction activities at SLC-5. As described in Section 4.2, the Proposed Action would have no significant impacts on Human Health and Safety associated with noise.

4.10.1.2. Launch Safety

Base personnel and general public safety during launches of the Daytona-E and Laguna-E vehicles would be ensured by federal emergency management readiness and response protocols detailed in Section 3.10. SLD 30 Range Safety would individually review launch trajectories to determine what areas would be affected since the hazard risk analysis is unique to each vehicle, history of reliability, and mission trajectory. The USCG would review and advise SLD 30 on all launch and reentry site evaluation risk assessments with focus on vessel navigation safety. The USCG supports SLD 30 with early warning communication to the maritime industry with NOTMAR, as discussed in Section 1.5, to assist with maritime safety and space operational review that have a maritime nexus. USCG District Eleven would evaluate Phantom and SLD 30 navigation risk assessments with launch and reentry activities associated with commercial and recreational vessels on the high seas off the California Coast. The USCG evaluates every launch and reentry activity for risk to waterway users and the environment under this process. Security and anti-terrorism requirements outlined in Section 3.10 would provide launch program safety compliance.

To issue a Vehicle Operator License, the FAA requires all launch and reentry operations to comply with the necessary notification requirements, including issuance of NOTAMs, as discussed in Section 2.3.2. NOTAMs assist general aviation pilots in scheduling around any temporary disruption of flight activities in the area of operation and provide notice of unanticipated or temporary changes to components of, or hazards in, the NAS. The FAA issues a NOTAM at least 72 hours prior to a launch or reentry activity in the airspace to notify pilots and other interested parties of temporary conditions. Advance notice via NOTAMs and the identification of Aircraft Hazard Areas would assist pilots in scheduling around any temporary disruption of flight activities in the area of operation to reduce risk to human safety.

While adhering to these safety measures and procedures and EPMs described in Section 2.3.3.7, there would not be significant impacts to human health and safety.

4.10.2. No Action Alternative

Under the No Action Alternative, construction of SLC-5, launches from SLC-5, or static fires would not occur resulting in no impacts on human health and safety.

4.11. Hazardous Materials and Waste Management

Factors considered in determining if implementing an alternative may have significant adverse impacts on hazardous materials and waste management include the extent or degree to which implementing an alternative would result in the following:

- Non-compliance with applicable regulatory requirements; or
- Human exposure to hazardous materials and wastes, or environmental release above permitted limits.

The FAA has not established a significance threshold for hazardous materials and pollution prevention.

Potential impacts resulting from hazardous materials and hazardous waste are evaluated using federal, state, and local regulatory requirements, contract specifications, and Base operating constraints, as outlined in Chapter 3 (Affected Environment). Non-compliance with applicable regulatory requirements, human exposure to hazardous materials and wastes, or environmental release above permitted limits, would be considered adverse impacts.

4.11.1. Preferred Alternative (Proposed Action)

4.11.1.1. Hazardous Materials and Waste

Compliance with all pertinent federal, state, and local laws and regulations, and applicable DAF and SLD 30 plans would govern all actions associated with implementing the Proposed Action and would minimize the potential for significant impacts.

During SLC-5 construction small quantities of hazardous materials would be used which would generate small volumes of hazardous wastes. Hazardous materials are expected to be used for construction activities and include diesel fuel and gasoline to power the construction equipment, hydraulic fluids, oils and lubricants, welding gases, paints, solvents, adhesives, and batteries. Launch support operations would use a small amount of products containing hazardous materials, including POLs, paints, solvents, oils, lubricants, acids, batteries, and chemicals. Phantom would also generate a small number of waste tires each year through routine use of the TEV and other pad support equipment during routine launch support operations. Payload processing would generate a small amount of empty containers, spent solvents, waste oil, spill cleanup materials (if used), and lead-acid batteries.

Fuels (i.e., kerosene) and oxidizers (i.e., LOX) would be the most significant hazardous materials onsite during operations. Loading and unloading operations would take place over appropriately designed and sized containment basins, with spill prevention and emergency response procedures in place. Proper handling practices of liquid fuels would adhere to 14 CFR Section 420.67 (*Separation distance requirements for handling incompatible energetic liquids that are co-located*) for liquid fuels and limit the risk of hazardous material releases due to leaking storage tanks, tanker trucks, delivery lines, or other infrastructure.

Phantom would identify, label, and accumulate any hazardous wastes IAW all applicable federal, state, and local regulations. Hazardous materials and wastes would be properly contained,

manifested, and managed per applicable federal, state, and local regulations, AFIs, AFMANs, DOD Directives, the site-specific health and safety plan, and associated EPMs. Accidental POL releases from vehicles, equipment, and transformer leaks would generate hazardous wastes, resulting in potential adverse impacts on the Proposed Action Area. All hazardous wastes and spills would be properly managed and disposed of per applicable federal, state, and local hazardous waste regulations and the HWMP (DAF 2022a). Hazardous materials and waste management regulations would follow procedures outlined in the HMMP (DAF 2020) and the HWMP DAF (2022a). Prior to beginning the project, Phantom would prepare a hazardous material Spill Prevention and Response Plan that would be implemented in the event of a spill. Phantom and any contractors working at the site would make all reasonable and safe efforts to contain and control any spills or releases that may occur. For a spill or accidental release, Phantom would implement an Emergency Response Plan and complete a Community Awareness and Emergency Response reporting form per local Santa Barbara County hazardous material and hazardous waste spill reporting requirements.

