DRAFT

ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT

For

TRIDENT II (D5) LIFE EXTENSION/LIFE EXTENSION 2 (D5LE/LE2) WEAPON SYSTEMS TESTING PROGRAM

UID#: EAXX-007-17-USN-1740598013

MAY 2025

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Abstract

Designation:	Environmental Assessment
Title of Proposed Action:	Environmental Assessment (EA)/Overseas Environmental Assessment (OEA) for the TRIDENT II (D5) Life Extension/Life Extension 2 (D5LE/LE2) Weapon Systems Testing Program
Lead Agency and Action Proponent for the EA/OEA:	Department of the Navy, Strategic Systems Programs
Cooperating Agency:	Department of the Air Force
Affected Region:	Pacific and Atlantic Fleets Broad Ocean Areas and Land-based Launch from the Naval Ordnance Test Unit at Cape Canaveral Space Force Station (CCSFS), Florida
Point of Contact:	Environmental Program Manager/SP2521 Strategic Systems Programs 1250 10th Street SE, Bldg 200, Suite 3600 Washington Navy Yard, DC 20374-5127
Unique ID #:	EAXX-007-17-USN-1740598013
Date:	MAY 2025

The United States (U.S.) Department of the Navy (DON or "Navy") has prepared this EA/OEA to analyze potential environmental impacts of conducting proposed flight tests and fielding evaluations for the TRIDENT II (D5) Life Extension (D5LE) and D5 Life Extension 2 (D5LE2) weapon systems testing program through the year 2039. The action proponent for this EA/OEA is Strategic Systems Programs (SSP), the command responsible for providing lifecycle support for the Navy's strategic weapons. The U.S. Department of the Air Force (DAF) is a cooperating agency for this action.

This EA/OEA was prepared in accordance with the National Environmental Policy Act (NEPA)(42 U.S. Code [U.S.C.] sections 4321, et seq.), DON and DAF regulations for implementing NEPA (32 Code of Federal Regulations [C.F.R.] Part 775 and Part 989, respectively), Chief of Naval Operations Instruction 5090.1E, and Executive Order 12114, *Environmental Effects Abroad of Major Federal Actions*. The DON has also voluntarily elected to generally follow regulations at 40 C.F.R. parts 1500–1508 that were in place at the outset of this EA/OEA to meet the agency's obligations under NEPA.

This EA/OEA evaluates the potential environmental impacts associated with the Proposed Action Alternative (a combination of both sea-based and land-based testing of the TRIDENT II (D5) weapon systems) and the No Action Alternative to the following resource areas: Air Quality, Biological Resources, Hazardous Materials and Waste Management, and Public Health and Safety. The Proposed Action would result in less than significant impacts to these resources.

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EXECUTIVE SUMMARY

Proposed Action

The United States (U.S.) Department of the Navy (DON or "Navy") has prepared this Environmental Assessment (EA)/Overseas Environmental Assessment (OEA) to analyze potential environmental impacts of conducting proposed land and sea flight tests and fielding evaluations for the TRIDENT II (D5) weapon systems testing program through the year 2039. The Proposed Action is to extend the program to include testing of the D5 Life Extension (D5LE) and D5 Life Extension 2 (D5LE2) weapon systems. The action proponent for this EA/OEA is Strategic Systems Programs (SSP), the command responsible for providing lifecycle support for the Navy's strategic weapons. The U.S. Department of the Air Force (DAF) accepted the DON's invitation to participate as a cooperating agency for this EA/OEA.

Sea-based Testing of the Weapon Systems

The proposed sea-based flight tests would include both the D5LE and D5LE2 weapon systems launched from submarines at sea. All test flights would be unarmed and launched from within a designated broad ocean area (BOA) in the Atlantic or Pacific Ocean, from a depth greater than 100 feet below the sea surface, and from at least 50 nautical miles (NM) offshore of the U.S. mainland. Most test launches would occur during daytime, though nighttime launches may also occur. During each test flight, the target area and flight path would be selected such that no land areas or sensitive areas (e.g., cultural resources, critical habitats) are overflown, and all test components would land within the BOA at least 200 NM from any landmass or islands. The Proposed Action would involve up to six test launches per year during Calendar Years (CYs) 2025–2028 for a combined total of up to 24 tests over the 4-year period and up to eight test launches per year during CYs 2029–2039 for a combined total of up to 88 tests over that 11-year period.

Land-based Testing of the Weapon Systems

The characteristics and operational profile of the proposed land-based testing would be the same as described above for the sea-based tests except the launches would occur from land from an existing coastal launch facility. No land areas would be overflown, and all components would land at least 50 NM from the U.S. shoreline and at least 200 NM from any other landmass or islands. Most test launches would occur during daytime, though some nighttime launches may also occur. The Proposed Action would include a total of up to 10 land-based test launches during the 5-year period from CY 2032–2036.

Purpose of and Need for the Proposed Action

The purpose of the Proposed Action is to demonstrate weapon system effectiveness, to test applicable design features, and to identify and validate effective operating procedures for deployment of the D5LE and D5LE2 weapon systems in both the Atlantic and Pacific Fleets. The Proposed Action is needed to further the Navy's execution of its congressionally mandated role and responsibility under United States Code Title 10, Section 8062 to maintain mission readiness of the nation's submarine forces. To meet Title 10 requirements, SSP conducts flight testing throughout the service life of the TRIDENT II (D5) weapon systems to ensure that accuracy, reliability, and performance requirements continue to be met. Sea-based testing of the weapon systems is needed in the Atlantic and Pacific study areas because both the Atlantic and Pacific Fleets must acquire and maintain proficiency with all deployed weapon systems.

Land-based testing is needed to ensure the technology is safe, reliable, and effective before being used on deployed submarines.

Alternatives Considered

The Navy defined and applied screening factors (described in Section 2.2) to help identify and evaluate potential options for implementing sea-based and land-based testing components of the Proposed Action. The alternatives development process yielded one viable option for each component and these were then combined into a single Proposed Action Alternative that, along with the No Action Alternative, was carried forward for focused analysis in this EA/OEA. The following describes the alternatives carried forward for focused analysis in the EA/OEA:

No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur. Critical flight testing needed to verify the operational performance and safety of the TRIDENT II (D5) weapon systems prior to deployment to the Ohio-class nuclear-powered submarines (SSBN) fleet would not occur. The No Action Alternative would not meet the purpose of and need for the Proposed Action; however, as required by the National Environmental Policy Act (NEPA), the No Action Alternative is carried forward for the purpose of establishing a baseline for analysis in this EA/OEA.

Proposed Action Alternative

Under the sea-based testing component of the Proposed Action Alternative, test flights of the inert TRIDENT II (D5) weapon systems would be launched from SSBNs within the Atlantic BOA associated with the Air Force Eastern Range or the Pacific BOA associated with the Southern California and Hawaii Range complexes, and all test components would land within the same BOA in which the test is conducted.

Under the land-based testing component of the Proposed Action Alternative, inert weapon systems would be launched from existing Space Launch Complex 46 at CCSFS, and all components would land within the same Atlantic BOA used for Atlantic sea-based testing above.

Summary of Environmental Resources Evaluated in the EA/OEA

NEPA and DON instructions for implementing NEPA specify that an EA/OEA should address those resource areas potentially subject to impacts. In addition, the level of analysis should be commensurate with the anticipated level of environmental impact. The following resource areas have been carried forward for analysis in this EA/OEA: Air Quality, Biological Resources, Hazardous Materials and Waste Management, and Public Health and Safety. In addition, the Proposed Action's compliance with the Coastal Zone Management Act is discussed in Appendix A.

The following resources were not evaluated in detail because potential effects would be negligible or nonexistent: Cultural Resources, Water Resources, Geological Resources, Land Use, Visual Resources, Airspace Management, Noise, Infrastructure, Transportation, and Socioeconomics.

Public and Agency Involvement

The DON and DAF are soliciting public and agency input regarding the Proposed Action through publication of this Draft EA/OEA. In the Final EA/OEA, Appendix B will describe the process followed for distribution of the Draft EA/OEA and will include responses to all comments received. The DON will

consider comments received during the public comment period prior to rendering a decision on the Proposed Action. All consultations and coordination with regulatory agencies listed below will be complete prior to the Final EA/OEA.

Pursuant to Section 7(a)(2) of the Endangered Species Act (ESA), the DON is conducting formal consultation with the U.S. Fish and Wildlife Service (USFWS) and informal consultation with National Marine Fisheries Service (NMFS) regarding potential impacts to ESA-listed species and designated critical habitat. In accordance with the Coastal Zone Management Act and appropriate agency guidance, the DON prepared a Coastal Consistency Determination and submitted it to the Florida Department of Environmental Protection (FDEP).

Summary of Potential Environmental Effects

Table ES-1 provides a summary of the potential effects associated with each of the alternatives analyzed.

Table ES-1 Summary of Potential Effects to Resource Areas

Resource Area	*No Action Alternative*	*The Proposed Action Alternative (Preferred)*	
		Sea-based Testing Component	*Land-based Testing Component*
Air Quality	Under the No Action Alternative, the Proposed Action would not occur and there would be no change to baseline air quality. Therefore, no significant effects to air quality or air resources would occur with implementation of the No Action Alternative.	Sea-based launches would not result in significant effects to air quality. Proposed launches would accelerate and travel so rapidly that emissions in the lower troposphere would be low. Because air emissions would be created in an attainment area; the Proposed Action is exempt from General Conformity requirements. At the time of this applicability analysis, emissions generated by test firing of Trident missiles would not occur within a Federal CAA designated nonattainment and/or maintenance area.	Land-based launches would result in similar impacts to air quality as those described for sea-based launches. Criteria pollutant emissions in the lower troposphere would not result in exceedances of National Ambient Air Quality Standards.

Resource Area	*No Action Alternative*	*The Proposed Action Alternative (Preferred)*	
		Sea-based Testing Component	***Land-based Testing Component***
Biological Resources	Under the No Action Alternative, the Proposed Action would not occur and there would be no change to biological resources. Therefore, no significant effects to biological resources would occur with implementation of the No Action Alternative.	Noise from launches and component splashdowns in the BOAs could startle marine species, and injury or mortality due to launch heat plumes and strikes from falling items would be possible. However, the likelihood of these effects would be so low as to be discountable due to the low density and uneven distribution of marine species, the large area of the BOAs in which these species would be distributed, the low number of annual tests, and the relatively low number of expended items. The DON has determined that launch activities may affect, but are not likely to adversely affect the ESA-listed species under the jurisdiction of the NMFS under section 7 of the ESA and is consulting with the Service as applicable.	There is no proposed construction or renovations associated with the Proposed Action, and therefore there would be no long-term impacts to vegetation or wildlife. Potential effects on terrestrial resources would result from launches, including exhaust heat plume, light, and noise. The noise associated with the launches would cause some startle responses from nearby wildlife. A USFWS-approved Light Management Plan would be developed to prevent artificial lighting from altering the behavior and movement of hatchling and adult sea turtles at night. Launch impacts within the Atlantic BOA from land-based launches were included in the DON's NMFS consultation. Launch impacts to terrestrial and near-shore species under the jurisdiction of the USFWS were the subject of a separate consultation with that Service. For species under the jurisdiction of the USFWS, the DON determined that the action may affect, and is likely to adversely affect the southeastern beach mouse, the Florida scrub-jay, and the eastern indigo snake. The DON determined that the Proposed Action may affect but is not likely to adversely affect the remaining ESA-listed species and have no effect on their critical habitat.

Resource Area	*No Action Alternative*	*The Proposed Action Alternative (Preferred)*	
		Sea-based Testing Component	***Land-based Testing Component***
Hazardous Materials and Waste Management	Under the No Action Alternative, the Proposed Action would not occur and there would be no change to hazardous materials and waste management. Therefore, no significant effects would occur with implementation of the No Action Alternative.	Overall, hazardous materials are not expected to be generated or deposited in concentrations high enough to adversely affect environmental quality in the BOAs. No detectable chemical, physical, or biological changes at any one location within the BOAs would be expected. Weapon system components would not contribute to floating or suspended marine debris as they are expected to sink thousands of feet to the ocean floor following splashdown. Based on the amount and expected post-test location of residual hazardous materials and wastes contained on the components, hazardous materials and wastes are expected to have negligible to minor impacts on environmental quality in the BOAs. Therefore, implementation of the sea-based component of the Proposed Action Alternative would not result in significant effects related to hazardous materials and waste management.	Similar to the sea-based component of the Proposed Action Alternative, all weapon system component materials, including the motors, re-entry bodies, and the materials carried within components, would be introduced in deep ocean waters of the Atlantic BOA, and the impacts from hazardous materials and wastes would be similar in nature to the sea-based component. For the land-based component, the Navy would conduct up to 10 launches total between 2032–2036. There would be no generation or disposal of industrial wastewater at SLC-46 from flight test activities. Any residual materials left behind at the SLC-46 launch site following the land-based launches would be containerized and removed in compliance with applicable regulatory requirements rather than being washed down. In addition, support vessels would adhere to all Uniform National Discharge Standards while operating in coastal and inland waters and would adhere to Navy Pollution Control Discharge Restrictions while operating in the BOAs. The Proposed Action would comply with the Coastal Zone Management Act and a Coastal Consistency Determination is included in Appendix A. The impacts from hazardous materials and wastes from these launches would not result in concentrations high enough to adversely impact the environmental quality of the Atlantic BOA or CCSFS. Therefore, implementation of this alternative would not result in significant effects related to hazardous materials and waste management.

Resource Area	*No Action Alternative*	*The Proposed Action Alternative (Preferred)*	
		Sea-based Testing Component	***Land-based Testing Component***
Public Health and Safety	Under the No Action Alternative, the Proposed Action would not occur and there would be no change to public health and safety. Therefore, no significant effects would occur with implementation of the No Action Alternative.	It would be highly unlikely that weapon system components would be directly encountered by civilian watercraft and aircraft in the BOAs, because the FAA and the USCG would issue NOTAMs and NOTMARs in both BOAs. Navy personnel would also verify that the ROI is clear of non-participants before initiating any activity that could be potentially hazardous to the public. Because there would be such a low likelihood of any human receptors in the Atlantic and Pacific BOAs, public exposure to increased noise would not be reasonably foreseeable. The launches would occur from undersea naval vessels and applicable safety procedures would be followed to prevent hazard risks. In addition, the weapon systems would not carry any payload that could potentially cause safety concerns. Therefore, potential impacts of the proposed sea-based testing to public health and safety would be less than significant.	The FAA and USCG would issue NOTAMs and NOTMARs that would be in effect for several hours before and after the test launches from CCSFS. The proposed test launches would not introduce any new types of activities at CCSFS that would increase the level of risk to the public. Navy personnel would also verify that the Atlantic BOA is clear of non-participants before initiating the test flights. The proposed land-based test launches would generate lower noise levels than other launches at SLC-46. Proposed test launches from CCSFS would generate sonic booms but the sonic boom should occur over the Atlantic Ocean and leave land-based receptors unaffected. Noise levels at sensitive off-installation locations would be below levels associated with significant noise effects. Therefore, potential impacts of the land-based testing to public health and safety would be less than significant.

Legend: BOA = broad ocean area; CCSFS = Cape Canaveral Space Force Station; ESA = Endangered Species Act; FAA = Federal Aviation Administration; NMFS = National Marine Fisheries Service; NOTAM = Notice to Airmen; NOTMAR = Notice to Mariners; ROI = Region of Influence; SLC-46 = Space Launch Complex Number 46; USCG = United States Coast Guard; USFWS = United States Fish and Wildlife Service

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Environmental Assessment/Oversees Environmental Assessment
TRIDENT II (D5) LIFE EXTENSION/LIFE EXTENSION 2 (D5LE/LE2)
WEAPON SYSTEMS TESTING PROGRAM
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Abbreviations and Acronyms

Acronym	Definition
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practice
BOA	broad ocean area
CAA	Clean Air Act
CCSFS	Cape Canaveral Space Force Station
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R.	Code of Federal Regulations
CO_2	carbon dioxide
CY	Calendar Year
D5LE	D5 Life Extension
D5LE2	D5 Life Extension 2
DAF	Department of the Air Force
dB	decibels
dBA	A-weighted decibels
DNL	Day-Night Average Sound Level
DERP	Defense Environmental Restoration Program
DoD	United States Department of Defense
DON	United States Department of the Navy
DPS	Distinct Population Segment
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FDEP	Florida Department of Environmental Protection
FMC	Fishery Management Council
FY	Fiscal Year
GHG	greenhouse gas
HAP	hazardous air pollutant
HAPC	habitat area of particular concern
HCl	hydrogen chloride
Hz	hertz
IRL	Indian River Lagoon
JFC	Joint Flight Campaign
kHz	kilohertz
L_{max}	Maximum Sound Level
LA_{max}	Maximum A-weighted Sound level
MBTA	Migratory Bird Treaty Act
MMPA	Marine Mammal Protection Act
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NGA	National Geospatial Intelligence Agency
NM	nautical miles
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide

Acronym	Definition
NOAA	National Oceanic and Atmospheric Administration
NOTAM	Notice to Airmen
NOTMAR	Notice to Mariners
NO_x	nitrogen oxides
ODS	Ozone Depleting Substance
OEA	Overseas Environmental Assessment
OEIS	Overseas Environmental Impact Statement
OPNAV	Office of the Chief of Naval Operations
OPNAVINST	Office of the Chief of Naval Operations Instruction
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in diameter
PM_{10}	particulate matter less than or equal to 10 microns in diameter
PTS	permanent threshold shift
RB	re-entry body
RCCTO	Rapid Capabilities and Critical Technologies Office
RCRA	Resource Conservation and Recovery Act
ROI	Region of Influence
SLC	Space Launch Complex
SLD 45	Space Launch Delta 45
SSBN	Ohio-class nuclear-powered submarines
SSP	Strategic Systems Programs
TSCA	Toxic Substances Control Act
TTS	temporary threshold shift
U.S.	United States
U.S.C.	United States Code
USASMDC	United States Army Space and Missile Defense Command
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
USSF	United States Space Force
VOC	volatile organic compound

1 Purpose of and Need for the Proposed Action

1.1 Introduction

The United States (U.S.) Department of the Navy (DON or "Navy") has prepared this Environmental Assessment (EA)/Overseas Environmental Assessment (OEA) to analyze potential environmental impacts of conducting proposed flight tests and fielding evaluations for the TRIDENT II (D5) weapon systems testing program through the year 2039. The Proposed Action would include testing of the D5 Life Extension (D5LE) and D5 Life Extension 2 (D5LE2) weapon systems. The action proponent for this EA/OEA is Strategic Systems Programs (SSP), the command responsible for providing lifecycle support for the Navy's strategic weapons.

The Proposed Action would include sea-based test launches from submarines in both the Pacific and Atlantic Oceans and land-based test launches from an existing launch facility on the U.S. coast into a defined broad ocean area (BOA). Test components would land in a designated BOA at least 50 nautical miles (NM) from the U.S. mainland and at least 200 NM from lands outside the continental U.S. (including islands). Proposed sea-based flight tests in both the Pacific and Atlantic would consist of up to six tests per year during Calendar Years (CYs) 2025–2028 (for a combined total of up to 24 sea-based test flights during this period), and up to eight tests per year during CYs 2029–2039 (a combined total of 88 sea-based test flights during this period). In addition to these sea-based testing totals, proposed land-based testing would include up to 10 test flights total during CYs 2032–2036.

This EA/OEA was prepared in accordance with the National Environmental Policy Act (NEPA)(42 U.S. Code [U.S.C.] sections 4321, et seq.), DON regulations for implementing NEPA (32 Code of Federal Regulations [C.F.R.] part 775), Chief of Naval Operations Instruction 5090.1E, and Executive Order (EO) 12114. The DON has also voluntarily elected to generally follow regulations at 40 C.F.R. parts 1500–1508 that were in place at the outset of this EA/OEA to meet the agency's obligations under NEPA.

EO 12114, *Environmental Effects Abroad of Major Federal Actions*, requires federal agencies to assess environmental effects when major federal actions have the potential to harm the environment outside the 50 states, territories, and possessions of the U.S., including marine waters seaward of the U.S. territorial seas.

The U.S. Department of the Air Force (DAF) is participating as a cooperating agency in the preparation of this EA/OEA since Cape Canaveral Space Force Station (CCSFS) has agreed to provide the launch facility and support for proposed land-based test flights of the weapon system. The DAF is participating as generally prescribed in its NEPA implementing regulations at 32 C.F.R. part 989, *Environmental Impact Analysis Process*.

1.2 Background

First deployed to the Fleet in 1990, the TRIDENT II (D5) weapon system is the sixth-generation missile in the U.S. Navy Fleet Ballistic Missile program, which began in 1956. Predecessor technologies in the program have included the Polaris A1, Polaris A2, Polaris A3, Poseidon (C3), and TRIDENT I (C4). The D5 weapon system is currently deployed on Ohio-class nuclear-powered submarines (SSBN).

The primary function of the TRIDENT II (D5) weapon system, as with predecessor technologies, is strategic deterrence. The concept of strategic deterrence means that a defending nation maintains a significant capability to strike a challenging nation such that a challenging nation will choose not to

attack. In the nearly 70 years since its inception, the credibility of each generation of the program as an effective deterrent has been maintained and bolstered through technological advancement and routine operational testing and evaluation.

Originally, the service life of the Ohio-class submarines was intended to be 30 years, which would have initiated a timeline for end of service by approximately fiscal year (FY) 2014, but the service life was later extended to 42 years to support a delay in investment in the next generation of SSBNs. To account for this extension in service life, SSP embarked on the first life extension program for the D5, D5LE. SSP introduced the D5LE to the fleet in 2017 and will continue to convert legacy D5 to D5LE as a function of normal maintenance schedules through approximately 2025. In parallel with these changes, planned decommissioning of Ohio-class submarines is set to begin (at a rate of one per year) in 2028, and the replacement Columbia-class submarines will begin to support the deterrence mission when the first vessel is expected to enter service in 2031. The planned transition from D5LE to D5LE2 will support this fleet modernization and help to extend the TRIDENT II (D5) weapon systems central role in strategic deterrence throughout the service life of the new class of submarines.

The Proposed Action would provide for sea-based operational testing of the TRIDENT D5LE and D5LE2 weapon systems in the Atlantic and Pacific BOAs, as well as land-based testing at CCSFS.

1.3 Locations

The proposed sea-based tests for D5LE and D5LE2 would occur in both the Atlantic and Pacific BOAs launched from submarines. Participating submarines would deploy to an existing sea range/BOA off the coast of southern California or an existing sea range/BOA off the southeast coast of Florida before engaging in test activities, which would be initiated at least 50 NM offshore. Proposed land-based test launches would originate from the existing Space Launch Complex (SLC) Number 46 (SLC-46) at CCSFS in Florida, with components landing in the Atlantic BOA.

1.4 Purpose of and Need for the Proposed Action

The purpose of the Proposed Action is to demonstrate weapon system effectiveness, test applicable design features, and to identify and validate effective operating procedures for deployment of the D5LE and D5LE2 weapon systems in both the Atlantic and Pacific Fleets.

The Proposed Action is needed to further the Navy's execution of its congressionally mandated role and responsibility under U.S.C. Title 10, Section 8062 to maintain mission readiness of the nation's submarine forces. To meet Title 10 requirements, SSP conducts flight testing throughout the service life of the TRIDENT II (D5) weapon systems to ensure that accuracy, reliability, and performance requirements continue to be met. Sea-based testing of the weapon systems is needed in both the Atlantic and Pacific study areas because both the Atlantic and Pacific Fleets must acquire and maintain proficiency with all deployed weapons systems. Land-based testing is needed to ensure that the technology is safe, reliable, and effective before being used on deployed submarines.

1.5 Scope of Environmental Analysis

This EA/OEA evaluates the potential effects to the human and natural environment from implementing the proposed TRIDENT II (D5) weapon systems testing program. The No Action Alternative is also evaluated as a requirement of NEPA to serve as a baseline from which to analyze the effects of not implementing the Proposed Action. Supported by the information and environmental analysis presented

in this document, the Navy will decide whether to implement the Proposed Action or to select the No Action Alternative.

The proposed test activities that are described and analyzed in this EA/OEA include: inert launches from the existing CCSFS launch facility into the Atlantic BOA for land-based tests, naval vessel operations and test launches at sea, and deposition of spent system components within the two BOAs for both land- and sea-based test flights.

The TRIDENT II (D5) weapon systems testing program as a whole includes current and ongoing mission support operations at existing Department of Defense (DoD) locations at Naval Base Kitsap Bangor (Washington) and Naval Submarine Base Kings Bay (Georgia), system component testing at Naval Air Weapons Station China Lake in California, activities at the Utah Test and Training Range, and other production facilities throughout the U.S. The operational characteristics, capacities, and tempo of these supporting functions would not change because of the Proposed Action, nor would there be any change in the transportation of test weapon systems or their components to, from, or between these sites. Accordingly, these activities do not require further NEPA analysis, are not included in this Proposed Action, and are not considered further in this EA/OEA.

During preparation for and implementation of the proposed test flights, U.S. military installations and shipyards in both the Atlantic and Pacific Ocean regions may be used in providing various forms of logistical and operational support (e.g., fueling, supply, and maintenance of vessels; system component storage and handling; range asset management and operations). These types of activities conducted at existing naval installations are not analyzed in this EA/OEA, as the Proposed Action does not include any increase or change to shore or sea-based transits at or near these existing military installations. These activities represent ongoing types of operations that are not dependent on the proposed flight tests and therefore are considered to be outside the scope of this EA/OEA analysis. These installations and shipyards are required to maintain their own NEPA documentation and regulatory permitting for ongoing and future activities.

The NEPA compliance documentation for those projects is being generated separately and concurrently by that agency as a function of its Command role at both locations. This EA/OEA incorporates those other NEPA documents by reference where applicable but does not directly address site-specific impacts from those construction projects. They are, however, considered in the cumulative effects analysis in Chapter 6 of this EA/OEA.

To provide Navy decision makers with sufficient information to plan and make informed decisions on the proposed weapon systems test program, this EA/OEA evaluates several environmental resource categories within the affected environments that potentially could be impacted. For the assessment of land-based and sea-based test flights, the following four environmental/resource categories were considered in detail: Air Quality, Biological Resources, Hazardous Materials and Waste Management, and Public Health and Safety.

1.6 Key Documents

Key documents are sources of information incorporated into this EA/OEA by reference. Documents are considered key because of similar actions, analyses, or impacts that may apply to this Proposed Action. Documents incorporated by reference in part or in whole include:

- *Hawai'i–Southern California Training and Testing Final Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement*, 2018 (DON, 2018a). The DON identified its need to

support and conduct current, emerging, and future training and testing activities in the Hawai'i-Southern California Study Area, which is made up of air and sea space off Southern California, around the Hawaiian Islands, and the air and sea space connecting them.

- *Atlantic Fleet Training and Testing Final Environmental Impact Statement (EIS)/Overseas EIS (OEIS)*, 2018 (DON, 2018b). This EIS assesses the potential environmental impacts associated with military readiness for training and testing, research, development, and evaluation of active sonar and explosives in the Atlantic Ocean BOA along the eastern coast of North America, portions of the Caribbean Sea and Gulf of America (formerly Gulf of Mexico) at Navy pier side locations, within port transit channels, near civilian ports, and in bays, harbors, and inshore waterways. The Atlantic Fleet Training and Testing Draft Supplemental EIS/OEIS for Atlantic Fleet Training and Testing provides a supplemental analysis of testing and training (DON, 2024a). The Draft Supplemental EIS/OEIS is publicly available and is expected to be finalized in the Fall of 2025.
- *Final Environmental Assessment, Finding of No Significant Impact, and Appendices for SpaceX Falcon Launches at Kennedy Space Center and Cape Canaveral Air Force Station*, 2020 (Federal Aviation Administration [FAA], 2020). This EA evaluates the potential environmental impacts from launching the Falcon 9 and Falcon Heavy from Kennedy Space Center's LC-39A and CCSFS's LC-40.
- *Joint Flight Campaign (JFC) Environmental Assessment/Overseas Environmental Assessment*, 2022 (DON and U.S. Army, 2022). The JFC EA/OEA provides analysis of proposed SSP and U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) experimental flight tests with a payload from one of four candidate launch sites, which include the Pacific Missile Range Facility/Kaua'i Test Facility, Kaua'i, Hawai'i; Wallops Flight Facility, Wallops Island, Virginia; Vandenberg Space Force Base, California; and CCSFS, Florida. Candidate impact areas include BOA in the Pacific and Atlantic Oceans.
- *Northwest Training and Testing EIS/OEIS Documents* (DON 2015a, 2019a, 2020a). The original EIS was completed in 2015 followed by supplemental documents in 2019 and a supplemental EIS/OEIS in 2020. These documents analyzed the continued training and testing activities within the Study Area. Proposed training and testing activities are similar to those that have occurred in the Study Area for decades and that were previously analyzed in the 2015 document. These activities include the use of active sound navigation and ranging, known as sonar, and explosives.

1.7 Relevant Laws and Regulations

The DON has prepared this EA/OEA based upon federal and state laws, statutes, regulations, and policies pertinent to the implementation of the Proposed Action, including the following:

- NEPA (42 U.S.C. section 4321 et seq.)
- EO 12114, *Environmental Effects Abroad of Major Federal Actions*, including the implementing regulation 32 C.F.R. part 187, *Environmental Effects Abroad of Major Department of Defense Actions*
- Navy Regulations for Implementing the Procedural Provisions of NEPA (32 C.F.R. part 775)
- Clean Air Act (CAA) (42 U.S.C. section 7401 et seq.)
- Clean Water Act (33 U.S.C. section 1251 et seq.)
- Rivers and Harbors Act (33 U.S.C. section 401 et seq.)
- Coastal Zone Management Act (16 U.S.C. section 1451 et seq.)
- National Historic Preservation Act (54 U.S.C. section 300101 et seq.)

- Endangered Species Act (ESA) (16 U.S.C. section 1531 et seq.)
- Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (16 U.S.C. section 1801 et seq.)
- Marine Mammal Protection Act (MMPA) (16 U.S.C. section 1361 et seq.)
- Migratory Bird Treaty Act (MBTA) (16 U.S.C. section 703 et seq.)
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 U.S.C. section 9601 et seq.)
- EO 12088, *Federal Compliance with Pollution Control Standards*
- EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*
- EO 13089, *Coral Reef Protection*
- EO 13175, *Consultation and Coordination with Indian Tribal Governments*
- Any additional, relevant statutes or governing directives

A description of the Proposed Action's consistency with these laws, policies, and regulations, as well as the names of regulatory agencies responsible for their implementation, is presented in Chapter 7.

1.8 Public and Agency Participation and Intergovernmental Coordination

The DON and DAF are soliciting public and agency input regarding the Proposed Action through publication of this Draft EA/OEA. In the Final EA/OEA, Appendix B will describe the process followed for distribution of the Draft EA/OEA and will include responses to all comments received. The DON will consider comments received during the public comment period prior to rendering a decision on the Proposed Action. All consultations and coordination with regulatory agencies listed below will be complete prior to the Final EA/OEA.

Pursuant to Section 7(a)(2) of the Endangered Species Act (ESA), the DON is conducting formal consultation with the U.S. Fish and Wildlife Service (USFWS) and informal consultation with National Marine Fisheries Service (NMFS) regarding potential impacts to ESA-listed species and designated critical habitat. In accordance with the Coastal Zone Management Act and appropriate agency guidance, the DON prepared a Coastal Consistency Determination and submitted it to the Florida Department of Environmental Protection (FDEP).

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2 Proposed Action and Alternatives

This EA/OEA provides an assessment of the potential environmental effects of implementing the Proposed Action and the No Action Alternative. Section 2.1 describes in more detail each of the components of the Proposed Action. Section 2.2 describes the screening factors the Navy considered while evaluating potential alternatives for the Proposed Action, and Section 2.3 explains why certain alternatives were not carried forward for detailed analysis in this EA/OEA. Section 2.4 describes the alternatives that are carried forward for analysis in this EA/OEA, including the No Action Alternative. Lastly, Section 2.5 lists the best management practices (BMPs) that are incorporated into the Proposed Action to avoid or reduce potential environmental impacts.

2.1 Proposed Action

The Proposed Action is to extend the TRIDENT II (D5) weapon systems testing program in support of the D5LE and D5LE2 weapon systems. The Proposed Action has two components:

1. Conduct sea-based test flights of unarmed weapon systems within both Atlantic and Pacific BOAs
2. Conduct land-based test launches of unarmed weapon systems from an existing U.S. coastal launch location into an Atlantic BOA

Each of these components is described in more detail below.

2.1.1 Sea-based Testing

The proposed flight tests from submarines at sea would include both the D5LE and D5LE2 weapon systems. All systems deployed under the Proposed Action would be unarmed and launched from a depth of greater than 100 feet below the sea surface and from at least 50 NM offshore of the U.S. mainland. Most test launches would occur during daytime, but nighttime launches may also occur. During each test flight, the target area and weapon system flight path would be selected such that no land areas or sensitive areas (e.g., cultural resources, critical habitats) are overflown, and all test components would land within the BOA at least 200 NM from any other landmass or islands. The proposed tests are required in both the Atlantic and Pacific BOAs to meet system certification requirements for fleet use in both regions.

Up to four surface vessels would conduct pre-flight support activities (e.g., surveillance/clearance of target areas, instrumentation checks, and required BMPs or mitigation measures) for each test flight. The BMPs (see Section 2.5) would include issuing a Notice to Airmen (NOTAM) and a Notice to Mariners (NOTMAR) to help ensure that projected impact areas are cleared of non-participating aircraft and surface vessels. For Atlantic-based tests, support vessels would depart from Port Canaveral, Florida, and for Pacific-based tests support vessels would depart from San Diego, California. Support vessel operations would occur in BOA launch areas. Support vessels would be at sea for up to 24 hours for each test flight.

The TRIDENT II (D)5 weapon system includes a three-stage, solid fuel, guided missile with an equipment section that carries independent non-tactical re-entry bodies (RBs). Destruct devices are attached to each of the three rocket motors and the equipment section to be remotely activated only if the weapon system were to deviate from its course or should other problems occur during flight.

During each test, the system would be fired from a launch tube on the submarine at depth. After broaching the surface, the first stage motor would ignite, providing initial propellant, followed by the second and third stage motors in sequence. The weapon system would follow a calculated ballistic trajectory to the designated and pre-cleared target impact area. The RBs would be released during down-range flight and travel on a predetermined trajectory to the designated impact area for that test launch. After burnout of the solid propellant and separation of each stage, the three spent motor casings and the equipment section casing would land in the BOA and sink. All solid fuel propellant in the rocket motors would be consumed before the spent motor casings impact the ocean surface. The spent casings would not be recovered.

The Proposed Action would involve up to six test flights per year during CYs 2025–2028 for a combined total of up to 24 tests over the 4-year period and up to eight test flights per year during CYs 2029–2039 for a combined total of up to 88 tests over the 11-year period. The allocation of these tests within each BOA is unknown at this time and may vary from year to year, but the requirement for testing in both the Atlantic and Pacific BOAs suggests that the number of test launches conducted in each BOA may be roughly equal overall.

2.1.2 Land-based Testing

The characteristics and operational profile of the proposed land-based testing would be the same as described above for the sea-based tests except the launch would occur from land at one existing coastal launch facility. For a land-based test launch, first-stage ignition would occur at ground level. The second and third stage motors would then ignite in sequence over the BOA. As with a sea-based test, up to four surface vessels would conduct pre-flight support activities in the BOA for each test flight. During each test flight, the weapon system would follow a calculated ballistic trajectory to a designated target impact area in the BOA. The RBs would be released during down-range flight and would also travel on a predetermined trajectory to the impact area. After burnout of the solid propellant and separation of each stage, the three spent motor casings and the equipment section casing would splash down at various points in the BOA and sink. As with the sea-based testing above, the spent casings would not be recovered following the tests. No land areas would be overflown, and all components would land at least 50 NM from the U.S. shoreline and at least 200 NM from any other landmass or islands. Most test launches would occur during daytime, but nighttime launches may also occur.

The Proposed Action would include a total of up to 10 land-based test launches during the 5-year period from CY 2032–2036.

2.2 Screening Factors to Evaluate Alternatives

The DON's implementing regulations for NEPA provide guidance on the consideration of alternatives for a proposed action and require exploration and objective evaluation of reasonable alternatives. Only those alternatives determined to be reasonable and that meet the purpose and need (see Section 1.4) require detailed analysis. This section describes the screening factors the Navy identified and applied to evaluate potential options for meeting program testing requirements for each component of the Proposed Action.

