







Supplemental Environmental Assessment/Overseas Environmental Assessment

Joint Flight Campaign Flight Tests

Final

Department of the Navy Strategic Systems Programs

U.S. Department of the Army Rapid Capabilities and Critical Technologies Office

VOLUME I

January

2024

DISTRIBUTION STATEMENT A: Approved for public release: distribution is unlimited.

This page intentionally left blank

FINAL

FINDING OF NO SIGNIFICANT IMPACT / FINDING OF NO SIGNIFICANT HARM SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT / OVERSEAS ENVIRONMENTAL ASSESSMENT JOINT FLIGHT CAMPAIGN FLIGHT TESTS

AGENCY: Department of the Navy, Department of the Army

BACKGROUND: The Joint Flight Campaign (JFC) flight tests are sponsored by the Office of the Under Secretary of Defense for Research and Engineering, which has designated the Department of the Navy Strategic Systems Programs (SSP) as one of two lead agencies for the Proposed Action. The United States Department of the Army (U.S. Army) has designated the U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) as the second lead agency. Together SSP and RCCTO form the joint Action Proponents for this Supplemental Environmental Assessment/Overseas Environmental Assessment (EA/OEA).

The Supplemental JFC EA/OEA provides additional analysis for new launch locations at the Pacific Missile Range Facility (PMRF) and the Pacific Spaceport Complex Alaska (PSCA) for up to six joint test operations per year until 2032, after the Finding of No Significant Impact / Finding of No Significant Harm is signed. The addition of the new launch locations in this Supplemental EA/OEA does not change the total number of flight tests analyzed in the 2022 JFC EA/OEA. The proposed JFC joint test operations evaluated in the Supplemental EA/OEA include the options to (1) launch from the Terminal High Altitude Area Defense (THAAD) launch pad at PMRF, (2) launch from PSCA, and (3) Pacific Broad Ocean Area (BOA) payload impact downrange of PSCA.

SSP, RCCTO, and the U.S. Army Space and Missile Defense Command have prepared this Supplemental EA/OEA in accordance with the National Environmental Policy Act (NEPA) (42 United States Code § 4321, as amended), the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (Title 40 Code of Federal Regulations §§ 1500-1508), the Department of the Army Procedures for Implementing NEPA (32 Code of Federal Regulations § 651), and Chief of Naval Operations Instruction M-5090.1.

DESCRIPTION OF THE PROPOSED ACTION: The U.S. Navy SSP and U.S. Army RCCTO are considering up to three launch locations at PMRF and PSCA, and payload impact areas in the Pacific BOA for the JFC Flight Tests Supplemental EA/OEA Proposed Action.

PMRF: Flight test activities may include launch from the THAAD launch site and impact of the payload in the Pacific BOA. PMRF's THAAD launch site was selected as an alternative test range for the JFC flight tests because of its launch pad infrastructure and suitability, data collection and storage capabilities, booster and explosive materials storage capabilities, available timeframe for test launches, range and explosive safety record, and ability to meet security requirements for conducting the Proposed Action.

PSCA: PSCA's Area 1 and Launch Pad-2 (LP-2) have been designated by PSCA to accommodate mobile systems with launchers because of their connections to range infrastructure (i.e., fiber, communications, etc.), lightning protection, and flat surface. Area 1 is a

gravel pad. LP-2 is a concrete pad. Area 1 was previously used by the THAAD launch system and Patriot weapon systems, and LP-2 has been used for Strategic Target System missions.

Pacific BOA: The Pacific BOA sites will be pre-selected as booster drop zones and payload impact zones and monitored to ensure that there will be no vessels or aircraft in the vicinity.

PURPOSE OF AND NEED FOR THE PROPOSED ACTION: The purpose of the Proposed Action is to perform the JFC land-based test launches at PMRF and PSCA, with payload impacts in the Pacific BOA, to collect data to verify Long-Range Hypersonic Weapon (LRHW) performance.