To protect water resources, any potentially contaminated wastewater would be collected, analyzed, and disposed of per CCR Title 22 & Title 27, Division 2, and the RWQCB General Waiver for Specific Discharges. Additional EPMs described in Sections 2.3.3.8 and 2.3.3.4 would further ensure that the Proposed Action would not have a significant impact on water resources.

Solid waste would be collected in on-site refuse containers and transported to an appropriate landfill or recycling center. During construction and initial operation human sewage would be collected in temporary on-site portable toilets subject to spill-prevention EPMs and serviced by a commercial contractor. The amount of hazardous materials needed and the waste generated by the Proposed Action would have little to no impact on waste processing capacity. Before implementing the project, the contractor would prepare a hazardous material Spill Prevention and Response Plan and obtain SLD 30/CEI concurrence. In addition, the EPMs described in Section 2.3.3.8 would be implemented. Therefore, the Proposed Action would not have a significant impact due to using and generating hazardous materials and hazardous wastes.

With adherence to existing policies and procedures as outlined in the applicable federal, state, and local regulations, as well as the EPMs described in Section 2.3.3.8, impacts from using hazardous materials associated with the Proposed Action would not be significant.

4.11.1.2. Military Munitions Response Program

Since a small portion of the SLC-5 Right of Entry overlaps with TM817, anomaly avoidance and UXO monitors would be required for all trenching, digging, and heavy equipment operations. Activities requiring anomaly avoidance and UXO monitoring would likely be limited to road improvement activities along Ladd Road (Figure 3.11-2). By adhering to the DOD Explosives Safety Board and all DOD/USSF protocols detailed in Section 3.11.5, and the EPMs described in Sections 2.3.3.8 and 2.3.3.7, the Proposed Action would have no significant impacts under the MMRP.

4.11.2. No Action Alternative

Under the No Action Alternative, construction of SLC-5, launches from SLC-5, or static fires would not occur resulting in no impacts on hazardous materials and waste management.

4.12. Solid Waste Management

Solid waste impacts are evaluated using federal, state, and local laws and regulations; permit conditions; and contract specifications. Adverse impacts would occur from noncompliance with applicable regulatory requirements or an increase in the amount of waste disposal that would exceed available waste management capacities. The FAA has not established a significance threshold for solid waste and pollution prevention.

4.12.1. Preferred Alternative (Proposed Action)

Solid waste generated during construction would include packaging from materials (cardboard and plastic), scrap materials (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 construction. During launch operations and facilities maintenance, a small amount of solid waste (cardboard packaging, wood, rags, plastic and aluminum bottles and cans, etc.) would be disposed of on a routine basis. Solid waste would be collected in on-site refuse containers and transported to the Santa Maria Transfer Station for waste disposal, diversion, and recycling. Solid waste would be minimized by strict compliance with VSFB's ISWMP. All materials that are disposed of off-base would be reported to the CEI Solid Waste Manager. The Santa Maria Regional Landfill would receive waste for disposal. Under the Proposed Action construction would cause a temporary increase in the quantity of solid waste generated on VSFB. However, the current remaining capacity of the landfill is 1,477,580 tons with a weekly throughput limit of 6,006 tons (CalRecycle 2023). The City of Santa Maria has also initiated development of a new landfill, the Santa Maria Integrated Waste Management Facility (Facility No. 42-AA-0076), located approximately 8 mi southwest of the City of Santa Maria. The new facility will have a design capacity of approximately 131 million CY of waste with an estimated closure date of 2105 (City of Santa Maria 2021). Therefore, there is adequate capacity to accommodate a temporary increase in solid waste generated from the construction of the Proposed Action, as well as the minimal increase in solid waste that would be generated during launch operations at SLC-5.

During construction and initial operation, sewage would be collected in temporary on-site portable toilets subject to spill-prevention EPMs and serviced by a commercial contractor. Before implementing the project, the contractor would prepare a hazardous material Spill Prevention and Response Plan and obtain SLD 30/CEI concurrence and implement the EPMs (Section 2.3.3.8).

Compliance with all applicable federal, state, local laws, and regulations, applicable SLD 30 plans and policies, and EPMs (Section 2.3.3.9), would govern all aspects of the Proposed Action, and would avoid or minimize potential impacts related to solid waste or pollution prevention. Therefore, the Proposed Action would not have a significant impact on solid waste management.

4.12.2. No Action Alternative

Under the No Action Alternative, construction of SLC-5, launches from SLC-5, or static fires would not occur resulting in no impacts on solid waste management.

4.13. Coastal Zone Management

The state of California has an approved Coastal Management Program, administered by the CCC, including the CCA of 1976 (California Public Resources Code, Section 30000 et seq.). The CCA includes policies to protect and expand public access to shorelines, and to protect, enhance, and restore environmentally sensitive habitats, including intertidal and nearshore waters, wetlands, bays and estuaries, riparian habitat, certain woods and grasslands, streams, lakes, and habitat for rare and endangered plants and animals.

Under the CZMA, Section 307, each Federal agency activity within or outside the coastal zone that affects any land or water use or natural resource of the coastal zone shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs. An impact on coastal resources could be considered significant if a project were inconsistent with the enforceable policies of the CCA. The FAA has not established a significance threshold for coastal resources.

4.13.1. Preferred Alternative (Proposed Action)

The USSF determined that coastal resources may be affected by the Proposed Action. Consequently, an analysis of the impacts of the Proposed Action on the coastal zone was conducted. Section 307(c)(1)(A) of the CZMA (16 USC Section 1456[c][1][A]) states that "each Federal agency activity within or outside the coastal zone that affects any land or water use or natural resource of the coastal zone shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs." Section 930.32 of the NOAA regulations implementing the CZMA (15 CFR Section 930.32[a][1]) defines "consistent to the maximum extent practicable" as being "fully consistent with the enforceable policies of management programs unless full consistency is prohibited by existing law applicable to the Federal agency."