2.2.1 Sea-based Testing

The Navy evaluated potential alternatives for achieving sea-based testing and fielding evaluation requirements of the D5LE and D5LE2 weapon systems against the following screening factors:

- The U.S. Strategic Command sets guidelines for the testing of weapon systems, which mandate flight-testing of the TRIDENT II (D5) weapon systems at a quantity and frequency sufficient to provide a statistically accurate analysis of weapons system components. This certification and validation testing is required to ensure the weapon systems remain fully capable while deployed on SSBNs and must be completed with a random set of weapon systems to ensure the test is reflective of all fleet operations.
- Sea-based testing must occur in both the Atlantic and Pacific fleet operating areas in BOAs that have been approved and established for ballistic missile testing.
- BOA testing areas must be of sufficient size to encompass sea-based launch areas, flight corridors, and impact areas that enable testing over the entire performance envelope required to demonstrate weapon system performance, while remaining at least 200 NM from any foreign territory or inhabited land areas.
- BOA testing areas should maximize use of existing naval operating areas, sea ranges, and range complexes to maximize use of fleet assets and ensure that BOA testing areas include impact areas with existing instrumentation capable of collecting system performance data or include sites suitable for deployment of required instrumentation.
- Launch sites must meet all program safety requirements.
- BOA testing areas should minimize, to the extent possible, inclusion of marine national monuments, national marine sanctuaries, and other known sensitive areas, or enable such areas to be easily avoided during the selection of weapon system flight paths.

2.2.2 Land-based Testing

The Navy evaluated potential alternatives for achieving land-based testing and verification requirements for the weapon system against the following screening factors:

- An existing onshore launch location must have the specialized infrastructure and personnel capable of conducting a flight test such that:
  - The launch pad can support the weapon launch system.
  - Facilities for assembly and storage of the weapon systems are available at the site or within a cost-effective distance for safe and secure transport of test systems to the launch site.
  - Launch data such as pre-mission analyses, real-time performance data, and post-mission analyses can be collected and stored at a classified level and analyzed in a timely manner.
  - Missile motors can be stored according to requirements.
  - The type of equipment required to support the tests (e.g., cranes, trucks, forklifts) is currently available or will be available during the testing and fielding timeframe.
- Land-based test launches of the weapon systems can occur from a single launch site and utilize a single BOA (i.e., testing in both the Atlantic and Pacific is not required like it is for sea-based testing).
- Launch and impact locations must be capable of providing required range safety.
- Launch and impact locations must meet security requirements.
- After launch, test flight corridors, and impact locations must occur within a BOA that has been approved and established for ballistic missile testing.

2.3 Alternatives Considered but not Carried Forward for Detailed Analysis

The DON applied the screening factors above to evaluate potential alternatives for implementing the two components of the Proposed Action. The following alternatives were considered, but not carried forward for detailed analysis in this EA/OEA because they did not meet the purpose and need for the project and/or did not satisfy the reasonable alternative screening factors presented in Section 2.2.

2.3.1 Testing within Other BOAs

Other BOA options (besides those associated with the Air Force Eastern Range in the Atlantic Ocean and the Southern California and Hawaii Range complexes in the Pacific Ocean–see Section 2.4.2) were considered but not carried forward for detailed analysis because they would not meet several of the established criteria and/or DON requirements and/or are not approved areas for ballistic missile testing. As such, the proposed D5LE and D5LE2 testing may not occur within those BOA areas.

2.3.2 Testing Solely in the Pacific or the Atlantic

As discussed in Section 2.2.1, the U.S. Strategic Command sets guidelines for the testing of weapons systems, which mandate flight-testing of the TRIDENT II (D5) weapon systems at a quantity and frequency sufficient to provide a statistically accurate analysis of weapons system components. This certification and validation testing is required to ensure the weapon systems remain fully capable while deployed on SSBNs and must be completed with a random set of weapon systems to ensure the test is reflective of all fleet operations. As a result, an alternative that limits testing exclusively to either the Atlantic Ocean or Pacific Ocean would not satisfy this core requirement and is not carried forward for detailed analysis.

2.3.3 Test Launches from NASA Wallops Flight Facility

National Aeronautics and Space Administration (NASA) Wallops Flight Facility is located on the east coast of Virginia approximately 900 miles north of CCSFS. While the facility has motor storage capabilities and a launch complex, it does not possess an assembly facility suitable for the weapon systems. The DON would need to construct a building that could be used to assemble the weapon system as well as a piece of equipment capable of erecting the system for launch. The time needed to fund and complete construction of these facilities would not meet the timeframe needed for testing and fielding the weapon system. Further, shipping motors from CCSFS to Wallops after testing at CCSFS would substantially increase logistical complexity and inefficiencies. A transport mechanism (e.g., truck or railcar) has not yet been developed to contain and transport a fully assembled system. For these reasons, the use of the NASA Wallops facility for land-based test launches of the weapon systems is not carried forward for detailed analysis in this EA/OEA.

2.3.4 Test Launches from Vandenberg Space Force Station

Vandenberg Space Force Station is located on the west coast in southern California nearly 3,000 miles from CCSFS. While the Vandenberg facility has a launch complex and motor storage capabilities, this location is similarly not equipped with all the requisite support facilities, trained staff, and transport mechanisms needed to support weapon system testing to meet the DON's purpose and need. For these reasons, the use of the Vandenberg Space Force Station for land-based test launches of the weapon systems is not carried forward for detailed analysis in this EA/OEA.

2.4 Alternatives Carried Forward for Analysis

2.4.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur. Critical flight testing needed to verify the operational performance and safety of the TRIDENT II (D5) weapon systems prior to deployment to the SSBN fleet would not be able to continue, and an essential mission component of the nation's nuclear deterrent capability would be reduced. The No Action Alternative would not meet the purpose of and need for the Proposed Action; however, as required by NEPA, the No Action Alternative is carried forward for analysis in this EA/OEA. The No Action Alternative is used to analyze the consequences of not undertaking the Proposed Action and helps to establish a comparative baseline for analysis of environmental effects of the action.

2.4.2 The Proposed Action Alternative

For each of the two components of the action (sea-based testing and land-based testing), only one potential option satisfied all of the screening factors in Section 2.2 and those were combined into a single Proposed Action Alternative carried forward for detailed analysis in this EA/OEA. Under this alternative, inert TRIDENT II (D5) sea-based launches would originate from SSBNs within the Atlantic and Pacific BOAs shown in Figures 2.4-1 and 2.4-2 and all components would land within the same BOA in which each test is conducted. Inert land-based launches of the weapon systems would originate from SLC-46 at CCSFS and all components would land within the Atlantic BOA shown in Figure 2.4-1.

The Proposed Action Alternative would involve up to six sea-based test flights per year during CYs 2025–2028 (24 maximum total) and up to eight test flights per year during CYs 2029–2039 (88 maximum total). The allocation of these tests within each BOA is unknown at this time and may vary from year to year but is expected to be approximately equal overall. All other characteristics of the test flights under this alternative would be as described above in Section 2.1.1. The Proposed Action Alternative would also involve a total of up to 10 land-based test launches from CCSFS into the Atlantic BOA during CY 2032–2036. The characteristics and operational profile of the proposed land-based testing would be the same as described in Section 2.1.2.

The Proposed Action Alternative is preferred because:

- The purpose and need for the action require both sea-based and land-based testing.
- This combined alternative provides for sea-based testing in both Atlantic and Pacific fleet operating areas and includes BOAs that have been approved and established for ballistic missile testing.
- This combined alternative satisfies all identified screening factors in Section 2.2.

The Naval Ordnance Test Unit at CCSFS has all the required infrastructure to assemble, store, test, and launch the weapon systems. The nearby Eastern Range also possesses the controls, instrumentation, and support equipment with the required data collection and testing capabilities needed for completing the field tests. In addition, the existing workforce includes personnel trained in the specific skills to support the TRIDENT II (D5) weapon systems program.

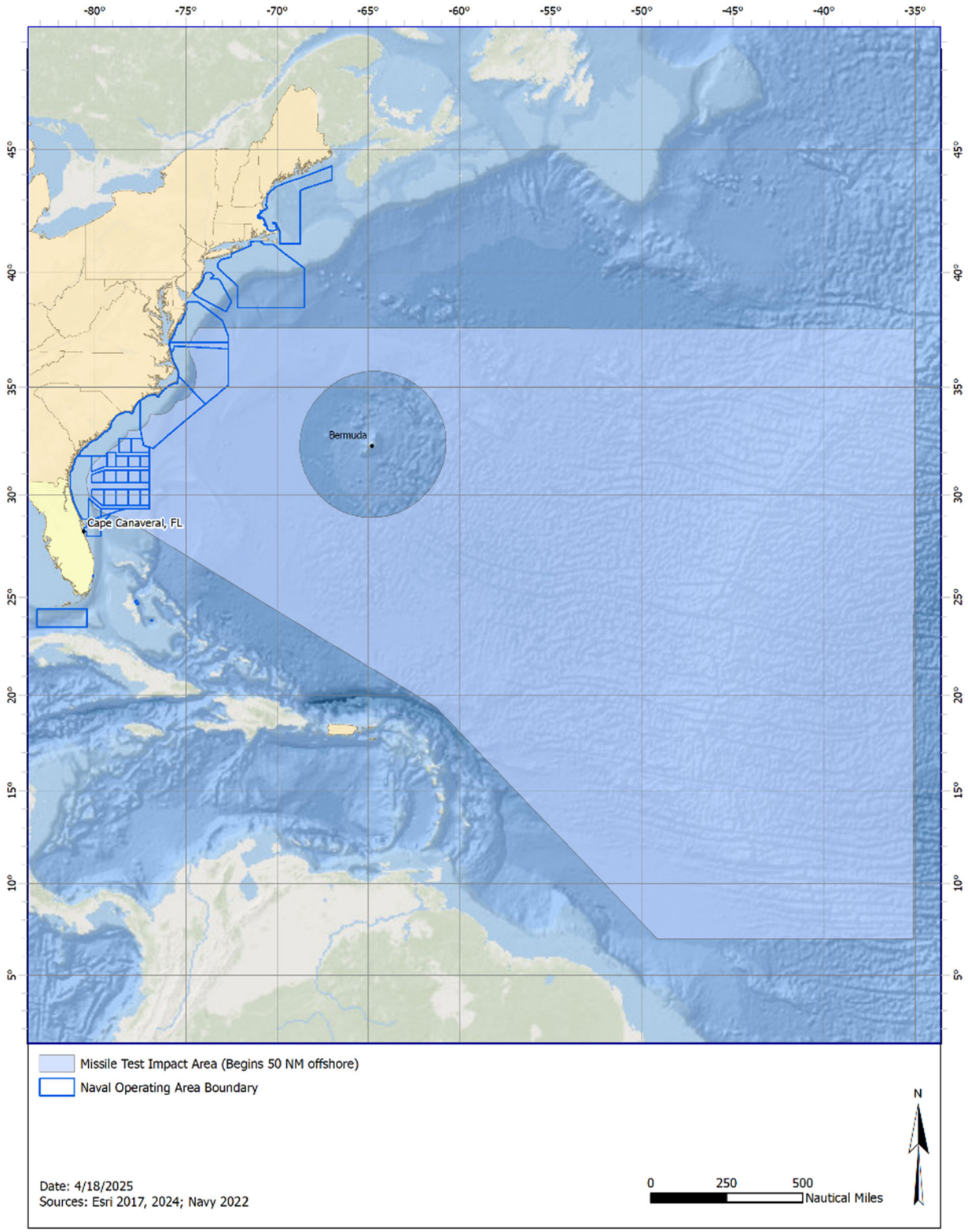

Figure 2.4-1 Atlantic BOA for Proposed Sea-based and Land-based TRIDENT II Flight Testing

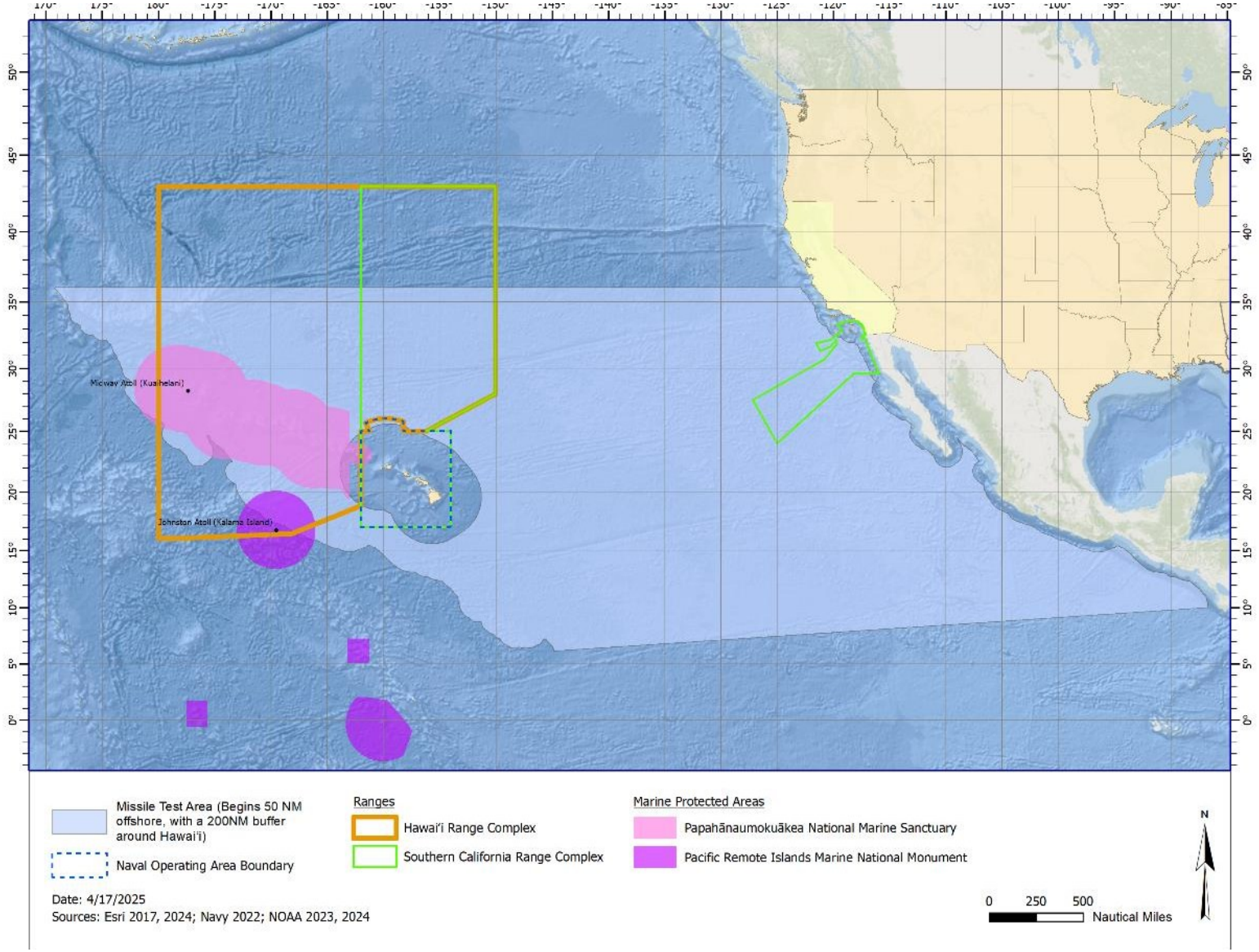

Figure 2.4-2 Pacific BOA for Proposed Sea-based TRIDENT II Flight Testing

2.5 Protective Measures Included in the Proposed Action

This section presents an overview of the BMPs and impact avoidance/minimization measures that are proactively incorporated into the Proposed Action to avoid or reduce potential environmental impacts. BMPs are distinguished from "mitigation measures" in the context of NEPA because BMPs are (1) included in the Proposed Action, (2) ongoing, regularly occurring practices, and/or (3) not unique to this Proposed Action. Minimization measures for protected species are proposed measures specific to this Proposed Action which may help to avoid or minimize effects to protected species or habitats.

2.5.1 Best Management Practices

The general BMPs that would be implemented for the Proposed Action are listed below:

- Prior to each weapon system test flight from CCSFS, pre-launch ground preparation activities would occur in compliance with standard launch site operating procedures and BMPs, including ground equipment checkout, flight vehicle-to-booster assembly checkout, and other preparations for flight testing.
- In coordination with the FAA and U.S. Coast Guard (USCG), NOTAMs and NOTMARs would be in effect throughout all proposed test launches (sea-based and land-based) to minimize the presence of civilian watercraft and aircraft in portions of the BOAs potentially affected by each test.
- In advance of each test event, Navy personnel would monitor affected portions of the BOA to verify that the areas are clear of non-participants before initiating any test activity that could be potentially hazardous to the public.
- The 45th Space Wing *Invasive Species Control Plan* (U.S. Space Force [USSF], 2019) would be implemented to minimize the potential spread and introduction of invasive species to the greatest extent practicable.
- Any residual materials left behind at the SLC-46 launch site following the land-based test launches would be containerized and removed in compliance with applicable regulatory requirements rather than being washed down.
- Support vessels would adhere to all Uniform National Discharge Standards while operating in coastal and inland waters and would adhere to Navy Pollution Control Discharge Restrictions while operating in the BOAs.

2.5.2 Minimization Measures for Protected Species

The USSF and DON are responsible for implementing all minimization and conservation measures specifically related to the Proposed Action. These minimization measures include but are not limited to:

- During planning for each test event, Navy personnel would apply the DON's Protective Measures Assessment Protocol to identify any applicable environmental mitigation requirements established to minimize potential impacts to protected marine species.
- Prior to a sea-based launch, to the extent practicable, the general launch area would be observed for the presence of ESA-listed marine species, and modifications would be made to the launch timing. All test activities would adhere to Management Guidelines associated with protected species discussed in the Space Launch Delta 45 (SLD 45) *Integrated Natural Resources Management Plan* for each species analyzed.

- During transit in the Atlantic and Pacific BOAs, support ship personnel would monitor for marine mammals and sea turtles to avoid potential vessel strikes. Vessel operators would maneuver and adjust speed to maintain a 460-meter (500-yard) mitigation zone around whales and a 180-meter (200-yard) zone around other marine mammals (except bow-riding dolphins), and within the vicinity of sea turtles, when possible. If marine mammals or sea turtles are sighted in mitigation zones, the Navy would maneuver the vessel to maintain distance, until the animal is deemed to no longer be in the mitigation zone.
- Post sea-based launch, the number, species, and behavior of any ESA-listed marine species observed in proximity to the launch area, if any, would be documented and reported to the NMFS.
- No launches, test component splashdowns, or payload impacts will occur within Marine National Monuments, National Marine Sanctuaries, Biologically Important Areas, or critical habitat located in the ocean study areas. No launch activities or anchoring are planned to occur within these areas.
  - All launches would occur at least 50nm from land.
  - All component splashdowns or payload impacts would occur at least 200nm from any land areas
  - To reduce the potential for Florida scrub-jay mortalities, launch site staff and contractors would be made aware of the prevalence of family groups near SLC-46. Personnel would be directed to travel on routes that are not adjacent to Florida scrub-jay family groups, when possible.
- To the greatest extent practicable, the USSF and the DON would avoid impacts to southeastern beach mouse habitat that are established to minimize impacts to the southeastern beach mouse population occurring within CCSFS.
- Standard protection measures specified in the SLD 45 *Integrated Natural Resources Management Plan* (USSF, 2023a) for eastern indigo snakes would be implemented to minimize potential effects on the species. Measures include education, signage, and reporting protocols.
- To minimize potential effects to nesting sea turtles, nighttime test launches from SLC-46 would be scheduled to occur between November and April (outside of turtle nesting season), when sea turtles are not actively nesting on the beaches adjacent to the launch complex. If any test operations were scheduled to occur at night during sea turtle nesting/hatching season, a Light Management Plan would be submitted to SLD 45 and the U.S. Fish and Wildlife Service (USFWS) for approval. Operation lighting would be covered under the Programmatic Biological Opinion for exterior lighting.

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3 Resource Definitions and Regulatory Setting

This chapter presents a description of the definitions and regulatory setting for the resources carried forward for analysis, including Air Quality, Biological Resources, Hazardous Materials and Waste Management, and Public Health and Safety. In addition, consideration of noise effects is included in both the Biological Resources sections (for effects on species and critical habitat) and the Public Health and Safety sections (for effects on humans). Chapter 4 presents the affected environment and environmental consequences from the sea-based testing component of the Proposed Action Alternative for each of these resources. Chapter 5 presents similar information for the land-based component of the Proposed Action Alternative for each resource. Appendix A presents a discussion of the Coastal Zone Management Act.

For resource topics not carried forward for detailed analysis of environmental impacts, Table 3.0-1 provides a brief resource description for each, along with the reason(s) it was not evaluated further in this EA/OEA.

Table 3.0-1 Justification for Resource Topics Not Carried Forward for Further Analysis

Resource Topic	*Description*
Cultural Resources	There are no identified cultural resources with the potential to be affected by proposed land-based test launches at SLC-46 at CCSFS. All weapon system flight path trajectories for both land-based and sea-based testing would be selected in advance for each testing event and all known marine sanctuaries, monuments, and protected cultural resources would be avoided. Therefore, there would be no reasonably foreseeable adverse effects to cultural resources within the Atlantic and Pacific BOAs or at CCSFS from the proposed D5LE and D5LE2 testing.
Water Resources	There are no groundwater or surface water resources in the Atlantic or Pacific BOAs or at SLC-46 at CCSFS that would be affected by the flight test activities. There would be no generation or disposal of industrial wastewater at SLC-46 from flight test activities. Any residual materials left behind at the SLC-46 launch site following the land-based launches would be containerized and removed in compliance with applicable regulatory requirements rather than being washed down. In addition, support vessels would adhere to all Uniform National Discharge Standards while operating in coastal and inland waters and would adhere to Navy Pollution Control Discharge Restrictions while operating in the BOAs. There would be minimal disturbance to ocean waters beyond the settling of the spent motor and equipment casings hundreds of miles apart and sinking thousands of feet to the sea floor. All solid fuel propellant in the rocket motors would be consumed before the spent motor casings impact the ocean surface. The Proposed Action would comply with the Coastal Zone Management Act and a Coastal Consistency Determination is included in Appendix A. Therefore, no reasonably foreseeable adverse effects would occur to water resources within the Atlantic and Pacific BOAs or at CCSFS from the proposed D5LE and D5LE2 testing.
Geological Resources	Minimal ground disturbance would occur in the Atlantic and Pacific BOAs from the flight test activities. Splashdown and settling of spent motor casings would occur offshore in deep ocean waters and would result in minimal benthic sediment disturbance. Additionally, ground disturbing activities would not occur at SLC-46 at CCSFS. Therefore, no reasonably foreseeable adverse effects would occur to geological resources within the Atlantic and Pacific BOAs or at CCSFS from the proposed D5LE and D5LE2 testing.

Resource Topic	*Description*
Land Use	All inert testing would occur in Atlantic and Pacific BOAs that have been approved and established for D5LE and D5LE2 testing. No construction, demolition, or any land use changes would occur at SLC-46 at CCSFS, and the tests would be consistent with federal, state, and local land use plans pertaining to launches at CCSFS. The weapon system flight path for each testing event, whether from SSBNs or from SLC-46 at CCSFS, would be selected to avoid populated land masses, and the deposition of inert test components would occur offshore in deep ocean waters at least 200 NM from any foreign territory or inhabited land areas. Compliance with the Coastal Zone Management Act Program is discussed in Appendix A. Therefore, no reasonably foreseeable adverse effects would occur to land use within the Atlantic and Pacific BOAs or at CCSFS from the proposed D5LE and D5LE2 testing.
Visual Resources	All inert testing would occur in Atlantic and Pacific BOAs that have been approved and established for D5LE and D5LE2 testing. No construction, demolition, or any land use/visually altering changes would occur at SLC-46 at CCSFS. All activities, including vessel operations, flight testing from SSBNs and SLC-46 at CCSFS would be consistent with activities that have occurred in the Atlantic and Pacific BOAs and CCSFS for decades and any temporary change to the visual environment would not likely alter the visual aesthetics of the ROI. Therefore, no reasonably foreseeable adverse effects would occur to visual resources within the Atlantic and Pacific BOAs or at CCSFS from the proposed D5LE and D5LE2 testing.
Airspace Management	All test flights would use airspace that is currently available for existing naval operations that occur in the Atlantic and Pacific study areas. Proposed testing activities would not require the establishment of new special use airspace routes or airspace modifications and would not change the relationship of existing special use airspace with federal airways, uncharted visual flight routes, and airport-related air traffic operations. Test flights would follow all relevant FAA regulations/requirements for flight testing and NOTAM requirements. Therefore, no reasonably foreseeable adverse effects would occur to airspace management within the Atlantic and Pacific BOAs or at CCSFS from the proposed D5LE and D5LE2 testing.
Infrastructure	Proposed testing activities would be consistent with existing activities that occur within the Atlantic and Pacific BOAs and at SLC-46 at CCSFS and would not be expected to impact existing infrastructure or utility resources. Therefore, no reasonably foreseeable adverse effects would occur to infrastructure within the Atlantic and Pacific BOAs or at SLC-46 at CCSFS from the proposed D5LE and D5LE2 testing.
Transportation	Transportation of flight test materials, equipment, and personnel would be consistent with activities that occur within the Atlantic and Pacific BOAs and at SLC-46 at CCSFS and would not be expected to impact existing transportation networks. Test flights would follow all relevant FAA regulations/requirements for flight testing and NOTAM/NOTMAR requirements to ensure aircraft and vessel safety. Additional rail transport of motors between the new railhead support facilities and SLC-46 at CCSFS would be minor given the small number and low frequency of proposed testing events. Therefore, no reasonably foreseeable adverse effects would occur to transportation within the Atlantic and Pacific BOAs or at SLC-46 at CCSFS from the proposed D5LE and D5LE2 testing.

Resource Topic	*Description*
Socioeconomics	During testing events commercial and recreational fishing may be temporarily affected if flight test activities restrict access to fishing areas in the Atlantic and Pacific BOAs. Aquaculture and tourism may also be temporarily affected. However, the Navy notifies the public about restricted areas and closures, and the closures would be short-term (typically 1.5 to 4 hours per location). Additionally, there are no additional personnel requirements or construction activities proposed. Therefore, no reasonably foreseeable adverse effects with respect to socioeconomic resources would occur within the Atlantic and Pacific BOAs or at SLC-46 at CCSFS from the proposed D5LE and D5LE2 testing.

Legend: BOA = broad ocean area; CCSFS = Cape Canaveral Space Force Station; D5LE = D5 Life Extension; D5LE2 = D5 Life Extension 2; FAA = Federal Aviation Administration; NM = nautical mile; NOTAM = Notice to Airmen; NOTMAR = Notice to Mariners; ROI = Region of Influence; SLC = Space Launch Complex; SSBN = Ohio-class nuclear-powered submarine

3.1 Air Quality

3.1.1 Resource Definition

This discussion of air quality includes criteria pollutants, standards, sources, permitting, and greenhouse gases (GHGs). Air quality in a given location is defined by the concentration of various pollutants in the atmosphere. A region's air quality is influenced by many factors, including the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions.

Most air pollutants originate from human-made sources, including mobile sources (e.g., cars, trucks, buses) and stationary sources (e.g., factories, refineries, power plants), as well as indoor sources (e.g., some building materials and cleaning solvents). Air pollutants are also released from natural sources such as volcanic eruptions and wildfires.

3.1.2 Regulatory Setting

3.1.2.1 Criteria Pollutants and National Ambient Air Quality Standards

The CAA is the primary federal statute governing the control of air quality. The CAA designates six pollutants as "criteria pollutants" for which the U.S. Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) to protect public health and welfare. Criteria pollutants include carbon monoxide, sulfur dioxide, nitrogen dioxide (NO_2), ozone, 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. Carbon monoxide, sulfur dioxide, NO_2, lead, and some particulates are emitted directly into the atmosphere from emissions sources. Ozone and some NO_2 and particulates are formed through atmospheric chemical reactions from other pollutant emissions (called precursors) that are influenced by weather, ultraviolet light, and other atmospheric processes.

NAAQS are classified as primary or secondary. Primary standards protect against adverse health effects; secondary standards are designed to protect public welfare, such as prevent damage to farm crops, vegetation, and buildings. Some pollutants have long- and short-term standards. Short-term standards are designed to protect against acute, or short-term health effects, while long-term standards were established to protect against chronic health effects.

Areas in compliance with the NAAQS are designated as attainment areas. Areas that do not meet NAAQS for criteria pollutants are designated nonattainment areas for that pollutant. Areas that have

transitioned from nonattainment to attainment are designated as maintenance areas and are also required to adhere to maintenance plans to ensure continued attainment. Areas that have not been formally classified are unclassified or unclassifiable and are considered to be in attainment.

The CAA requires states to develop a general plan to attain and maintain the NAAQS in all areas of the country and a specific plan for each nonattainment or maintenance pollutant (including the pollutant's precursor) to achieve (nonattainment) or maintain (maintenance) compliance with the appropriate NAAQS for that pollutant. These plans, known as State Implementation Plans, are developed by state and local air quality management agencies and submitted to EPA for approval.

In addition to the NAAQS for criteria pollutants, national standards exist for hazardous air pollutants (HAPs), which are regulated under Section 112(b) of the 1990 CAA Amendments. HAPs (such as benzene and formaldehyde) are compounds known or suspected to cause cancer or other serious health and environmental effects. Unlike criteria pollutants, there are no NAAQS for HAPs. The *National Emission Standards for Hazardous Air Pollutants* regulate HAP emissions from stationary sources (40 C.F.R. part 61). EPA also promulgated a Mobile Source Air Toxics Rule to regulate HAPs from mobile sources. Mobile sources associated with the Proposed Action would operate intermittently over a large area and would produce negligible amounts of HAPs. Given the dispersed and transient nature of these emissions and their limited contribution to overall ambient air quality, further quantitative analysis is not warranted; thus, HAPs are not evaluated further in this analysis.

3.1.2.2 General Conformity

The EPA General Conformity Rule (40 C.F.R. part 93, Subpart B) applies to federal actions occurring in nonattainment or maintenance areas when the total direct and indirect emissions of nonattainment or maintenance pollutants (or their precursors) exceed specified thresholds. The emissions thresholds that trigger requirements for a conformity determination are called *de minimis* levels. *De minimis* levels (in tons per year) vary by pollutant and also depend on the severity of the nonattainment status for the air quality management area in question. At the time of this applicability analysis, emissions generated by test firing of Trident missiles would not occur within a federal CAA-designated nonattainment and/or maintenance area.

3.1.2.3 Greenhouse Gases

GHGs are air pollutants that trap heat in the atmosphere. These emissions occur from natural processes and human activities. The natural balance of GHGs in the atmosphere regulates Earth's temperature. Examples of GHGs from human activities include carbon dioxide, methane, nitrous oxide, and fluorinated gases. Each GHG has a different ability to trap heat in the atmosphere. To account for these differences, GHG emissions are reported as a carbon dioxide equivalent and commonly expressed in units of metric tons. The analysis in this EA/OEA calculates GHG emissions for purposes of making relative comparisons across the project alternatives.

As of April 11, 2025, the Council on Environmental Quality implementing regulations (40 C.F.R. parts 1500–1508) for NEPA 42 U.S.C. 4321 et seq., are no longer in effect. In light of this change, the DON's analysis of GHG emissions, social cost of carbon, and climate change is included in this document to avoid noncompliance with federal court rulings that interpret the requirements of NEPA. The 9th Circuit Court of Appeals has established a precedent for considering climate change impacts in NEPA reviews, as seen in *Center for Biological Diversity v. National Highway Traffic Safety Administration* (538 F.3d 1172, 2008). Similarly, the D.C. Circuit Court of Appeals in *Sierra Club v. Federal Energy Regulatory*

Commission (867 F.3d 1357, 2017) found an EIS to be deficient where the agency failed to estimate carbon emissions and to consider environmental effects. Thus, the DON is including these analyses in an abundance of caution to ensure compliance with federal court rulings regarding NEPA.

3.2 Biological Resources

3.2.1 Resource Definition

Biological resources include living, native, or naturalized plant and animal species and the habitats within which they occur. Plant associations are referred to generally as vegetation, and animal species are referred to generally as wildlife. Habitat can be defined as the resources and conditions present in an area that support a plant or animal.

Within this EA/OEA, biological resources are divided into four major categories: (1) terrestrial vegetation, (2) terrestrial wildlife, (3) marine vegetation, and (4) marine wildlife. Threatened, endangered, and other special status species are discussed in their respective categories.

3.2.2 Regulatory Setting

Special status species, for the purposes of this assessment, are those species listed as threatened or endangered under the ESA and species afforded federal protection under the MMPA, MBTA, Bald and Golden Eagle Protection Act (BGEPA), or the Magnuson-Stevens Fishery Conservation and Management Act.

The purpose of the ESA is to conserve the ecosystems upon which threatened and endangered species depend and to conserve and recover listed species. Section 7 of the ESA requires action proponents to consult with the USFWS or NMFS to ensure that their actions are not likely to jeopardize the continued existence of federally listed threatened and endangered species, or result in the destruction or adverse modification of designated critical habitat. Critical habitat cannot be designated on any areas owned, controlled, or designated for use by the DoD where an Integrated Natural Resources Management Plan has been developed that, as determined by the Department of the Interior or Department of Commerce Secretary, provides a benefit to the species subject to critical habitat designation.

All marine mammals are protected under the provisions of the MMPA. The MMPA prohibits any person or vessel from "taking" marine mammals in the U.S. or the high seas without authorization. The MMPA defines "take" to mean "to harass, hunt, capture, or kill or attempt to harass, hunt, capture, or kill any marine mammal." The National Defense Authorization Act of Fiscal Year 2004 (Public Law [PL] 108-136) amended the definition of "harassment" as applied to military readiness activities or scientific research activities conducted by or on behalf of the federal government, consistent with Section 3(18)(B) of the MMPA [16 U.S.C. section 1362(18)(B)]. The Fiscal Year 2004 National Defense Authorization Act adopted the definition of "military readiness activity" as set forth in the Fiscal Year 2003 National Defense Authorization Act (PL 107-314). Military training activities within the Study Area are composed of military readiness activities as that term is defined in PL 107-314 because training activities constitute "training and operations of the Armed Forces that relate to combat" and "adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use." For military readiness activities, the relevant definition of harassment is any act that:

- injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild ("Level A harassment"); or

- disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering to a point where such behavioral patterns are abandoned or significantly altered ("Level B harassment") [16 U.S.C. section 1362(18)(B)(i) and (ii)].

Birds, both migratory and most native-resident bird species, are protected under the MBTA, and their conservation by federal agencies is guided by EO 13186, *Migratory Bird Conservation*. Under the MBTA it is unlawful by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill, [or] possess migratory birds or their nests or eggs at any time, unless permitted by regulation. The 2003 National Defense Authorization Act gave the Secretary of the Interior authority to prescribe regulations to exempt the Armed Forces from the incidental taking of migratory birds during authorized military readiness activities. The final rule authorizing the DoD to take migratory birds in such cases includes a requirement that the Armed Forces must confer with the USFWS to develop and implement appropriate conservation measures to minimize or mitigate adverse effects of the Proposed Action if the action would have a significant negative effect on the sustainability of a population of a migratory bird species.

Bald and golden eagles are protected by the BGEPA. This Act prohibits anyone, without a permit issued by the Secretary of the Interior, from taking bald eagles, including their parts, nests, or eggs. The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."

The Magnuson-Stevens Fishery Conservation and Management Act provides for the conservation and management of the fisheries. Under the Act, Essential Fish Habitat (EFH) consists of the waters and substrate needed by fish to spawn, breed, feed, or grow to maturity.

3.3 Hazardous Materials and Waste Management

3.3.1 Resource Definition

This section discusses hazardous materials, hazardous waste, toxic substances, and contaminated sites.

3.3.2 Regulatory Setting

Hazardous materials are defined by 49 C.F.R. section 171.8 as "hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous in the Hazardous Materials Table, and materials that meet the defining criteria for hazard classes and divisions in 49 C.F.R. part 173." Transportation of hazardous materials is regulated by the U.S. Department of Transportation regulations.

Hazardous wastes are defined by the Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments, as: "a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (A) cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed." Certain types of hazardous wastes are subject to special management provisions intended to ease the management burden and facilitate the recycling of such materials. These are called universal wastes and their associated regulatory requirements are specified in 40 C.F.R. part 273. Five types of waste are currently covered under the universal wastes regulations: hazardous waste batteries, hazardous waste pesticides that are either recalled or collected in waste pesticide collection programs,

mercury containing equipment, aerosol cans, and hazardous waste lamps, such as fluorescent light bulbs.

Special hazards are those substances that might pose a risk to human health and are addressed separately from other hazardous substances. Special hazards include asbestos-containing material, polychlorinated biphenyls (PCBs), and lead-based paint. EPA is given authority to regulate special hazard substances by the Toxic Substances Control Act (TSCA). Asbestos is also regulated by EPA under the CAA, and CERCLA.

The DoD established the Defense Environmental Restoration Program (DERP) to facilitate thorough investigation and cleanup of contaminated sites on military installations (active installations, installations subject to Base Realignment and Closure, and formerly used defense sites). The Installation Restoration Program and the Military Munitions Response Program are components of the DERP. The Installation Restoration Program requires each DoD installation to identify, investigate, and clean up hazardous waste disposal or release sites. The Military Munitions Response Program addresses nonoperational rangelands that are suspected or known to contain unexploded ordnance, discarded military munitions, or munitions constituent contamination. The Environmental Restoration Program is the DON's initiative to address DERP.