The Proposed Action is needed to prove that the Conventional Prompt Strike weapon system and Army LRHW system meet all key performance requirements within the capabilities of the All-Up-Round missile used by both systems. To meet the Conventional Prompt Strike and LRHW program objectives, test events must satisfy certain critical objectives. Critical objectives include demonstrating weapon system effectiveness, demonstrating applicable design features, and establishing effective operating procedures, which also ensure the safety of the warfighter and the public.

ALTERNATIVES CONSIDERED: A list of the full screening criteria/evaluation factors is in the 2022 JFC EA/OEA. To meet the JFC program objectives additional screening factors were identified for the JFC Flight Tests Supplemental EA/OEA. The screening factors are as follows:

1. The launch and impact location must be available for and capable of conducting JFC flight tests within the required timeframes.
2. The launch pad is capable of supporting the Transporter Erector Launcher launch configuration.
3. The launch pad is capable of supporting the weight of the Transporter Erector Launcher and supporting equipment.
4. The equipment and personnel required to support the test will be available when required.
5. Capable of incorporating the additional locations for flight tests beginning in the first quarter of Fiscal Year 2025.
6. Launch and impact locations must meet security requirements.

No Action Alternative: The No Action Alternative would not meet the purpose and need for the Proposed Action. Under the No Action Alternative, the Action Proponents could not test the All-Up-Round missile at the analyzed locations, which would adversely impact national security and the United States' strategic deterrence mission. The Proposed Action would not occur, and the Action Proponents would not pursue the JFC flight tests at PMRF's THAAD launch site or PSCA's Area 1 or LP-2. Under the No Action Alternative, JFC flight tests would not impact the Pacific BOAs not analyzed in the 2022 JFC EA/OEA. The actions analyzed in the JFC EA/OEA would still occur under the No Action Alternative, including JFC launches from Sandia National Laboratories/Kaua`i Test Facility Launch Pad 42 with impact in the Pacific BOA.

SUMMARY OF ENVIRONMENTAL RESOURCES EVALUATED IN THE SUPPLEMENTAL EA/OEA: Council on Environmental Quality regulations, NEPA, and Navy and Army 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.

Table 1 summarizes the resources that were evaluated in detail in the Supplemental EA/OEA. The resources that were not further evaluated had potential impacts that were determined to be negligible or nonexistent.

Table 1. Summary of the Anticipated Impacts to the Environmental Resources in the Region of Influence

	Proposed Action		
Resource	**PMRF**	**PSCA**	**Pacific Ocean BOA**
Air Quality and Climate Change		E	
Airspace Management			
Water Resources	E	E	E
Geology and Soils			
Cultural Resources	E		
Biological Resources	E	E	E
Land Use			
Noise and Vibration			
Infrastructure and Utilities			
Transportation/Traffic			
Public Health and Safety	E	E	
Hazardous Materials and Wastes	E	E	E
Socioeconomics, Environmental Justice		E	
Aesthetics and Visual Resources			

Note: Shaded boxes marked E indicate areas that were evaluated in detail.

SUMMARY OF POTENTIAL ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND MAJOR MITIGATING ACTIONS

Proposed Action

Pacific Missile Range Facility: Table 2 summarizes the potential impacts associated with the implementation of the Proposed Action at PMRF. **Table 5** lists mitigating actions for PMRF.

Table 2. Summary of Potential Impacts Associated with the Implementation of the Proposed Action – PMRF