The USSF prepared a CD that analyzed how and to what degree the Proposed Action would affect California coastal zone uses and resources, as defined in the applicable, enforceable policies. The results of the analysis demonstrated that some components of the Proposed Action could have short-term, temporary effects to California coastal zone uses and resources. However, the USSF would implement EPMs (Section 2.3.3) for the Proposed Action, which would reduce the potential impacts of its proposed activities on coastal zone uses and resources. In addition to the consultations held with the CCC, the USSF has conducted appropriate consultations with USFWS, NMFS, SHPO and with the SYBCI. The USSF determined that the Proposed Action is consistent to the maximum extent practicable with the enforceable policies of the CCMP and no significant impacts would occur on the coastal zone. Therefore, the USSF requested CCC concurrence on a CD for the Proposed Action on 9 November 2023 (Appendix D). The CCC concurred with DAF CD (No. CD-0010-22) and found the proposed project consistent to the maximum extent practicable with the enforceable policies of the CCMP on 20 December 2023 (Appendix D).

4.13.2. No Action Alternative

Under the No Action Alternative, construction of SLC-5 would not occur and no launches or static fire operations would occur resulting in no impacts on coastal resources.

4.14. Utilities

Impacts associated with utilities are related to changes in the supply or demand of a particular resource. The supply of a utility is also referred to as its capacity. As long as the capacity of a particular utility is higher than the demand for that resource, no impact occurs. However, if the demand exceeds the capacity or if the demand is increased beyond the resource's projected rate of increase, an impact would occur, and the significance of the impact is determined based on the degree to which the capacity is strained. The FAA has not established a significance threshold for energy supply.

4.14.1. Preferred Alternative (Proposed Action)

Ground based communication and electrical power is required under the Proposed Action. Existing infrastructure around the SLC-5 area would be used as much as practicable to reduce the need for any additional construction. The existing utilities (electrical and communications) near the project site would be extended from their current location, through the utility corridor shown in Figure 2.3-5, to newly constructed SLC-5 infrastructure. Under The Preferred Alternative, new utility infrastructure would be required to support Daytona-E and Laguna-E launch operations; however, no new utility usage above what has previously been experienced at the project site in the past during the Scout program or ongoing activities nearby would occur and VSFB has adequate capacity to support the Phantom's launch program utility needs. At maximum cadence of 48 launches and static fire per year, the annual usage for deluge would range between 100,800 to 480,000 gallons (0.31 to 1.47 ac-ft). An additional maximum of 72,000 gallons (0.22 ac-ft) per year would be required to support the personnel and operational activities at SLC-5. Therefore, at maximum cadence, up to 552,000 gallons (1.69 ac-ft) of water per year would be used under the Proposed Action at SLC-5. This represents approximately 0.06% of the total annual water usage on VSFB and would not noticeably affect the quantity of water available or exacerbate water scarcity at VSFB or the surrounding area or the amount of water pumped from the San Antonio water basin. In addition, under a USAF contract, American Water Operations & Maintenance, which operates the water distribution and wastewater collection systems at VSFB, is saving approximately 22 million gallons/year by re-introducing potable water into the system during fire-hydrant flushing instead of disposing of the water in storm drains (AFCEC 2015). Water use under the Proposed Action represents a negligible offset of up to 2.5% of this program. Therefore, the Proposed Action would not have a significant impact on water supply or other utilities at VSFB.

4.14.2. No Action Alternative

Under the No Action Alternative, construction of SLC-5 would not occur, and no launches or static fire operations would occur resulting in no impacts on utilities.

4.15. Socioeconomics

Socioeconomic impacts would be considered significant if they substantially altered the location and distribution of the local population, caused the population to exceed historic growth rates, decreased jobs so as to substantially raise the regional unemployment rates or substantially reduce income generation. They would also be considered significant if they substantially

affected the local housing markets and vacancy rates, or resulted in the need for new social services and support facilities. The FAA has not established a significance threshold for socioeconomics.

4.15.1. Preferred Alternative (Proposed Action)

Approximately 25-30 personnel would temporarily be on VSFB during construction of pad improvements at SLC-5. An estimated 10 payload representatives would fly out for final payload integration and check-outs for each mission. Approximately 30 permanent Phantom staff would be hired to support the Proposed Action at VSFB. This minor increase in permanent personnel is a small fraction of the civilian workforce of VSFB and Santa Barbara County and would not be expected to alter the existing levels of service for housing and social services on VSFB and the surrounding communities. The increase in personnel is expected to occur over time and Phantom expects to hire a mix of local and non-local people. A variety of single-family homes and apartments are available in the greater Lompoc/Santa Maria area. The median sold home price in Lompoc is $617,500 and $620,000 in Santa Maria (Realtor.com 2023a, 2023b). A review of local housing databases found approximately 219 available rentals that were not age-restricted (Apartments.com 2023) and 95 residences for sale at or below a home-sale price of $700,000 (Zillow 2023). While Phantom expects to hire a mix of local and non-local people, this analysis assumes all hires to be non-local. These hires would make up approximately 9.5 percent of available properties for rent and sale; however, the availability of properties for sale and rent fluctuate based on seasonal and economic conditions. The Military Housing Office and VSFB leadership have been actively engaged in meeting with developers and local officials to inform them of housing needs for the base in the hopes it will encourage future housing development to address both current and future housing needs for both the local communities and the base.