3.4 Public Health and Safety

3.4.1 Resource Definition

The discussion of public health and safety includes consideration of any project-related activities, occurrences, or operations that have the potential to affect the safety, well-being, or health of members of the public. The primary goal is to identify and avoid potential accidents or increased health or safety risks that could impact the general public. Based on the nature of the Proposed Action, the analysis for this EA/OEA focuses on human exposure to noise and operational safety in the airspace, sea space, and terrestrial components of the project areas involved.

Typically, a NEPA analysis of public health and safety would also include the potential for environmental health and safety risks to children. EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, requires federal agencies "to identify and assess environmental health and safety risks that may disproportionately affect children and shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks." Considering the characteristics of this Proposed Action (see Section 2.1) and the remoteness of the project areas (Section 2.4.2), the likelihood that children would be present in the Atlantic and Pacific BOAs or in the vicinity of the SLC-46 launch site at CCSFS, or would otherwise be exposed to environmental health or safety risks from the Proposed Action is extremely low. In addition, the standard DON and DAF safety measures that would be employed during both sea-based and land-based testing (including pre-test surveillance/clearance, notifications to mariners and aircraft, and other measures described in Chapter 2) would minimize health and safety risks for all members of the public so any risks would not disproportionately affect children even if they were present in any of the project areas. Accordingly, the DON's obligations under EO 13045 have been met and this Proposed Action would not present disproportionate health and safety risks to children. Therefore, this topic is not considered further in this EA/OEA.

3.4.1.1 Noise Terminology and Metrics

Noise is defined as unwanted sound. The discussion of noise exposure as a function of public health and safety focuses on potential effects to the human environment (Sections 3.2, 4.2, and 5.2 address noise effects on biological resources). A variety of acoustical metrics have been developed to describe sound events and to estimate potential effects of the sound on sensitive receptors, such as residences. The metrics and terminology used in this EA are described briefly below.

Decibel. The decibel (dB) is a logarithmic unit of measure that describes the intensity of sound. The threshold of human hearing is 0 dB, conversations are typically held at about 60 dB and sounds above 120 dB begin to cause discomfort. Because of the logarithmic nature of the decibel unit, sound levels cannot be simply added or subtracted and are somewhat cumbersome to handle mathematically. However, some useful rules help when dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. Second, the total sound level produced by two sounds with different levels is usually only slightly more than the higher of the two. For example: 50.0 dB + 60.0 dB = 60.4 dB.

A-weighted Decibel. A-weighting is a mathematical process that de-emphasizes frequencies that are not heard efficiently by the human ear. Decibels that have been A-weighted are denoted as "dBA." Sound levels associated with common sound sources include a garbage disposal at 3 feet, which is approximately 85 dBA and a lawn mower at 25 feet, which often exceeds 90 dBA.

Maximum Sound Level. The highest sound level measured during a single event, in which the sound changes with time, is called the maximum sound level (abbreviated as L_{max}). The highest A-weighted sound level measured during a single event is called the maximum A-weighted sound level (abbreviated as LA_{max}). Although it provides a straightforward description of the event, L_{max} (or LA_{max}) does not describe how long the sound lasts or how frequently it occurs, nor does it account for the added intrusiveness of events that occur late at night.

Day-Night Average Sound Level (DNL). DNL is a cumulative noise metric that reflects that total sound energy in a 24-hour period. To account for increased sensitivity to noise at night, DNL applies an additional 10-dB adjustment to events during the acoustical nighttime period, defined as 10:00 p.m. to 7:00 a.m. DNL represents long-term exposure to noise and does not represent a level heard at any given time. Studies of community annoyance in response to numerous types of environmental noise show that there is a positive correlation between DNL and the percent of the population that can be expected to be highly annoyed by the noise.

3.4.2 Regulatory Setting

3.4.2.1 Noise

This subsection discusses regulatory points of reference used in assessing the significance of potential effects of the Proposed Action. Military activities, such as testing and training, are exempted from requirements imposed by the Noise Control Act of 1972 to ensure that military readiness is not impeded by noise level restrictions. The DoD recognizes that noise levels associated with some military activities are not compatible with noise-sensitive land uses, such as residences. As described in DoD Instruction 4165.57, *Air Installations Compatible Use Zones*, not all land uses are considered to be compatible at noise levels greater than 65 dB DNL. DNL has been adopted by the DoD and several other federal agencies as the primary noise metric for the assessment of community reaction.

3.4.2.2 Airspace and Sea Space Safety

Aircraft and airspace safety is based on the physical risks associated with aircraft flight. Military aircraft fly in accordance with Federal Aviation Regulations (FAR) Part 91, *General Operating and Flight Rules*, which govern such things as operating near other aircraft, right-of-way rules, aircraft speed, and minimum safe altitudes. In addition, Navy airspace use must also adhere to the flight rules, air traffic control, and safety procedures provided in DON guidance. NOTAMs alert aircraft pilots of any hazards enroute to or at a specific location, such as upcoming or ongoing military testing or training exercises with airspace restrictions. Civilian aircraft pilots have a responsibility to be aware of restricted airspace and any NOTAMs that are in effect, and to abide by aviation rules as administered by the FAA.

Similarly, NOTMARs provide timely marine safety information for the correction of all U.S. Government navigation charts and publications from a wide variety of sources, both foreign and domestic. To ensure the safety of life at sea, the information published in the NOTMAR is designed to provide for the correction of unclassified nautical charts, the unclassified National Geospatial-Intelligence Agency (NGA)/Defense Logistics Information System Catalog of Hydrographic Products, U.S. Coast Pilots, NGA List of Lights, USCG Light Lists, and other related nautical publications produced by the NGA, National Ocean Service, and the USCG.

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4 Affected Environment and Environmental Consequences: Sea-based Testing

This chapter presents a description of baseline conditions and an analysis of potential direct and indirect effects for each environmental resource that could be affected by implementing the sea-based testing component of the Proposed Action Alternative. All potentially relevant environmental resource areas were initially considered for analysis in this EA/OEA. In compliance with NEPA and DON guidelines, the discussion of the affected environment (i.e., existing conditions) focuses only on those resource areas potentially subject to impacts. Additionally, the level of detail used in describing a resource is commensurate with the anticipated level of potential environmental impact.

In determining whether an effect of the Proposed Action is significant, NEPA requires consideration of both context and intensity. Context means that the significance of an action must be analyzed under several perspectives such as society as a whole, the affected region, the affected interests, and the locality. Significance varies with the setting of a proposed action. For instance, in the case of a site-specific action, significance would usually depend on the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant. Intensity refers to the severity or extent of the potential environmental impact, which can be thought of in terms of the potential amount of the likely change. In general, the more sensitive the context, the less intense a potential impact needs to be to yield a finding of significance. Likewise, when the context is less sensitive, a higher level of intensity is required for a potential impact to be considered significant.

4.1 Air Quality

Emissions from sea-based test launches associated with the Proposed Action Alternative would affect air quality within the atmosphere stretching from the ocean surface to 3,000 feet above ground level. Therefore, the effects analysis focused on two ROIs, for criteria pollutants, the lowest levels of the atmosphere (EPA considers pollutants emitted at altitudes greater than 3,000 feet above ground level to be above the default atmospheric mixing layer, and therefore they do not affect ground level air quality) (EPA, 1992), and global GHG concentrations.

4.1.1 Affected Environment

The proposed sea-based test launches would occur at least 50 NM offshore of the U.S. mainland and therefore the requirements of the CAA do not apply in these areas. Launches within the BOAs would occur far enough offshore that their emissions would not measurably affect areas regulated under the CAA (within state waters, normally 3 NM from shore and 9 NM from shore for Florida). Criteria air pollutant levels within these expansive regions in both the Pacific and Atlantic Oceans are generally very low, due to a lack of and distance from substantial air pollutant sources.

Because support vessels operating on the West Coast for the Proposed Action would originate from San Diego Harbor, the conformity regulation applies to emissions occurring within California state waters (within 3 NM of the coast), which are part of the San Diego Air Basin. This region is designated as a severe nonattainment area for ozone (nitrogen oxides [NO_x] and volatile organic compounds [VOCs] as precursors). The applicable General Conformity *de minimis* thresholds for the San Diego Air Basin are 25 tons per year for VOCs and NO_x. East Coast vessels would originate from Port Canaveral, which is in attainment of all NAAQS.

4.1.2 Environmental Consequences

Effects on air quality are based on estimated direct and indirect emissions associated with the action alternatives. The potential effects of proposed GHG emissions are by nature global and cumulative effects. Therefore, the analysis of GHGs emitted from the Proposed Action Alternative sea-based testing is presented in Section 6.4.1.

As previously stated, a significance determination is only required for activities that may have reasonably foreseeable adverse effects on the human environment. Air pollutant emissions from the Proposed Action could have a reasonably foreseeable adverse effect, thus requiring a significance determination.

A stressor is considered to have a significant effect on the human environment based on an examination of the context of the action and the intensity of the effect. In the present instance, the effects of air emissions would be considered significant if a measurable or anticipated degree of change in air quality or ozone depletion would be substantial and highly noticeable compared to existing conditions, effects would contribute to an exceedance of a NAAQS, or exposure to HAPs would cause significant and unacceptable health effects to populations, including sensitive receptors. If the context of the action and intensity of the effect do not reach the criteria listed above, the effects of air pollutant emissions would be considered less than significant.

4.1.2.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to baseline air quality. Therefore, no significant effects to air quality or air resources would occur with implementation of the No Action Alternative.

4.1.2.2 Potential Effects of the Proposed Action

Criteria Pollutants

To assess the air quality effects associated with sea-based testing under the Proposed Action Alternative, emissions were calculated for the proposed sea-based launches of the weapon systems. As emissions data for the weapon systems have not been holistically quantified, emissions were calculated by using emissions data for the Minuteman III missile, as both launch vehicles are powered by very high energy solid propellants produced by a common manufacturer, the Minuteman III is the most similar rocket for which emissions data exist (U.S. Air Force, 2019), and such data are the best available for this analysis. The TRIDENT II (D5) weapon systems weigh approximately twice as much as the Minuteman III; therefore, the analysis assumed that a TRIDENT II (D5) weapon system launch would emit twice the amount of pollutants compared to a Minuteman III launch. These calculations account for criteria pollutants and hydrogen chloride (HCl) released during each launch. In addition, carbon dioxide emissions for a launch were estimated from data derived for solid fuel-powered commercial launch vehicles (National Academies of Sciences, Engineering, and Medicine, 2021). Table 4.1-1 presents estimates of emissions that would occur by booster stage from an individual weapon system launch.

Table 4.1-1 Estimated Launch Emissions for the Weapon Systems

Launch Stage	Air Pollutant Emissions (tons)							
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$	CO_2	HCl
1st Stage	0.01	0.22	0.00	0.00	2.52	1.76	2.84	1.97
2nd Stage	0.00	0.07	0.00	0.00	0.76	0.53	22.65	0.59
3rd Stage	0.00	0.04	0.00	0.00	0.40	0.28	11.99	0.31
Total	**0.01**	**0.33**	**0.00**	**0.00**	**3.67**	**2.57**	**37.48**	**2.87**

Note: Lead emissions would be less than 0.001 tons per year.

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; HCl= hydrogen chloride; NO_x = nitrogen oxides; PM_{10} and $PM_{2.5}$ = particulate matter with a diameter of less than or equal to 10 microns and 2.5 microns, respectively; SO_x = sulfur oxides; VOC = volatile organic compound

The estimated annual emissions for the Proposed Action Alternative sea-based test launches are presented in Table 4.1-2. The launch schedule includes six launches per year from 2025 to 2028 and eight launches per year from 2029 to 2039.

Table 4.1-2 Proposed Action Alternative Sea-based Launch Emissions

Year	Air Pollutant Emissions (tons per year)							
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$	CO_2	HCl
2025–2028	0.04	1.96	0.00	0.00	22.03	15.43	224.86	17.19
2029–2039	0.06	2.62	0.00	0.00	29.37	20.57	299.81	28.65

Note: Lead emissions would be less than 0.001 tons per year.

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; HCl = hydrogen chloride; NO_x = nitrogen oxides; PM_{10} and $PM_{2.5}$ = particulate matter with a diameter of less than or equal to 10 microns and 2.5 microns, respectively; SO_x = sulfur oxides; VOC = volatile organic compound

The analysis of criteria pollutants focuses on the potential for air pollutant sources to contribute to an exceedance of a NAAQS. Under the CAA, the NAAQS only apply to areas within 3 NM of U.S. shorelines (i.e., within state waters; Florida state waters extend to 9 NM). However, these standards were used as context to determine air quality effects in the BOAs. Given that the proposed weapon system launches would accelerate so quickly in altitude, only a small percentage of the first-stage launch emissions would occur within the atmospheric mixing layer of 3,000 feet in height above the ocean surface (see Table 4.24.1-1). As a result, the effect of launch emissions in the lower troposphere near the ocean surface would result in low ambient pollutant concentrations. When added to the low air pollutant levels within the BOA ROIs, the combined effects would not approach levels associated with any NAAQS. In addition, because launches would occur at least 50 NM from shore, launch emissions would not measurably affect criteria pollutant concentrations or NAAQS attainment status of any onshore or nearshore air quality management area. Therefore, the effects of the Proposed Action Alternative sea-based testing to criteria pollutant levels would be less than significant.

In addition to launch emissions, the sea-based component of the Proposed Action Alternative also includes support vessel operations that contribute to overall air pollutant emissions. Each launch would be supported by a fleet of up to four vessels, which, for modeling purposes, are represented by the U.S. Naval Ship Waters (T-AGS-45) and three Pathfinder-class survey ships (T-AGS-60). These vessels are of the size and type that normally support launches. These vessels operate within the BOA launch zones, with each mission lasting up to 24 hours. Emission factors for these vessels were derived using the Marine Engine Fuel Consumption and Emissions Calculator (DON, 2025), considering different engine types and operational modes. These factors were applied to estimate emissions for each vessel during the specified operational periods.

The estimated annual emissions from these vessels are presented in Table 4.1-3, detailing emissions both within and beyond 3 NM from shore for the periods 2025–2028 and 2029–2039. The combined estimated annual air pollutant emissions under the Proposed Action, including both launch and vessel emissions, are summarized in Table 4.1-4.

Table 4.1-3 Annual Vessel Emissions for Round-Trip Tests (2025-2039)

Years	*Air Pollutant Emissions (tons per year)*					
	NO_X	*CO*	*SO_X*	*PM*	*VOC*	*CO_2*
2025–2028 (6 tests per year) – Within 3 NM	8.59	0.32	0.003	0.02	0.15	316.86
2025–2028 (6 tests per year) – Beyond 3 NM	45.76	2.15	0.02	0.13	0.77	1741.09
2029–2039 (8 tests per year) – Within 3 NM	11.45	0.42	0.004	0.03	0.2	422.48
2029–2039 (8 tests per year) – Beyond 3 NM	61.02	2.87	0.02	0.18	1.02	2321.45

Notes: [1.] Annual emissions are based on the number of round-trip tests conducted per year, with six tests per year from 2025 to 2028 and eight tests per year from 2029 to 2039. Two annual emissions scenarios are provided to reflect these test frequencies.
[2.] Total emissions per round trip were calculated using emission factors generated by the DON and MSC Marine Engine Fuel Consumption and Emissions Calculator. Emission factors were applied to each vessel engine type, and emissions were calculated for three operational modes: Restricted Waters within 3 NM (4 hours), Underway within 3 NM (2 hours), and Underway beyond 3 NM (18 hours). The emissions for each mode were summed to obtain total emissions per round trip.
[3.] Annual emissions were then calculated by multiplying the total emissions per trip by the number of tests per year (6 or 8). This calculation was performed for each pollutant.
Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NM= nautical mile; NO_X = nitrogen oxides; PM_{10} and $PM_{2.5}$ = particulate matter with a diameter of less than or equal to 10 microns and 2.5 microns, respectively; SO_x = sulfur oxides; VOC = volatile organic compounds

Table 4.1-4 Estimated Annual Air Pollutant Emissions Under the Proposed Action

Years	*Air Pollutant Emissions (tons per year)*						
	NO_X	*CO*	*SO_X*	*$PM_{2.5}$*	*PM_{10}*	*VOC*	*CO_2*
Trident D5LE							
2025–2028 Vessels Within 3 NM	8.59	0.32	0.00	0.02	0.02	0.15	316.86
Total 2025–2028 Within 3 NM	**8.59**	**0.32**	**0.00**	**0.02**	**0.02**	**0.15**	**316.86**
2025–2028 Launch Emissions	1.96	0.04	0.00	15.43	22.03	0.00	224.86
2025–2028 Vessels Beyond 3 NM	45.76	2.15	0.02	0.12	0.13	0.77	1,741.09
Total 2025–2028	**47.72**	**2.19**	**0.02**	**15.55**	**22.16**	**0.77**	**1,965.95**
Trident D5LE and D5LE2							
2029–2039 Vessels Within 3 NM	11.45	0.42	0.00	0.03	0.03	0.20	422.48
Total 2029–2039 Vessels Within 3 NM	**11.45**	**0.42**	**0.00**	**0.03**	**0.03**	**0.20**	**422.48**
2029–2039 Launch Emissions	2.62	0.06	0.00	20.57	29.37	0.00	299.81
2029–2039 Vessels Beyond 3 NM	61.02	2.87	.02	0.16	0.18	1.02	2,321.45
2029–2039 Total	**63.64**	**2.93**	**0.02**	**20.73**	**29.55**	**1.02**	**2,621.26**

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; NM= nautical mile; NO_x = nitrogen oxides; PM_{10} and $PM_{2.5}$ = particulate matter with a diameter of less than or equal to 10 microns and 2.5 microns, respectively; SO_x = sulfur oxides; VOC = volatile organic compounds

Conformity Applicability Analysis

A conformity applicability analysis was conducted to compare the net increase in annual emissions from the Proposed Action within the San Diego Air Basin ROI to these thresholds. If annual emissions remain below the *de minimis* level, no further action is required under the General Conformity Rule. If emissions exceed the threshold, a General Conformity Determination would be required.

Emissions estimates for the Proposed Action are provided in Table 4.1-5, which presents annual emissions of VOCs and NO_x from vessel operations within the state waters of the San Diego Air Basin. As shown, the annual emissions are below the 25 tons per year *de minimis* threshold, meaning the Proposed Action is exempt from further General Conformity requirements. A Record of Non-Applicability has been prepared and is included in Appendix C, along with detailed emissions calculations.

Table 4.1-5 Annual Conformity-Related Emissions for the Proposed Action within the San Diego Air Basin

Years	*Air Pollutant Emissions (tons per year)*	
	VOCs	*NO_X*
2025–2028	0.15	8.59
2029–2039	0.20	11.45
Conformity *de minimis* Thresholds	25	25

Legend: NO_x = nitrogen oxides; VOC = volatile organic compound

In conclusion, the implementation of sea-based testing under the Proposed Action Alternative would not result in significant effects to air quality.

4.2 Biological Resources

4.2.1 Affected Environment

The following discussions provide a description of the existing conditions for each of the categories under biological resources in the Atlantic and Pacific BOAs. Threatened and endangered species are discussed in each respective section below with a composite list applicable to the Proposed Action provided in Table 4.2-1.

Table 4.2-1 Threatened and Endangered Species and Critical Habitat Known to Occur or Potentially Occurring in the Sea-based Study Area

Common Name	*Scientific Name*	*Federal Listing Status*	*Occurrence*	*Critical Habitat Present/Status*
Mammals				
North Atlantic right whale	*Eubalaena glacialis*	FE	ABOA	Designated, but does not occur in the sea-based study area
Blue whale	*Balaenoptera musculus*	FE	ABOA, PBOA	None designated
Fin whale	*Balaenoptera physalus*	FE	ABOA, PBOA	None designated
Humpback whale (Central America and Mexico DPSs)	*Megaptera novaeangliae*	FE/FT[1]	PBOA	Designated
Sei whale	*Balaenoptera borealis*	FE	ABOA, PBOA	None designated
False killer whale (Main Hawaiian Islands DPS)	*Pseudorca crassidens*	FE	PBOA	Designated
Sperm whale	*Physeter macrocephalus*	FE	ABOA, PBOA	None designated
Guadalupe fur seal	*Arctocephalus townsendii*	FT	PBOA	None designated
Hawaiian monk seal	*Neomonachus schauinslandi*	FE	PBOA	Designated, but does not occur in the study area

Common Name	*Scientific Name*	*Federal Listing Status*	*Occurrence*	*Critical Habitat Present/Status*
Birds				
Black-capped petrel	*Pterodroma hasitata*	FE	ABOA	None designated
Hawaiian petrel	*Pterodroma sandwichensis*	FE	PBOA	None designated
Short-tailed albatross	*Phoebastria albatrus*	FE	PBOA	None designated
Band-rumped storm-petrel	*Oceanodroma castro*	FE	PBOA	None designated
Newell's shearwater	*Puffinus newelli*	FT	PBOA	None designated
Bermuda petrel	*Pterodroma cahow*	FE	ABOA	None designated
Fishes				
Atlantic sturgeon (multiple DPSs)	*Acipenser oxyrinchus oxyrinchus*	E/T[3]	ABOA	Proposed, but does not occur in the study area
Nassau grouper	*Epinephelus striatus*	T	ABOA	Proposed, but does not occur in the study area
Smalltooth sawfish (United States DPS)	*Pristis pectinata*	E	ABOA	Proposed, but does not occur in the study area
Giant manta ray	*Mobula birostris*	FT	ABOA, PBOA	None designated
Oceanic whitetip shark	*Carcharhinus longimanus*	FT	ABOA, PBOA	None designated
Scalloped hammerhead shark (Central and Southwest Atlantic and Eastern Pacific DPSs)	*Sphyrna lewini*	FE/FT[2]	ABOA, PBOA	None designated
Reptiles				
Green sea turtle (North Atlantic DPS)	*Chelonia mydas*	FT	ABOA	Proposed
Green sea turtle (East Pacific and Central North Pacific DPSs)	*Chelonia mydas*	FT	PBOA	Proposed, but does not occur in the study area
Hawksbill sea turtle	*Eretmochelys imbricata*	FE	ABOA, PBOA	Designated, but does not occur in the study area
Kemp's ridley sea turtle	*Lepidochelys kempii*	FE	ABOA	None designated
Leatherback sea turtle	*Dermochelys cariacea*	FE	ABOA, PBOA	Designated
Loggerhead sea turtle (Northwest Atlantic Ocean DPS)	*Caretta caretta*	FT	ABOA	Designated
Loggerhead sea turtle (North Pacific Ocean DPS)	*Caretta caretta*	FE	PBOA	None designated
Olive ridley sea turtle	*Lepidochelys olivacea*	FE/FT[4]	ABOA, PBOA	None designated

Notes: [1] Humpback whale: Central America DPS is listed as endangered; Mexico DPS is listed as threatened.
[2] Scalloped hammerhead shark: Central and Southwest Atlantic DPSs are listed as threatened; Eastern Pacific DPS is listed as endangered.
[3] Atlantic sturgeon: Carolina DPS, Chesapeake Bay DPS, New York Bight DPS and South Atlantic DPS are listed as endangered. The Gulf of Maine DPS is listed as threatened.
[4] Olive ridley sea turtles belonging to Mexico's Pacific Coast breeding populations are considered endangered by the National Marine Fisheries Service. All other populations are considered threatened.

Legend: ABOA = Atlantic Broad Ocean Area; DPS = distinct population segment; FE = federal endangered; FT = federal threatened; PBOA = Pacific Broad Ocean Area

Source: DON and U.S. Army, 2022

4.2.1.1 Marine Species

Marine Vegetation

Marine vegetation discussed in this section includes plants occurring in marine waters. Because most of the open ocean exceeds the euphotic or "sunlit" zone depth, benthic habitat for vegetation is limited primarily to coastal waters. Benthic algae would not be expected in the Atlantic and Pacific BOAs. Kelp algae are limited to areas north of the Atlantic BOA and shoreward of the Pacific BOA and therefore do not occur in the study area. However, floating algae of the genus *Sargassum* is found in the Atlantic BOA.

Marine Mammals

Jurisdiction over marine mammals is maintained by NMFS and the USFWS. NMFS maintains jurisdiction over whales, dolphins, porpoises, seals, and sea lions. The USFWS maintains jurisdiction for certain other marine mammal species, including walruses, polar bears, dugongs, sea otters, and manatees. Marine species under the purview of the USFWS are discussed in Section 5.2.

All marine mammals in the study area are protected under the MMPA. As identified in previous analysis of launch operations (DON and U.S. Army, 2022; DON, 2004) and in NMFS stock assessment reports (Caretta, et al., 2023; Hayes et al., 2023), dozens of marine mammal species occur in the Atlantic and Pacific BOAs, including whales, dolphins, and in the Pacific BOA, seals and sea lions. Depending on the species, marine mammals may occur individually, in small groups, or in groups of hundreds of animals. During recent surveys of the western Atlantic Ocean from the shore to 100 to 200 meters water depth, and in the U.S. Exclusive Economic Zone (EEZ), bottlenose dolphins, short-beaked common dolphins (*Delphinus delphis*), sperm whales (*Physeter macrocephalus*), and pilot whales (*Globicephala* spp.) were the most observed species (NMFS, 2024a). Examples of frequently observed species in the Pacific Ocean include bottlenose dolphins (*Tursiops truncatus*), spinner dolphins (*Stenella longirostris*), false killer whales (*Pseudorca crassidens*), killer whales (*Orcinus orca*), and short-finned pilot whales (*Globicephala macrorhynchus*) among others (Marine Mammal Commission, 2024). Marine mammal density in marine waters is generally low, particularly for whales (DON, 2024b, 2024c).

Nine marine mammal species in the study area are listed under the ESA (see Table 4.2-1). The Florida manatee occurs in marine and estuarine waters adjacent to CCSFS and is addressed in Section 5.2. North Atlantic right whales (*Eubalaena glacialis*) occur primarily in shallow continental shelf waters, including offshore of CCSFS, but occasionally travel to deeper offshore areas in the Atlantic BOA. Some individuals migrate seasonally between feeding areas offshore of New England and Canada as well as calving grounds in shallow coastal waters from North Carolina to Florida. Right whales occur near CCSFS from November to April. Blue whales (*Balaenoptera musculus*), fin whales (*Balaenoptera physalus*), sei whales (*Balaenoptera borealis*), and sperm whales occur throughout the Atlantic and Pacific BOAs. Humpback whales (*Megaptera novaeangliae*) are distributed globally. The West Indies distinct population segment (DPS), which is associated with the Atlantic BOA, is not listed under the ESA. However, individuals of the Central America and Mexico DPSs, which are listed under the ESA, occur in the Pacific BOA. The Main Hawaiian Islands insular false killer whale (*Pseudorca crassidens*) DPS generally occurs within about 72 kilometers (39 NM) of land around the main Hawaiian Islands (NMFS, 2025). The Guadalupe fur seal (*Arctocephalus townsendi*) and Hawaiian monk seal (*Neomonachus schauinslandi*) occur in the Pacific BOA.

NMFS designated critical habitat for certain DPSs of the humpback whale, including the Central America and Mexico DPSs, in 2021 (86 *Federal Register* 21082). In the study area, critical habitat for both DPSs extends from 50 to 3,700 meters water depth from Washington to southern California and overlaps a very small area of the northeastern portion of the Pacific BOA (Figure 4.2-1). Essential features consist of prey species (mostly small pelagic schooling fish) of sufficient quality, abundance, and accessibility. NMFS designated critical habitat for the Main Hawaiian Islands insular false killer whale DPS in 2018 (83 *Federal Register* 35062). Critical habitat occurs from the 45-meter depth contour to the 3,200-meter depth contour around the Main Hawaiian Islands from Niihau east to Hawaii (Figure 4.2-2). Critical habitat occurs near, but does not overlap, the Pacific BOA boundary. Essential features of the critical habitat consist of adequate space for movement and use within shelf and slope habitat; prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth; waters free of pollutants of a type and amount harmful to Main Hawaiian Islands insular false killer whales; and sound levels that would not significantly impair false killer whales' use or occupancy.

Sea Turtles

Of the six sea turtle species that are found in U.S. waters or that nest on U.S. beaches, all are designated as either threatened or endangered under the ESA. Sea turtles are highly migratory and utilize the waters of more than one country in their lifetimes. The USFWS and NMFS share federal jurisdiction for sea turtles with the USFWS having lead responsibility on the nesting beaches and NMFS, the marine environment.

Sea turtle species that occur in the study area are listed in Table 4.2-1. General distribution in marine and estuarine waters is summarized below, based on information in the *Marine Biological Evaluation for the Joint Flight Campaign* (U.S. Army Space and Missile Defense Command [USASMDC], DON, and U.S. Army RCCTO, 2021) and *Navy Conventional Prompt Strike Weapon System Flight Tests Biological Evaluation* (DON and USASMDC, 2024). Nesting sea turtles are discussed in Section 5.2. Sea turtle hatchlings and early juveniles are generally pelagic. Older juveniles and adults of most species primarily occur in nearshore habitats (potentially including estuarine areas), although individuals may occur in the open ocean during foraging, developmental, or reproductive migrations. Green sea turtle post-hatchlings, early juveniles, and (in the Pacific Ocean) adults occur in estuarine or shallow nearshore waters, while older juveniles are pelagic, and adults also migrate through deeper water. Hawksbill sea turtle (*Eretmochelys imbricata*) hatchlings and small juveniles inhabit oceanic waters before moving to nearshore coral reef habitats as older juveniles. Loggerhead sea turtle (*Caretta caretta*) hatchlings and early juveniles also inhabit the open ocean, often associating with *Sargassum* mats before moving to nearshore foraging habitats. Leatherback sea turtles (*Dermochelys coriacea*) occur mostly in the open ocean but are occasionally found in coastal areas. Olive ridley sea turtles (*Lepidochelys olivacea*) are mainly pelagic but may inhabit coastal areas, especially during breeding migrations. Adult Kemp's ridley sea turtles (*Lepidochelys kempii*) occur in nearshore habitats, but hatchlings and juveniles may be found offshore in association with *Sargassum* mats.

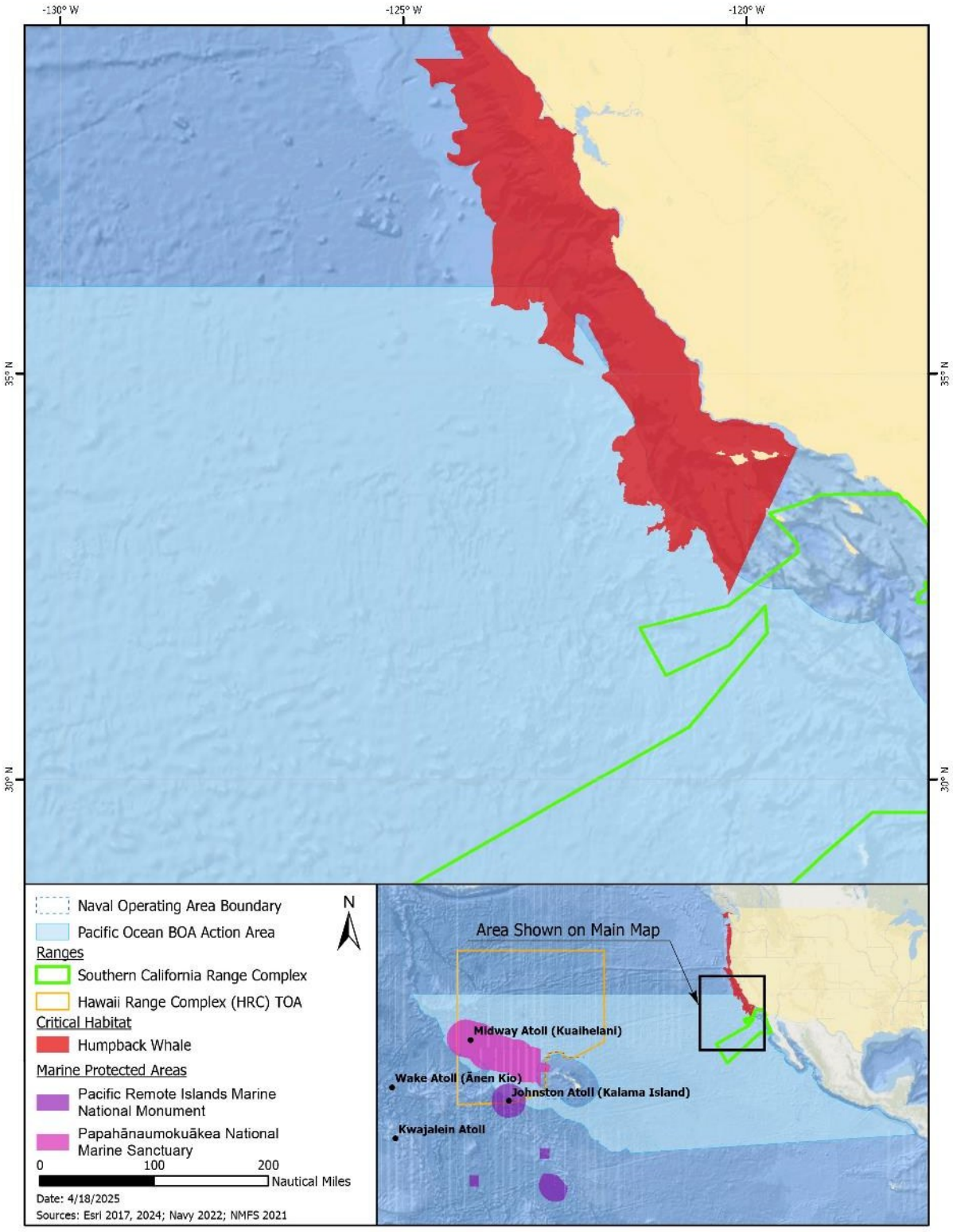

Figure 4.2-1 Humpback Whale Critical Habitat in the Study Area

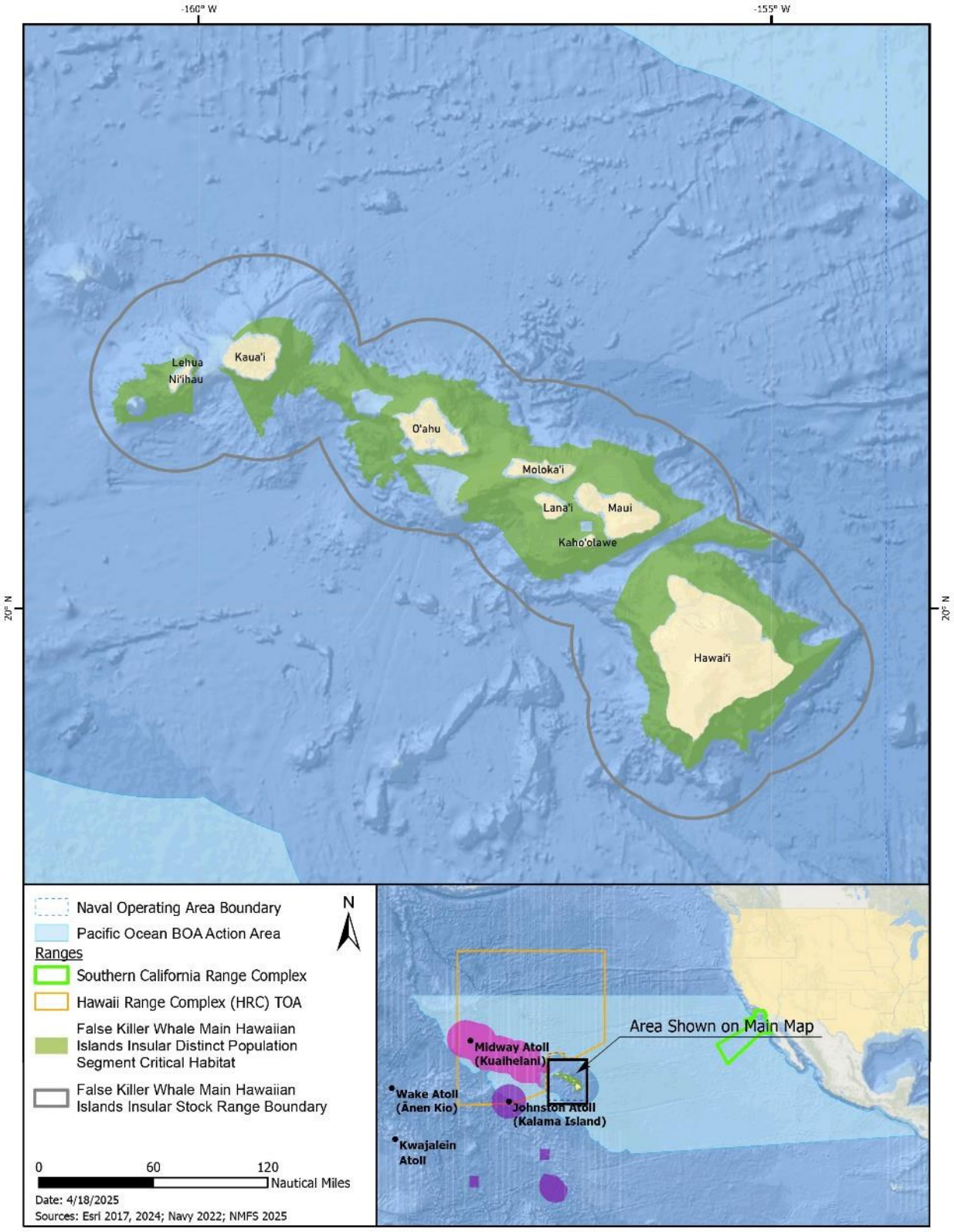

Figure 4.2-2 False Killer Whale Critical Habitat and Range Around the Main Hawaiian Islands

All of the sea turtle species listed in Table 4.2-1 occur in the Atlantic and Pacific BOAs except for the Kemp's ridley, which does not occur in the Pacific BOA. During recent surveys of the U.S. Atlantic coast from the shore to 100 to 200 meters water depth, the loggerhead turtle was the species most often observed (NMFS, 2024a). The green sea turtle is the most common species in the Pacific Ocean in the vicinity of Hawaii and along the Pacific Coast of the United States and Mexico, from Baja California to sometimes as far north as Alaska (Hawaii Division of Aquatic Resources, 2024; USFWS, 2025). Surface density of sea turtles in nearshore and offshore marine waters is low (NMFS, 2024b; DON, 2024b, 2024c).