Resource	Summary of Potential Impacts
Water	The JFC flight tests potential releases, current regulations, and infrastructure specific to PMRF lead to the conclusion that any impacts to water resources from the JFC flight tests will not have adverse impacts on hydrologic function or quality at PMRF. Because the existing drainage ditches are designed to move water away from the agricultural fields during irrigation and rainfall, no residual effects of past launches are expected. Turbidity may temporarily increase due to grounding rods temporarily being installed up to 1.8 meters (6 feet) below ground surface, although suspended matter will settle out and return to base levels post-test removal. No permanent impacts to water resources will be expected as a result of the Proposed Action.
Cultural Resources	The Proposed Action will not require construction at the THAAD launch site. There are no properties eligible for listing on the National Register of Historic Places at the launch site. No impacts on cultural resources will be expected as a result of this Proposed Action. Therefore, no Section 106 consultation with the Hawai`i State Historic Preservation Division is required for the Proposed Action.
Biological Resources	The Proposed Action has the potential to impact biological resources in the PMRF region of influence through exposure to elevated sound pressure levels, wildfire risk from launch, launch emissions, artificial lighting, and increased human activity and equipment operation. Terrestrial Vegetation: JFC activities will have no long-term adverse impact on vegetation at PMRF. Terrestrial Wildlife: The primary stressor of concern to most wildlife species at PMRF is launch noise. Based on the expected distribution of Endangered Species Act (ESA)-listed species and the expected maximum sound pressures from launch, the impact of launch noise on ESA-listed species will be negligible to minor and short-term. Overall, terrestrial wildlife will not be significantly impacted by these JFC Supplemental launch and launch support activities at PMRF. Marine Wildlife: Marine wildlife will not to be impacted by JFC activities in the PMRF region of influence. Vehicle launch and overflight will result in elevated noise levels in air but based on expected sound pressure levels in marine habitats, there will be no effects to marine wildlife. Environmentally Sensitive Habitats: No impacts to Essential Fish Habitat nor to designated critical habitat for lau`ehu are expected due to launch activities at PMRF. ESA Protected Resources: Because the Proposed Action may affect some terrestrial ESA-listed species, the Action Proponents consulted with the U.S. Fish and Wildlife Service under Section 7 of the ESA. A Biological Evaluation was prepared to fully evaluate the potential effects of the Action on ESA-listed species and designated critical habitats. Based on the analyses in the Biological Evaluation, JFC Supplemental activities may affect but are not likely to adversely affect four Hawaiian waterbird species, nēnē, Hawaiian hoary bats, hauled out green sea turtles, or designated critical habitat for lau`ehu. The U.S. Army and Navy have consulted with the U.S. Fish and Wildlife Service under Section 7 of the ESA for JFC Supplemental launch activities at the THAAD launch site.
Public Health and Safety	JFC mission personnel will follow the same health and safety procedures developed under existing plans at PMRF. Federal, state, and local regulations as well as PMRF standard operating procedures will be followed for launch site preparation, booster handling, and all hazardous operations. PMRF Missile Flight Analysis, Ground Safety, Range Safety, Ocean Clearance, Transportation Safety, and Fire and Crash Safety procedures will be followed to ensure the safety of workers and members of the public. PMRF will issue Notices to Air Missions and Notices to Mariners ahead of any JFC flight test, in accordance with range safety and Federal Aviation Administration requirements. In accordance with Executive Order 13045, Protection of Children from Environmental Health and Safety Risks, the proponents have determined that since the JFC flight tests will be conducted on Department of Defense property and out in the open ocean, the JFC flight test has no environmental health and safety risks that may disproportionally affect children. The Proposed Action will not impact public health and safety at PMRF.

Resource	Summary of Potential Impacts
Hazardous Materials and Wastes	Any hazardous materials and waste generated in support of the Proposed Action will not be expected to exceed PMRF's capacity to manage, store, or dispose of them in accordance with federal, state, or local laws; nor will the Proposed Action be expected to increase the risk of, or create new, human and environmental health risks.

Pacific Spaceport Complex Alaska: Table 3 summarizes the potential impacts associated with the implementation of the Proposed Action at PSCA. **Table 5** lists Mitigating Actions for PSCA.