The Santa Barbara County Association of Governments (SBCAG) 2021 Regional Housing Needs Allocation Final Plan identified a minimum need of 24,586 housing units within Santa Barbara County between 2023 and 2031, and 8,187 housing units in the Lompoc/Santa Maria area (SBCAG 2021). The projected staff increase only represents less than 1 percent of the planned housing units in this area. Additionally, depending on the proportion of local people hired, the need for housing new staff moving into the region from other areas would further decrease. While the Proposed Action would not significantly affect the demand for local housing and the need for social services and support facilities, the addition of added economic activity would result in a small but positive impact on the local economy. Additionally, the indirect effects of material purchases and sub-contract labor force growth would also be a positive impact.

Potential socioeconomic impacts from re-routing aircraft due to commercial space operations would be similar to re-rerouting aircraft for other reasons (e.g., weather, runway closures, wildfires, military exercises, etc.). These could potentially include additional airline operating costs for increased flight distances and times resulting from re-routing aircraft and increased passenger costs as a result of impacted passenger travel, including time lost from delayed flights, flight cancellations, and missed connections. Alternatively, restricting or preventing a launch event would have socioeconomic impacts on Phantom, commercial payload providers, and consumers of payload services. However, advanced notices via NOTAMs would assist general aviation pilots and airlines in scheduling around any temporary disruption of flight activities in

the area of operation, thus avoiding or minimizing any potential impacts to the NAS, airlines, and passenger travel. Operations would not result in closing any public airport or so severely restrict using surrounding airspace to prevent access to an airport for extended time. Given existing airspace closures for launch operations on VSFB are temporary and the FAA's previous analyses related to the NAS have concluded minor or minimal impacts on the NAS from commercial space launches, the FAA does not expect airspace closures would result in significant socioeconomic impacts. Local air traffic controls would coordinate with airports and aircraft operators to minimize launch operations effects on airport traffic flows, as well as traffic flows in en-route airspace. Therefore, the Proposed Action would not generate significant negative socioeconomic impacts on the region and would generate a small positive impact.

4.15.2. No Action Alternative

Under the No Action Alternative, construction of SLC-5, launches from SLC-5, or static fires would not occur resulting in no impacts on the socioeconomic outlook.

5.0 Cumulative Impacts

Cumulative impacts are defined by CEQ as "effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR Part 1508.1). The FAA analyzes the potential cumulative impacts IAW CEQ regulations and FAA Order 1050.1F. The effects of the Proposed Action in combination with the effects of other relevant past, present, and reasonably foreseeable future projects are evaluated in this cumulative effects analysis. The depth of this analysis is commensurate with the potential for significant impacts.

Spatial boundaries were delineated to determine the area and projects the cumulative impacts analysis would address. The spatial boundary is VSFB, the city of Lompoc, the NCI, and the broad ocean area, which accounts for all potential cumulative impacts. Past, present, and reasonably foreseeable actions at VSFB and the surrounding area include current and future aircraft operations at the airport, rocket launches, rocket engine testing, development in the local area related to activities at VSFB, and any other development that may occur as a result of economic growth in the area. The projects identified in the following sections include those that had or have the potential to affect the environmental impact categories analyzed in this EA. The No Action Alternative is not analyzed because it would have no cumulative effects on the environment.

5.1. Past Actions

Past actions at VSFB, the city of Lompoc, and the NCI are primarily tied to commercial and military rocket launches, construction on VSFB's launch pads, regular military, and commercial use of VSFB (e.g., takeoffs, landings, launches), and Lompoc community development projects (Table 5.1-1).

Table 5.1-1: Past Actions Recently Completed at or around VSFB

- Military and commercial rocket launches and regular aircraft take-offs and landings at VSFB
- Voluntourism restoration project on San Nicolas Island[1]
- Completion of a 22.5 megawatts solar farm on VSFB[2]
- Completion of Building 7000 on VSFB with LEED Gold certified[3]
- Kids Motorsports Park at River Park[4]

Sources: [1]Kleist 2018, [2]30th Space Wing Public Affairs 2017, [3]Balance Green Consulting 2022, [4]City of Lompoc

5.2. Present Actions

Present actions at VSFB include military and commercial rocket launch programs and several residential developments in the adjacent city of Lompoc (Table 5.2-1).

Table 5.2-1: Reasonably Foreseeable Future Actions at or around VSFB

- SpaceX commercial rocket launches and landings[1]
- Firefly commercial rocket launches[2]
- Boeing X-37B Spaceplane landings by DAF[3]
- Military and commercial rocket launches, and regular aircraft take-offs and landings, at VSFB
- Approved private development projects in Lompoc[4] including:
  - Community Health Centers of the Central Coast
  - Summit View Homes
  - Mosaic Walk 13 Unit Residential Project
  - Burton Ranch
  - River Terrace Residential Development
- Construction of Strauss Wind Energy Project in Lompoc[5]
- Lompoc Valley Parks, Recreations and Pool Foundation Project - Lompoc Motorsport Park[6]
- Pier Construction on Santa Cruz Island[7]
- Simplified Acquisition of Base Engineer Requirements program projects on VSFB[8]

Sources: [1]DAF 2016, [2]Gray 2022, [3]DAF 2022b, [4]City of Lompoc 2022, [5]Department of Planning and Development Santa Barbara County 2019, [6]City of Lompoc 2016, [7]National Park Service 2022, [8]GovTribe 2018

5.3. Reasonably Foreseeable Actions

Reasonably foreseeable future actions at VSFB include continued launches of both commercial and military launch vehicles, regular military aircraft takeoffs and landings, and the development of residential and community real estate in Lompoc (Table 5.3-1).