Designated and proposed critical habitat occurs for the loggerhead and green sea turtle, respectively, in Atlantic Ocean waters offshore of CCSFS (Figure 4.2-3 and Figure 4.2-4). Designated leatherback sea turtle critical habitat occurs in the nearshore Pacific Ocean off southern California (Figure 4.2-5). In 2014, NMFS designated critical habitat for the loggerhead sea turtle Northwest Atlantic Ocean DPS (79 *Federal Register* 39856). To characterize different use patterns seasonally and geographically, NMFS identified five different habitat types: (1) nearshore reproductive habitat (portions of nearshore waters adjacent to nesting beaches used by females and hatchlings to transit to open water), (2) winter area, (3) breeding areas, (4) constricted migratory corridors (migratory corridors restricted in width), and (5) *Sargassum* habitat (juvenile loggerhead developmental habitats). Physical and biological features associated with the five habitat types generally consist of oceanic conditions that concentrate certain life stages together at different locations and in different seasons. Of these types, *Sargassum* critical habitat and a very small area of winter critical habitat occur in the Atlantic BOA.

In 2023, NMFS and USFWS proposed to designate new areas of critical habitat and modify existing areas of critical habitat for threatened and endangered DPSs of the green sea turtle (88 *Federal Register* 46572). NMFS proposed to designate marine critical habitat in nearshore waters (from the mean high-water line to 20 meters depth) off the coasts of Florida and other U.S. states and territories, including California. However, none of the proposed nearshore habitat overlaps with the study area. The proposed critical habitat also includes surface-pelagic foraging/resting critical habitat (e.g., *Sargassum* habitat) from 10 meters water depth to the outer boundary of the U.S. EEZ in the Atlantic Ocean and Gulf of America. This proposed critical habitat type, which includes concentrated components of the *Sargassum*-dominated drift community and currents that carry turtles to these communities, occurs in the Atlantic BOA.

In 2012, NMFS revised designated critical habitat for the leatherback sea turtle (77 *Federal Register* 4170). Critical habitat is designated from shore to the 3,000-meter isobath along segments of the U.S. west coast and overlaps a very small area along the northeastern edge of the Pacific BOA. Primary constituent elements consist of prey species (primarily jellyfish) of sufficient condition, distribution, diversity, abundance, and density to support individual and population growth, reproduction, and development.

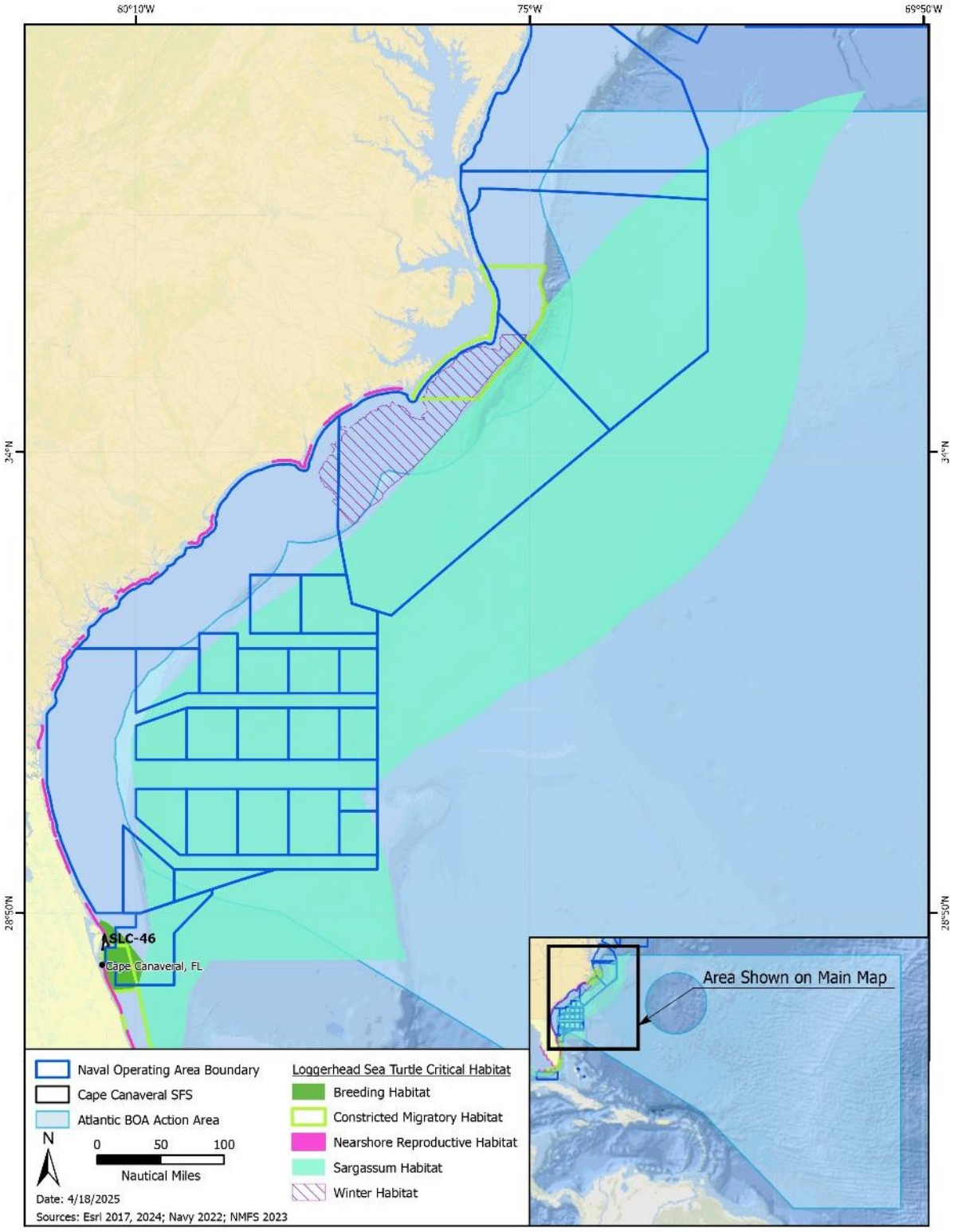

Figure 4.2-3 Loggerhead Sea Turtle Critical Habitat in the Study Area

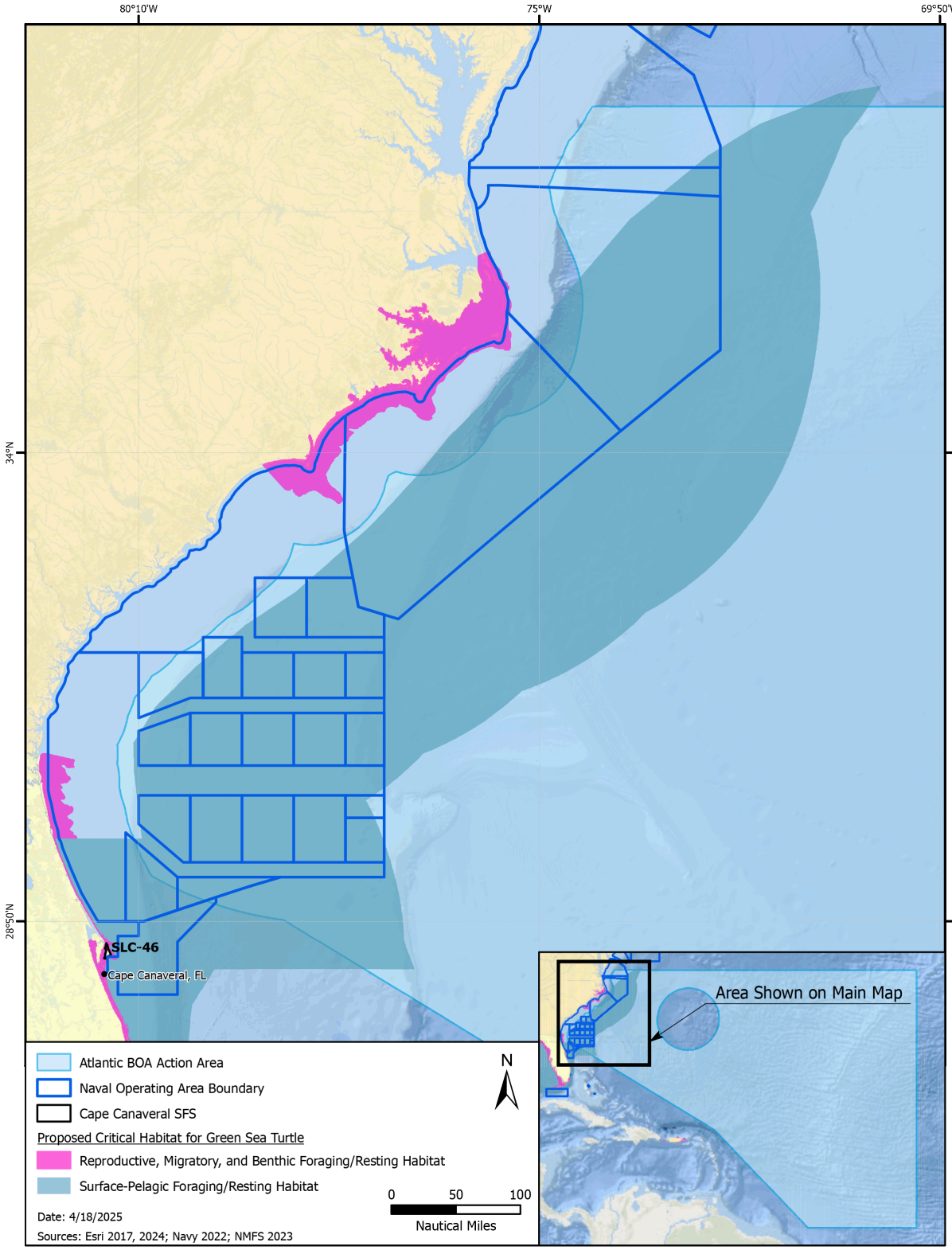

Figure 4.2-4 Proposed Green Sea Turtle Critical Habitat in the Study Area

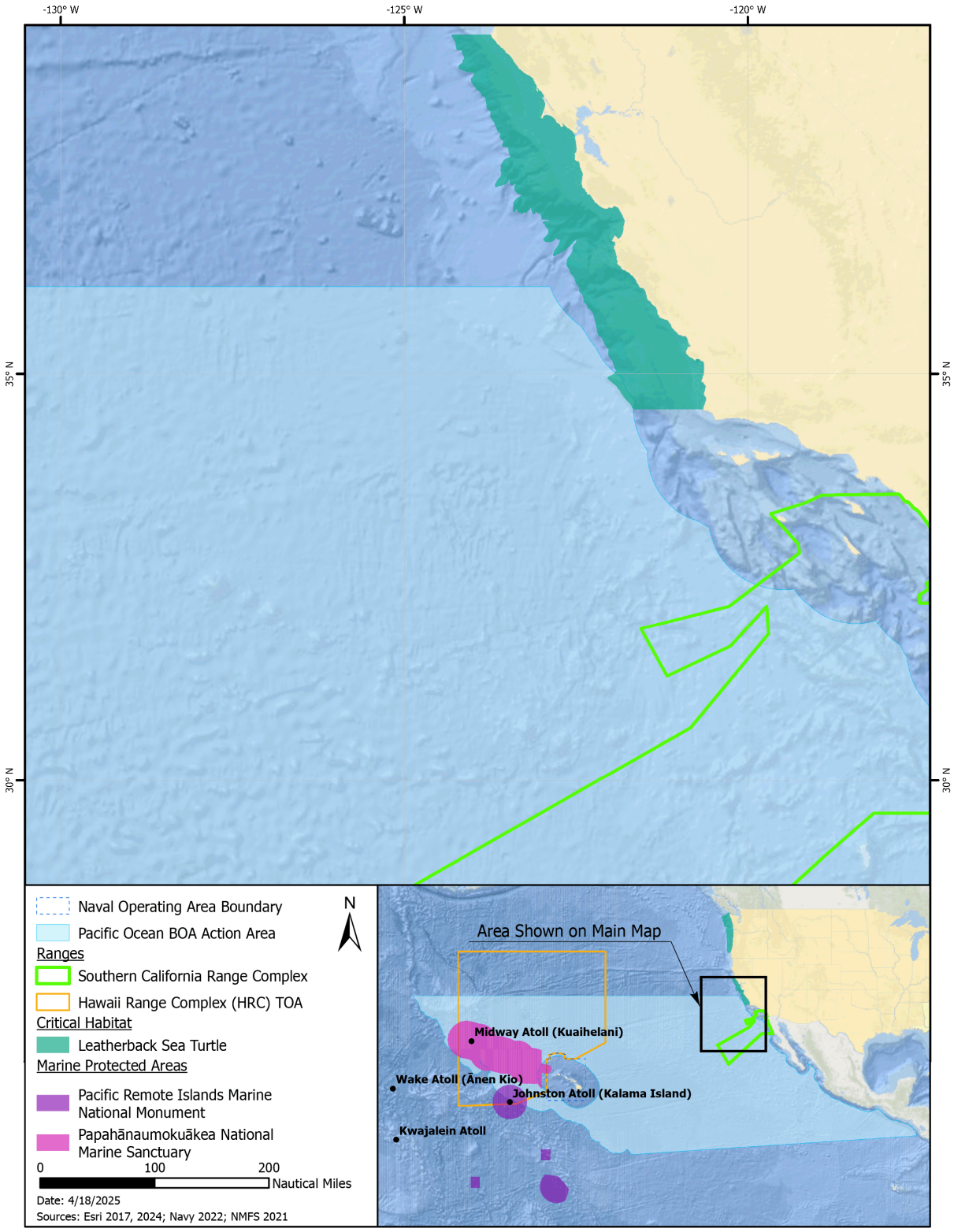

Figure 4.2-5 Leatherback Sea Turtle Critical Habitat in the Study Area

Fish

Information on fishes in the offshore Atlantic and Pacific BOAs is provided in the *Atlantic Fleet Training and Testing Final EIS/OEIS* (DON, 2018b), *Hawaii-Southern California Training and Testing EIS/OEIS* (DON, 2018a), and *Joint Flight Campaign Environmental Assessment/Overseas Environmental Assessment* (DON and U.S. Army, 2022). Thousands of marine fish species occur worldwide throughout the water column and in association with all seafloor habitats (Fricke et al., 2024). The number of species found near the surface is relatively low because of the lack of structured habitat. For example, a study of surface waters from approximately Virginia to northern Florida found the density of large fishes to be 1.7 individuals per square kilometer (Wilmott et al., 2021). The biomass of mesopelagic fish, which occur at depths of 200 to 1,000 meters, is likely much greater than in other ocean zones (Irigoien et al., 2014). Some mesopelagic species such as lanternfishes ascend to shallow water at night and return to deeper water during the day. On the seafloor, hard bottom habitats usually support higher fish densities than areas of loose sediments (Flavio et al., 2023). In addition, for species associated with the seafloor, there is a general pattern of decreasing biomass, abundance, and size with increasing depth. Highly mobile fish species such as tunas and swordfish undergo transatlantic feeding and reproductive migrations in the tropical Atlantic Ocean (southern part of the Atlantic BOA) (Nobrega et al., 2023). One study found that the number of mesopelagic fish species (e.g., lanternfish) was higher overall in tropical and equatorial Atlantic waters than in subtropical, temperate, and cold regions (Olivar et al., 2017).

Fish are vital components of the marine ecosystem. They have great ecological and economic aspects. To protect this resource, NMFS works with the regional Fishery Management Councils (FMCs) to identify the essential habitat for every life stage of each federally managed species using the best available scientific information. EFH has been described for approximately 1,000 managed species to date. EFH includes all types of aquatic habitat where fish spawn, breed, feed, or grow to maturity, including wetlands, coral reefs, seagrasses, and rivers.

EFH occurs in the Atlantic and Pacific BOAs. Regarding the Atlantic BOA, due to the large geographic area, three FMCs have jurisdiction over managed species that occur in portions of the study area: the South Atlantic FMC, Mid-Atlantic FMC, and New England FMC. In addition, EFH for highly migratory species (e.g., tunas, sharks, and billfish), which is managed by NMFS, is present. EFH in the Atlantic BOA includes the water column; coral and live/hard bottom, deep-water corals; sponges; submerged vegetation; algal communities; floating *Sargassum* mats; artificial reefs; outcroppings; and all unconsolidated sediments. Habitat areas of particular concern (HAPCs), which are subsets of EFH that provide extremely important ecological functions or that are especially vulnerable, occur in portions of the study area. HAPC in the Atlantic BOA consists of the water column and all substrates, as well as topographic features such as canyons and terraces. Extensive deep-water coral habitats that are HAPC include the Cape Lookout *Lophelia* Banks, *Oculina* Bank and Experimental Closed Area, and Stetson-Miami Terrace.

In the Pacific BOA, EFH is designated by the Pacific FMC for groundfish and highly migratory species. The Pacific Coast Groundfish Fishery Management Plan, which covers the western U.S. coast from Washington to southern California, identifies EFH for numerous sharks and skates, roundfish (e.g., cods), rockfish, and flatfish (e.g., sole and flounders) (Pacific Fishery Management Council, 2024a). Generally, EFH consists of all waters and substrate in depths less than 3,500 meters (including the upriver extent of saltwater intrusion), and seamounts in depths greater than 3,500 meters. HAPCs include estuaries, canopy kelp, seagrass, and rocky reefs. Managed Highly Migratory Species include tunas, sharks, billfish/swordfish, and dolphinfish (Pacific Fishery Management Council, 2024b). EFH for Highly

Migratory Species consists of epipelagic, neritic, oceanic, and mesopelagic waters from the coast/nearshore out to the EEZ. There are no designated HAPCs for Pacific Highly Migratory Species.

Six fish species listed under the ESA occur in the study area: the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), Nassau grouper (*Epinephelus striatus*), smalltooth sawfish (*Pristis pectinata*), giant manta ray (*Mobula birostris*), oceanic whitetip shark (*Carcharhinus longimanus*), and scalloped hammerhead shark (*Sphyrna lewini*) (see Table 4.2-1).

Atlantic sturgeons are found along the east coast of North America, from southern Canada to northern Florida. They spend most of their adult life in the ocean migrating into coastal estuaries and rivers to spawn in spring and fall. Most of their time is likely spent near the bottom. While this species is largely believed to occur close to the coast, recent acoustic monitoring research suggests that, in at least some areas, Atlantic sturgeon may occupy deeper portions of the continental shelf more often than previously thought (Hager and Mathias, 2018). Critical habitat has been designated for this species but none occurs in the study area.

Nassau grouper are found in tropical and subtropical waters in the Caribbean and western North Atlantic, including south Florida, U.S. Virgin Islands, Puerto Rico, Bermuda, the Bahamas, the Greater Antilles, the Lesser Antilles, and central America. This species inhabits high-relief coral reefs and rocky bottoms from nearshore to a depth of 100 meters and rest on or near the bottom, with juveniles inhabiting macroalgae and seagrass beds and patch reefs (Bester, 2012). There is no Nassau grouper critical habitat present in the study area.

Smalltooth sawfish occur between Florida and Cape Hatteras, North Carolina. This species inhabits shallow, coastal waters, including estuaries, bays, and river mouths in the tropical Atlantic Ocean. The mangroves serve as important nursery habitats for juveniles. As they mature, they move into deeper waters (NMFS, 2025b). There is no critical habitat within the Action Area.

Giant manta rays are found throughout the world's oceans in tropical, subtropical, and temperate waters (USSF, 2023a). They may occur in water depths from less than 10 meters to more than 1,000 meters, frequently utilizing productive areas with upwelling. The species may occur in estuarine waters near oceanic inlets. Giant manta rays are generally solitary but aggregate at cleaning sites and to feed and mate. This species is observed off Brevard County year-round.

Oceanic whitetip sharks are found worldwide in warm tropical and subtropical waters (USSF, 2023a). Individuals typically occur near the surface of the water column but may dive to at least 150 meters depth. The species generally prefers open ocean waters, with abundance decreasing near continental shelves. However, individuals are occasionally found in nearshore waters.

In 2014, NMFS issued a listing determination on six DPSs of the scalloped hammerhead shark (79 *Federal Register* 52576). NMFS listed the Central and Southwest Atlantic DPS as threatened, and the Eastern Pacific DPS as endangered. Individuals from other DPSs could potentially occur in the study area, but they are not listed under the ESA. The scalloped hammerhead shark, found in temperate to tropical waters worldwide, is a coastal pelagic species commonly found over the continental shelf and in adjacent deeper water (Florida Museum, 2024). Individuals occur from the surface to depths of at least 275 meters. These sharks generally remain close to shore during the day, occasionally entering estuarine waters, and move to deeper waters to feed at night.

Coral

Corals are invertebrates that are related to anemones, jellyfish, and hydras. They are made of invertebrate polyps and can generally be categorized as either hard or soft. Hard corals have calcium carbonate skeletons, grow in colonies, and are reef-building animals that live in symbiosis with phytoplankton called zooxanthellae. Soft corals are flexible, have calcareous particles in their body walls for structural support, can be found in both tropical and cold ocean waters, do not grow in colonies or build reefs, and do not always contain zooxanthellae.

Shallow-water corals may occur on hard substrate in the study area, but shallow-water coral reefs are not present offshore of CCSFS or in areas that would be affected in the Atlantic or Pacific BOAs. However, deep-water corals occur in the BOAs where appropriate substrate and physical conditions occur. Deep-water corals do not form reef structures, but rather form mounds called "lithoherms" over hard bottom areas (Lumsden et al., 2007). These structures often support fish and invertebrate populations. Particularly extensive zones of deep-water corals occur offshore of the southeastern United States at the Blake Plateau and *Oculina* Bank. The Blake Plateau lies seaward of the continental shelf and slope, extending from North Carolina to southern Florida in water depths of about 1,000 to 3,000 feet. Recent sonar mapping surveys at Blake Plateau identified an area of nearly continuous deep-water coral mounds approximately 300 miles long and 70 miles wide (Sowers et al., 2024), which represents the largest known mound area worldwide. The *Oculina* Bank extends for about 100 miles along the continental shelf edge off central Florida in water depths of about 230 to 350 feet (Reed, 2006; National Oceanic and Atmospheric Administration [NOAA], 2024a). This area supports diverse invertebrate and fish communities. Deep-water corals are found in areas of the Pacific BOA such as in the Pacific Remote Islands Marine National Monument (Nautilus Live, 2024; Marine Conservation Institute, 2024), as well as numerous other pinnacles, seamounts, and oceanic islands (Lumsden et al., 2007).

Seabirds

Numerous seabird species occur in the study area and are protected under the MBTA. Most seabirds nest in colonies on the ground of coastal areas or oceanic islands but are solitary outside of breeding season except for occasional feeding aggregations. Abundance is typically greater near ocean features that concentrate prey (e.g., upwelling zones). Individuals may travel long distances from land while foraging. A total of 34 seabird species were identified during recent surveys over the Atlantic EEZ (NMFS, 2024a). The most commonly observed species were herring gulls (*Larus marinus*), black-capped petrels (*Pterodroma hasitata*), and Audubon's shearwater (*Puffinus Iherminieri*). Nine major seabird groups occur over the Pacific Ocean (DON, 2018b). Fourteen species were identified in the open Pacific Ocean and near the Hawaiian Islands in the *Overseas Environmental Assessment (OEA) for TRIDENT II D-5 Pacific Missile Testing* (DON, 2004). ESA-listed seabird species in the study area include the black-capped petrel in the nearshore Atlantic Ocean and Atlantic BOA, the Bermuda petrel (*Pterodroma cahow*) in the Atlantic BOA, and the Hawaiian petrel (*Pterodroma sandwichensis*), short-tailed albatross (*Phoebastria albatrus*), band-rumped storm-petrel (*Oceanodroma castro*), and Newell's shearwater (*Puffinus newelli*) in the Pacific BOA (see Table 4.2-1).

Invertebrates

Animals that live on the sea floor are called benthos. Most of these animals lack a backbone and are called invertebrates. Typical benthic invertebrates include sea anemones, sponges, corals, sea stars, sea urchins, worms, bivalves, crabs, and many more. Invertebrates also occur throughout the water column.

Many thousands of invertebrate species occur in the Atlantic and Pacific BOAs (DON, 2018a, 2018b). The diversity and abundance of benthic arthropods (e.g., crabs, lobsters, and barnacles) and mollusks (e.g., snails, clams, and scallops) are highest on the continental shelf due to high productivity and availability of complex habitats. Organisms occurring on the seafloor in deep ocean zones are generally small and have sparse populations. The only areas of the deep ocean known to be densely populated are hydrothermal vents and cold seeps. Many pelagic invertebrates migrate to deeper waters during the day, presumably to decrease predation risk. However, some invertebrates (e.g., some jellyfish and squid species) may occur in the water column, including near the surface, at any time.

4.2.2 Environmental Consequences

This analysis focuses on terrestrial wildlife and vegetation that may potentially be affected by the Proposed Action as well as those that are protected under federal or state law or statute.

4.2.2.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to biological resources. Therefore, no significant effects to biological resources would occur with implementation of the No Action Alternative.

4.2.2.2 Potential Effects of the Proposed Action

The study area for the analysis of effects to biological resources associated with the Proposed Action Alternative sea-based testing includes the marine areas in the Atlantic and Pacific BOAs where the TRIDENT II (D5) weapon systems would be launched and components such as spent motor stages, fairings, RBs, and motor/equipment casings would be expended. The study area encompasses the zones where biological resources could be affected by noise (including sonic booms), hazardous chemicals, and direct strikes.

Marine Vegetation

Because most marine vegetation is benthic and occurs in shallower-water euphotic ones, marine vegetation would not be significantly affected by sea-based launches. Benthic algae would not be affected during launch because there is no contact with the ocean bottom. In addition, benthic algae would not be affected by landing of the spent missile components as this would likely occur in the deeper portions of the BOAs, where benthic algae are not present. As discussed in the *Overseas Environmental Assessment (OEA) for TRIDENT II D-5 Pacific Missile Testing* (DON, 2004), propellant and combustion byproducts from at-sea launches would be extremely localized and would be quickly diluted to non-detectable levels. These constituents would therefore not affect floating *Sargassum* algae in the Atlantic BOA. Heat from engine ignition could damage floating *Sargassum* algae in a small area (radius of tens of feet), but effects would be negligible in the context of the enormous quantities that occur in the Atlantic BOA.

Marine Wildlife

Potential effects of the Proposed Action on marine wildlife are discussed below. Potential effects on threatened and endangered species and critical habitats are discussed, specifically in the following subsection. In general, marine wildlife may be affected by emissions and heat from rocket launches, noise, direct strikes, and expended items.

Launch Emissions and Heat

Emissions over the BOAs would be dispersed in the atmosphere and any substances that entered the marine environment would be diluted by ocean water. Solid fuel propellant would be consumed before the spent motor casings impact the ocean surface. Due to the massive volume of water in the oceans and dilution, hazardous substances would not be present in concentrations that would harm marine wildlife or affect water column or seafloor habitats. Refer to Section 4.3.2.2 for additional information regarding hazardous substances.

During launches from submarines in the BOAs, ignition of the first-stage rocket motor after launch would produce heat that is intense enough to flash-boil the ocean surface in a radius of tens of feet (DON, 2004). Any marine wildlife occurring at or very near the surface within the heat plume, including mammals, fish, seabirds, and invertebrates, would likely be injured or killed. The number of animals potentially affected would be low because of the dispersed distribution and low density of animals at the surface in offshore waters, and the limited time over which effects could occur. Intense heat would persist for only a few seconds because the weapon system would rapidly rise away from the launch point and water temperatures would quickly return to normal due to mixing with surrounding ocean waters. Some animals in the near vicinity might be startled by the missile's movement through the water column and swim away before ignition. Given the relatively low number of launches (approximately seven launches annually, split between the Atlantic and Pacific BOAs), small area affected per launch, and low surface density of wildlife in the BOAs, launch heat would affect a small number of animals, would not result in lasting effects on behavior, and would not affect populations of any species. Therefore, effects would be less than significant.

Noise

Test launches in the BOAs would produce impulsive noise (underwater missile expulsion, sonic booms, and fallen components striking the water surface) and non-impulsive noise (in-air engine ignition). Potential noise effects on wildlife include stress, startle response, behavioral changes (e.g., disruption of activities such as feeding), and, in cases of high noise intensity, temporary or permanent hearing damage. Noise produced in the air generally has a limited effect on submerged animals. In-air sound is transmitted into water mostly within a narrow cone below the source (DON, 2018a). At greater angles, most sound reflects off the water surface. At low altitudes, sound levels reaching the water surface are relatively high, but the transmission area is small. Conversely, as the sound source gains altitude, the transmission area increases but sound levels diminish. Once sound enters the water, it propagates through the water column and loses intensity with distance from the source (Erbe et al., 2022).

Various types of marine wildlife have best hearing sensitivity in particular frequency ranges. As a group, marine mammals are sensitive to a wide range of frequencies, with best hearing in different species ranging from very low frequency (e.g., some baleen whales) to very high frequency (e.g., pygmy sperm whale [Kogia breviceps]). Sea turtle hearing is most sensitive at low frequencies (below 400 Hertz [Hz] in water). Most fish, which can detect particle motion and sound pressure through the lateral line, inner ear, and swim bladder, are hearing generalists and primarily detect particle motion at relatively low frequencies between 50 Hz and 2 kilohertz (kHz). Some species possess anatomical specializations that allow hearing at frequencies up to 10 kHz, and over 100 kHz in a few species. Most marine invertebrates do not sense sound pressure, but some species are sensitive to nearby low-frequency particle motion. A summary of species functional hearing sensitivity, auditory effects thresholds, and area affected by underwater missile expulsion and in-air engine ignition, as well as splashdown of the three missile

stages, equipment section, and RBs, is provided in Table 4.2-2 for marine mammals, sea turtles, and fish. Note that expulsion, which is an in-water noise source, affects a larger area than rocket propulsion noise and therefore sets the radial distance to threshold for the combined expulsion/propulsion event. Regarding component splashdown, RBs would produce the highest noise levels and are the focus of subsequent evaluation. The information in the table incorporates the latest DON and NMFS criteria and thresholds for impulsive noise and sound levels modeled for TRIDENT II (D5) weapon systems launch and component splashdown (DON, 2004, 2024d; NMFS, 2024).

Impulsive noise would be produced by the gas-driven expulsion of missiles from the submarine launch tube (DON, 2004). Marine wildlife that detect the noise could exhibit startle and behavioral reactions, but the effects would generally be short term, and the number of animals affected would be low relative to population numbers. As shown in Table 4.2-2, the range to auditory effects (permanent threshold shift [PTS] and temporary threshold shift [TTS]) would be less than 57 meters for marine mammals and sea turtles, and the range to physical injury to fish would be about 18 meters. Few animals would be expected at these distances from a submarine, and injury and auditory effects to marine species would therefore be very unlikely. In addition, personnel would conduct pre-launch surveys for protected marine mammal and sea turtle species, and launches would not occur if such species were present in the survey area.

Noise would be produced in the air during stage 1 engine ignition, which would occur approximately 50 feet above the water surface (DON, 2004). The noise would enter the water column in a small area under the missile for a short time (seconds) after ignition. Engine noise reaching the water surface would quickly diminish as the missile gained altitude. Individuals of marine wildlife species (e.g., marine mammals, sea turtles, fish, birds, and invertebrates) occurring near the surface at the launch point would likely exhibit temporary startle and behavioral reactions, with effects diminishing with distance from the launch. Marine wildlife close to the launch point at ignition could suffer temporary or permanent hearing damage, but the potential would be very low. This conclusion is supported by the very small areas currently estimated for ignition noise levels associated with injury (fish) and PTS/TTS (mammals and turtles) (see Table 4.2-2). Table 4.2-3 shows the highest marine mammal and sea turtle densities in the Atlantic and Pacific BOAs, along with the area of acoustic effects caused by the loudest Trident II (D5) source (RB splashdown) along with an estimate of affected individuals. The resulting estimated number of animals potentially experiencing TTS per launch would essentially be zero. In addition, personnel would conduct pre-launch surveys for protected marine mammal and sea turtle species, and launches would not occur if such species were present in the survey area.

Table 4.2-2 Hearing Information and Area Affected by Weapon System Launches in the Broad Ocean Areas

Functional Hearing Group	*Effect Category*	*Effect Threshold (re 1µPa)*	*Distance to Threshold (meters)*							*Affected Area (square kilometers)*		
			Missile Expulsion/Engine Ignition	*Engine Ignition*	*Stage 1 Splashdown*	*Stage 2 Splashdown*	*Stage 3 Splashdown*	*Equipment Section Splashdown*	*RB Splashdown*	*Missile Expulsion*	*Engine Ignition*	*RB Splashdown*[1]
Very low frequency cetaceans	PTS	222 dB (peak)	2.8	2.8	NA	NA	NA	NA	2.5	0.000025	0.000025	0.00013
	TTS	216 dB (peak)	5.7	5.7	NA	NA	NA	NA	4.9	0.0001	0.0001	0.00053
Low-frequency cetaceans	PTS	222 dB (peak)	2.8	2.8	NA	NA	NA	NA	2.5	0.000025	0.000025	0.00013
	TTS	216 dB (peak)	5.7	5.7	NA	NA	NA	NA	4.9	0.0001	0.0001	0.00053
High-frequency cetaceans	PTS	230 dB (peak)	1.1	1.1	NA	NA	NA	NA	0.0	0.000004	0.000004	0.0
	TTS	224 dB (peak)	2.3	2.3	NA	NA	NA	NA	2.0	0.000016	0.000016	0.000084
Very high frequency cetaceans	PTS	202 dB (peak)	28.3	28.3	3.1	2.0	0.0	1.6	24.6	0.0025	0.0025	0.013
	TTS	196 dB (peak)	56.6	56.6	6.2	4.0	1.9	3.2	49.2	0.010	0.010	0.053
Otariid pinniped	PTS	230 dB (peak)	1.1	1.1	NA	NA	NA	NA	0.0	0.000004	0.000004	0.0
	TTS	224 dB (peak)	2.3	2.3	NA	NA	NA	NA	2.0	0.000016	0.000016	0.000084
Phocid pinniped	PTS	223 dB (peak)	2.5	2.5	NA	NA	NA	NA	4.4	0.00002	0.00002	0.00011
	TTS	217 dB (peak)	5.0	5.0	NA	NA	NA	NA	2.2	0.00008	0.00008	0.00042

Functional Hearing Group	Effect Category	Effect Threshold (re 1µPa)	Distance to Threshold (meters)							Affected Area (square kilometers)		
			Missile Expulsion/Engine Ignition	Engine Ignition	Stage 1 Splashdown	Stage 2 Splashdown	Stage 3 Splashdown	Equipment Section Splashdown	RB Splashdown	Missile Expulsion	Engine Ignition	RB Splashdown[1]
Sea turtles	PTS	230 dB (peak)	1.1	0.0	NA	NA	NA	NA	0.0	0.0	0.0	0.0
	TTS	224 dB (peak)	2.3	2.3	NA	NA	NA	NA	2.0	0.000016	0.000016	0.000084
Fish	Physical injury	206 dB (peak)	17.9	17.9	NA	NA	NA	NA	15.6	0.001	0.001	0.0053
	Behavioral	186 dB (SEL cumulative)	160.0	160	1.9	1.3	0.0	1.0	10.7	0.08	0.08	0.0025
Mysticetes	Behavioral	185 dB (peak)	201	201	22.0	14.3	6.8	11.3	175	0.13	0.13	0.67
Odontocetes	Behavioral	168 dB (peak)	1,421	1,421	155.6	101.2	48.2	79.7	1,235	6.3	6.3	34
Sensitive species (beaked whales)	Behavioral	133 dB (peak)	79,883	79,883	8,751	5,692	2,710	4,479	69,464	20,000	20,000	110,000
Pinnipeds	Behavioral	156 dB (peak)	5,655	5,655	619.5	403.0	191.8	317.1	4,918	100	100	530

Note: [1] Assumes the maximum possible number of 7 re-entry bodies are used.