Table 3. Summary of Potential Impacts Associated with the Implementation of the Proposed Action – PSCA

Resource	Summary of Potential Impacts
Air Quality and Climate Change	Air Quality: there could be up to 6 flight tests per year for a total of 60 flight tests over a 10-year period. The estimated annual emissions for all flight tests do not exceed the Prevention of Significant Deterioration significant indicator levels for pollutants of concern. Therefore, no significant impacts to air quality are anticipated from flight tests at PSCA. Climate Change: Although there is a potential for the release of greenhouse gas emissions, the estimated tons per year are unknown or unqualifiable because the LRHW All-Up-Round missile is still in development and there are no estimated emissions for greenhouse gases (carbon dioxide equivalent). Additionally, due to the small amount of carbon monoxide produced in the LRHW All-Up-Round surrogate, the increase in emissions is anticipated to be under the comparable U.S. Environmental Protection Agency presumptive effects threshold of 75,000 tons per year. Therefore, the Proposed Action would not be expected to result in a significant contribution to global climate change.
Water Resources	Short-term, minor impacts on water resources will occur as a result of LRHW All-Up-Round missile launches. Effects from launch operations will occur only during launches as a result of rocket exhaust product deposition. Any waste materials generated will be disposed of according to applicable regulations and range procedures and policy by PSCA, and will not impact groundwater, surface waters, or wetlands.
Biological Resources	The Proposed Action has the potential to impact biological resources in the PSCA region of influence through exposure to elevated sound pressure levels, heat, and wildfire risk from launch, launch emissions, and increased human activity and equipment operation. Terrestrial Vegetation: Plants near the launch pads may be temporarily affected by heat and emissions from vehicle launch. However, based on studies of vegetation conducted after launches from PSCA, no long-term effects on vegetation will be expected. Vegetation will be expected to return to normal within a year of the launch and there will be no adverse impacts to special-status, rare, or otherwise important vegetation. Terrestrial Wildlife: The potential exists for launch noise to cause behavioral disturbance of pinnipeds hauled out in terrestrial habitats; however, based on expected noise levels and previous monitoring during launches, impacts will be minor. In addition, the National Marine Fisheries Service has determined that PSCA launch activities will not reach the level of take for any cetaceans (whales and dolphins) and that any noise that could reach these species will be discountable. Overall impacts on terrestrial wildlife will be negligible to minor and short-term. Marine Resources: Sonic booms and other flight test noises are unlikely to affect marine wildlife and noise impacts from sonic booms will be nonexistent or negligible for marine biological resources including ESA-listed species. Environmentally Sensitive Habitats: No impacts to Essential Fish Habitat or other environmentally sensitive habitats are expected due to launch activities at PSCA. ESA Protected Resources: Proposed launch activities will either have no effect on or will not adversely affect ESA-listed species at PSCA and impacts will be nonexistent to negligible. The U.S.

Resource	Summary of Potential Impacts
	Army and Navy have consulted with the U.S. Fish and Wildlife Service under Section 7 of the ESA for potential effects on species in nearshore waters.
Public Health and Safety	JFC mission personnel will follow the same health and safety procedures developed under existing plans at PMRF. Federal, state, and local regulations as well as PMRF standard operating procedures will be followed for launch site preparation, booster handling, and all hazardous operations. PMRF Missile Flight Analysis, Ground Safety, Range Safety, Ocean Clearance, Transportation Safety, and Fire and Crash Safety procedures will be followed to ensure the safety of workers and members of the public. PMRF will issue Notices to Air Missions and Notices to Mariners ahead of any JFC flight test, in accordance with range safety and Federal Aviation Administration requirements. In accordance with Executive Order 13045, Protection of Children from Environmental Health and Safety Risks, the proponents have determined that since the JFC flight tests will be conducted on Department of Defense property and out in the open ocean, the JFC flight test has no environmental health and safety risks that may disproportionally affect children. The Proposed Action will not impact public health and safety at PMRF.
Hazardous Materials and Waste	Any hazardous materials and waste generated in support of the Proposed Action will not be expected to exceed PMRF's capacity to manage, store, or dispose of them in accordance with federal, state, or local laws; nor will the Proposed Action be expected to increase the risk of, or create new, human and environmental health risks.
Socioeconomics/ Environmental Justice	The Proposed Action will restrict subsistence fishing, commercial and tourist activities to the offshore waters near PSCA (lasting approximately 8 hours for each flight test event), which could reduce commercial fishing and tourism related opportunities (fishing, sightseeing, aircraft trips, hunting). Additionally, some of the project related personnel are expected to use local hotels, thus reducing the number of rooms available for tourists. Although fishing (i.e., subsistence resources) is allowed year-round, the Navy is aware of the major fishing season for Old Harbor and to mitigate impact to the fishing community associated with Old Harbor, to the extent possible the Navy will avoid testing during the fishing season. As closure during flight tests will be infrequent and temporary (lasting approximately 8 hours for each flight test event) impacts to daily fishing limits (commercial and subsistence) will be negligible. PSCA will continue to hire local fishing vessels to serve as boundary boats during the safety closure periods. A Notice to Air Missions will be issued concurrently with the Notice to Mariners, imposing flight restrictions in the overhead safety and hazard zones for approximately 8 hours.