Table 5.3-1: Reasonably Foreseeable Actions

- Regular aircraft take-offs and landings, at VSFB
- Up to 110 space vehicle launches annually with DOD and commercial payloads from VSFB, including Blue Origin, Firefly, Phantom, Northrop Grumman, Stratolaunch, ABL Space Systems, United Launch Alliance, SpaceX, Virgin Orbit, and Relativity programs.
- Further infrastructure development for expanded commercial space launch capabilities at VSFB[1]
- Approved private development project in Lompoc[2]
  - Community Health Centers of the Central Coast
  - Summit View Homes
  - Mosaic Walk 13 Unit Residential Project
  - Burton Ranch
  - River Terrace Residential Development
- Military and commercial rocket launches on VSFB
- Regular aircraft take-offs and landings at VSFB

Sources: [1]Erwin 2022, [2]City of Lompoc 2022

5.4. Environmental Consequences

The Proposed Action's impacts discussed in Chapter 4 (Environmental Consequences) were analyzed for their potential to result in cumulative impacts when added to other past, present, and reasonably foreseeable future actions. As discussed in Chapter 4, the Proposed Action would result in less than significant impacts related to air quality, sound, biological resources, marine resources, water resources, cultural resources, DOT Act Section 4(f) Properties, recreation, human health and safety, hazardous materials and waste, solid waste, coastal zone resources, and utilities. The potential cumulative impacts on those environmental impact categories are summarized in Table 5.4-1.

Table 5.4-1: Summary of Cumulative Impacts

Resource	Cumulative Impacts
Air Quality	Past, present, and reasonably foreseeable future actions have resulted and will result in air emissions in the ROI. Construction of residential and commercial projects in and around VSFB, along with air and space craft operations, would result in increased emissions. All emissions would be temporary and not likely to result in an exceedance of air quality standards, including the NAAQS. Additionally, ecological restoration projects and renewable energy projects, including the Strauss Wind Energy Project, in and around VSFB would result in improved air quality and net-negative GHG emissions. The Proposed Action would result in temporary air emissions during projectile transport activities, site preparation, mobilization activities, and static fire and launch events. These emissions are relatively small and temporary in nature. When combined with other past, present, and reasonably foreseeable future actions, the Proposed Action is not expected to result in exceedance of any air quality standards, including the NAAQS thresholds, because of the low amount of emissions and the temporary nature of the emissions. Therefore, the Proposed Action is not expected to result in significant cumulative impacts on air quality.
Sound	Construction of SLC-5 and the associated infrastructure and utilities within the Proposed Action Area and for other projects would result in temporary, intermittent impacts localized to each project site. Construction projects are typically temporary in duration, and the noise impacts during construction under the Proposed Action would not be a major contributor to the noise setting on VSFB. Noise effects associated with launch and missile activities on VSFB are relatively short (typically no more than five minutes per event). Appropriate environmental analyses are conducted for these activities. Noise produced during launch under the Proposed Action is anticipated to be short (about two minutes), substantially less than noise levels produced by larger vehicles launched from nearby facilities (SLC-4 and SLC-6), primarily contained on VSFB, and would not contribute a significant cumulative impact to the noise setting within the ROI. The sonic boom produced during ascent of the Daytona-E and Laguna-E would be less than 2 psf and would not impact land. Therefore, implementation of The Preferred Alternative in conjunction with other past, present, or reasonably foreseeable projects would not result in cumulative noise impacts within the ROI.
Terrestrial Biological Resources	**Vegetation Resources**: The Proposed Action would potentially impact vegetation resources within the ROI, as presented in Section 4.3.1. Vegetation resources would be impacted during construction of SLC-5 and the associated infrastructure and utilities. The analysis indicated the Proposed Action would not have a significant impact on vegetation resources within the ROI. Overall, long-term consequences are unlikely given the relatively small area of undeveloped land (33.54 ac) potentially impacted and EPMs discussed in Section 2.3. Therefore, the incremental contribution of the Proposed Action, when added to the