Legend: dB = decibel; NA = not applicable, peak sound level below applicable threshold; PTS = permanent threshold shift; RB = re-entry body; re 1µPA = referenced to 1 micropascal; SPL = sound pressure level; TTS = temporary threshold shift

Table 4.2-3 Re-entry Body Splashdown Effects Based on Maximum Species Densities

Species		*Maximum Estimated Density (animals/square kilometer)*[1]	*Affected Area for TTS (square kilometers)*	*Number of Animals Affected per missile Test (TTS)*[2]
Atlantic Broad Ocean Area				
Marine mammals by hearing group	VLF (Fin whale [*Balaenoptera physalus*])	0.0015	0.00053	0.0000008
	LF (Minke whale [*Balaenoptera acutorostrata*])	0.002	0.00053	0.0000011
	HF (Spinner dolphin [*Stenella longirostris*])	0.17	0.000084	0.0000143
	VHF (Harbor porpoise [*Phocoena phocoena*])	0.045	0.053	0.0023850
Sea turtle	Loggerhead turtle (*Caretta caretta*)	0.22	0.000084	0.0000185
Pacific Broad Ocean Area				
Marine mammals by hearing group	VLF (Blue whale [*Balaenoptera musculus*])	.004022	0.00053	0.0000021
	LF (Minke whale [*Balaenoptera acutorostrata*])	.000916	0.00053	0.0000005
	HF (Short-beaked common dolphin [*Delphinus delphis*])	1.735002	0.000084	0.0001457
	VHF (Dall's porpoise [*Phocoenoides dalli*])	0.031385	0.053	0.0016634
Sea turtle	Loggerhead turtle (*Caretta caretta*)	0.24	0.000084	0.0000202

Notes: [1] Maximum densities are sourced from (DON, 2024b, 2024c). Densities reflect the greatest value from areas within these reports that are within the Proposed Action BOAs. Density data is not available for the entire Proposed Action BOAs. However, because species maximum densities occur nearer the coasts rather than far out to sea, use of these densities results in a very conservative estimate of effects.

[2] Assumes seven re-entry body splashdowns per missile.

Legend: BOA = broad ocean area; HF = high frequency; LF = low frequency; TTS = temporary threshold shift; VHF = very high frequency; VLF = very low frequency

Sonic booms may be produced by RBs during final approach to the impact area. Sonic booms produced by missiles would occur at high altitude and would not likely affect marine wildlife. Sonic booms produced by RBs would not be expected to affect submerged animals. RBs would descend at a steep angle, resulting in most of the acoustic energy projecting nearly horizontally and reflecting off the water surface. In addition, there is limited transfer of acoustic energy from air into the water column (Erbe et al., 2022). Research results published by the Department of the Air Force indicate that the sonic boom

harassment risk for submerged marine mammals and sea turtles is associated with an overpressure level substantially greater than levels that would be produced during the proposed activities (U.S. Air Force Research Laboratory, 2000). Evaluation of sonic booms for previous weapon system (missile) flight tests provided estimates of maximum sound levels at the ocean surface of 135 dB referenced to a pressure of 1 micropascal (vehicle) and 175 dB referenced to a pressure of 1 micropascal (payload near impact) (USASMDC, DON, and U.S. Army RCCTO, 2021). These levels are well below the TTS, PTS, and injury thresholds for marine mammals, sea turtles, and fish (see Table 4.2-2). Sound levels at the surface would be above the behavioral threshold for some species groups but would attenuate when crossing the water interface and with propagation through the water column. Maximum levels would be very brief (milliseconds) and would affect a small area. Temporary behavioral effects would generally be associated with seabirds and other wildlife present at or very near the surface at the time of a sonic boom arrival. The probability of a marine mammal, sea turtle, or fish occurring in the affected area near the surface at the same time a sonic boom arrived would be low.

Splashdown of Trident II (D5) fallen vehicle components (missile stages, equipment casings, and RBs) would produce underwater noise levels above the threshold of temporary hearing effects in marine mammals, sea turtles, and fish. Noise analyses indicate that these sound levels would extend for only a short distance, ranging from 2 to 49 meters from the source (note PTS would only apply to high-frequency cetaceans and is modeled at 3.1 meters). Table 4.2-3 shows representative marine mammal and sea turtle species that have the highest densities in the Atlantic and Pacific BOAs, along with the area of acoustic effects caused by RB splashdown. The resulting estimated number of animals potentially experiencing TTS per splashdown would essentially be zero. Effects to species with lower densities would be correspondingly less. Splashdown of other components would affect smaller areas and result in lower affected animal estimates. Effects would likely be limited to short-term behavioral responses. Other types of wildlife (e.g., fish and invertebrates) present near component splashdown areas in the BOAs would experience similar effects, including temporary startle and behavioral reactions. However, the number of animals affected would be low relative to population numbers because of the low species densities in the BOAs (e.g., marine wildlife is not likely to be present at the splashdown areas) and small number of tests.

Overall, the potential for marine wildlife to experience injury or hearing effects due to noise associated with missile tests would be very low. The most likely effect would be startle and behavioral reactions. These responses would generally be of short duration, with no long-term effects on populations expected. Therefore, the effects of noise on marine wildlife would be less than significant.

Direct Strike

Seabirds in the BOAs could be struck by missiles during launch and flight as well as by falling items, including RBs, missile stages, and casings. However, the potential would be very low due to the dispersed and transient distribution of seabirds, large air volume above the BOAs relative to the items, and low number of tests and associated expended items. Other types of marine wildlife, including mammals, sea turtles, fish, and invertebrates, could be struck by these items when they are launched through or impact the water. The potential for strikes would be similarly low because of the low density of wildlife at the surface in the open ocean (refer to maximum densities found in Table 4.2-3) and the low number of expended items relative to the large BOA surface area. The potential for direct strikes as items sink through the water column would also be low. Mobile animals could potentially detect and avoid approaching items. Less mobile animals such as some pelagic invertebrates would generally be displaced rather than struck due to water flow around the moving objects. Items that settle to the

seafloor could injure, kill, or displace marine species (e.g., fish and invertebrates), particularly sessile species or species with limited mobility. Support vessel strikes on marine wildlife would be unlikely due to the relatively low number of vessel operations and low surface density of wildlife. Mobile species could potentially detect and avoid approaching vessels, although strike potential is greater for large, slower-moving species such as whale sharks (Rhincodon typus). Vessel hulls have a hydrodynamic shape, and pelagic marine invertebrates would therefore generally be disturbed, rather than struck, as the water flows around a vessel. Some invertebrates near the surface could be impacted by propeller-generated turbulence. Overall, for marine wildlife species, a small number of individuals relative to population sizes would be affected by direct strike and the effects would be less than significant.

Expended Items

Expended items (e.g., boosters, casings, and RBs) that settle on the seafloor would affect benthic habitats used by wildlife such as some fish and invertebrate species. Expended items may break up on contact with the ocean surface, but it is not anticipated that the pieces would be of a size or appearance that marine wildlife would potentially ingest. It is also not expected that the expended items would meaningfully contribute to microplastic pollution of the oceans because of the vast ocean water volume and the relatively few proposed launches. Most expended items would settle on unconsolidated substrates such as sand and mud, which characterize much of the BOAs. Depending on water currents and item size, deposited items could remain exposed on the seafloor or they or could become covered with sediments. Exposed items would represent a short- to long-term change from soft to hard benthic habitat type, but the affected area would be negligible relative to the size of the study area. Some items could settle onto and damage sensitive habitats such as hard bottom or deep-water corals. The probability of striking these habitats is generally low because, overall, they are rare in the study area compared to soft substrate. Deep-water corals are sensitive to damage because of their slow growth rate and long recovery time. The potential for effects on deep-water corals and hard bottom habitats would be less than significant due the low number of items that would be expended, and the dispersed locations of expended items (i.e., not all items would be expended in areas with sensitive habitats).

Biological Resources Environmental Consequences Summaries (Non-threatened and Endangered Species)

In summary, launch emissions and heat, noise (including sonic boom overpressure), direct strikes, and expended items would affect a low number of marine animals relative to population sizes, and effects on marine habitats would be minor. Effects associated with the Proposed Action would not be significant.

Migratory Bird Treaty Act Determination

The Navy has determined that the sea-based Proposed Action Alternative would not result in a significant adverse effect on a population of a migratory bird species. If, over the course of training and testing activities, the Navy determines that a population of migratory birds would be significantly impacted, the Navy would be required to confer and cooperate with the USFWS to develop and implement appropriate conservation measures to minimize or mitigate such significant adverse effects. Based on the analysis contained in this section, the Navy's proposed military readiness activities would not adversely impact any population of migratory bird species. This conclusion is supported by mitigation measures that limit potential effects, precision targeting, and locations where military readiness activities would occur.

Marine Mammal Protection Act Determination

There would be no harassment of marine mammals per the MMPA as amended by the National Defense Authorization Act of Fiscal Year 2004 (PL 108-136). The Proposed Action is a military readiness activity. The Proposed Action does not have the significant potential to injure a marine mammal or marine mammal stock in the wild or disturb a marine mammal or marine mammal stock to the point where behavioral patterns are abandoned or significantly altered. The chances of any marine mammal being harassed by elevated sound levels, direct contact (test components), hazardous materials, or vessel strike are extremely low. No animals are expected to be harassed from direct contact or from exposure to hazardous materials. If any effects of proposed flight test noise on marine mammals were realized, they would be expected to be limited to short-duration startle responses with no lasting effects.

Essential Fish Habitat Determination

Based on the above analysis of sea-based testing under the Proposed Action Alternative, launch heat plumes and emissions would not adversely affect EFH or HAPC in the study area. Expended items would not adversely affect soft substrate EFH or HAPC in the Atlantic or Pacific BOAs. Expended items may damage hard bottom and deep-water corals because of the potential for items to settle on these habitats. However, the potential for effects would be less than significant due to the limited distribution of these habitats in the overall Atlantic and Pacific BOAs and the relatively low number and dispersed location of expended items.

Threatened and Endangered Species

Threatened and endangered species likely to occur within the study area of the Proposed Action are listed in Table 4.2-1. Potential effects on these species and associated critical habitats are discussed below.

Marine Mammals

As shown in Table 4.2-1, eight ESA-listed marine mammal species under NMFS jurisdiction occur in the Atlantic BOA and/or Pacific BOA. Potential effects on these species resulting from the Proposed Action would be similar to those described for marine wildlife above.

Because of the low potential for ESA-listed marine mammals to be present in the launch area (due to low species densities in the BOAs), implementation of BMPs that would preclude launch if these species were observed in the area (refer to the *Best Management Practices* subsection below or in Section 2.5), and the rapid acceleration of missiles to high altitude, engine emissions from at-sea test launches would not affect ESA-listed marine mammals. Sonic booms and noise from launches and component splashdowns could startle marine mammals. Those at or near the surface would be the most affected. Effects may include behavioral reactions such as diving or swimming away from the area. The reactions would likely be minor and short term, and within the range of typical behaviors. ESA-listed marine mammals would not likely be exposed to noise levels associated with auditory damage (refer to the *Noise* subsection above). Injury or mortality due to launch heat plumes and strikes by missiles, RBs, and other components would be very unlikely due to the BMPs, the low density of ESA-listed marine mammals in the open ocean, limited amount of time spent at and near the surface, and low number of items that would be expended annually relative to the size of the BOA surface area. Marine mammals would not be expected to ingest expended materials, as most materials bear no resemblance to their natural prey and the expended materials would likely be too large to ingest incidentally.

The potential for support vessels to strike marine mammals would be very low due to low species surface density, low number of vessel operations, and protective measures. The Proposed Action would not meaningfully increase total vessel traffic in the Atlantic or Pacific BOAs. Personnel would use the DON's Protective Measures Assessment Protocol to identify applicable environmental mitigation requirements that minimize potential impacts to protected marine species. While some vessels may temporarily travel at speeds up to 40 knots, vessels would mostly operate at speeds ranging from stationary (holding position) to 15 knots, further reducing the probability of a strike. Navy personnel on support vessels would monitor for the presence of protected marine species in designated target areas for each test event. As described in the *Best Management Practices* subsection below (and in Section 2.5), personnel would adhere to distance and vessel speed requirements if marine mammals were observed.

Designated critical habitat for the Mexico and Central America humpback whale DPSs occurs offshore of southern California in a small portion of the Pacific BOA. Test launches from submarines and splashdown of various components (e.g., motor casings) could affect small schooling fish that are humpback whale prey by direct strike and disturbance. However, given the large population numbers of such fishes, the low likelihood of a large school being present at the time and place of a launch, and the relatively low number of tests, effects on prey species populations would not be detectable. In addition, component splashdown close enough to shore to coincide with humpback whale critical habitat would be highly unlikely. Hazardous substances and vessel traffic would not affect prey. There would be no effect on humpback whale critical habitat. Designated critical habitat for the Main Hawaiian Islands insular false killer whale DPS would not be directly affected by the Proposed Action. Noise produced by splashdown of fallen components outside the critical habitat boundary would not be of sufficient intensity or duration to impair false killer whales' use or occupancy of the habitat. Strikes by support vessels within critical habitat would be very unlikely because of the low species surface density, low number of vessel operations, and required protective measures. The DON has determined that the Proposed Action would have no effect on designated critical habitat for the Main Hawaiian Islands insular DPS of false killer whales.

Pursuant to the ESA, the DON has concluded that the Proposed Action may affect, but is not likely to adversely affect, the ESA-listed North Atlantic right whale, blue whale, fin whale, humpback whale (Mexico and Central America DPSs), sei whale, false killer whale (Main Hawaiian Islands insular DPS), sperm whale, Guadalupe fur seal, and Hawaiian monk seal. The DON has also concluded that the Proposed Action would not affect designated critical habitat for the humpback whale and false killer whale (Main Hawaiian Islands insular DPS). The DON is consulting with NMFS as required by section 7(a)(2) of the ESA.

Sea Turtles

As shown in Table 4.2-1, six sea turtle species occur in the overall study area. Nesting adult sea turtles and hatchlings on the beach are under USFWS jurisdiction and are discussed in Section 5.2. Potential effects of the Proposed Action on sea turtles occurring in the BOAs would be similar to those described for general wildlife above.

Emissions from test launches in the BOAs would not affect ESA-listed sea turtles. Sonic booms and noise from at-sea launches and component splashdowns in the BOAs could startle sea turtles, particularly those at or near the surface, causing behavioral reactions. The reactions would likely be minor and short term, and within the range of typical behaviors. Exposure to noise levels associated with auditory

damage would not be expected (refer to the *Noise* subsection above). Injury or mortality due to launch heat plumes and strikes of fallen items would be very unlikely due to the low density of sea turtles in the open ocean, limited amount of time spent at and near the surface, and low number of items that would be expended annually relative to the size of the BOAs. As described for marine mammals, the potential for support vessels to strike sea turtles would be very low due to low species surface density, low number of vessel operations, and protective measures (refer to the *Best Management Practices* subsection below).

Expended booster components and other items such as casings and RBs could fall onto and damage *Sargassum* mats in the Atlantic BOA, which is designated and proposed critical habitat for loggerhead and green sea turtles, respectively. Due to the dispersed and transitory distribution of *Sargassum* habitat and the relatively low number and small size of expended items, substantial effects would not occur due to fallen components. Heat from engine ignition could damage floating *Sargassum* algae in a small area (radius of tens of feet) in the Atlantic BOA, but effects would be negligible in the context of the enormous quantity of this habitat type available. Support vessels would generally displace floating *Sargassum* algae rather than damaged it due to the hydrodynamic hull shape. Propellant and combustion byproducts from at-sea launches would be extremely localized and would be quickly diluted to non-detectable levels. These constituents would therefore not affect floating *Sargassum* algae in the Atlantic BOA. It is highly unlikely that missile launches or component splashdown would occur in the very small area of loggerhead turtle winter habitat that overlaps the Atlantic BOA, which is located about 50 NM off the coast of North Carolina. The DON's Protective Measures Assessment Protocol would identify this area of critical habitat prior to launch and the location of launch and splashdowns would be adjusted to avoid effects to this critical habitat.

Designated critical habitat for the leatherback sea turtle occurs offshore of southern California in a small portion of the Pacific BOA. Test launches from submarines and splashdown of various components could kill or injure leatherback turtle prey items including jellyfish. However, given the large population numbers of prey species and the relatively low number of tests, effects on populations would not be detectable. Hazardous substances and vessel strikes would not affect prey abundance. In addition, it is highly unlikely that launches or splashdown would occur near the California coast, and these activities would therefore not affect prey populations.

Pursuant to the ESA, the DON has concluded that the Proposed Action may affect, but is not likely to adversely affect, the ESA-listed green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle, and olive ridley sea turtle. The DON has concluded that the Proposed Action may affect, but is not likely to adversely affect, designated critical habitat for the loggerhead sea turtle (Northwest Atlantic Ocean DPS) and proposed critical habitat for the green sea turtle (North Atlantic DPS) in the Atlantic BOA. The DON has concluded that the Proposed Action would have no effect on designated critical habitat for the leatherback sea turtle in the Pacific BOA. The DON is consulting with NMFS as required by section 7(a)(2) of the ESA.

Fishes

As shown in Table 4.2-1, three fish species under NMFS jurisdiction with the potential to be affected by the Proposed Action occur in the Atlantic and/or Pacific BOAs. Potential effects on these species would be similar to those described for general wildlife above.

Emissions from test launches in the BOAs would not affect ESA-listed fishes. Sonic booms and noise from launches and component splashdowns could startle ESA-listed fish occurring very near the surface,

causing behavioral reactions. The reactions would likely be minor and short term, and within the range of typical behaviors. Injury or mortality due to launch heat plumes and strikes of fallen items or vessels would be very unlikely due to the low density of ESA-listed fishes in the BOAs, limited occurrence near the surface, low number of items that would be expended annually relative to the size of the BOA surface area, and low number of vessel operations.

Pursuant to the ESA, the DON has concluded that the Proposed Action may affect, but is not likely to adversely affect, the ESA-listed Atlantic sturgeon, Nassau grouper, smalltooth sawfish, giant manta ray, oceanic whitetip shark, and scalloped hammerhead shark. The DON is consulting with NMFS as required by section 7(a)(2) of the ESA.

Birds

As shown in Table 4.2-1, six seabird species may occur in the Atlantic and/or Pacific BOAs. Potential effects on these species resulting from the Proposed Action would be similar to those described for general wildlife above.

Sonic booms and noise from launches and component splashdowns in the BOAs could startle seabirds, and injury or mortality due to launch heat plumes and strikes from falling items would be possible. However, these effects would be very unlikely due to the low density and uneven distribution of seabirds, large area of the BOAs in which seabirds would be distributed, low number of annual tests, and relatively low number of items that would be expended.

Pursuant to the ESA, the DON has concluded that the Proposed Action may affect, but is not likely to adversely affect, the ESA-listed black-capped petrel, Hawaiian petrel, short-tailed albatross, band-rumped storm-petrel, Newell's shearwater, and Bermuda petrel.

Best Management Practices

The DON would implement the following BMPs to proactively reduce the potential effects of the proposed activities on biological resources associated with sea-based testing of the D5LE and D5LE2 weapon systems:

- Prior to launches in the Atlantic and Pacific BOAs, ship personnel would monitor the launch area for ESA-listed and MMPA-protected species. Launches would not occur if these species were observed in the launch area.
- During transit in the Atlantic and Pacific BOAs, ship personnel would monitor for marine mammals and sea turtles to avoid potential vessel strikes. Vessel operators would maneuver and adjust speed to maintain a 460-meter (500-yard) mitigation zone around whales and a 180-meter (200-yard) zone around other marine mammals (except bow-riding dolphins), and within the vicinity of sea turtles, when possible.
- Any observations of stranded, injured, or dead ESA-listed species would be immediately reported to NMFS.

4.3 Hazardous Materials and Waste Management

4.3.1 Affected Environment

The DON has implemented a strict Hazardous Material Control and Management Program and a Hazardous Waste Minimization Program for all activities. These programs are governed DON-wide by applicable Office of the Chief of Naval Operations (OPNAV) instructions and at the installation by specific

instructions issued by Base Commanders. The DON continuously monitors its operations to find ways to minimize the use of hazardous materials and to reduce the generation of hazardous wastes. The ROI for hazardous materials and waste is within the Atlantic and Pacific BOAs (see Figures 2.4-1 and 2.4-2).

The affected environment in the ROI includes the broad open ocean and seafloor. Generally, the affected environment would be within deep ocean waters. There are a variety of underwater topographic features within the Atlantic and Pacific Oceans, thus general descriptions about the hazardous materials and waste affected environment are included in this discussion. Generally, waters in both BOAs are deep with the average depth of the Atlantic Ocean measuring 11,962 feet (maximum depth 27,493 feet) (Britannica, 2021). The Pacific Ocean is the largest and deepest ocean measuring an average depth of 13,000 feet (NOAA, 2024b).

Substances and materials introduced into the BOAs may be transported and influenced by ocean currents, salinity, temperature, pH ocean floor substrate, biological processes, and ocean stratification and mixing (DON, 2018b). Ocean currents, tides, and storms in the BOAs mix and redistribute seawater and consequently redistribute and dilute substances that are dissolved and suspended in ocean waters (DON, 2018a). Temperature and pH can influence the solubility of trace metals in seawater and the concentration of metals varies with the type of metal and the position in the water column (DON, 2018a). Water and sediment characteristics and quality within much of the Atlantic BOA are described in detail in the Atlantic Fleet Training and Testing EIS/OEIS (DON, 2018a). Water and sediment characteristics and quality within much of the Pacific BOA are described in detail in the Hawaii-Southern California Training and Testing EIS/OEIS (DON, 2018a). While the study areas for these EISs do not completely overlap with the proposed Atlantic and Pacific BOAs, the affected environment described in these documents still represents the best available information for the affected environment, and the relevant sections of these documents are incorporated here by reference.

One of the main global ocean pollution concerns, including the waters of the BOA ROI, is marine debris. Marine debris includes any persistent solid material that is intentionally or unintentionally disposed of or abandoned into the marine environment (NOAA, 2024c). Common types of marine debris include various forms of plastic and abandoned fishing gear, as well as clothing, metal, glass, and abandoned and derelict vessels (NOAA, 2024c). Debris that sinks to the seafloor is a concern for ingestion and entanglement by marine life and may contribute to marine habitat degradation, contributing to deep water habitat damage (NOAA, 2024c).

4.3.2 Environmental Consequences

4.3.2.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change associated with hazardous materials and wastes. Therefore, no significant effects would occur with implementation of the No Action Alternative.

4.3.2.2 Potential Effects of the Proposed Action

As described in Section 2.1.1, under this alternative all inert sea-based flight tests would be deployed from SSBNs within the Atlantic and Pacific BOAs. During each test, the weapon system would be fired from a launch tube on the submarine. After burnout of the propellant and separation of each stage, the three spent motor casings and the equipment section casing would land in the BOA and sink. All solid fuel propellant in the rocket motors would be consumed before the spent motor casings impact the

ocean surface. All component materials, including the motors, RBs, and the materials carried within components, would be introduced in deep ocean waters of the BOAs.

The principal source of potential impacts would be unburned propellant residue and batteries. Each of the two motor boosters would exhaust onboard propellant before dropping into the ocean. Rocket propellant normally contains 50 to 85 percent ammonium perchlorate by weight and 5 to 22 percent aluminum powder, a fuel additive (DON, 2018b). Based on EPA and other studies evaluating munitions constituents at military sites where explosives and propellants have been used, the EPA concluded that perchlorate was generally not detected at ranges and that perchlorate is so soluble in water that surface accumulation (on land) does not occur (DON, 2018b). Studies have concluded that the motors used in the weapons systems are highly efficient, consuming over 99 percent of the propellant perchlorate during use (DON, 2018b). It is expected that only trace amounts, likely at undetectable levels, of propellant would remain in boosters when they splash down into the ocean (DON 2018b).

Residual quantities of some hazardous materials may remain on the boosters and casings (including batteries); these would be carried to the ocean floor by the sinking components and would undergo changes in the presence of seawater. When metals are exposed to seawater, they begin to corrode but movement of metals into the sediments or water column would be slow and restricted to a small area around the metals (DON, 2018b). Residual materials would slowly dissolve, and substances would be redistributed and diluted by physical ocean mixing and diffusion (DON, 2018b). Any residual chemical concentration near submerged boosters would decrease over time as the leaching rate decreases and further redistribution and dilution occurs. Even at active military bombing ranges, studies have revealed low concentrations of metals, generally below minimum detection limits (DON, 2018b). Expected metal concentrations within the BOAs would be expected to be significantly lower than at active bombing ranges given the size of the BOAs, the low numbers and frequency of tests over time, and the broad distribution of flight paths, target areas, and components within each BOA. Therefore, metals would likely be undetectable in surrounding sea water and sediments at any one location within the BOAs.

Overall, hazardous materials/wastes are not expected to be deposited in concentrations high enough to adversely affect the environmental quality in the BOAs. Weapon system components would not contribute to floating or suspended marine debris as they are expected to sink thousands of feet to the ocean floor. Overall, based on the amount and expected post-test location of residual hazardous materials and wastes contained on the components, hazardous materials and wastes are expected to have negligible to minor impacts in the BOAs. Therefore, implementation of the Proposed Action Alternative would not result in significant effects related to hazardous materials and waste management.

4.4 Public Health and Safety

4.4.1 Affected Environment

For the sea-based testing component of the Proposed Action Alternative, the ROI for public health and safety comprises the Atlantic and Pacific BOAs (see Figures 2.4-1 and 2.4-2 in Section 2.4.2). Both BOAs are located at least 50 NM from the continental U.S. and 200 NM from any landmass or islands.

Human activities and associated elevated noise levels are infrequent at any given location in the Atlantic and Pacific BOAs. The acoustic environment is characterized primarily by sounds of natural origin.

Through the Naval Safety Command, the DON promotes a proactive and comprehensive safety program designed to reduce, to the greatest extent possible, any potential adverse impacts on public health and

safety from training and testing activities (Naval Safety Command, 2024). The DON schedules training and testing activities to minimize conflicts with the use of sea space and airspace within ranges and throughout the study area to ensure the safety of DON personnel, the public, commercial aircraft, commercial and recreational vessels, and military assets.

The priority when planning and conducting flight tests is safety for both military personnel and for the public. Standard operating procedures pertaining to health and safety are followed during any naval operation, regardless of whether it occurs in territorial or international waters. At-risk public includes those commercial and recreational users transecting the open ocean and airspace overlying the BOAs.

Both sea space and airspace safety measures within the Atlantic BOA are discussed in detail in the Atlantic Fleet Training and Testing EIS/OEIS (DON, 2018b). Sea space and airspace safety measures within the Pacific BOA are described in detail in the Hawai'i-Southern California Training and Testing EIS/OEIS (DON, 2018a). While the study areas for these EISs do not completely overlap the proposed Atlantic and Pacific BOAs for this action, the affected environment described in these documents still represents the best available information for the affected environment, and the relevant sections of these documents are incorporated here by reference.

4.4.1.1 Sea Space

The affected environment for health and safety within the ROI includes the Atlantic and Pacific sea space in the BOAs. While most of the Atlantic and Pacific study areas are accessible for recreational activities, the majority of recreational activities occur closer to the eastern and western coast of North America and most commercial activities occur along established routes. The intensity of use generally declines with increasing distance from the shoreline. Operators of recreational and commercial vessels have a duty to abide by maritime regulations administered by the USCG, which oversees maritime activities within U.S. (territorial) waters. The International Maritime Organization provides guidance for maritime activities in international waters. In naval ranges within the BOA, Range Control has published safety procedures for activities conducted both nearshore and offshore. Furthermore, in accordance with 33 C.F.R. part 72, *Aids to Navigation*, the USCG informs private and commercial vessels about temporary closures via NOTMAR. These notices provide information about durations and locations of closures because of activities that are potentially hazardous to surface vessels. Broadcast notices on maritime frequency radio, weekly publications by the appropriate USCG Navigation Center, and global positioning system navigation charts disseminate these navigational warnings.

4.4.1.2 Airspace

Health and safety may also be affected in the airspace overlying the Pacific and Atlantic BOAs. During training and testing activities in the BOAs, the DON ensures that the appropriate safety zones are clear of non-participants before engaging in certain activities, such as weapon system deployment. Inability to obtain a "clear range" could result in the delay, cancellation, or relocation of an event. Furthermore, DON operations occurring in the airspace are planned and implemented according to Office of the Chief of Naval Operations Instruction 3770.2L, *Department of the Navy Airspace Procedures and Planning*, and are subject to FAA regulations and guidance (DON, 2017a). Airspace operations in international airspace beyond FAA control are guided by the framework presented by the International Civil Aviation Organization's Global Aviation Safety Plan. Aside from the operating areas, which include restricted airspace, Military Operations Areas, and Warning Areas, airspace overlying the Pacific and Atlantic BOAs is accessible to military, commercial, and recreational activities along designated flight routes. Some areas are temporarily off-limits to civilian and commercial use. The DON implements advance NOTAMs through the FAA prior to conducting any tests that might be hazardous to non-participants. NOTAMs

alert aircraft pilots of any hazards enroute to or at a specific location, such as upcoming or ongoing military exercises with airspace restrictions. Civilian aircraft pilots have a responsibility to be aware of restricted airspace and any NOTAMs that are in effect. Pilots have a duty to abide by aviation rules as administered by the FAA (DON, 2018b).

4.4.2 Environmental Consequences

4.4.2.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to public health and safety. Therefore, no significant effects would occur with implementation of the No Action Alternative.

4.4.2.2 Potential Effects of the Proposed Action

In the Atlantic and Pacific BOAs, safety measures would be taken to ensure that no non-participating humans would be near the launch or impact locations during TRIDENT II (D5) weapon systems tests. Because the presence of human receptors would be highly unlikely, noise effects on receptors in the Atlantic and Pacific BOAs are not reasonably foreseeable.

While public health and safety could be affected by the risk of physical collisions with weapon system components during the testing events, it would be highly unlikely that such components would be directly encountered by civilian boats and aircraft in the BOAs because the DON would coordinate with the FAA and USCG to issue NOTAMs and NOTMARs in both BOAs and most recreational activities take place in nearshore waters. The NOTAMs and NOTMARs in the BOAs would be in effect for several hours before and after the testing event to warn air and mariner traffic about the tests. As required, DON personnel would also verify that the ROI is clear of non-participants before initiating any activity that could be potentially hazardous to the public. Together, these procedures minimize the potential for adverse interactions between the proposed testing activities and civilian activities.

Additionally, training and test launches have been conducted in both BOAs for decades without causing significant damage or safety impacts to personnel or equipment. For the reasons described above, implementation of the Proposed Action Alternative would not result in significant effects to public health and safety.

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5 Affected Environment and Environmental Consequences: Land-based Testing

This chapter presents a description of the environmental resources and baseline conditions that could be affected by implementing the land-based testing component of the Proposed Action Alternative and an analysis of the potential direct and indirect effects of conducting such tests.

All potentially relevant environmental resource areas were initially considered for analysis in this EA/OEA. In compliance with NEPA and DON guidelines, the discussion of the affected environment (i.e., existing conditions) focuses only on those resource areas potentially subject to impacts. Additionally, the level of detail used in describing a resource is commensurate with the anticipated level of potential environmental impact.

In determining whether an effect of the Proposed Action is significant, NEPA requires consideration of both context and intensity. Context means that the significance of an action must be analyzed in several contexts such as society as a whole (e.g., human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of a proposed action. For instance, in the case of a site-specific action, significance would usually depend on the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant. Intensity refers to the severity or extent of the potential environmental impact, which can be thought of in terms of the potential amount of the likely change. In general, the more sensitive the context, the less intense a potential impact needs to be to yield a finding of significance. Likewise, when the context is less sensitive a higher level of intensity is required for a potential impact to be considered significant.

5.1 Air Quality

5.1.1 Affected Environment

The project study area for air quality includes Brevard County and the adjacent Atlantic coastline and nearshore waters, as this is the domain that would experience the highest project air quality impacts. The transport of project emissions beyond this area would disperse to low ambient levels.

Brevard County currently is in attainment for all NAAQS. Compliance with the NAAQS in the region is due to a lack of substantial emission sources, abundant sunshine, persistent sea breezes, and frequent rain showers that promote atmospheric mixing and limit the buildup of air pollutants in a given location.

The FDEP regulates sources of air quality in Florida. The FDEP enforces the NAAQS by monitoring air quality, developing rules to regulate and to permit stationary sources of air emissions, and contributing to air quality attainment planning processes statewide.

Stationary sources of emissions at CCSFS operate under an FDEP General Permit that covers internal combustion engines. Emission units other than the internal combustion units, which operate under the Air General Permit, are exempt under the FDEP Generic Facility Exemption (62-210.300 (3)).

5.1.2 Environmental Consequences

Effects on air quality are based on estimated direct and indirect emissions associated with the proposed test launches. The weapon system launches from CCSFS associated with the Proposed Action Alternative would affect criteria pollutants levels within Brevard County (the focus of which is the lowest 3,000 feet of the atmosphere, as discussed in Section 4.1). The potential effects of proposed GHG emissions are by

nature global and cumulative effects so the analysis of GHGs emitted from the Proposed Action Alternative land-based testing is presented in Section 6.4.1.

5.1.2.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to baseline air quality. Therefore, no significant effects to air quality or air resources would occur with implementation of the No Action Alternative.

5.1.2.2 Potential Effects of the Proposed Action

Criteria Pollutants

To assess the air quality effects of land-based test flights under this Proposed Action Alternative, emissions were calculated for the proposed test launches with the same methods as those used for the sea-based launches in Section 4.1. These calculations account for criteria pollutants, HCl, and carbon dioxide (CO_2) released during each launch. Table 4.1-1 in Section 4.1.2.2 presented estimates of emissions by booster stage that would occur from an individual launch.

The estimated annual emissions for the Proposed Action Alternative land-based launches are presented in Table 5.1-1. The testing of the weapon system would include up to 10 land-based test launches from 2032 through 2036, with an assumed rate of two launches per year during this period.

Table 5.1-1 Annual Proposed Action Alternative Land-based Launch Emissions

Year	Annual Air Pollutants (tons)							
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$	CO_2	HCl
2032	0.05	0.65	0.00	0.00	7.34	5.14	74.95	5.73
2033	0.05	0.65	0.00	0.00	7.34	5.14	74.95	5.73
2034	0.05	0.65	0.00	0.00	7.34	5.14	74.95	5.73
2035	0.05	0.65	0.00	0.00	7.34	5.14	74.95	5.73
2036	0.05	0.65	0.00	0.00	7.34	5.14	74.95	5.73

Notes: Lead emissions would be less than 0.001 tons per year.

Legend: CO = carbon monoxide; CO_2 = carbon dioxide; HCl = hydrogen chloride; NO_x = nitrogen oxides; PM_{10} and $PM_{2.5}$ = particulate matter with a diameter of less than or equal to 10 microns and 2.5 microns, respectively; SO_x = sulfur oxides; VOC = volatile organic compound

The analysis of criteria pollutants focuses on the potential for air pollutant sources to contribute to an exceedance of a NAAQS. Given that the proposed launches would accelerate so quickly in altitude, only a small percentage of the first stage launch emissions (refer to Table 4.1-1) would occur within the atmospheric mixing layer of 3,000 feet in height above the ground. As a result, the effect of launch emissions in the lower troposphere within Brevard County would result in ambient pollutant concentrations that would not contribute to an exceedance of a NAAQS. Therefore, the effects of the Proposed Action Alternative land-based testing to criteria pollutant levels would be less than significant.

5.2 Biological Resources

5.2.1 Affected Environment

This section describes the existing conditions for each of the categories under biological resources at and around SLC-46 at CCSFS, including adjacent estuarine and nearshore areas. Threatened and endangered species are discussed in each respective section below with a composite list applicable to this Alternative provided in Table 5.2-1. Potential effects to biological resources may include exposure to

launch emissions, noise, rocket nozzle exhaust heat, sediment, water quality, and physical harm due to direct strikes.