Pacific Ocean: Table 4 summarizes the potential impacts associated with the implementation of the Proposed Action in the Pacific Ocean. Mitigating Actions for the Pacific Ocean are listed in **Table 5.**

Table 4. Summary of Potential Impacts Associated with the Implementation of the Proposed Action-Pacific Ocean

Resource	Summary of Potential Impacts
Water Resources	There will be no disturbance to ocean waters beyond the settling of the individual booster stages hundreds of kilometers (miles) apart as they come to rest on the sea floor after splashing down into the ocean along the flight path and slowly sinking thousands of meters (feet). Turbidity may be temporarily increased. It is anticipated that the release of hazardous materials from missiles into seawater will not be significant. Therefore, adverse water quality effects from the payload are expected to be minimal to insignificant.
Biological Resources	The Proposed Action has the potential to impact biological resources in the Pacific Ocean region of influence through exposure to elevated sound levels, direct contact from launch vehicle components, exposure to hazardous materials, and increased vessel activity. Marine Wildlife: Overall, marine mammals, sea turtles, seabirds, and fish are not expected to be significantly impacted by any JFC activities in the BOA. Any effects, if realized, will likely be limited

Resource	Summary of Potential Impacts
	to short-term startle reactions, and marine wildlife will be expected to return to normal behaviors within minutes. The Proponents have concluded that the Proposed Action will not result in incidental take of any marine mammal species protected under the Marine Mammal Protection Act or of birds protected under the Migratory Bird Treaty Act in the BOA. Environmentally Sensitive Habitats: Essential Fish Habitat (EFH) and designated critical habitat for ESA listed species occurs within the deep waters of the stage 1 booster drop zones. Given the limited size and characteristics of components and the time between tests, direct contact and hazardous chemicals from the stage 1 boosters will have negligible and likely undetectable adverse effects on EFH. While the proposed activity will not adversely affect EFH to the extent that there will be a reduction in the quantity or quality of EFH, the Action Proponents consulted with the National Marine Fisheries Service for potential minimal adverse effects to EFH in the Hawaiian Exclusive Economic Zone. Proposed activities are also unlikely to affect any designated critical habitat. The flight path will cross over the Papahānaumokuākea Marine National Monument. However, the stage 1 booster drop zone does not occur in the monument and no part of the Proposed Action will impact the monument. ESA Protected Resources: Proposed activities in the BOA may affect but are not likely to adversely affect marine ESA listed species and designated critical habitats. The Action Proponents prepared a biological evaluation to full evaluate the potential effects of proposed activities on ESA listed species and requested an amended consultation for JFC activities from the National Marine Fisheries Service to include JFC Supplemental activities. The National Marine Fisheries Service issued a letter of concurrence that proposed activities may affect but are not likely to adversely affect ESA-listed species.
Hazardous Materials and Wastes	The propellant is expected to be completely expended prior to splashdown. All payload materials are expected to sink to the ocean floor. Visible debris on the surface of the ocean will be recovered and removed and will not pose a significant source of solid or hazardous waste. Therefore, overall impacts from hazardous materials and waste in the Pacific Ocean are anticipated to be negligible.