Resource	Cumulative Impacts
	impacts of all other past, present, and reasonably foreseeable future actions, would not result in significant impacts on vegetation resources in the ROI or beyond, including impacts on ESA listed species. **Wildlife Resources**: The Proposed Action would potentially impact wildlife resources within the ROI, as presented in Sections 4.3.2 and 4.3.3. Wildlife resources would be impacted during construction of SLC-5 and the associated infrastructure and utilities and from noise during launch and static fire events. The analysis indicated the Proposed Action would not have a significant impact on wildlife resources within the ROI. Overall, long-term consequences are unlikely given the relatively small area potentially impacted, short duration of the test activities, and EPMs proposed in Section 2.3.3.2. Therefore, the incremental contribution of the Proposed Action, when added to the impacts of all other past, present, and reasonably foreseeable future actions, would not result in significant impacts on wildlife resources in the ROI or beyond, including impacts on ESA listed species.
Marine Biological Resources	General threats to marine mammals include water quality degradation (chemical pollution), commercial industries (fisheries bycatch, explosive pest deterrents, and other interactions), noise, hunting, vessel strike, marine debris, disease and parasites, power plant entrainment, and climate change. Potential impacts of actions that affect marine mammals include mortality, injury, disturbance, and reduced fitness, including reproductive, foraging, and predator avoidance success. The susceptibility of marine mammals to these outcomes often depends on proximity, severity, or vulnerability to the stressor and vulnerability can be increased as multiple stressors compound on an individual. The Proposed Action would potentially impact pinnipeds hauled out within the ROI, as presented in Section 4.4.1. Pinnipeds hauled out on land would be affected by noise and visual disturbance during launch and static fire events. The analysis indicates the Proposed Action would not have a significant impact on pinnipeds within the ROI. Overall, long-term consequences for hauled out pinnipeds are unlikely given the long history of monitoring that has documented pinniped reactions at haulouts to similar events. Therefore, the incremental contribution of the Proposed Action, when added to the impacts of all other past, present, and reasonably foreseeable future actions, would not result in significant impacts on marine mammals in the ROI or beyond.
Water Resources	Projects on VSFB, including the Proposed Action, are required to utilize site-specific BMPs and conduct site restoration, as necessary, to minimize impacts on water quality. Any impacts tend to be localized and temporary during the project duration. First stages expended into the broad ocean area would typically break up upon re-entry and sink after impact. If they impact the ocean intact, they would potentially contain a residual amount of propellant. As discussed in Section 4.5.1.1, these propellants are almost completely immiscible, highly volatile, and would spread quickly, rapidly reduce in concentration, minimizing any likelihood of exposure. Therefore, the incremental contribution of the Proposed Action, when added to the impacts of all other past, present, and reasonably foreseeable future actions, would not result in significant impacts on water resources.
Cultural Resources	General threats to cultural resources in the ROI include C&D projects, infrastructure development, and invasive weed control projects. All projects on VSFB are evaluated for potential impacts to cultural resources. Evaluation for NRHP eligibility, Section 106 consultation, and Native American consultation are conducted when appropriate. These processes serve to avoid, and minimize impacts to cultural resources. Implementing the Proposed Action and other construction activities on VSFB involving activities that disturb intact, native soils or demolish structures over 50 years of age could result in impacts to cultural resources. Cumulative impacts would result if project activities

Resource	Cumulative Impacts
	caused major ground disturbances in areas of high paleontological sensitivity that may contain intact subsurface prehistoric or historic archaeological resources. Cumulative impacts would result from incremental changes that collectively and over time impact the NRHP eligibility or listing status of a historic property. EPMs would be implemented to minimize and avoid impacts on sensitive archaeological resources to include the presence of an archaeologist and Native American monitor during all ground-disturbing activities, if required by the ICRMP. If cultural resources are discovered during project-related ground-disturbing activities, all excavation would be halted until the significance of the find is assessed. Therefore, the incremental contribution of the Proposed Action, when added to the impacts of all other past, present, and reasonably foreseeable future actions, would not result in meaningful significant impacts on cultural resources in the ROI or beyond.
DOT Act Section 4(f) Properties	Under the Proposed Action, Jalama Beach County Park would occasionally be evacuated during launch activities. However, Phantom would comply with the closure agreement between the USSF and Santa Barbara County. Therefore, implementation of the Preferred Alternative in conjunction with other past, present, or reasonably foreseeable projects would not result in significant cumulative impacts to Section 4(f) properties in the ROI or beyond.
Transportation	Past, present, and reasonably foreseeable projects in the ROI would contribute to increased traffic volumes in the region. However, given the low ADT volumes and good levels of service currently experienced on the roadways that would be affected by project activities on VSFB and its vicinity, and the relatively small and temporary increase in daily vehicle traffic that would be generated by the Proposed Action, no significant cumulative adverse effects to capacity are expected to occur as a result of the Proposed Action.
Recreation	Jalama Beach County Park would occasionally be evacuated during launch activities under the Proposed Action. However, Phantom would comply with the closure agreement between the USSF and Santa Barbara County. Additionally, the USCG issues NOTMAR defining a Public Ship Avoidance Area for launch events from VSFB that are temporary and lifted as soon as the USCG determines it is safe to do so. The impacts to recreation would be infrequent and temporary. Therefore, implementation of the Preferred Alternative in conjunction with other past, present, or reasonably foreseeable projects would not result in significant cumulative impacts to recreation in the ROI or beyond.
Human Health and Safety	The Proposed Action and other concurrent projects on VSFB could result in increased risks to human health and safety. Implementing the Proposed Action and other similar actions at VSFB would slightly increase the short-term risk associated with personnel performing work at project locations. SLD 30 has developed hazardous areas that constrain project sites to ensure the health and safety of workers (Section 3.10); these hazard areas have been in use for decades' worth of launch and military activities and applied to many on-base projects. DOD and DAF emergency management readiness and response to public health and safety issues are detailed in DODI 6055.17, DODI 6200.03, AFI 10-2519, and AFI 10-2501. These DOD and DAF instructions have been established for a wide variety of DOD operations and projects and require compliance to mitigate impacts to human health and safety. Any potential contractors would be required to establish and maintain safety programs that would provide protection to their workers and limit the exposure of personnel to work hazards. The safety program would include coordination with the AFCEC MMRP manager and contact with the weapons safety specialist for SLD 30 for information on DAF and SLD 30 policies on UXO safety for construction work at VSFB. Projects on VSFB are regulated by the same policies and processes to prevent significant impacts on human health and safety from launch activities, weapons testing, and other military actions on VSFB. By implementing the required safety measures, there would be no significant cumulative impacts resulting from the Proposed Action and other anticipated projects.