Table 5.2-1 Threatened and Endangered Species and Critical Habitat Known to Occur or Potentially Occurring in the Land-based ROI

Common Name	*Scientific Name*	*Federal Listing Status*	*Study Area*	*Critical Habitat Present/Status*
Mammals				
Southeastern beach mouse	*Peromyscus polionotus niveiventris*	FT	CCSFS	No
Tricolored bat	*Perimyotis subflavus*	PE	CCSFS	No
Florida manatee	*Trichechus manatus latirostris*	FT	Atlantic BOA	Designated
Birds				
Crested caracara	*Caracara plancus audubonii*	FT	CCSFS	No
Eastern black rail	*Laterallus jamaicensis* ssp. *jamaicensis*	FT	CCSFS	No
Florida scrub-jay	*Aphelocoma coerulescens*	FT	CCSFS	No
Piping plover	*Charadrius melodus*	FT	CCSFS	No
Rufa red knot	*Calidris canutus rufe*	FT	CCSFS	Proposed
Wood stork	*Mycteria americana*	FT	CCSFS	No
Reptiles				
Eastern indigo snake	*Drymarchon couperi*	FT	CCSFS	No
Green sea turtle	*Chelonia mydas*	FT	CCSFS	No[1]
Leatherback sea turtle	*Dermochelys coriacea*	FE	CCSFS	No
Loggerhead sea turtle	*Caretta caretta*	FT	CCSFS	No[1]
Kemp's ridley sea turtle	*Lepidochelys kempii*	FE	CCSFS	No
Insects				
Monarch butterfly	*Danaus plexippus*	PT	CCSFS	No

Note: [1] Proposed green sea turtle beach nesting critical habitat does not extend to CCSFS property. Designated loggerhead sea turtle beach nesting critical habitat occurs in the Cape Canaveral region, but CCSFS property is excluded from the designation because an Integrated Natural Resources Management Plan providing benefit to the species is in place.

Legend: BOA = broad ocean area; C = candidate species for federal ESA listing; CCSFS = Cape Canaveral Space Force Station; FE = federal endangered; FT = federal threatened; NL = not listed; PE = proposed endangered; PT = proposed threatened; ROI = Region of Influence

Source: USFWS, 2024d; USSF, 2023a

5.2.1.1 Terrestrial Vegetation

Vegetation includes terrestrial plant as well as freshwater aquatic communities and constituent plant species. The primary vegetation communities present within SLC-46 and the surrounding area include beach dune, coastal grassland, coastal strand, basin marsh, upland forests, and scrub communities. Developed areas consist of terrestrial grasses (primarily Bermuda grass [*Cynodon dactylon*] or bahia grass [*Paspalum notatum*]) and weeds that are regularly maintained or mowed. These areas provide a 475- to 2,000-foot buffer between the launch pad and native habitats surrounding SLC-46. Most vegetated areas are highly fragmented due to development at CCSFS, including roads, utility corridors, buildings, and launch complexes (USSF, 2023a).

A large portion of the vegetation in this area is inhabited by invasive species. Brazilian pepper (*Schinus terebinthifolia*) predominates the invasive flora at CCSFS, with 29 other noxious weeds and exotic

invasive plant species present in lower densities. Australian pine (*Casuarina equisetifolia*) is also widespread and grows singly or as small, dense groves scattered across CCSFS. Other observed invasive species include cogon grass (*Imperata cylindrica*), chaste tree (*Vitex trifolia*), melaleuca (*Melaleuca quinquenervia*), mimosa (*Albizia julibrissin*), and torpedo grass (*Panicum repens*) (USSF, 2019).

5.2.1.2 Terrestrial Wildlife

Wildlife includes all animal species (i.e., insects and other invertebrates, freshwater fish, amphibians, reptiles, birds, and mammals) focusing on the species and habitat features of greatest importance or interest. Common wildlife species and special status species found on and near CCSFS are discussed below.

Mammals*.* More than 25 terrestrial mammal species are known to occur on or in the vicinity of CCSFS (USSF, 2023a). Common species include white-tailed deer (*Odocoileus virginianus*), armadillo (*Dasypus novemcinctus*), raccoon (*Procyon lotor*), feral hog (*Sus scrofa*), and cotton rat (*Sigmodon hispidus*) (USSF, 2023a). The southeastern beach mouse (*Peromyscus polionotus niveiventris*) is the only strictly terrestrial ESA-listed mammal species found at CCSFS (see Table 5.2-1). There are discrete habitat patches of the southeastern beach mouse on the Cape Canaveral Complex (USFWS, 2019). The southeastern beach mouse is known to inhabit coastal dune and strand communities, as well as scrub and disturbed communities resembling southeastern beach mouse habitat structurally and compositionally (USSF, 2023a).

The tricolored bat (*Perimyotis subflavus*) was proposed for ESA listing in September 2022 (87 *Federal Register* 18852). In Florida, the tricolored bat can be found in forested areas throughout the year where they roost in trees, primarily among leaves. The bat faces extinction due to effects from white-nose syndrome, a deadly disease affecting cave-dwelling bats in North America (USSF, 2023a). SLD 45 installations contain suitable tricolored bat habitat for roosting, foraging, and commuting. During acoustic surveys conducted in 2019, tricolored bats were detected in various locations throughout CCSFS (USSF, 2023a).

Birds. More than 200 bird species occur at or near CCSFS (USSF, 2023a) including those protected under the MBTA and the BGEPA. These include a diversity of seabirds, shorebirds, grassland birds, and wetland birds, as well as species associated with scrub habitats and urban areas. Almost all of these species are protected under the MBTA, and 46 species were identified as USFWS Birds of Conservation Concern that may occur in the ROI. Examples of commonly observed species protected under the MBTA include the brown pelican (*Pelecanus occidentalis*), ring-billed gull (*Larus delawarensis*), black skimmer (*Rynchops niger*), double-crested cormorant (*Phalacrocorax auritus*), royal tern (*Thalasseus maximus*), and willet (*Tringa semipalmata*). Bald eagles could be observed within the ROI where protections by BGEPA and those outlined in the SLD 45 *Integrated Natural Resources Management Plan* are in place. Refer to the USFWS Information for Planning and Consultation website for a complete list of protected bird species in the ROI.

Seven ESA-listed bird species have the potential to occur in the CCSFS ROI, including the Florida scrub-jay (*Aphelocoma coerulescens*), piping plover (*Charadrius melodus*), eastern black rail (*Laterallus jamaicensis* ssp. *jamaicensis*), Audubon's crested caracara (*Caracara cheriway*), wood stork (*Mycteria americana*), red knot (*Calidris canutus rufa*), and roseate tern (*Sterna dougalli*) (USFWS, 2024a; USSF, 2023a).

The Florida scrub-jay is present in Florida scrub habitat at CCSFS. Quality habitat for the Florida scrub-jay is not present in the immediate area around SLC-46; however, suitable habitat and documented Florida scrub-jay groups are within roughly 6,000 feet of SLC-46 (USSF, 2023a). Florida scrub-jays are also documented at Kennedy Space Center and Merritt Island National Wildlife Refuge area (USSF, 2023a).

Primary threats to the Florida scrub-jay are habitat loss, fragmentation, and degradation caused by urbanization and fire suppression (USSF, 2023a).

Reptiles and Amphibians. At least 50 amphibian and reptile species occur on or near CCSFS (USSF, 2023a). These include the Florida pine snake (*Pituophis melanoleucus mugitus*) and several ESA-listed species (see Table 5.2-1). The American alligator (*Alligator mississippiensis*) is treated as threatened under the ESA due to its similar appearance to the federally threatened American crocodile. American alligators typically inhabit lakes, ponds, rivers, bayous, swamps, and marshes (USSF, 2023a).

Quality sandhill, scrub, and pine flatwoods habitat are present at CCSFS for the gopher tortoise (*Gopherus polyphemus*) and eastern indigo snake (*Drymarchon couperi*). The gopher tortoise is considered a keystone species providing refuge for more than 300 animal species in their deep underground burrows. The eastern indigo snake requires large tracts of land and often utilize gopher tortoise burrows for refuge. Of more than 1,000 gopher tortoise burrows video-scoped on CCSFS, no eastern indigo snakes were documented inhabiting the burrows (USSF, 2023a).

5.2.1.3 Marine Species

Marine Vegetation

Marine vegetation includes plants occurring in marine or estuarine waters. These may include mangroves, algae, and various grasses.

Mangrove habitat, including combinations of white mangrove (*Laguncularia racemosa*), black mangrove (*Avicennia germinans*), and red mangrove (*Rhizophora mangle*), occurs with uneven distribution along the Banana River along the western side of CCSFS (USSF, 2023a). Mangroves provide habitat for many fish species, as well as other types of wildlife. Seagrass beds of variable density occur throughout the Indian River Lagoon (IRL) system adjacent to CCSFS, including some basins and impoundments that are inland from the lagoon system. Seven seagrass species are found in the system, with shoal grass (*Halodule wrightii*) being the most common (St. Johns River Water Management District, 2024). Seagrass provides habitat for many fish and invertebrate species and is a food source for sea turtles (particularly the green sea turtle) and the Florida manatee. Various species of attached and drifting macroalgae occur in the IRL system (Hall et al., 2022). Benthic algae occur offshore of CCSFS in the Atlantic BOA.

Fish

The ESA-listed Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), Nassau grouper (*Epinephelus striatus*), and smalltooth sawfish (*Pristis pectinata*) may also occur in the study area. These benthic species are typically found on or near the bottom in coastal waters and, for smalltooth sawfish and (rarely) Nassau groupers, in estuarine waters of the IRL system (USSF, 2023a). However, effects to these species or their benthic habitats near SLC-46 from the Land-based Alternative would not be expected. Therefore, the Atlantic sturgeon, Nassau grouper, and smalltooth sawfish are not discussed further in this EA/OEA.

Marine Mammals

All marine mammals present in the ROI are protected under the MMPA. The jurisdiction over marine mammals is maintained by NMFS and USFWS. NMFS maintains jurisdiction over whales, dolphins, porpoises, seals, and sea lions. The USFWS maintains jurisdiction for certain other marine mammal species, including walruses, polar bears, dugongs, sea otters, and manatees. This section looks at species primarily under the jurisdiction of USFWS. Effects to all other marine mammals would be the same as

those described for the sea-based testing component of the Proposed Action Alternative and are not discussed here.

The Florida manatee, a subspecies of the west Indian manatee (*Trichechus manatus*), is included in this section because it is under USFWS jurisdiction. All other marine mammals in the ROI are under NMFS jurisdiction and are addressed in Section 5.2. The Florida manatee occurs in coastal and inland waters of the southeastern United States, Gulf of America, Caribbean Sea, northern South America, and the Bahamas. The species resides in brackish, marine, and freshwater systems in riverine and coastal areas near CCSFS, including the IRL system and coastal marine water. Manatees rely on seagrass and drifting algae for their food sources. Demographic analyses conducted in previous years indicated Florida stock of manatees were increasing or stable; however, the effects of the ongoing unusual mortality events on population sizes are unknown at this time (USFWS, 2023).

In Brevard County, the USFWS has designated all inland waters of the Banana River and all waterways between the Indian and Banana Rivers as critical manatee habitat (USSF, 2023a). Constituent elements are not identified, only geographic areas. The USFWS proposed to revise Florida manatee critical habitat in September 2024 (89 *Federal Register* 78134) (USFWS, 2024b). The revised area would include additional areas of the IRL system and identifies specific physical and biological features essential to the conservation of the species. The proposed revision would not change the occurrence of critical habitat adjacent to CCSFS.

Sea Turtles

Of the six sea turtle species that are found in U.S. waters or that nest on U.S. beaches, all are designated as either threatened or endangered under the ESA. Sea turtles are highly migratory and utilize the waters of more than one country in their lifetimes. The USFWS and NMFS share federal jurisdiction for sea turtles with the USFWS having lead responsibility on the nesting beaches and NMFS, the marine environment. Five sea turtle species occur in nearshore waters adjacent to CCSFS, including the green, hawksbill, Kemp's ridley, leatherback, and loggerhead turtle. The IRL system provides developmental habitat for juvenile green and loggerhead sea turtles. A significant population of juvenile green turtles occur in the TRIDENT Basin at CCSFS, where they feed on algae (USSF, 2023a).

Although five sea turtle species occur in estuarine and nearshore Atlantic Ocean waters adjacent to CCSFS, only four species (green, leatherback, loggerhead, and Kemp's ridley sea turtles) are known to nest on CCSFS property (see Table 5.2-1). These species typically nest between March and October on CCSFS (USSF, 2023a). The hawksbill sea turtle occurs offshore of CCSFS, but nesting is not known to occur (USSF, 2023a). Canaveral National Seashore north of CCSFS documented 6,188 loggerhead sea turtle nests, 6,331 green sea turtle nests, 27 leatherback sea turtle nests, and 1 Kemp's ridley sea turtle nest in 2022 (NPS, 2024). Based on nest surveys on CCSFS between 1986 through 2022, the average annual number of loggerhead sea turtle nests was 2,332 and the average annual number of green sea turtle nests for the same years was 128 (USSF, 2023a). Since 1986, a total of 157 leatherback nests have been documented on CCSFS and 2 Kemp's ridley nests were documented in 2015 (USSF, 2023a). At CCSFS, the beach areas from low tide to just behind the leading dune are considered protected nesting habitat for ESA-listed sea turtle species. Since 1986, the SLD 45 has implemented a sea turtle plan that employs preservation techniques such as exterior light management, predator control, rescue and release of hatchlings, nest relocation, daily nest surveys, salvage and stranding activities, and participation in the State of Florida Index Nesting Beach Survey (USSF, 2023a).

Designated loggerhead and proposed green sea turtle nesting beach critical habitat occurs in the Cape Canaveral region but is not designated on CCSFS property because the installation's Integrated Natural Resources Management Plan provides a benefit to the species (USSF, 2023a). In 2023, the USFWS

proposed to designate green sea turtle nesting beach critical habitat in the Cape Canaveral region, but the proposed habitat does not extend to CCSFS property (88 *Federal Register* 46376). Proposed green sea turtle and designated loggerhead sea turtle critical habitats are 8 miles north of SLC-46. Designated and proposed sea turtle critical habitat in estuarine and marine areas is discussed in Section 5.2.

5.2.2 Environmental Consequences

This analysis focuses on terrestrial wildlife and vegetation that may potentially be affected by the Proposed Action as well as those that are protected under federal or state law or statute.

5.2.2.1 No Action Alternative

Under the No Action Alternative the Proposed Action would not occur and there would be no change to biological resources. Baseline conditions would remain the same and no significant effects to biological resources would occur with implementation of the No Action Alternative.

5.2.2.2 Potential Effects of the Proposed Action

The study area for the analysis of effects to biological resources associated with the land-based component of the Proposed Action Alternative includes SLC-46, adjacent habitats, and nearshore waters adjacent to CCSFS that may be exposed to noise, particulate emissions, heat, and visual effects from the launches. There would be no new construction, repair, renovation, or demolition at SLC-46.

Terrestrial Vegetation

Heat and emissions from rocket exhaust can result in localized vegetation scorching and spotting. Historically, vegetation scorching on CCSFS has been limited to areas less than 2.5 acres within 495 feet of launch pads (USSF, 2023a). As discussed in the *Joint Flight Campaign Environmental Assessment/Overseas Environmental Assessment* (DON and U.S. Army, 2022) and *Environmental Assessment for Space Florida Launch Site Operator License at Launch Complex-46* (FAA, 2008), exhaust plumes from vehicle launches at CCSFS contain hazardous chemicals (e.g., HCl) that may be deposited on vegetation outside launch site boundaries, but substantial long-term effects are not expected. As previously mentioned, the vegetation immediately around launch pads is regularly mowed to minimize the risk of brush fires. Much of the near-field vegetation (i.e., 475 to 2,000 feet) has been removed to create a buffer between the launch pad and native vegetation (USSF, 2023a); therefore, there would not be significant effects to vegetation from the land-based component of the Proposed Action Alternative.

Nearshore Marine Vegetation

Heat and emissions from launches could potentially damage vegetation near the launch site. There would be no heat effects on mangroves or emergent vegetation that function as habitat for fish, invertebrates, or other wildlife associated with the Banana River because of the distance between these resources and SLC-46. As discussed in the *Joint Flight Campaign Environmental Assessment/Overseas Environmental Assessment* (DON and U.S. Army, 2022) and *Environmental Assessment for Space Florida Launch Site Operator License at Launch Complex-46* (FAA, 2008), exhaust plumes from vehicle launches at CCSFS contain hazardous chemicals (e.g., HCl) that may be deposited on vegetation outside launch site boundaries, but substantial long-term effects are not expected. Given the low number of SLC-46 launches (approximately 10 launches between CYs 2032–2036), the amount of such substances deposited around SLC-46 would be low. Because chemical deposition attenuates with distance from the source as well as dilutes when mixed with water, the potential for hazardous chemicals to settle on or be transported to estuarine and nearshore marine water and to affect mangroves, seagrass, and

submerged or floating algae would be very low. Effects on marine vegetation, including vegetation that is EFH, would not be significant.

Nearshore Marine Wildlife

Effects to marine mammals under the jurisdiction of NMFS that would occur in the nearshore and estuarine environments at CCSFS would be the same as those described in Section 4.2.2.2 for the sea-based component of the Proposed Action Alternative and are not repeated here. As detailed for vegetation, emissions from launches at SLC-46 would not likely harm marine wildlife or affect estuarine or marine sediment or water quality to the extent that habitat function would be diminished. Deposition of emission constituents (e.g., hydrochloric acid) near SLC-46 would be limited by the low number of launches, concentration attenuation with distance, and dilution.

High-intensity noise from launches at SLC-46 would not be expected in the water column in estuarine waters or the nearshore Atlantic Ocean because sound energy produced at launch and at low altitude would be reflected off the water surface because the angle of incidence would be greater than the critical angle, and sound entering the water from higher altitudes would be of low intensity. When discussing airborne noise propagating into water, the "angle of incidence" refers to the angle at which a sound wave hits the water surface, while the "critical angle" is the specific angle where the sound would propagate into the water. When the sound arrives at an incident angle that is greater than the critical angle, the sound is almost totally reflected back into the air (Erbe et al., 2022).

Designated critical habitat for the North Atlantic right whale occurs offshore of CCSFS. Launches at SLC-46 would not affect the essential features of critical habitat (sea surface conditions and water temperature and depth requirements). Launches would not cause substantial noise levels in the water column. Noise exposure would be limited to whales occurring at the surface. The probability of an individual surfacing near SLC-46 at the same time a launch occurred, and reacting behaviorally, would be low.

Terrestrial Wildlife

Potential effects of the Proposed Action on terrestrial wildlife are discussed below. Potential effects on threatened and endangered species and critical habitats are discussed specifically in the following subsection. In general, terrestrial wildlife may be affected by emissions and heat from rocket launches, noise, direct strikes, and expended items.

Terrestrial wildlife at CCSFS, including mammals, birds, and reptiles, may be affected by elevated sound pressure levels, hazardous chemicals, and heat from launches. SLC-46 is in an area where routine human activity and equipment operation occurs. Elevated noise levels could startle wildlife and cause behavioral reactions such as fleeing. However, these effects would be localized, temporary, and not of sufficient intensity to have any significant, long-term effects on local populations. Animals very close to the launch pad could experience temporary hearing loss, but the number of individuals affected would be very small relative to population numbers. Emissions such as HCl are known to precipitate out of the air around launch pads in the presence of water vapor. Previous rocket launches are estimated to have deposited 0.427 grams of HCl per square meter of surface area over 4 square miles; however, substantial long-term effects are not expected due to the low concentration of HCl deposition per square meter (FAA, 2008). Heat produced from the launches could potentially affect wildlife within the ROI causing thermal stress to nearby wildlife, which may cause wildlife to flee the area, or disrupt foraging or nesting behaviors. However, due to the short duration of localized heat, long-term effects to wildlife are not anticipated. The low annual number of land-based launches (approximately 10 launches

between CYs 2032–2036) further suggests that noise, emissions, and heat from this alternative would have less than significant effects on terrestrial wildlife.

Gopher tortoises may exhibit short-term startle responses to launch noise and might retreat into burrows. The gopher tortoises at CCSFS are likely accustomed to launch noise and routine human activity and would be expected to return to normal behaviors within a short timeframe.

During launches at SLC-46, it is possible that birds in the immediate area would be startled by launch noise and temporarily leave the area, which could disrupt feeding and nesting activities. Monitoring of sea and shore birds by the USSF has shown no interruption of activities, or any evidence of abnormal behavior or injury during previous launches at CCSFS (USSF, 2023a). The continued presence of migratory, sea, and shore birds at CCSFS suggests that rocket launches over the past few decades have not significantly inhibited the populations of the species currently present. A bird strike is possible during launch events; however, it is unlikely since most wildlife will startle away from the launch pad due to noise and heat prior to the rockets' lift off. As described in *Environmental Assessment for Space Florida Launch Site Operator License at Launch Complex-46* and the SLD 45 *Integrated Natural Resources Management Plan*, launches from CCSFS have not resulted in wildlife mortalities (FAA, 2008; USSF, 2023a). Even though migratory birds are present at CCSFS, the DON concludes that the Proposed Action would not result in intentional take of any bird species protected under the MBTA. In the unlikely event of a migratory or special status bird strike, the appropriate agency would be consulted. The SLD 45 holds a Federal Depredation Permit, which accounts for an unplanned number of birds that may be affected with changing mission, safety, and damage assessments (USSF, 2023a)**.**

Biological Resources Environmental Consequences Summaries (Non-threatened and Endangered Species)

In summary, launch emissions and heat, noise (including sonic boom overpressure), direct strikes, and expended items would affect a low number of terrestrial and nearshore animals relative to population sizes, and effects on terrestrial and nearshore habitats would be minor. Effects associated with the Proposed Action would not be significant.

Migratory Bird Treaty Act Determination

The Navy has determined that the land-based Proposed Action Alternative would not result in a significant adverse effect on a population of a migratory bird species. If, over the course of training and testing activities, the Navy determines that a population of migratory birds would be significantly impacted, the Navy would be required to confer and cooperate with the USFWS to develop and implement appropriate conservation measures to minimize or mitigate such significant adverse effects. Based on the analysis contained in this section, the Navy's proposed military readiness activities would not adversely impact any population of migratory bird species. This conclusion is supported by mitigation measures that limit potential effects, precision targeting, and locations where military readiness activities would occur.

Marine Mammal Protection Act Determination

There would be no harassment of marine mammals per the MMPA as amended by the National Defense Authorization Act of Fiscal Year 2004 (PL 108-136). The Proposed Action is a military readiness activity. The Proposed Action does not have the significant potential to injure a marine mammal or marine mammal stock in the wild or disturb a marine mammal or marine mammal stock to the point where behavioral patterns are abandoned or significantly altered. The chances of any marine mammal being

harassed by elevated sound levels, direct contact (test components), hazardous materials, or vessel strike are extremely low. No animals are expected to be harassed from direct contact or from exposure to hazardous materials. If any effects of proposed flight test noise on marine mammals were realized, they would be expected to be limited to short-duration startle responses with no lasting effects.

Threatened and Endangered Species

ESA candidate, threatened, and endangered species likely to occur within the study area are shown in Table 5.2-1. Suitable habitat exists within terrestrial, beach, and nearshore habitats of the ROI for the Florida manatee, tricolored bat, southeastern beach mouse, North Atlantic right whale, Florida scrub-jay, red knot, piping plover, Audubon's crested caracara, wood stork, eastern black rail and roseate tern, eastern indigo snake, and monarch butterfly as well as nesting loggerhead, green, leatherback, and Kemp's ridley sea turtles. Potential effects from noise, direct strike, emissions, heat, and habitat disturbances associated with the launches on these species and associated critical habitats are discussed below.

No effects to wildlife due to direct contact from debris are expected during normal flight operations as wildlife are not expected to be in high concentrations near launch activities (DON and U.S. Army, 2022). An early flight termination would cause weapon system debris to impact along the flight corridor but would likely be in offshore waters where concentrations of manatees and ESA-listed bird species would not be high. Emissions from vehicle launches would have little effect on wildlife due to the low levels and short duration of emissions. While heat or emissions from rocket exhaust have the potential to kill or injure wildlife if they are directly exposed to exhaust, wildlife are unlikely to be affected. Based on their distributions and abundance at CCSFS and based on the brief period of potential exposure, special status species are unlikely to be harmed by vehicle exhaust.

Florida manatees are in the sirenian functional hearing group. Noise effects resulting from missile launch activities do overlap with the hearing range of the sirenian functional hearing group (DON, 2017b). The nearshore marine environment, where manatees may occur, may experience some minor noise effects during launch activities. In-air noise from launch activities would have little impact on manatees because noise from airborne sources does not transmit as well under water (DON, 2017b). In-air sound is transmitted into water mostly within a narrow cone of about 13 degrees from vertically below the source (DON, 2018a). At greater angles, most sound reflects off the water surface. The Florida manatee regularly occurs in the Banana River west of the study area. However, only 10 land-based launches would occur over a 5-year period; therefore, noise disturbance would not be frequent, would be spaced out over time, and would be of short duration (less than 1 minute of noise exposure per launch as the weapon system rapidly accelerates out of the launch area, both in altitude and distance). Additionally, manatees would likely not have their heads above the water, exposing their ears during a launch. A manatee spends almost all its time with its head under water and only exposes its nostrils to breathe, keeping its ears submerged. Some individuals in the area during launch activities may experience temporary effects, including startle reactions and may avoid the study area. But these individuals are expected to resume normal behaviors shortly after the launch occurred, and long-term effects to individuals would not occur. Critical habitat for calving, foraging, and safe harbor for manatees exists on the western boundary of CCSFS in the Banana River. The Banana River manatee sanctuary extends from the Kennedy Athletic, Recreation, and Social Park I to the northern terminus of the Banana River. This area is protected from entry by any unauthorized motorized watercraft (Scheidt, 2021). Manatee designated critical habitat occurs approximately 4 miles to the west of SLC-46 (DON and U.S. Army, 2022). The Proposed Action carries the weapon system east, over the Atlantic Ocean and away from

Florida manatee critical habitat. This area could be exposed to noise and emissions from the launches. The noise effects would be minor as the noise source would be traveling parallel to the water and the probability of significant noise levels penetrating the water surface is low. Emissions extending west toward manatee critical habitat would be low as HCl deposition is minor within a 4-mile radius and would continue to dilute as the missile moved away from SLC-46 to the east. Launches from SLC-46 are not expected to alter the nearshore habitat in a way that could affect the Florida manatee. The Atlantic Coast manatee critical habitat would be overflown only 10 times over 5 years. Launches are not expected to affect manatee critical habitat because none of the physical or biological features essential to the conservation of the species would be affected.

Designated critical habitat for the North Atlantic right whale occurs offshore of CCSFS. Launches at SLC-46 would not affect the essential features of critical habitat (sea surface conditions and water temperature and depth requirements). Launches would not cause substantial noise levels in the water column. Noise exposure would be limited to whales occurring at the surface. The probability of an individual surfacing near SLC-46 at the same time a launch occurred, and reacting behaviorally, would be low.

Noise from launch events would not significantly affect tricolored bats near SLC-46. Roosting tricolored bats may startle from noise produced during launch activities. This species is not roost limited and regularly moves between roost sites. If noise were to rise to the level to disturb tricolored bats, they would relocate to a roost away from the disturbance. According to the *Environmental Assessment for Stoke's Nova Launch Program at Cape Canaveral Space Force Station, Florida*, the tricolored bat is a high-frequency echolocator, and most noise frequencies from launches would be in a frequency lower than the bat can hear. Bat species that use echolocation for foraging are only affected by ambient noise generated during launch activities if the species uses low-frequency echolocation (Stoke Space Technologies, 2024). Because the tricolored bat uses high-frequency echolocation, increased ambient noise would not alter its activity.

Emissions and heat from the launches are not likely to substantially affect the beach mouse or their habitat. The weapon system launches are relatively infrequent, and emissions would disperse from the ROI quickly with the salt spray mixing from the Atlantic Ocean. Heat would only affect beach mice very near the launches; however, they would likely startle or seek refuge underground prior to any effects from weapon system exhaust launch heat. While beach mice are known to occur in habitats outside the perimeter fence near SLC-46, any effects from launches are not likely to significantly affect beach mice. Effects would be short term and minor and may include some level of startle response to noise during launches. According to the Biological Opinion for the *Reactivation of Space Launch Complex 14 at Cape Canaveral Space Force Station, Florida*, ground vibration produced through rocket launches has largely been unstudied, but given the substantial forces produced, some degree of vibration upon liftoff is reasonably certain to occur. It is expected that southeastern beach mice inhabiting areas near the launch pad may be exposed to vibrations produced by launch activities; therefore, burrow collapse is possible from the vibrations during liftoff. The nearest southeastern beach mice detections are within 1 mile of SLC-46 as shown in Figure 5.2-1. The effect of burrow collapse on southeastern beach mice may range from a minor energetic cost in rebuilding the burrow to increased exposure to avian predators to loss (lethal) of individuals if young are buried below the soil (USFWS, 2024c).

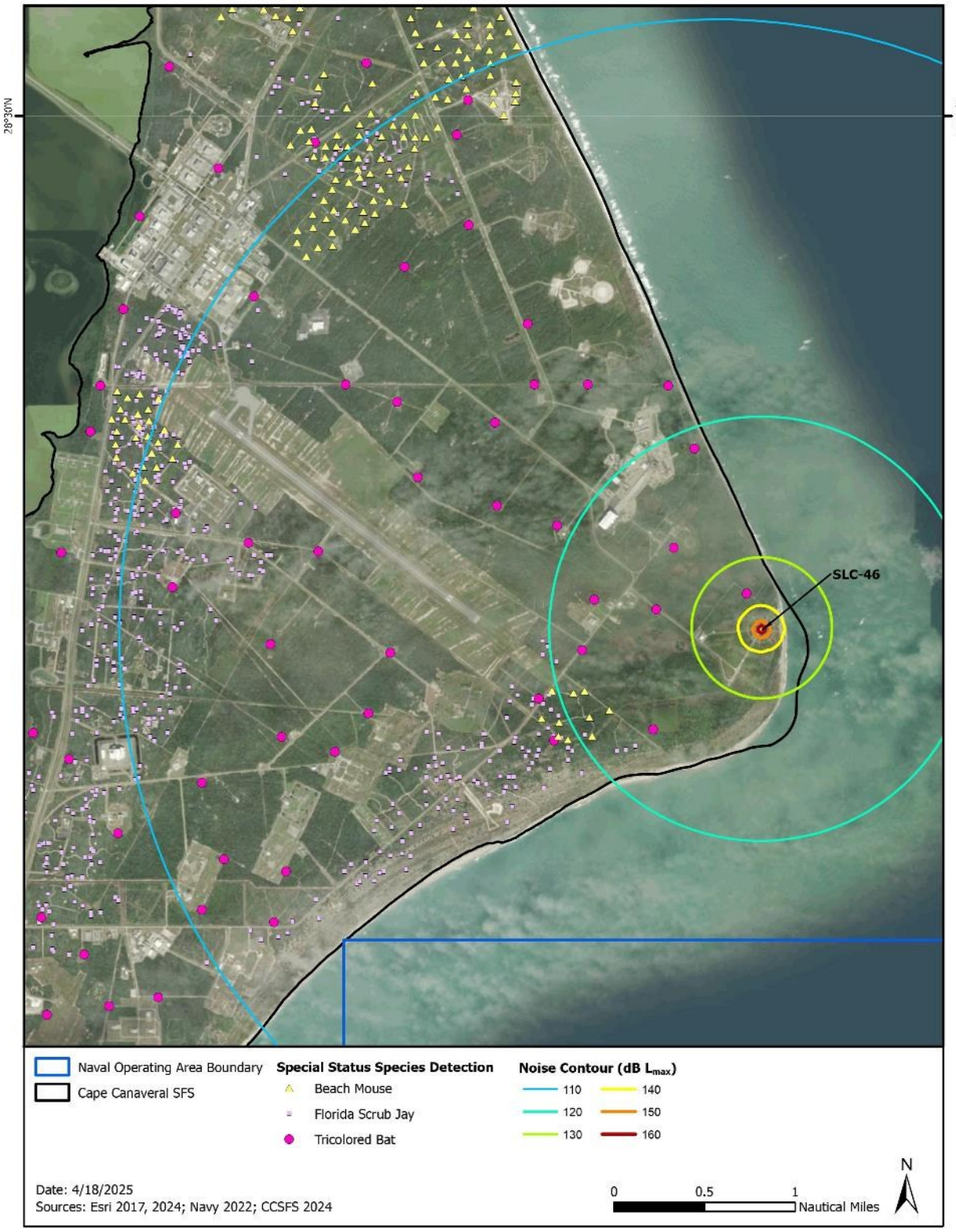

Figure 5.2-1 SLC-46 Noise Contours and Special Status Species

The ESA-listed terrestrial bird species occurring in the land-based study area would potentially be exposed to high-intensity noise from launches at SLC-46. Birds occurring in the area would startle at the first indication of a noise event and would not be affected long term as most return to the area once the noise source is gone. The Florida scrub-jay occurs in the vicinity of launch facilities at CCSFS, and the potential exists for individuals to be affected by launch activities. Noise generated during land-based test launches under the Proposed Action Alternative was assessed using the noise model RUMBLE (version 3) with modeling parameters that are described in Appendix D, *Land-based Launch Propulsion Noise Study.* Scrub-jay detections and suitable habitat exists within the outer extent of the 120 dB L_{max}, the outer extent of the 110 dB L_{max}, and just beyond the 110 dB L_{max} as shown in Figure 5.2-1. Terrestrial species, including the scrub-jay present near the study area, are expected to flush from the launch area when noise, heat, and vibrations start prior to liftoff. This could remove individuals who are incubating eggs or foraging. Due to the presence of suitable habitat and detections of the Florida scrub-jay within areas that would be exposed to noise levels up to 120 dB L_{max}, with more detections beyond 1 NM of the launch site, it is possible the scrub-jay would flush from nests within their territory during launches and potentially abandon their territory for those birds occurring near SLC-46, resulting in loss of eggs/young in the nest.

Effects on the red knot, piping plover, Audubon's crested caracara, wood stork, and roseate tern would be less than significant. These species are not known to commonly nest within the ROI and would have the same startle response as other bird species and avoid SLC-46 during launches (USSF, 2023a).

Nesting critical habitat has been proposed for the green sea turtle and is designated for the loggerhead sea turtle North Atlantic DPS (88 *Federal Register* 46572) (79 *Federal Register* 39856). Green and loggerhead sea turtle nesting and hatchling emergence generally occurs at night. Under the Proposed Action, there would be test launches occurring during nighttime hours. Therefore, nesting adults and post-emergent hatchlings would potentially be adversely affected by launches under the Proposed Action if launches were conducted during sea turtle nesting season. Due to the low number of launches in a 5-year period, affects to nesting sea turtles and emergent hatchlings are expected to be low. In general, pre-flight activities, including final vehicle assembly and preflight checks would take place during daylight hours. However, any activities that take place after sundown could affect ESA-listed loggerhead, green, and leatherback sea turtles by artificial lighting. The Department of the Air Force has implemented a Sea Turtle Preservation Program at CCSFS to minimize effects on sea turtles, specifically to prevent artificial lighting from altering the behavior and movement of hatchling and adult sea turtles at night (USSF, 2023a). All activities conducted under the Proposed Action would be in accordance with this program and a USFWS-approved Light Management Plan would be in place for the prior to launch activities as needed. With a USFWS-approved Light Management Plan in place, the potential effects of lighting for launch activities at SLC-46 are covered under previous section 7 consultations with the USFWS.

Noise produced during launches at SLC-46 could cause behavioral reactions in sea turtles occurring in estuarine and marine waters adjacent to CCSFS, but effects would be limited to individuals at the surface. Generally, reptiles exposed to intermittent, high-amplitude noise exhibit multiple indicators signifying an elevated stress response and demonstrated altered foraging behavior (Kepas et al., 2023). Sea turtles could be exposed to noise during test launches while foraging, mating, or seeking refuge in the nearshore marine habitat. In-air noise from launch activities would have little impact on sea turtles under the water surface because noise from airborne sources do not transmit well under water (DON, 2017b). Designated and proposed critical habitat occurs for loggerhead and green sea turtles,

respectively, in estuarine waters adjacent to CCSFS (green sea turtle only), Atlantic Ocean nearshore waters adjacent to CCSFS, and areas over the continental shelf offshore of CCSFS. Launches at SLC-46 would not affect oceanic conditions that concentrate certain life stages of turtles, areas of unrestricted movement, or underwater refugia or food resources. Launches may occur at night and prior to the implementation of the Proposed Action; a USFWS-approved Light Management Plan would be developed to prevent artificial lighting from altering the behavior and movement of hatchling and adult sea turtles. Launches would not cause substantial noise levels in the estuarine or nearshore water column. Launch noise could potentially disrupt mating activity, but the effects would be temporary and not likely to affect reproduction. Proposed green sea turtle and designated loggerhead sea turtle critical habitats are 8 miles north of SLC 46 and would also not be affected by any stressors associated with the Proposed Action.

Noise and vibration created through launch activities can increase stress on the eastern indigo snake (Bogan et al., 2024). The increased stress can result in immunosuppression that can increase mortality of individuals (Van Waeyenberge et al., 2018). Direct strikes of sea turtle species and the eastern indigo snake from the land-based launch activities under the Proposed Action are not anticipated to occur. Additionally, eastern indigo snakes typically occur underground, within burrows away from the launch site. Vibrations from launch may affect gopher tortoise burrows that eastern indigo snakes may utilize.