Mitigation Measures: Table 5 summarizes mitigation measures for the Proposed Action.

Table 5. Summary of Mitigation Measures for the Proposed Action

Resource	Mitigation Measure
Air Quality and Climate Change	The following mitigation measures will be implemented as part of the Proposed Action at Pacific Spaceport Complex Alaska (PSCA) to minimize the potential effects of carbon monoxide from Proposed Action: • Use hybrid gasoline–electric vehicles (alternate fuel source). • Use battery electric vehicles. • Follow vehicle maintenance practices for vehicle efficiency and use of fuel. • Increase the use of low-carbon fuels. • Reduce the number of vehicles used by workers. • Use public transit. • Develop and use transportation strategies to reduce carbon monoxide production (i.e., car/van pool).
Biological Resources	**PMRF Biological Conservation and Mitigation Measures** The following avoidance, minimization, and conservation measures will be implemented as part of the Proposed Action at PMRF to minimize the potential effects of the Proposed Action on Endangered Species Act (ESA)-listed species:

Resource	Mitigation Measure
	• Prior to conducting project activities, all personnel will receive on-site training in coordination with the PMRF Environmental Program to ensure personnel understand PMRF's natural resource policies and wildlife protection regulations and protocols. • Training will include established PMRF Environmental Management Policies and guidelines relevant to the season of proposed activities, including "Nēnē Guidelines for PMRF Operations", "Good Samaritan Hazing" training for nēnē", "PMRF Dark Skies Program Briefing & Natural Resources Training", and "Shearwater Fallout Instructions". • All project personnel will be trained on the presence of ESA-listed species on PMRF and the importance of adhering to posted speed limits to avoid collision with protected wildlife. • Project personnel will not approach, disturb, or feed any protected animal species or their nests. • Project personnel will avoid entering beaches. • Project-related vehicle and equipment operation will occur within paved or maintained areas. • Areas up to the THAAD launch site fence line will be maintained free of flammable vegetation to minimize fire potential. • Non-native areas surrounding the THAAD site will be regularly mowed. Bushes, trees, shrubs, and short statured grass will be regularly cleared to reduce wildfire risk and avoid creating nesting habitat for nēnē. • The areas adjacent to the launch pad will be pre-soaked with water prior to launch if deemed necessary due to extremely dry or windy conditions. Site conditions and the need for vegetation wetting will be evaluated and coordinated with PMRF Range and Environmental Offices prior to launch. • Fire and emergency service crews will be present at every launch. • If the flight test will occur during the Hawaiian seabird fledging season, the Action Proponents will comply with the requirements of the 2014 and 2018 biological opinions as implemented by the Navy at PMRF, as well as any relevant procedures resulting from potential future Navy PMRF consultations with the U.S. Fish and Wildlife Service (USFWS) regarding the effects of lighting on ESA-listed seabirds. • Whenever possible, night lighting will be avoided or minimized. Where security or safety concerns require night lighting, either full cut-off lighting fixtures will be used or, if full cut-off fixtures cannot be installed, motion sensors will be used or lights will be turned off when not necessary. Between September 15th and December 15th, all project activities will be Dark Skies compliant. • Standard PMRF patrols will be conducted to confirm any exposed lights during the night are required and meet shielding requirements. • Standard PMRF biweekly wildlife surveys and nest searches will be conducted. • Launch area inspections (sweeps) will be conducted during launch set-up and prior to every launch to check for wildlife that may have entered the launch area. • If nēnē are observed loafing or foraging within 61 meters (200 feet) of the launch pad within 24 hours preceding the launch, project or PMRF test personnel would coordinate a response with the PMRF Environmental Office. Response solutions might include hazing (compliant with the nēnē 4(d) rule) by trained and authorized personnel to encourage nēnē to leave the area, or a nēnē nest search (within 61 meters [200 feet] of the launch pad) if birds are unwilling to leave the area. If a nēnē nest were found within 53 meters (175 feet) of the launch pad, PMRF Environmental Office will be notified and the USFWS will be contacted (by PMRF Environmental Office personnel) for further coordination on a course of action before the launch proceeds.