Resource	Cumulative Impacts
	Therefore, implementation of the Proposed Action with other past, present, or reasonably foreseeable projects would not result in significant cumulative impacts on human health and safety.
Hazardous Materials and Waste	Past, present, and future projects on VSFB are subject to the same protocols and procedures for the management of hazardous materials and waste. In addition to federal, state, and local rules, installation management of any hazardous materials would occur by complying with Base-specific manuals and protocols such as the HMMP, the Hazardous Materials Emergency Response Plan, and the ISWMP. Slight variances in protocols may occur in contractors' or project proponents' project-specific Emergency Response Plan as it pertains to the unique requirements and processes of individual Proposed Actions. Additionally, EPMs like the prescribed EPMs for this Proposed Action in Section 2.3.3.8, would be implemented to minimize impacts to hazardous materials or hazardous waste management from similar Proposed Actions. Impacts to hazardous materials and waste management from launch activities, weapons testing, and other military actions on VSFB are closely monitored and controlled by the same policies and procedures to ensure impacts are mitigated or minimized and do not result in significant cumulative detrimental effects to hazardous materials and waste management resources. Therefore, implementing the Proposed Action with other past, present, or reasonably foreseeable projects would not result in significant cumulative impacts on hazardous materials and waste management.
Solid Waste Management	The cumulative projects listed above, including the Proposed Action, will result in an overall increase in solid waste generation resulting from vegetation clearing, construction, and waste produced during the launch operations. All operations and activities on VSFB are required to comply with all applicable federal, state, local laws, and regulations, and applicable SLD 30 plans. Local landfills have adequate capacity to process the projected temporary increases in solid waste, especially with the development of the Santa Maria Integrated Waste Management Facility. Therefore, with adhering to disposal and recycling requirements and EPMs described in Section 2.3.3.9, the Proposed Action would not have a significant cumulative impact on solid waste management.
Coastal Zone Management	The Proposed Action would not adversely affect land use. Past, present, and reasonably foreseeable actions would need to conform to applicable Federal, state, and county requirements and DAF instructions and planning principles. Cumulative projects would be modified during the project review process to ensure compatibility with existing land uses and consistency with management plans. These projects have been and would be assessed separately under NEPA and the California Environmental Quality Act, as applicable, and the effects would be analyzed and disclosed. Therefore, implementing the Proposed Action with other past, present, or reasonably foreseeable projects would not result in significant cumulative impacts on coastal zone management.
Utilities	Past, present, and future projects on VSFB would contribute to increases in demand for utility resources; however, utility capacity would be required to be greater than demand. SLD 30 will extend utilities to reach launch facilities, but the existing utility capacity is greater than the anticipated demand to support launch facilities for 110 cumulative launches and supporting infrastructure. The substation that supports south base launch facilities is capable of supporting over 1,000 amps of distribution loads. SLD 30 profiles the loads for every launch, and has not exceeded 100 amps of usage. The existing system can support 10 times the current load, well within the requirements for cumulative launches. If existing utility capacity is not greater than the anticipated demand, SLD 30 would improve utility capacity during infrastructure development for expanded commercial space launch capabilities at VSFB (Table 5.3-1) and thus help offset cumulative impacts to utility resources. Additionally, American Water Operations & Maintenance, which operates the water distribution and wastewater collection systems at VSFB, is saving approximately 22 million gallons/year by re-introducing potable water into the system during fire-hydrant

Resource	Cumulative Impacts
	flushing instead of disposing of the water in storm drains (AFCEC 2015). Water use under the Proposed Action represents a negligible offset of up to 2.2% of this program. Therefore, implementation of the Proposed Action in conjunction with other past, present, or reasonably foreseeable projects would not result in significant cumulative impacts to utilities in the ROI.
Socioeconomics	The long-term employment for personnel supporting the Proposed Action would be considered positive and would augment other local community businesses and industries. VSFB is a major employer in the region and the presence of VSFB and new employers, including Phantom, can cause a chain of economic reactions throughout the local region. VSFB launch operations would not result in closing any public airport or so severely restrict using surrounding airspace to prevent access to an airport for extended time. Given existing closed airspace surrounding VSFB and the FAA's previous analyses related to the NAS have concluded minor or minimal impacts on the NAS from commercial space launches, the effects from airspace closures would result in insignificant socioeconomic impacts. As a result, the overall cumulative effect of the Proposed Action, when considered with other past, present, and reasonably foreseeable future actions on socioeconomics is considered beneficial and less than significant.

5.4.1. Summary

The Proposed Action, when combined with past, present, and reasonably foreseeable future actions, would not result in significant cumulative impacts on the human environment.