Broadly, butterflies have poor hearing and hearing in butterflies is poorly studied. Sounds are sensed through veins in a butterfly's wings. Caterpillars sense sound through their setae and primarily respond to sudden noises. A study by Taylor and Yack (2019) found that monarch butterfly caterpillars responded to sound frequencies between 50 and 900 Hz and at a sound level beginning at 79 dB. They also found that monarch caterpillars can become habituated to sounds.

Pursuant to the ESA, the DON has concluded that the Proposed Action may affect, and is likely to adversely affect, the ESA-listed southeastern beach mouse, Florida scrub-jay, and eastern indigo snake. The Proposed Action may affect, but is not likely to adversely affect, the Florida manatee, tricolored bat, North Atlantic right whale, red knot, piping plover, Audubon's crested caracara, wood stork, eastern black rail, roseate tern, loggerhead sea turtle, green sea turtle, leatherback sea turtle, Kemp's ridley sea turtle, and monarch butterfly. Because there are no that would affect habitat, the Proposed Action would have no effect on designated critical habitat for the Florida manatee and loggerhead sea turtle as well as proposed designated critical habitat for the green sea turtle. There would be no effects to all other proposed/designated critical habitats as they do not occur in the Proposed Action ROI.

5.3 Hazardous Materials and Waste

5.3.1 Affected Environment

The DON has implemented a strict Hazardous Material Control and Management Program and a Hazardous Waste Minimization Program for all activities. These programs are governed DON-wide by applicable OPNAV instructions and at the installation by specific instructions issued by the Base Commander. The DON continuously monitors its operations to find ways to minimize the use of hazardous materials and to reduce the generation of hazardous wastes. For the land-based component of the Proposed Action Alternative, the ROI for hazardous materials and waste is the Atlantic BOA and the existing launch pad at CCSFS.

The affected environment for the Atlantic BOA is described in Section 4.3.1. As discussed in Section 1.5, all land-based launch preparations and operations including transportation, storage, and handling of

hazardous materials and wastes to or at naval installations for loading onto launch platforms (such as the existing launch pad at CCSFS) as part of military readiness activities have been previously analyzed within the various DON Fleet and range complex EIS/OEISs listed in Section 1.6. As such, these land-based actions are not discussed further in this analysis.

5.3.2 Environmental Consequences

5.3.2.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change associated with hazardous materials and wastes. Therefore, no significant effects would occur with implementation of the No Action Alternative.

5.3.2.2 Potential Effects of the Proposed Action

Under this alternative, inert weapon system test missiles would be launched from an existing launch pad at CCSFS, and all components would land within the Atlantic BOA (refer to Figure 2.4-1). Up to 10 land-based test launches total would occur during the 5-year period from CY 2032–2036. There would be no generation or disposal of industrial wastewater at SLC-46 from flight test activities. Any residual materials left behind at the SLC-46 launch site following the land-based launches would be containerized and removed in compliance with applicable regulatory requirements rather than being washed down. In addition, support vessels would adhere to all Uniform National Discharge Standards while operating in coastal and inland waters and would adhere to Navy Pollution Control Discharge Restrictions while operating in the BOAs. The Proposed Action would comply with the Coastal Zone Management Act and a Coastal Consistency Determination is included in Appendix A.

Similar to the sea-based testing under the Proposed Action Alternative, all weapon system component materials, including the motors, RBs, and the materials carried within components, would be introduced in deep ocean waters of the Atlantic BOA. The impacts from hazardous materials and wastes would be similar in nature to those described in Section 4.3.2. Under the Proposed Action Alternative there would be substantially fewer land-based launches than sea-based launches, and hazardous materials are not expected to be found in concentrations high enough to adversely affect the environmental quality in the Atlantic BOA. Therefore, no reasonably foreseeable significant adverse impacts to environmental quality would occur within the Atlantic BOA or at CCSFS from the proposed land-based testing.

5.4 Public Health and Safety

5.4.1 Affected Environment

For the land-based testing component of the Proposed Action Alternative, the ROI for public health and safety is within the Atlantic BOA (as discussed in Section 4.4.1) and the vicinity of the existing launch pad at CCSFS. With respect to human exposure to noise, the ROI includes areas on and near CCSFS and in the Atlantic BOA in which the proposed activities would be audible. On CCSFS, noise from rocket operations is a notable part of the acoustic environment. The 2008 *Environmental Assessment for Space Florida Launch Site Operator License at Launch Complex (SLC)-46*, which resulted in a Finding of No Significant Impact, analyzed potential noise effects associated with up to 24 rocket launches per year from SLC-46 (FAA, 2008). The 2008 EA analyzed launches of rockets, such as the Athena-2, with mass at launch as high as 264,000 pounds (Space Launch Now, 2025). Precautions are taken on CCSFS, in accordance with applicable laws and regulations, to ensure that people are not exposed to noise levels that could be

harmful to hearing. The closest off-installation noise-sensitive location to SLC-46 is the city of Cape Canaveral, which is more than 7 miles to the southwest.

Through the Naval Safety Command, the Navy promotes a proactive and comprehensive safety program designed to reduce, to the greatest extent possible, any potential adverse impacts on public health and safety from training and testing activities (Naval Safety Command, 2024). The Navy schedules training and testing activities to minimize conflicts with the use of sea space and airspace within ranges and throughout the study area to ensure the safety of Navy personnel, the public, commercial aircraft, commercial and recreational vessels, and military assets.

5.4.2 Environmental Consequences

5.4.2.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to public health and safety. Therefore, no significant effects would occur with the implementation of the No Action Alternative.

5.4.2.2 Potential Effects of the Proposed Action

Noise generated during land-based test launches under the Proposed Action Alternative was assessed using the noise model RUMBLE (version 3) with modeling parameters that are described in Appendix D, *Land-based Launch Propulsion Noise Study*. Under a highly conservative operational scenario in which all 10 proposed test launches occur within a single year and during the hours between 10:00 p.m. and 7:00 a.m. (when a decibel penalty is applied for increased intrusiveness), noise levels associated with the proposed test launches would remain well below 65 dBA DNL at off-installation locations. This finding indicates a low likelihood of annoyance in nearby communities, and no incompatible land use off-installation resulting from implementation of the Proposed Action. Maximum noise levels during individual test launches would not exceed OSHA hearing conservation criteria (115 dBA) or unweighted sound levels associated with a minimal risk of structural damage claims (111 dB) at off-installation locations (see Appendix D, Section D.D.6 for additional details). Noise levels generated by the proposed weapon system test launches would be lower than other launches previously assessed for noise impacts at SLC-46, as discussed above in Section 1.1.1. Weapon system test launches from CCSFS would generate sonic booms but the sonic boom should occur over the Atlantic Ocean and leave land-based receptors unaffected. In summary, noise levels at sensitive off-installation locations would be below levels associated with significant noise effects.

As discussed in Section 4.4.2, it is highly unlikely that weapon system components would be directly encountered by civilian boats and aircraft in the BOAs, because the Navy would coordinate with the FAA and USCG to issue NOTAMs and NOTMARs that would be in effect for several hours before and after each launch. Navy personnel would also verify that the ROI is clear of non-participants before initiating any activity that could be potentially hazardous to the public and flight test operations would be conducted in compliance with all federal, state, and local safety standards and requirements, including CCSFS safety requirements. Furthermore, test launches have been occurring at CCSFS and in the Atlantic BOA for decades without significant safety risks or impacts to the public.

The proposed test flights would not introduce new types of activities or environmental health and safety risks that would directly or indirectly affect the public. Therefore, the land-based testing component of the Proposed Action Alternative would not result in significant effects to public health and safety.

6 Cumulative Effects of the Proposed Action Alternative

This section assesses the potential cumulative effects of implementing the Proposed Action Alternative and includes: (1) a definition of cumulative effects, (2) an overview of past, present, and reasonably foreseeable future actions relevant to cumulative effects, (3) an analysis of the incremental interaction the Proposed Action may have with other actions, and (4) an evaluation of cumulative effects potentially resulting from these interactions.

6.1 Definition of Cumulative Effects

Cumulative effects are defined as the impact on the environment that results from the incremental effects of the Proposed 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. Cumulative effects can result from actions with individually minor but collectively significant effects taking place over a period of time.

To determine the scope of environmental impact analyses, agencies shall consider cumulative actions, which when viewed with other Proposed Actions have cumulatively significant effects and should therefore be discussed in the same impact analysis document.

Cumulative effects are most likely to arise when a relationship or synergism exists between a Proposed Action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping with or in close proximity to the Proposed Action would be expected to have more potential for a relationship than those more geographically separated. Similarly, relatively concurrent actions would tend to offer a higher potential for cumulative effects. To identify cumulative effects, the analysis needs to address the following three fundamental questions.

- Does a relationship exist such that affected resource areas of the Proposed Action might interact with the affected resource areas of past, present, or reasonably foreseeable actions?
- If one or more of the affected resource areas of the Proposed Action and another action could be expected to interact, would the proposed action affect or be affected by impacts of the other action?
- If such a relationship exists, then does an assessment reveal any potentially significant effects not identified when the Proposed Action is considered alone?

6.2 Scope of Cumulative Effects Analysis

The scope of the cumulative effects analysis involves both the geographic extent of the effects and the timeframe in which the effects could be expected to occur. For this EA/OEA, the study area delimits the geographic extent of the cumulative effects analysis. In general, the study area includes those areas previously identified in Chapter 3 for the respective resource areas. The timeframe for cumulative effects centers on the timing of the Proposed Action.

Another factor influencing the scope of cumulative effects analysis involves identifying other actions to consider. Beyond determining that the geographic scope and timeframe for the actions interrelate to the Proposed Action, the analysis employs the measure of “reasonably foreseeable” to include or exclude other actions. For the purposes of this analysis, public documents prepared by federal, state, and local government agencies form the primary sources of information regarding reasonably

foreseeable actions. Documents used to identify other actions include notices of intent for EISs and EAs, management plans, land use plans, and other planning-related studies.

6.3 Past, Present, and Reasonably Foreseeable Actions

This section focuses on past, present, and reasonably foreseeable future projects at and near the Proposed Action locale. In determining which projects to include in the cumulative effects analysis, a preliminary determination was made regarding the past, present, or reasonably foreseeable action. Specifically, using the first fundamental question included in Section 6.1, it was determined if a relationship exists such that the affected resource areas of the Proposed Action (included in this EA/OEA) might interact with the affected resource area of a past, present, or reasonably foreseeable action. If no such potential relationship exists, the project was not carried forward into the cumulative effects analysis. Actions considered but excluded from further cumulative effects analysis are not catalogued here as the intent is to focus the analysis on the meaningful actions relevant to informed decision-making. Projects included in this cumulative effects analysis are listed in Table 6.3-1.

Table 6.3-1 Cumulative Action Evaluation

Action	*Proponent*	*Location*	*Timeframe*	*Description*
Atlantic Fleet Training and Testing	DON	Atlantic BOA	Past, Present, and Future	Military readiness training and testing activities in the Atlantic Fleet Training and Testing study area located along the east coast of North America and in the Atlantic Ocean. Includes training and testing activities at Navy pier-side locations, within port transit channels, near select civilian ports, and in bays, harbors, and waterways. The DON has conducted these training and testing activities in the Atlantic BOA for decades and will continue in a similar manner into the foreseeable future. Activities include training with aircraft, vessels, and weapon systems, and the use of active sonar and explosives (DON, 2009a, 2009b, 2018b).
Wallops Flight Facility Operations	NASA	Atlantic BOA	Past, Present, and Future	As part of site-wide operations at Wallops Flight Facility, activities include booster and payload splashdown and recovery in the Atlantic BOA as part of orbital and suborbital rocket operations (NASA, 2009, 2018).
DON Conventional Prompt Strike Weapon System Flight Tests	DON	Atlantic BOA Pacific BOA	Future	The DON has prepared a Draft EA/OEA to evaluate the potential environmental impacts of the Proposed Action which consists of conducting Navy CPS weapon system flight tests in both Atlantic and Pacific BOAs. Testing would involve up to eight flight test launches per year from various sea-based launch locations conducted over a 10-year period. All flight tests would be at-sea flight tests launched from existing naval vessels operating in Pacific and Atlantic BOAs. The Draft EA/OEA released in May 2024 evaluates the potential effects to the human and natural environment from implementing the proposed CPS weapon system flight tests program (DON, 2024e).
Falcon Launches	SpaceX and FAA	Atlantic BOA Pacific BOA	Past, Present, and Future	Launch and reentry of SpaceX vehicles from Florida and waterborne landing and recovery operations in the Atlantic and Pacific Oceans (FAA, 2019, 2020).
Flight Campaign	DON and U.S. Army	Atlantic BOA Pacific BOA	Present and Future (through 2032)	Experimental flight tests for hypersonic weapons conducted from land-based launch sites in Hawaii, Virginia, California, and Florida with payload impact in the Pacific and Atlantic Oceans. Atlantic BOA activities include booster splashdown, payload impact, and vessel activity (DON and U.S. Army, 2022).
Launch of NASA Routine Payloads	NASA	Atlantic BOA Pacific BOA Kwajalein Atoll	Past, Present, and Future	Launch of NASA routine payloads with expendable launch vehicles from launch facilities in Florida, California, Virginia, Alaska, and Kwajalein Atoll with flight and potential component splashdown in the Atlantic and Pacific Oceans (NASA, 2011).
Hawaii-California Training and Testing	DON	Pacific BOA	Past, Present, and Future	Military readiness training and testing activities in the Hawaii- California Training and Testing study area in the central and eastern North Pacific. These training and testing activities have occurred in the Pacific BOA for decades and will continue in a similar manner into the foreseeable future. Activities include aircraft and vessel operations, missile and munitions testing, and use of active sonar and explosives (DON, 2018a).

Action	*Proponent*	*Location*	*Timeframe*	*Description*
Mariana Islands Training and Testing	DON	Pacific BOA	Past, Present, and Future	Ongoing and future training and testing activities conducted at sea in the Mariana Islands Training and Testing study area to ensure military readiness. Activities include air, amphibious, anti-submarine, electronic, expeditionary, mine, strike, and surface warfare training and testing. Activities involve the use or operation of vessels, aircraft, munitions, sonar, and explosives (DON, 2015b, 2020b).
Northwest Training and Testing	DON	Pacific BOA	Past, Present, and Future	Training and testing activities in the Northwest Training and Testing study area off the west coast of the U.S., including offshore waters of the Pacific Ocean. Training and testing activities have occurred in this area for decades and will continue in a similar manner into the foreseeable future for the purpose of military readiness. Activities in the offshore area include aircraft and vessel operation, use of ordnance and munitions, and the use of sonar and explosives (DON, 2015a, 2020a).
Point Mugu Sea Range Training and Testing	DON	Pacific BOA	Past, Present, and Future	Continuing military readiness activities at Point Mugu Sea Range in a manner similar to the training and testing the Navy has conducted there for decades. Activities at the fully instrumented Sea Range include a wide range of weapon systems research, testing, and evaluation activities, including hypersonic vehicle test programs, as well as fleet training and testing (DON, 2002).
Missile Defense Systems Flight Tests	Missile Defense Agency	Pacific BOA	Past, Present, and Future (through 2027)	Ongoing intercept flight tests of missile defense systems in the Pacific including in the Gulf of Alaska. Activities in the Pacific BOA involve vessel operation, target and interceptor flight, and splashdown of intercept debris in the ocean (MDA, 2021).
U.S. Space Force – Space Systems Command Flight Tests	USSF	Pacific BOA	Present and Future	Two flight test demonstrations from Wake Island to a deep-water RTS site near Gagan Islet, Kwajalein Atoll (USSF, 2022).
Minuteman III Flight Testing	U.S. Air Force	Pacific BOA Kwajalein Atoll	Past, Present, and Future (through 2030)	Minuteman III intercontinental ballistic missile flight testing from Vandenberg Space Force Base, California to locations in the Pacific BOA and at Kwajalein Atoll. Past testing included reentry vehicle land impacts at Illeginni Islet. Current and future testing involves only deep-water terminal impact sites at Kwajalein Atoll and in the Pacific BOA. Involves booster splashdown and vessel activity in the Pacific BOA (U.S. Air Force, 2004, 2013, 2020a).

Action	*Proponent*	*Location*	*Timeframe*	*Description*
Sentinel Flight Testing	U.S. Air Force	Pacific BOA Kwajalein Atoll	Future (2024-2030)	Implementation of the Sentinel Program (previously known as the Ground Based Strategic Deterrent Program), which is meant to replace the aging Minuteman III system, would require flight testing of the missile system. The test program would involve launches from Vandenberg Space Force Base; flight over, booster splashdown in, and reentry vehicle impact in the Pacific Ocean; and reentry vehicle impact at land or deep-water locations in Kwajalein Atoll. Up to nine flight tests per year would be conducted with a portion of these terminating at Kwajalein Atoll, including up to three total land impacts at Illeginni Islet (U.S. Air Force, 2021).
Advanced Hypersonic Weapon System Flight Testing	U.S. Army	Pacific BOA Kwajalein Atoll	Past	DoD testing of advanced hypersonic weapons for conventional prompt strike capabilities. Activities include splashdown of three vehicle stages in the Pacific BOA as well as payload impact on land at Illeginni Islet or in the deep ocean waters of Kwajalein Atoll (USASMDC, 2011, 2014).
Flight Experiment 1 and Flight Experiment 2	DON	Pacific BOA Kwajalein Atoll	Past	Launch of a developmental payload from a land-based launch site at Kauai Test Facility at Pacific Missile Range Facility, Hawaii with payload impact at Illeginni Islet or deep-water impact zones within Kwajalein Atoll in the RMI. Activities in the Pacific BOA included vehicle overflight, booster splashdown, and vessel activity (DON, 2017c, 2019b).
Air-Launched Rapid Response Weapon Flight Testing	U.S. Air Force	Pacific BOA Kwajalein Atoll (Illeginni Islet)	Past	Flight testing of a developmental air-launched weapon system with flight and booster splashdown in the Pacific BOA and payload impact at Illeginni Islet at Kwajalein Atoll (U.S. Air Force, 2020b).
Hypersonic Flight Test 3	U.S. Army	Pacific BOA Kwajalein Atoll	Past	Flight test of a launch vehicle and payload system launched from Kodiak Island, Alaska with flight and booster splashdown in the Pacific BOA and payload impact at deep-water or Illeginni Islet land impact sites at Kwajalein Atoll (U.S. Army, 2021).
Reconstitution and Enhancement of the Space Launch 20 Complex, CCSFS	USSF	CCSFS	Present, and Future	EA for the Reconstitution and Enhancement of the Space Launch Complex 20 Multi-User Launch Operations at Cape Canaveral Air Force Station, Florida. The Final EA was completed in 2020 (U.S. Air Force, 2020c).
Starship/Super Heavy Operations (SpaceX) at KSC	NASA/SpaceX	KSC	Future	Construction of a new launch complex to support Starship/Super Heavy launch operations to provide redundancy and capacity and allow SpaceX to increase the flight rate of Starship and minimize potential disruptions to Falcon, Falcon Heavy, and Dragon missions at SLC-39A.
Starship/Super Heavy Operations (SpaceX) at CCSFS	DAF/SpaceX	CCSFS	Future	EIS for proposed reconstruction of the existing SLC-37 infrastructure to support up to 76 Starship/Super Heavy launches and landings annually. An alternative to the proposed action would be construction of a new SLC-50 to support the same number of launches/landings in an area that is currently undeveloped.

Action	*Proponent*	*Location*	*Timeframe*	*Description*
Blue Origin Orbital Launch Site at CCSFS	DAF	CCSFS	Past, present, and future	Construction and operation of a commercial launch site at the combined areas of Launch Complexes 11 and 36 at CCSFS, a long-term lease for use of the launch site, engine testing, and up to 12 launches per year (beginning in 2018) of a liquid-fueled heavy-lift class orbital vehicle, with landing and recovery of the vehicle on an at-sea platform in the Atlantic Ocean.
Launches and Landings, CCSFS	USSF	CCSFS and KSC	Past, present, and future	Past actions include launches and landings of NASA operations and non-NASA operations. These include Shuttle, Delta IV, Atlas V, Falcon 9, Falcon Heavy, and U.S. Air Force-sponsored military and commercial rocket launches. Estimated actions include 1 Delta IV launch, 21 Terrain 1 launches, 17 Atlas V/Vulcan launches, 215 Falcon 9 and Falcon Heavy launches, and 30 Blue Origin launches, totaling 284 planned launches between 2020 and 2023 (DON and U.S. Army, 2022). Additionally, the EA for Stoke's Nova Launch Program at CCSFS includes a breakdown of approved past, present, and planned future launch actions at CCSFS and KSC (Stoke Space Technologies, 2024). According to the EA there were a total of 226 launches between 2018 and 2023 and a total of 645 planned launches between 2024 and 2028 (Stoke Space Technologies, 2024).
Infrastructure improvements, CCSFS	USSF	CCSFS	Present and Future	Infrastructure improvements to enable USSF to meet DoD and tenant mission requirements by improving, modernizing, and expanding the infrastructure at CCSFS. Infrastructure improvements are necessary to successfully implement the Eastern Range mission, including an increased launch cadence, in a safe and efficient manner. The Final EA to identify and evaluate the potential effects on the natural and human environment associated with proposed infrastructure improvements at CCSFS, Florida was completed in 2023 (USSF, 2023b).
Engineering Test Facility	DON	CCSFS	Future	Includes construction of a weapon system support equipment laboratory and systems integration laboratory in support of research, development, test and evaluation of equipment and techniques for the launching, recovery, maintenance, transport and testing of missiles and guided missile support equipment. An EA for this project is currently in process (DON, 2024f).
Cape Canaveral Railhead	DON	KSC	Future	Includes up to 2,135 square-feet of facility construction for a Ballistic Missile Processing Facility and Motor Transfer Facility to receive and ship motors and components and inert missiles. An EA for the Cape Railhead project is currently in process (DON, 2024g).

Legend: CCSFS = Cape Canaveral Space Force Station; CPS = Conventional Prompt Strike; DoD = Department of Defense; DON = Department of the Navy; EA = Environmental Assessment; FAA = Federal Aviation Administration; KSC = Kennedy Space Center; MDA = Missile Defense Agency; NASA = National Aeronautics and Space Administration; OEA = Overseas Environmental Assessment; RMI = Republic of the Marshall Islands; RTS = Regional Training Site; U.S. = United States; USASMDC = United States Army Space and Missile Defense Command; USSF = United States Space Force

6.4 Cumulative Effects Analysis for the Proposed Action Alternative

Where feasible, the cumulative effects were assessed using quantifiable data; however, for many of the resources included for analysis, quantifiable data are not available and a qualitative analysis was undertaken. In addition, where an analysis of potential environmental effects for future actions has not been completed, assumptions were made regarding cumulative effects related to this EA/OEA where possible. The analytical methodology presented in Chapter 3, which was used to determine potential effects to the resources analyzed in this document, was also used to determine cumulative effects.

6.4.1 Air Quality

6.4.1.1 Description of Geographic Study Area

The ROIs for assessing cumulative air quality effects in the BOAs include criteria pollutants within the lowest levels of the atmosphere within the BOAs (the focus of which is the lowest 3,000 feet of the atmosphere, as discussed in Section 4.1), and criteria pollutants within Brevard County (for land-based test launches). The ROI for the cumulative analysis of GHG emissions is worldwide. These global effects would be manifested as effects to resources and ecosystems within the BOAs.

6.4.1.2 Relevant Past, Present, and Future Actions

Section 4.1 and Section 5.1 describe the existing air quality conditions in the project areas for sea-based and land-based components of the Proposed Action Alternative (respectively), which reflect the aggregate effects of past and present actions within the BOAs and global environment. Air quality effects combined from past, present, and future cumulative projects (including those identified in Table 6.3-1) to the BOAs and global environment would include the following:

- Criteria pollutant levels in BOAs would continue at low ambient levels and well below any NAAQS.
- Brevard County would continue to comply with the NAAQS, due to adherence to state and federal plans enacted to achieve and to maintain these standards.
- Continued compliance by most nations with the 1987 Montreal Protocol and its amendments would gradually increase ozone concentrations within the stratosphere. The ozone layer is predicted to recover to near its pre-1980 levels by the middle of the 21st century (EPA, 2024).
- Criteria pollutant levels in BOAs would continue at low ambient levels and well below any NAAQS.
- Brevard County would continue to comply with the NAAQS, due to adherence to state and federal plans enacted to achieve and to maintain these standards.
- GHG emissions could continue to accumulate in the atmosphere, changing its ability to retain heat.

6.4.1.3 Cumulative Effects Analysis

Cumulative air quality effects from the Proposed Action Alternative are based on the increase in emissions that would occur from the action, in combination with emissions from cumulative projects including missile training and testing activities in both BOAs, associated aircraft and vessel operations, weapons system and munitions testing, use of ordnance and munitions, and the use of sonar and explosives as well as the launching of test missiles, commercial rockets, and DoD rockets from CCSFS. The following analyses considered the cumulative effects of these emissions regarding (1) criteria pollutant concentrations within the lowest levels of the atmosphere in each BOA (the focus of which is

the lowest 3,000 feet of the atmosphere, as discussed in Section 4.1, (2) criteria pollutant concentrations in Brevard County, and (3) GHGs.

Criteria Pollutants

The analysis in Section 4.1.2 for proposed sea-based testing and Section 5.1.2 for land-based tests concluded that criteria pollutant emissions from the proposed weapon system launches within the BOA ROIs along with emissions generated from support vessel transits would result in low ambient pollutant concentrations. Nominal sources of air emissions from future cumulative projects would continue to produce low air pollutant concentrations within these expansive regions and at locations likely far removed in time and location from Proposed Action Alternative test launches. As a result, emissions from the Proposed Action Alternative test flights in the BOAs, combined with emissions from past, present, and reasonably foreseeable future projects, would result in low ambient pollutant concentrations that would not approach levels associated with any NAAQS. In addition, any launch emissions transported from a BOA to an onshore region at least 50 NM away would not measurably affect criteria pollutant concentrations or the NAAQS attainment status of such regions. Therefore, cumulative air quality effects from the alternative within the BOA ROIs would be less than significant.

The analysis in Section 4.1.2 concluded that vessel transits from San Diego Bay would result in *de minimis* emissions of criteria pollutants and is therefore presumed to conform to the State Implementation Plan. Because it conforms to the State Implementation Plan, which sets standards for and assesses trends of emissions, it is not anticipated that the emissions from the Sea-based Alternative combined with other sources would result in significant effects to air quality.

The analysis in Section 5.1.2 concluded that criteria pollutant emissions from the proposed weapon system launches within Brevard County would not contribute to an exceedance of a NAAQS. Contributions from cumulative sources to localized project impacts would be limited by the geographical and temporal separation of the cumulative projects. Transport of these emissions to the locality surrounding the project site at CCSFS would result in ambient impacts below levels of concern, as demonstrated by the attainment status of all NAAQS within Brevard County. As a result, emissions from terrestrial launches under the Proposed Action Alternative, in combination with emissions from cumulative projects, would not contribute to an exceedance of a NAAQS. Therefore, cumulative air quality effects from the Proposed Action Alternative within Brevard County would not be significant.

Greenhouse Gases

Data presented in Section 4.1.2 depicted the annual CO_2 emissions associated with the weapon system launches proposed under the sea-based component of the Proposed Action Alternative. As noted in Section 5.1.2, the GHG emissions from the land-based component would be lower than those described for the sea-based testing. In total, for all years and launches, the Proposed Action Alternative would result in GHGs equivalent to 4,961.96 metric tons of CO_2. To put that in perspective, it is the same amount of GHGs resulting from the annual electricity use of 1,034 homes (EPA, 2025). The amounts of GHG emissions from the Proposed Action Alternative along with those of the identified cumulative actions would incrementally contribute to total GHG concentrations in the atmosphere and would overall represent a negligible fraction of worldwide GHG emissions, which in 2022 exceeded 57.4 gigatons of CO_2 equivalent (United Nations Environment Programme, 2023).

6.4.2 Biological Resources

6.4.2.1 Description of Geographic Study Area

The ROI for biological resource impacts includes the BOAs in the Atlantic and Pacific and the immediate vicinity of CCSFS. These include missile training and testing activities in both BOAs, associated vessel operations, weapons system and munitions testing, use of ordnance and munitions, and the use of sonar and explosives as well as the launching of test missiles, commercial rockets, and DoD rockets from CCSFS.

6.4.2.2 Relevant Past, Present, and Future Actions

Relevant actions include those listed in Table 6.3-1 that expend materials into the Atlantic and Pacific BOAs and that occur at CCSFS. These include missile training and testing activities in both BOAs, associated aircraft and vessel operations, weapons system and munitions testing, use of ordnance and munitions, and the use of sonar and explosives. The launching of test missiles, commercial rockets, and DoD rockets from CCSFS would be relevant.

6.4.2.3 Cumulative Effects Analysis

For sea-based testing the potential for impacts from noise or direct contact from weapon systems boosters or other system components is extremely low given the size of the area, the size of system components, and the low densities of marine species in the BOA. The relevant cumulative actions have similar effects in the BOA. Due to the amount, tempo, and diverse launch and landing areas of the Proposed Action Alternative sea-based testing, the possibility of Proposed Action and relevant action effects overlapping in time and space and having a cumulative effect is not plausible. Therefore, the sea-based component of the Proposed Action Alternative would not result in significant cumulative effects to biological resources.

The (up to) 10 land-based test launches during the 5-year period from CY 2032–2036 would represent a small fraction of overall launches and tests from CCSFS and Kennedy Space Center during that time. Future annual launches at Kennedy Space Center may reach 300 and launches at CCSFS are projected to increase substantially as well. While the Proposed Action Alternative launches represent a negligible contribution to overall launches, and result in relatively minor effects per launch (when compared to other rockets proposed for launching at CCSFS and Kennedy Space Center, for example SpaceX's Starship-Super Heavy future annual proposed flight cadence is 76 at CCSFS and 44 at Kennedy Space Center, and at up to 492 feet tall, this rocket is 11 times taller than a Trident II), identified projects along with the Proposed Action Alternative and would nominally result in increases in the frequency that wildlife would be exposed to noise, heat, emissions, and vibrations. Some species may habituate to these disturbances whereas others may exhibit behavioral and/or stress responses. Repeated launches/tests at the same locations may cause area avoidance by some species. Activities affecting biological resources would be conducted in accordance with the CCSFS *Integrated Natural Resources Management Plan* (USSF, 2023a).

All launches/tests would undergo consultation and coordination with the USFWS and NMFS pursuant to the ESA and MMPA as necessary. The Proposed Action combined with past, present, and reasonably foreseeable actions would not likely jeopardize the existence of any ESA-listed species. Mitigation measures would be developed during consultation with the USFWS or NMFS on a project-by-project basis that would minimize potential future impacts. These would include monitoring of special status species as well as the continuance of special status species management, protection, and education

plans. Therefore, implementation of the land-based launch component of the Proposed Action Alternative in conjunction with other cumulative actions, would result in cumulative effects to biological resources; however, effects would be less than significant.

6.4.3 Hazardous Materials and Waste Management

6.4.3.1 Description of Geographic Study Area

The ROI for cumulative effects is the Pacific and Atlantic BOAs and CCSFS. Cumulative effects on hazardous materials and waste from military expended materials have occurred due to past actions in the ROI. Pollution and marine debris from anthropogenic sources are widespread in the world's oceans and have been adversely impacting marine ecosystems and human health (NOAA, 2024c). In general, there is less marine pollution and debris in deep offshore ocean areas than in nearshore coastal locations, but effects from past federal, state, public, and commercial activities have still occurred in the ROI.

6.4.3.2 Relevant Past, Present, and Future Actions

The past, present, or reasonably foreseeable actions that could add to the cumulative effects to hazardous materials and waste are included in Table 6.3-1.

6.4.3.3 Cumulative Effects Analysis

When considered alone, the Proposed Action military expended materials would have negligible to minor impact on hazardous materials and waste management in the ROI. Any contributions to cumulative effects in the ROI would be negligible additive effects and no interactive effects have been identified. Based on the relatively small amount of military expended materials involved with proposed activities, the Proposed Action would have a negligible contribution to cumulative effects to hazardous materials and waste management in the ROI. Therefore, implementation of the Proposed Action combined with the past, present, and reasonably foreseeable future projects, would not result in significant effects within the ROI.

6.4.4 Public Health and Safety

6.4.4.1 Description of Geographic Study Area

The geographic study areas for evaluating cumulative effects from TRIDENT II (D5) weapon systems test flights, as well as other relevant past, present, and future activities, are the Atlantic and Pacific BOAs and CCSFS. At CCSFS, the study area includes the missile launch pad and associated launch facilities.

6.4.4.2 Relevant Past, Present, and Future Actions

Missile training and testing activities have been conducted in both BOAs for decades and will continue in a similar manner into the foreseeable future. Such activities may include aircraft and vessel operations, weapon system and munitions testing, use of ordnance and munitions, and the use of sonar and explosives. The launching of test missiles, commercial rockets, and DoD rockets from CCSFS would also continue as part of the mission of CCSFS. Several DoD branches would continue to launch missiles that are similar in size to the TRIDENT II (D5) weapon systems and would have similar effects. Some military and commercial launches may include missiles that are larger in size and have more substantial environmental effects than the TRIDENT II (D5) weapon systems.

6.4.4.3 Cumulative Effects Analysis

The proposed sea-based testing activities in the Atlantic and Pacific BOAs would include six test flights per year during CYs 2025–2028. In CYs 2029–2039 there would be an additional two flight tests per year for an annual total of eight tests. All proposed testing activities would be conducted using existing naval vessels and would operate in accordance with established DON safety procedures to protect personnel and the public. At CCSFS, missile launches and test events have been occurring for decades and all safety procedures would continue to be followed to ensure the safety of members of the public.

Because the area in which the Proposed Action and other actions in the Atlantic and Pacific BOAs would take place is very large, the likelihood that the same location would be affected by noise associated with both the Proposed Action Alternative and another action is very low. Furthermore, as noted in Section 4.4.2.2, human exposure to noise in the Atlantic and Pacific BOAs is not reasonably foreseeable because the areas near launch and impact locations would be cleared of non-participants prior to missile tests and NOTAMs and NOTMARs would be issued in advance of all propose tests.

Regarding proposed land-based test launches from CCSFS, as stated in Section 5.4.2.2, elevated time-averaged noise levels associated with the Proposed Action, which includes 10 launches over a 5-year period, would affect only areas within the boundaries of CCSFS. As noted in Section 3.4.1, adding two noise sources that differ by more than 10 dB results in only a minimal change in the overall noise level. At the closest noise-sensitive location to SLC-46 (i.e., the city of Cape Canaveral located more than 7 miles away), the DNL associated with the proposed test launches would be sufficiently low that it would not contribute measurably to overall noise levels exceeding 65 dBA DNL when combined with noise generated by other past, present, and reasonably foreseeable actions.

For the reasons listed above, the Proposed Action Alternative combined with the identified past, present, and reasonably foreseeable future projects, would not result in significant impacts related to public health and safety within the ROI.

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7 Other Considerations Required by NEPA

7.1 Consistency with Other Federal, State, and Local Laws, Plans, Policies, and Regulations

In accordance with NEPA and DON's procedures/regulations implementing NEPA, analysis of environmental consequences shall include discussion of possible conflicts between the Proposed Action and the objectives of federal, regional, state, and local land use plans, policies, and controls. Table 7.1-1 identifies the principal federal and state laws and regulations that are applicable to the Proposed Action and describes briefly how compliance with these laws and regulations would be accomplished.

Table 7.1-1 Principal Federal and State Laws Applicable to the Proposed Action

Federal, State, Local, and Regional Land Use Plans, Policies, and Controls	*Status of Compliance*
National Environmental Policy Act (NEPA); Navy procedures for Implementing NEPA	Compliant
Clean Air Act	Compliant
Clean Water Act	Compliant
Rivers and Harbors Act	Compliant
Coastal Zone Management Act	Compliant
National Historic Preservation Act	Compliant
Endangered Species Act	Compliant
Magnuson-Stevens Fishery Conservation and Management Reauthorization Act	Compliant
Marine Mammal Protection Act	Compliant
Migratory Bird Treaty Act	Compliant
Bald and Golden Eagle Protection Act	Compliant
Comprehensive Environmental Response, Compensation, and Liability Act	Compliant
Emergency Planning and Community Right-to-Know Act	Compliant
Resource Conservation and Recovery Act	Compliant
Toxic Substances Control Act	Compliant
Executive Order 12088, Federal Compliance with Pollution Control Standards	Compliant
Executive Order 12114, Environmental Effects Abroad of Major Federal Actions (Department of Navy implementing regulation 32 C.F.R. part 287)	Compliant
Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks	Compliant
Executive Order 13089, Coral Reef Protection	Compliant
Executive Order 13175, Consultation and Coordination with Indian Tribal Government	Compliant

7.2 Relationship between Short-Term Use of the Environment and Long-Term Productivity

NEPA requires an analysis of the relationship between a project's short-term impacts on the environment and the effects that these impacts may have on the maintenance and enhancement of the long-term productivity of the affected environment. Impacts that narrow the range of beneficial uses of the environment are of particular concern. This refers to the possibility that choosing one development site reduces future flexibility in pursuing other options, or that using a parcel of land or other resources often eliminates the possibility of other uses at that site.