Resource	Mitigation Measure
	• No trimming or removal of trees is expected for the Proposed Action. Any trimming or removal of trees over 4.6 meters (15 feet) tall would be conducted outside of the Hawaiian hoary bat pupping season (June 1 to September 15). • No additional fencing or barbed wire would be installed for the Proposed Action at PMRF. • Standard PMRF security procedures will be followed during JFC launch activities. No project-related vehicles, equipment, or personnel would enter beach habitats. **Pacific Ocean Biological Conservation and Mitigation Measures** The following avoidance, minimization, and conservation measures will be implemented as part of the Proposed Action in the Pacific Broad Ocean Area to minimize the potential effects of the Proposed Action on ESA-listed and Marine Mammal Protection Act protected species: • During travel to and from impact zones, and during raft deployment, ship personnel would monitor for marine mammals and sea turtles to avoid potential vessel strikes, consistent with Navy standard operating procedures for vessel operation. Vessel operators would adjust speed or raft deployment based on the presence of special-status animals and/or lighting and turbidity conditions. • Vessel operations would only occur when weather and sea conditions are acceptable for safe travel. Vessel operations would not involve any intentional ocean discharges of fuel, toxic wastes, or plastics and other solid wastes that could potentially harm marine life. • Any accidental spills from support equipment operations would be contained and cleaned up. Spill response kits would be available on all support equipment. • Proposed activities would not involve any vessel anchoring. • Measures would be implemented to ensure all vessel hulls do not pose a risk of introducing new invasive species and therefore would not increase abundance of invasive species present at project locations. • Payload impact sites would be inspected after each flight test and any visible flight test debris on the ocean surface would be recovered and removed to the extent practicable. • The Action Proponents will submit an annual report to the National Marine Fisheries Service as required and specified in their 2021 ESA Section 7 letters of concurrence. The annual report would include information regarding JFC program activities and observations of ESA-listed species, submitted within 30 days of the end of each program year.
Public Health and Safety	**PMRF Public Health and Safety Mitigation Measures** • PMRF publishes dedicated warning Notices to Air Missions and Notices to Mariners 1 week before flight tests. In addition, a 24-hour recorded message is updated on the hotline daily by Range Operations to inform the public when and where hazardous operations will take place. Pre-launch Notices to Air Missions and Notices to Mariners will be issued 24 hours before launch in the ocean and flight areas defined, and the areas will be actively monitored prior to launch. **PSCA Public Health and Safety Mitigation Measures** • Pasagshak Point Road is closed at the site boundary and monitored during launch day to ensure that no unauthorized personnel enter the Ground Hazard Area. • PSCA will publish Notices to Air Missions and Notices to Mariners, coordinate security closures of lands and waters around PSCA and with the U.S. Coast Guard, Federal Aviation Administration, and the Alaska Department of Transportation and Public Facilities. Imminent launches will be announced on the local radio as well as in the newspaper.