6.0 Glossary

Table 6.0-1: Glossary of Terms

Term	Definition
Space Launch Delta (SLD 30)	SLD 30 at VSFB is the USSF organization responsible for DOD space and missile launch activities on the west coast of the U.S. Satellites destined for polar or near-polar orbit are launched from VSFB, and ballistic missiles are tested. The Delta supports West Coast launch activities for the USSF, DOD, Missile Defense Agency, NASA, NRO, foreign nations, and various private industry contractors.
Intergovernmental Coordination, Public and Agency Participation	The USSF implements a process known as Intergovernmental Coordination, Public and Agency Participation, which is used for the purpose of agency coordination and implements scoping requirements.
Section 7 of the Endangered Species Act (ESA)	Under Section 7 of the ESA of 1973, as amended (16 USC 1531 et seq.), federal agencies are required to assess the effect of projects authorized, funded by, or carried out by federal agencies on federally listed threatened or endangered species. Section 7 consultations with the USFWS and NMFS are required for federal projects if such actions have the potential to directly or indirectly affect listed species or destroy or adversely modify critical habitat.
Coastal Zone Management Act (CZMA)	Under the CZMA of 1972, as amended (16 USC 1451-1466), each Federal agency activity within or outside the coastal zone that affects any land or water use or natural resource of the coastal zone shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs.
National Historic Preservation Act (NHPA)	Native American traditional cultural properties are protected by the NHPA of 1966, as amended (54 USC Section 300101 et seq.). Traditional cultural properties are eligible for listing in the NRHP because of their association with cultural practices or beliefs of a living community that (1) are rooted in that community's history, and (2) are important in maintaining and continuing cultural identity of the community. Traditional cultural properties may be identified by Native Americans or other living communities. Even if resources that are significant to Native American Tribes may not be considered traditional cultural properties, these resources may be afforded protection by other laws, regulations, or EOs. Section 106 of the NHPA requires federal agencies to consider the effects of their actions on historic properties listed in or eligible for inclusion in the National Register and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings. The regulations implementing Section 106 (36 CFR Part 800) specify a consultation process to assist in satisfying this requirement.
SLC-5	SLC-5 was originally constructed in 1961 for the Scout launch program. It was used by 69 Scout launch vehicles between 1962

Term	Definition
	and 1994. After 1994 it was decommissioned. All facilities at SLC-5 were deactivated and demolished between 2009 and 2012.
CEQ National Environmental Policy Act Implementing Regulations	CEQ's regulations at 40 CFR Chapter V, Subchapter A (Parts 1500-1508).
Environmental Protection Measures (EPMs)	Mandatory EPMs (denoted by "will," "shall," or "would") are part of the project design and would be implemented as part of the Proposed Action so as to avoid, minimize, reduce, or compensate for the anticipated potential environmental impacts. Discretionary measures (denoted by "may" or "could") may or may not be implemented to further reduce environmental impacts.
Notices to Airmen (NOTAMs)	A NOTAM provides notice of unanticipated or temporary changes to components of, or hazards in, the NAS (FAA Order JO 7930.2S, *Notices to Airmen*).
Local Notices to Mariners (NOTMARs)	A NOTMAR provides notice of temporary changes in conditions or hazards in navigable waterways. Western Range operations, which would include the proposed launches from SLC-5, currently follow the procedures stated in a Letter of Agreement (dated 15 June 2021) between DAF and FAA. The Letter of Agreement establishes responsibilities and describes procedures for the SLD 30, Western Range Operations, within airspace common to the Oakland Air Route Traffic Control Center, Los Angeles Air Route Traffic Control Center, Santa Barbara Terminal Radar Approach Control Facility, Fleet Area Control and Surveillance Facility, Air Traffic Control System Command Center, Pacific Military Altitude Reservation Function, and Central Altitude Reservation Function areas of jurisdiction. The Letter of Agreement also defines responsibilities and procedures applicable to operations, which require the use of Restricted Areas, Warning Areas, Air Traffic Controlled Assigned Airspace, and/or altitude reservations within Western Range airspace.
Toxic Hazard Zones	Toxic Hazard Zones are areas established downwind of launch site operations to protect workers from exposure to toxic vapors emitted during the transfer or loading of liquid propellants or maintenance of launch systems. These zones can extend 20,000 ft or more from a launch site.
Missile/Space Launch Vehicle Flight Hazard Zones and Explosive Safety Zones	Missile/Space Launch Vehicle Flight Hazard Zones and Explosive Safety Zones are established under the flight path of missile or space launch vehicle launches to protect personnel from debris fall-out under the launch trajectory. Explosive safety zones are established from 75 to 5,000 ft around launch sites and buildings where rocket propellants are stored to protect personnel from potential explosive hazards. Both of these hazard zones must be evacuated before any launch.
Radiofrequency Radiation Hazard Areas	Radiofrequency Radiation Hazard Areas are established around transmitters on VSFB that can present radiation hazards to people

Term	Definition
	and potentially detonate electroexplosive devices. The size varies depending on the transmitter power and antenna reception.
Airfield Clear Zones, Lateral Clear Zones (LCZs), and Accident Potential Zones (APZs)	Airfield Clear Zones, Lateral Clear Zones (LCZs), and Accident Potential Zones (APZs) are established around the VSFB airfield runway and contain restrictions on certain land uses. Clear zones and LCZs are areas where the accident potential is so high that land use restrictions prohibit reasonable land use. Clear zones occur at both ends of the runway, and LCZs extend 1,000 ft from both sides of the centerline along the length of the runway. The ground surface within the Lateral Clear Zone must be graded to certain requirements and kept clear of fixed or mobile objects, except for necessary navigational aids and meteorological equipment. Two APZs, APZs I and II, are less critical than clear zones but still possess significant potential for accidents. Acceptable uses within APZ I areas include industrial or manufacturing, communication and utilities transportation, wholesale trade, open space, recreation, and agriculture, but not uses that concentrate people in small areas. Acceptable uses within APZ II areas include business services and commercial retail trade uses of low intensity or scale of operation, but not high-density operations.
Air Installations Compatible Use Zones	Air Installations Compatible Use Zones are areas where certain land uses are restricted due to the combined potential for accidents and noise and the need for clearing obstacles.
Unexploded Ordnance Closure Areas	UXO Closure Areas are areas on VSFB that were used as ordnance training ranges and potentially contain UXO. On 27 September 2010, all areas known or suspected to contain UXO on VSFB were closed to non-mission/recreational activities. Any proposed work in these areas must be coordinated with the Weapons Safety and Explosive Ordnance Disposal offices. Depending on the area, escorts may or may not be required.

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