In the short-term, effects to the human environment with implementation of the Proposed Action would primarily relate to the weapon system test deployment. Air quality would be negligibly impacted in the short term. The Proposed Action would not significantly impact the long-term natural resource productivity of the BOAs and would not result in any impacts that would significantly reduce environmental productivity or permanently narrow the range of beneficial uses of the environment.

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10 Distribution List

To be provided in the Final EA/OEA

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Appendix A
Coastal Consistency Determination

To be provided in the Final EA/OEA

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Appendix B
Public and Agency Participation

To be provided in the Final EA/OEA

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Appendix C
Record of Non-Applicability (RONA) for Clean Air Act Conformity and Calculations

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C.1 General Conformity Rule - Record of Non-Applicability (RONA) for Clean Air Act Conformity

Environmental Assessment (EA)/Overseas Environmental Assessment (OEA) for the Trident II D5LE/LE2 Weapon System Testing Program

Designation:	**Environmental Assessment**
Title of Proposed Action:	Environmental Assessment (EA)/Overseas Environmental Assessment (OEA) for the Trident II D5LE/LE2 Weapon System Testing Program
Lead Agency and Action Proponent for the EA/OEA:	Department of the Navy
Cooperating Agency:	United States Space Force
Affected Region:	Pacific and Atlantic Fleets Broad Ocean Areas and Land-based Launch from the Naval Ordnance Test Unit at Cape Canaveral Space Force Station (CCSFS), Florida
Point of Contact:	Environmental Program Manager/SP2521 Strategic Systems Programs 1250 10th Street SE, Bldg 200, Suite 3600 Washington Navy Yard, DC 20374-5127

Proposed Action and Emissions Summary:

The Clean Air Act requires federal actions in air pollutant nonattainment or maintenance areas to conform to the applicable State Implementation Plan. The State Implementation Plan is designed to achieve or maintain an attainment designation of air pollutants as defined by the National Ambient Air Quality Standards (NAAQS). The regulations governing this requirement are found in 40 Code of Federal Regulations part 93, also known as the "General Conformity Rule," which applies to federal actions occurring in regions designated as nonattainment or areas subject to maintenance plans. Emission (*de minimis*) thresholds have been established for actions with the potential to have significant air quality impacts. A project/action in an area designated as nonattainment/maintenance and exceeding the *de minimis* thresholds must have a general conformity determination prepared to address significant impacts.

Because vessels operating on the West Coast for the Proposed Action would originate from San Diego Harbor, the conformity regulation applies to emissions occurring within California state waters (within 3 nautical miles of the coast), which are part of the San Diego Air Basin. This region is designated as a severe nonattainment area for ozone (VOCs and NO_x as precursors).

Air Emissions Summary

Based on the maximum annual project emissions estimates identified in Table 1 below, a general conformity determination is not required, because the maximum annual direct and indirect emissions for the Environmental Assessment Proposed Action are well below the *de minimis* thresholds.

Supporting documentation and emissions estimates can be found in the Environmental Assessment in Section 3.4, *Air Quality*.

Table 1 Summary of Maximum Annual Air Pollutant Emissions Compared to the Applicable Conformity *de minimis* Thresholds – Proposed Action

Proposed Action Sea-Based Launches	***Annual Emissions (tons/year)***	
	VOCs	***NO_x***
2025 – 2028 - six tests per year	0.15	8.59
2029 – 2039 - eight tests per year	0.20	11.45
Conformity *de minimis* Thresholds	25	25

Notes: NO_x = nitrogen oxides; VOC = volatile organic compound

Date RONA Prepared: March 14, 2025

RONA Prepared by: Allison Williams - Leidos

RONA Approval:

_____

Signature Date

C.2 RONA Calculations

This section presents an export of results directly from the air quality modeling software for support vessel transits, retaining the organizational headings, text, and table formatting produced by the software. Data generated by DON and Military Sealift Command Marine Engine Fuel Consumption and Emission Calculator.

Each launch is supported by a fleet of up to four vessels, which, for modeling purposes, are represented by the USNS Waters (T-AGS-45) and three Pathfinder-class survey ships (T-AGS-60). For Pacific Broad Ocean Area (BOA) launches, these vessels would originate from the San Diego Bay area and would operate within the Pacific BOA launch zone, with each mission lasting up to 24 hours. Emission factors for these vessels were derived using the Marine Engine Fuel Consumption and Emissions Calculator, considering different engine types and operational modes. These factors were applied to estimate emissions for each vessel during the specified operational periods.

Hourly Emissions Rates for Vessel Engines (kg/hr)						
	Emissions - Kilograms per Hour					
Vessel	NO_x	CO	SO_x	PM	HC	CO_2
USNS Waters (T-AGS 45) Vessel - Underway	90.3	1.8	0.0	0.2	1.3	3,094
USNS Waters (T-AGS 45) Vessel - Restricted Waters	54.2	1.0	0.0	0.1	0.8	1,822
Pathfinder-Class Survey Ships (T-AGS 60) Vessel - Underway	98.3	5.4	0.0	0.3	1.7	3,854
Pathfinder-Class Survey Ships (T-AGS 60) Vessel - Restricted Waters	26.1	0.6	0.0	0.1	0.5	951

USNS Waters (T-AGS 45) Vessel Emissions by ROI (Pounds/Launch)						
	NO_x	CO	SO_x	PM	VOC	CO_2
Within 3 nm (Restricted Waters) - T-AGS 45	477.1	8.68	0.14	1.25	6.79	16,030
Within 3 nm (Underway) - T-AGS 45	397.34	8.04	0.12	1.07	5.80	13,614
Beyond 3 nm (Underway) - T-AGS 45	3,576.1	72.35	1.11	9.66	52.19	122,524

Pathfinder-Class Survey Ships (T-AGS 60) Vessel Emissions by ROI (Pounds/Launch)						
	NO_x	CO	SO_x	PM	VOC	CO_2
Within 3 nm (Restricted Waters) - T-AGS 60	689.8	16.8	0.21	1.87	13.89	25,106
Within 3 nm (Underway) - T-AGS 60	1,297.6	71.7	0.45	3.87	22.56	50,871
Beyond 3 nm (Underway) - T-AGS 60	11,678.5	645.3	4.04	34.81	203.0	457,839

Total Vessel Emissions by ROI (Pounds/Launch)						
	NO_x	CO	SO_x	PM	VOC	CO_2
Within 3 nm (Restricted Waters)	1,166.9	25.5	0.4	3.12	20.7	41,136
Within 3 nm (Underway)	1,695.0	79.7	0.6	4.94	28.4	64,485
Total - Within 3 nm	2,861.9	105.2	0.9	8.07	49.0	105,621
Total Beyond 3 nm (Underway)	15,254.6	717.7	5.1	44.5	255.2	580,362

Annual Vessel Emissions for Round-Trip Tests (lbs) (2025-2039)						
Years	NO_x	CO	SO_x	PM	VOC	CO_2
2025-2028 (6 tests per year) - Within 3 nm	17,171	631	6	48	294	633,726
2025-2028 (6 tests per year) - Beyond 3 nm	91,528	4,306	31	267	1,531	3,482,174
2029-2039 (8 tests per year) - Within 3 nm	22,895	842	7	65	392	844,968
2029-2039 (8 tests per year) - Beyond 3 nm	122,037	5,741	41	356	2,042	4,642,899

1. Annual emissions are based on the number of round trip tests conducted per year, with six tests per year from 2025 to 2028 and eight tests per year from 2029 to 2039. Two annual emissions scenarios are provided to reflect these test frequencies.
2. Total emissions per round trip were calculated using emission factors generated by the Navy and MSC Marine Engine Fuel Consumption and Emissions Calculator. Emission factors were applied to each vessel engine type, and emissions were calculated for three operational modes: Restricted Waters within 3 NM (4 hours), Underway within 3 NM (2 hours), and Underway beyond 3 NM (18 hours). The emissions for each mode were summed to obtain total emissions per round trip.
3. Annual emissions were then calculated by multiplying the total emissions per trip by the number of tests per year (6 or 8). This calculation was performed for each pollutant.

Annual Conformity-Related Emissions for the Proposed Action (tpy)		
Years	VOCs	NO_x
2025 - 2028	0.15	8.59
2029 - 2039	0.20	11.45

Estimated Annual Air Pollutant Emissions Under the Proposed Action							
Years	Air Pollutant Emissions (tpy)						
	NO_x	CO	SO_x	$PM_{2.5}$	PM_{10}	VOC	CO_2
2025 - 2028 Vessel Within 3nm	8.59	0.32	0.00	0.02	0.02	0.15	316.86
Total 2025-2028 Within 3nm	**8.59**	**0.32**	**0.00**	**0.02**	**0.02**	**0.15**	**316.86**
2025 - 2028 Launch Emissions	1.96	0.04	0.00	15.43	22.03	0.00	224.86
2025 - 2028 Vessel Beyond 3nm	45.76	2.15	0.02	0.12	0.13	0.77	1,741.09
Total 2025-2028	**47.72**	**2.19**	**0.02**	**15.55**	**22.16**	**0.77**	**1,965.95**
2029 - 2039 Vessel Within 3nm	11.45	0.42	0.00	0.03	0.03	0.20	422.48
Total 2029 - 2039 Vessel Within 3nm	**11.45**	**0.42**	**0.00**	**0.03**	**0.03**	**0.20**	**422.48**
2029 - 2039 Launch Emission	2.62	0.06	0.00	20.57	29.37	0.00	299.81
2029 - 2039 Vessel Beyond 3nm	61.02	2.87	0.02	0.16	0.18	1.02	2,321.45
2029 - 2039 Total	**63.64**	**2.93**	**0.02**	**20.73**	**29.55**	**1.02**	**2,621.26**

Notes:
• CO = carbon monoxide; NOX = nitrogen oxides; SOX = sulfur oxides; PM_{10} and $PM_{2.5}$ = particulate matter with a diameter of less than or equal to 10 microns and 2.5 microns, respectively; VOC = volatile organic compounds; CO_2 = carbon dioxide.

U.S. Navy Vessel Emission Data

Generated on 03/10/2025 at 11:41:56 AM

by Navy and MSC Marine Engine Fuel Consumption and Emission Calculator

Vessel Set Totals

	kg NOx	kg SOx	kg CO	kg CO2	kg HC	kg PM
All Ships Total	124,432	42	6,068	4,804,863	2,235	364

	kg NOx	kg SOx	kg CO	kg CO2	kg HC	kg PM
All Crafts Total	0	0	0	0	0	0

	kg NOx	kg SOx	kg CO	kg CO2	kg HC	kg PM
All Boat Total	0	0	0	0	0	0

	kg NOx	kg SOx	kg CO	kg CO2	kg HC	kg PM
All Vessel Set Total	124,432	42	6,068	4,804,863	2,235	364

Vessel 1 of 1

Ship T-AGS 60 **Type** AGS **Propulsion** Diesel Electric

Engine Characteristics

Engine 12-645F7B **No. of Engines** 2 **Use** IPG **Operating Profile** Constant

Engine 16-645F7B **No. of Engines** 2 **Use** IPG **Operating Profile** Constant

Engine 6V-92TA **No. of Engines** 1 **Use** EDG **Operating Profile** Constant

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Analysis Parameters

Hrs Underway 1000 **Hrs Restricted Waters** 1000 **Hrs Not Underway** 0 **Fuel Sulfur %** 0.0015 **Shore Power** No

Analysis Results

Engine 12-645F7B **No. of Engines** 2 **Use** IPG **Operating Profile** Constant Speed

Emission Data:

	kg NOx	kg SOx	kg CO	kg CO2	kg HC	kg PM
Underway	60,129	21	4,406	2,455,191	1,102	185
Restricted Waters	0	0	0	0	0	0
Not Underway	0	0	0	0	0	0
12-645F7B Total	60,129	21	4,406	2,455,191	1,102	185

Engine 16-645F7B **No. of Engines** 2 **Use** IPG **Operating Profile** Constant Speed

Emission Data:

	kg NOx	kg SOx	kg CO	kg CO2	kg HC	kg PM
Underway	38,121	12	973	1,394,947	605	106
Restricted Waters	26,122	8	631	950,635	526	71
Not Underway	0	0	0	0	0	0
16-645F7B Total	64,243	20	1,603	2,345,583	1,130	176

Engine 6V-92TA **No. of Engines** 1 **Use** EDG **Operating Profile** Constant Speed

Emission Data:

	kg NOx	kg SOx	kg CO	kg CO2	kg HC	kg PM
Underway	55	0	53	3,721	3	3
Restricted Waters	5	0	5	368	0	0
Not Underway	0	0	0	0	0	0
6V-92TA Total	60	0	58	4,089	3	3

Vessel Emission Totals:

	kg NOx	kg SOx	kg CO	kg CO2	kg HC	kg PM
Underway	98,304	34	5,432	3,853,860	1,709	293
Restricted Waters	26,128	8	636	951,003	526	71
Not Underway	0	0	0	0	0	0
Vessel Total	124,432	42	6,068	4,804,863	2,235	364

U.S. Navy Vessel Emission Data

Generated on 03/10/2025 at 11:48:49 AM

by Navy and MSC Marine Engine Fuel Consumption and Emission Calculator

Vessel Set Totals

	kg NOx	kg SOx	kg CO	kg CO2	kg HC	kg PM
All Ships Total	144,526	44	2,813	4,915,606	2,090	386

	kg NOx	kg SOx	kg CO	kg CO2	kg HC	kg PM
All Crafts Total	0	0	0	0	0	0

	kg NOx	kg SOx	kg CO	kg CO2	kg HC	kg PM
All Boat Total	0	0	0	0	0	0

	kg NOx	kg SOx	kg CO	kg CO2	kg HC	kg PM
All Vessel Set Total	144,526	44	2,813	4,915,606	2,090	386

Vessel 1 of 1

Ship T-AGS 45 **Type** AGS **Propulsion** Diesel Electric

Engine Characteristics

Engine 12V-71T 7123-7305 **No. of Engines** 1 **Use** EDG **Operating Profile** Constant

Engine 16-645F7B **No. of Engines** 5 **Use** IPG **Operating Profile** Constant

Analysis Parameters

Hrs Underway 1000 **Hrs Restricted Waters** 1000 **Hrs Not Underway** 0 **Fuel Sulfur %** 0.0015 **Shore Power** No

Analysis Results

Engine 12V-71T 7123-7305 **No. of Engines** 1 **Use** EDG **Operating Profile** Constant Speed

Emission Data:

	kg NOx	kg SOx	kg CO	kg CO2	kg HC	kg PM
Underway	180	0	45	5,602	3	6
Restricted Waters	18	0	4	554	0	1
Not Underway	0	0	0	0	0	0
12V-71T 7123-7305 Total	198	0	49	6,156	3	6

Engine 16-645F7B **No. of Engines** 5 **Use** IPG **Operating Profile** Constant Speed

Emission Data:

	kg NOx	kg SOx	kg CO	kg CO2	kg HC	kg PM
Underway	90,125	28	1,782	3,088,433	1,315	238
Restricted Waters	54,203	16	982	1,821,016	771	141
Not Underway	0	0	0	0	0	0
16-645F7B Total	144,328	44	2,764	4,909,450	2,087	379

Vessel Emission Totals:

	kg NOx	kg SOx	kg CO	kg CO2	kg HC	kg PM
Underway	90,305	28	1,827	3,094,036	1,318	244
Restricted Waters	54,221	16	986	1,821,570	772	142
Not Underway	0	0	0	0	0	0
Vessel Total	144,526	44	2,813	4,915,606	2,090	386

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Appendix D
Land-based Launch Propulsion Noise Study

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D.1 Introduction

This report documents the Land-based propulsion noise study performed in support of the Environmental Assessment (EA)/Overseas Environmental Assessment (OEA) for TRIDENT II (D5) Life Extension/Life Extension 2 (D5LE/LE2) weapon system testing. The Proposed Action would include of up to 10 land-based test launches total during the 5-year period from Calendar Years (CYs) 2032–2036 from Space Launch Complex (SLC) Number 46 (SLC-46) at Cape Canaveral Space Force Station (CCSFS).

Noise associated with parts of the Proposed Action other than land-based launch propulsion (i.e., at-sea missile launch, missile component splashdown, and sonic booms) would affect only broad ocean area (BOA) and would not be expected to affect human receptors. Test launches in the BOA and missile component splashdown would occur greater than 50 nautical miles (NM) from the shore and would not be audible from land. Sonic booms generated during test launches would be projected forward of the missile flight path and would intersect the surface in the BOA. Potential noise effects associated with these parts of the Proposed Action on biological resources are discussed in Section 4.2.2 and Section 5.2.2 of the EA/OEA.

Potential environmental effects from land-based launch propulsion noise are evaluated in relation to human annoyance, hearing conservation, and structural damage. This noise study is structured as follows:

- Section D.2 describes proposed weapon system operations.
- Section D.3 provides brief descriptions of noise metrics used in this report.
- Section D.4 summarizes the relationships of noise levels, as stated using metrics described in Section D.3, to potential noise effects
- Section D.5 presents modeling methods and input parameters used to calculate noise levels in this study.
- Section D.6 states the results of the noise modeling.
- Section D.7 summarize the findings of the noise study.

D.2 TRIDENT II (D5) Weapon System Operations

The TRIDENT II (D5) weapon system is a three-stage, solid-fuel missile that weighs approximately 130,000 pounds (DON, 2021). As noted previously, the DON proposes up to 10 total test launches from SLC-46 during the 5-year period from CYs 2032–2036, averaging two launches per year. The weapon system test launches from SLC-46 would be on an easterly launch azimuth, meaning that the flight path would be over the Atlantic Ocean almost immediately after departure from SLC-46. Launches are expected to occur during the day, but night launches are possible. Static fire tests are not part of the Proposed Action.

D.3 Noise Metrics

A variety of acoustical metrics have been developed to describe sound events and to estimate potential effects of the sound on sensitive receptors, such as residences. The metrics and terminology used in this noise study are described briefly below.

Decibel. The decibel (dB) is a logarithmic unit of measure that describes the intensity of sound. The threshold of human hearing is 0 dB, conversations are typically held at about 60 dB and sounds above 120 dB begin to be felt as discomfort. Because of the logarithmic nature of the decibel unit, sound levels cannot be simply added or subtracted and are somewhat cumbersome to handle mathematically. However, some useful rules help when dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. Second, the total sound level produced by two sounds with different levels is usually only slightly more than the higher of the two. For example: 50.0 dB + 60.0 dB = 60.4 dB.

A-weighted Decibel. A-weighting a mathematical process that de-emphasizes frequencies that are not heard efficiently by the human ear. Decibels that have been A-weighted are denoted as "dBA." Sound levels associated with common sound sources include a garbage disposal at 3 feet, which is approximately 85 dBA and a lawn mower at 25 feet, which often exceeds 90 dBA.

Maximum Sound Level. The highest sound level measured during a single event, in which the sound changes with time, is called the maximum sound level (abbreviated as L_{max}). The highest A-weighted sound level measured during a single event is called the maximum A-weighted sound level (abbreviated as LA_{max}). Although it provides a straightforward description of the event, L_{max} (or LA_{max}) does not describe how long the sound lasts or how frequently it occurs, and it does not account for the added intrusiveness of events that occur late at night.

Day-Night Average Sound Level (DNL). DNL is a cumulative noise metric that reflects that total sound energy in a 24-hour period. To account for increased sensitivity to noise at night, DNL applies an additional 10-dB adjustment to events during the acoustical nighttime period, defined as 10:00 p.m. to 7:00 a.m. DNL represents long-term exposure to noise and does not represent a level heard at any given time.

D.4 Noise Effects

The relationships of noise levels, as stated using metrics described in Section C.3, to potential noise effects are described below.

Annoyance. DNL is the primary noise metric of the Department of Defense (DoD), Federal Aviation Administration, and U.S. Environmental Protection Agency. Studies of community annoyance in response to numerous types of environmental noise show that there is a positive correlation between DNL and the percent of the population that can be expected to be highly annoyed by the noise. At noise levels greater the 65 dB DNL, not all land uses are considered to be compatible in accordance with DoD guidelines in DoD Instruction 4165.57, *Air Installations Compatible Use Zones*.

Hearing Conservation. Hearing conservation regulations such as the Occupational Safety and Health Administration regulations published at 29 Code of Federal Regulations Section 1910.95 are applicable to workplace environments but are also referenced as a conservative threshold for hearing conservation in non-workplace setting. The Occupational Safety and Health Administration regulations established 115 dBA as the upper noise level limit in a workplace environment.

Structural Damage. The potential for structural damage claims is approximately one damage claim per 100 households exposed at 120 dB and one in 1,000 households at 111 dB (Guest and Slone, Jr., 1972). A less overly conservative threshold decibel value for structural damage is provided in the Committee on Hearing, Bioacoustics, and Biomechanics Guidelines for Preparing Environmental Impact Statements on Noise, which states "While certain frequencies (such as 30 Hz for window breakage) might be of more concern than other frequencies, one may conservatively consider all sound lasting more than 1 second

above a sound pressure level of 130 dB (1 Hz to 1000 Hz) as potentially damaging to structures" (Committee on Hearing, Bioacoustics and Biomechanics, 1977).

D.5 Noise Modeling Methods

This analytical approach used in this noise study conservatively estimates Proposed Action noise levels to demonstrate levels associated with potentially significant impacts would not be exceeded. As such, this study should be considered a screening analysis for potential significant impacts. Potential noise effects would warrant a more detailed analysis if:

- DNL associated with the Proposed Action were to exceed 60 dBA at an off-installation location, indicating a high likelihood of annoyance.
- A-weighted maximum noise levels (LA_{max}) would exceed 115 dBA off-installation exceeding a conservative threshold
- Un-weighted maximum noise level (L_{max}) were to exceed 111 dB off-installation exceeding a very conservative lower threshold for structural damage claims risk.

Noise modeling was conducted using RUMBLE (version 3.0) an application designed to compute community noise exposures associated with rocket operations (James, Salton, Calton, and Lympany, 2020). The software takes into account characteristics of the rocket (e.g., thrust, nozzle diameter), operational parameters (e.g., number of operations, trajectory) and environmental factors (e.g., atmospheric conditions) in calculation of noise levels. The non-proprietary version used for this noise study uses a single representative surface impedance for propagation over both land and water. To demonstrate that noise levels associated with the Proposed Action would not exceed levels associated with significant impacts, noise levels were modeled using the Minotaur C rocket, which defined in the RUMBLE database, as noise surrogate for the TRIDENT II (D5) weapon systems. The Minotaur is a solid-propellant rocket like the TRIDENT II (D5), but weighs approximately 161,000 pounds, whereas the TRIDENT II (D5) weapon system weighs approximately 130,000 pounds. Because rocket noise levels are strongly correlated to thrust, which is correlated to rocket mass, use of the Minotaur C provides a conservative estimation of source noise levels. A rocket trajectory defined in RUMBLE was used to represent a potential TRIDENT II (D5) weapon system launch trajectory.

The DNL associated with the Proposed Action was calculated for a very conservative operational scenario that is highly unlikely, but which is presented to demonstrate that noise levels with potentially significant noise impacts would not be exceeded. In this conservative operational scenario, the 10 test launches that are proposed to occur over a five-year period would all occur within a single year and all launches would occur between 10:00 p.m. and 7:00 a.m. (incurring a 10-dB "penalty" in calculated DNL). Therefore, actual DNL associated with the Proposed Action would likely be substantially lower than the values calculated in this noise study.

D.6 Calculated Noise Levels

The modeled LA_{max}, unweighted L_{max}, and A-weighted DNL are shown in **Figure D-1**, **Figure D-2**, and **Figure D-3**, respectively.

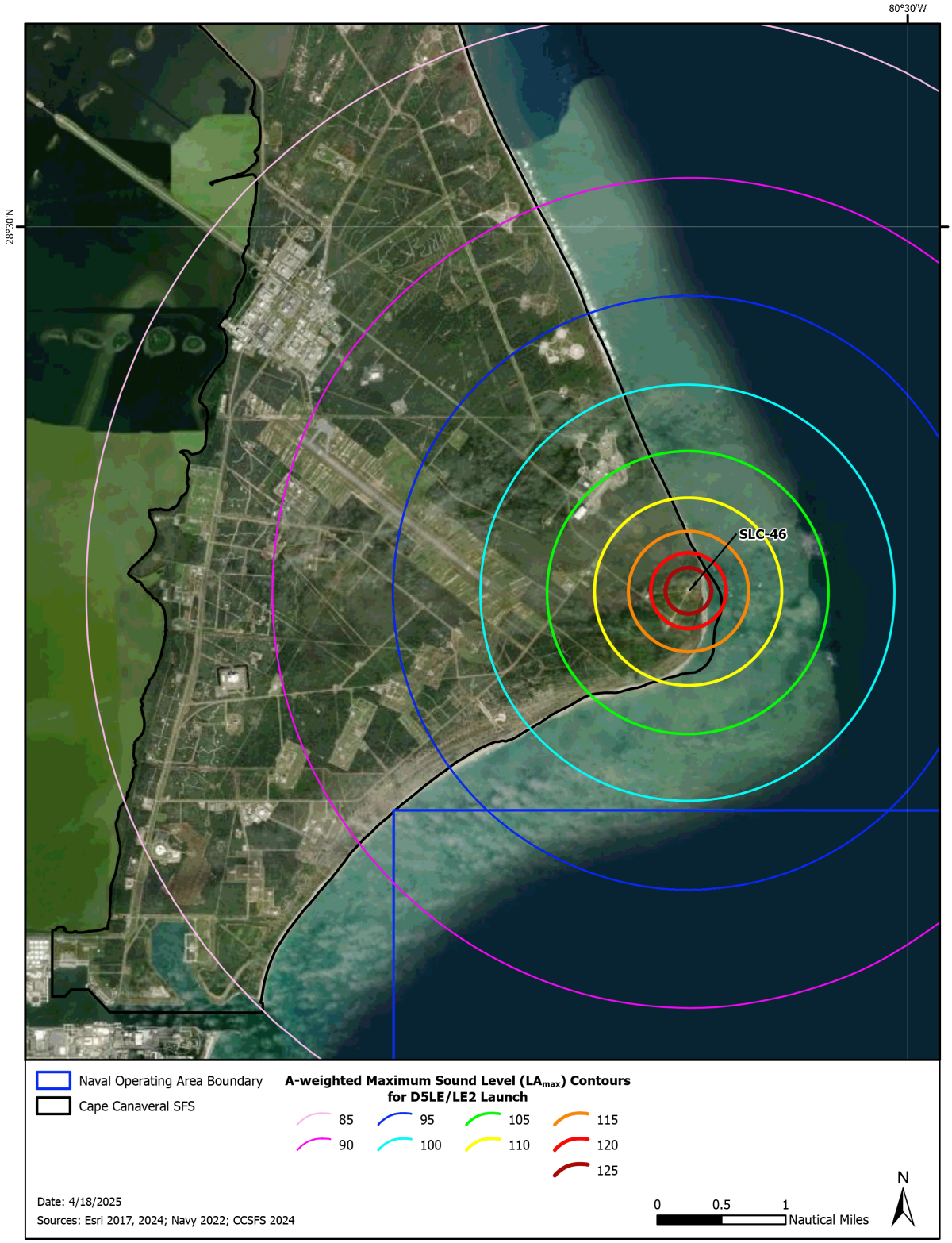

Figure D-1 LA_{max} Contours for a Proposed Weapon System Launch

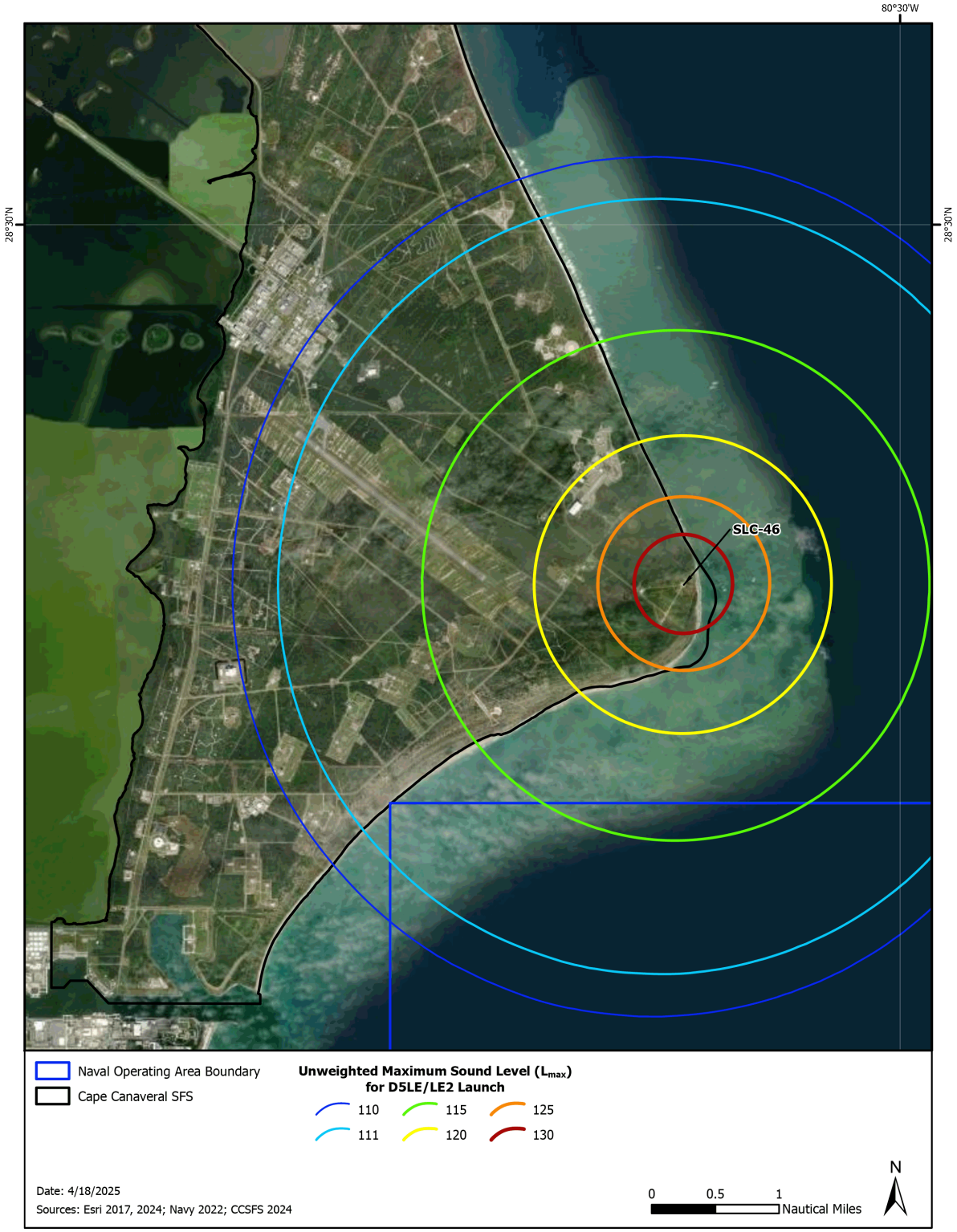

Figure D-2 Unweighted L_{max} for a Proposed Weapon System Launch

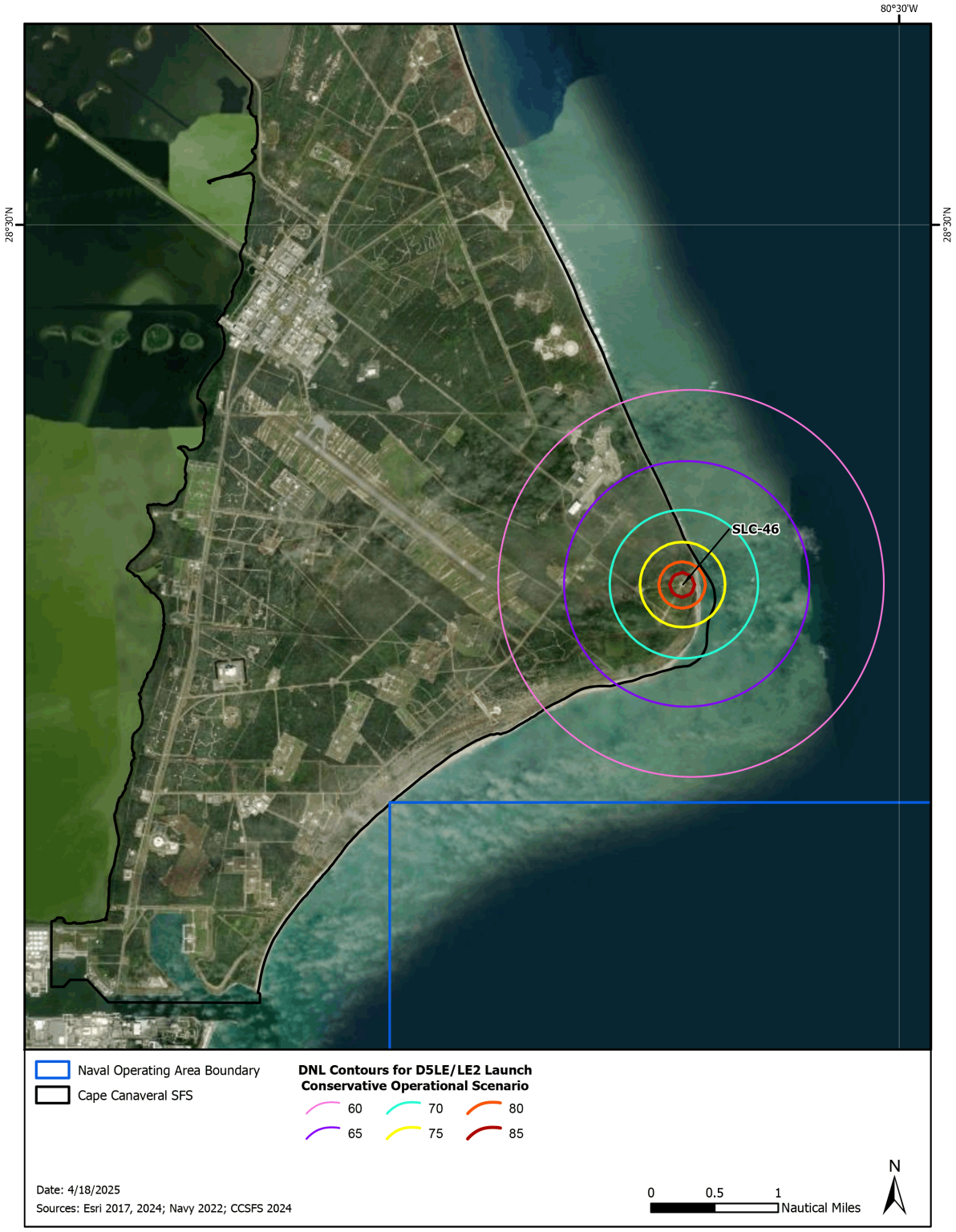

Figure D-3 DNL Contours for Proposed Weapon System Launch - Conservative Operational Scenario

Other activities on CCSFS and Kennedy Space Center (KSC), including the operations of rockets, generate noise that affects areas near SLC-46. As noted in Section D.3, adding a sound that is more than 10 dB less intense than another sound has only minimal effect on overall sound level. Time-averaged noise levels (i.e., DNL) generated by proposed TRIDENT II (D5) weapon system operations are sufficiently low that they would not have potential to increase overall levels at nearby noise-sensitive off-installation locations to greater than 65 dB DNL.

D.7 Noise Effects of the Proposed Action

This section documents the potential environmental effects of noise associated with the proposed weapon system test launches from SLC-46. Potential effects considered include annoyance, hearing conservation, and structural damage.

Annoyance. The DNL 60 dBA contour is used to conservatively identify the potential for significant noise impacts resulting from the propulsion noise generated by operations at SLC-46. The area identified within the 60 dBA contour for cumulative noise does not include land outside of the boundary of CCSFS, and, thus, no residences are impacted.

Hearing Conservation. An upper limit noise level of LA_{max} 115 dBA is used as a guideline to protect human hearing from long-term continuous daily exposures to high noise levels and to aid in the prevention of noise-induced hearing loss. The entire land area encompassed by the 115 dBA noise contour is within CCSFS boundaries. People working on CCSFS in an area exposed to potentially hazardous noise levels would wear hearing protection in accordance with applicable regulations. Therefore, the risk of hearing loss is negligible.

Structural Damage. The potential for structural damage claims is approximately one damage claim per 100 households exposed at 120 dB and one in 1,000 households at 111 dB (Guest and Slone, Jr., 1972). The 120 dB and 111 dB contours do not encompass any land outside of CCSFS and KSC boundaries.

D.8 References

Committee on Hearing, Bioacoustics and Biomechanics. (1977). *Guidelines for Preparing Environmental Impact Statements on Noise.* Washington, D.C.: Committee on Hearing, Bioacoustics and Biomechanics, Assembly of Behavioral and Social Sciences, The National Research Council.

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