Resource	Mitigation Measure
Hazardous Materials and Wastes	**PMRF Hazardous Materials and Waste Mitigation Measures** • Hazardous materials usage and waste will continue to be managed by PMRF under existing applicable federal, state, local, and Department of Defense requirements. Authorized personnel will follow the existing range transportation safety plan and ordnance storage, handling, and safety plans. The Action Proponents must comply with range management plans for oil and hazardous materials outlined in the range Spill Prevention Control and Countermeasures Plan, the Installation Spill Contingency Plan, and existing standard operating procedures. • Only trained and authorized mission critical personnel will utilize support equipment and material hazards needed to perform the Proposed Action. • Ordnance management procedures found in Pacific Missile Range Facility Instruction (PMRFINST) 8020.5, Explosive Safety Criteria for Range Users Ordnance Operations, will be followed. • Any program using a new type of ordnance device for which proven safety procedures have not been established requires an Explosive Safety Approval before the ordnance is allowed on PMRF or used on a test range. This approval involves a detailed analysis of the explosives and of the proposed test activities, procedures, and facilities for surveillance and control, an adequacy analysis of movement and control procedures, and a design review of the facilities where the ordnance items will be handled. The JFC Supplemental EA/OEA Action Proponents will continue updating the existing JFC Explosive Safety Approval process with any new information as it becomes available. **PSCA Hazardous Materials and Waste Mitigation Measures** • Hazardous materials usage and waste will continue to be managed by PSCA under existing applicable federal, state, local, and Department of Defense requirements. Authorized personnel will follow the existing range transportation safety plan and ordnance storage, handling, and safety plans. The Action Proponents must comply with Launch Site management plans for oil and hazardous materials outlined in existing standard operating procedures. • Only trained and authorized mission critical personnel will utilize support equipment and material hazards needed to perform the Proposed Action. • Although unlikely, in the event of an accident at PSCA, the Action Proponents must remediate any hazardous materials and return the land to a natural or previous state, in accordance with a mitigation approach developed by the Action Proponents, which will be coordinated with and confirmed by the Alaska Department of Environmental Conservation. **Pacific Ocean Hazardous Material and Waste Mitigation Measures** • Although no residual debris is expected following impact, after each flight test a recovery team will be sent to inspect the impact location as soon as range safety clears the area. Visible debris on the surface of the ocean will be recovered and removed after each flight test (up to six joint test operations per year until 2032).
Socioeconomics/ Environmental Justice	**Socioeconomics/Environmental Justice Mitigation Measures** **PSCA Socioeconomics/Environmental Justice** • To the extent possible the Navy will avoid testing during the fishing season (the prime fishing time is from July-September).

PUBLIC INVOLVEMENT: The U.S. Army and Navy circulated the Draft Supplemental EA/OEA for public review for 30 days from **December 1** to **December 31, 2023**. Two comments were received from members of the public and five comments were received from U.S. Agencies on the Draft Supplemental EA/OEA. Responses to those comments are included in Appendix B of the Final Supplemental EA/OEA.

POINT OF CONTACT: The Supplemental EA/OEA addressing this action may be obtained from: U.S. Army Space and Missile Defense Command, P.O. Box 1500 Huntsville, AL 35807, Attn: David Fuller, or at the document website: https://jfceaoea.govsupport.us/.

CONCLUSION: Based on the analysis presented in the Supplemental EA/OEA, the U.S. Army and Navy have concluded that the implementation of the Proposed Action will not significantly impact the quality of the human and natural environment and will not significantly harm the environment of the global commons (high seas). Accordingly, there is no requirement to prepare an Environmental Impact Statement or Overseas Environmental Impact Statement.

APPROVED:

JOHNNY R. WOLFE, JR.
Vice Admiral, U.S. Navy
Director, Strategic Systems Programs

ROBERT A. RASCH, JR.
Lieutenant General, U.S. Army
Director, Rapid Capabilities and
Critical Technologies Office

This page intentionally left blank

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From – To)*
18 January 2024	NEPA Document	July 2022 – March 2024

4. TITLE AND SUBTITLE

Joint Flight Campaign (JFC) Flight Tests Supplemental Environmental Assessment / Overseas Environmental Assessment (EA/OEA)

Final

5a. CONTRACT NUMBER
W9113M-17-D-0009

5b. GRANT NUMBER
Not Applicable (N/A)

5c. PROGRAM ELEMENT NUMBER
N/A

6. AUTHOR(S)

U.S. Army Space and Missile Defense Command
KFS, LLC

5d. PROJECT NUMBER
N/A

5e. TASK NUMBER
W9113M18FD010

5f. WORK UNIT NUMBER
N/A

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

U.S. Army Space and Missile Defense Command
PO Box 1500
Huntsville, AL 35807-3801

8. PERFORMING ORGANIZATION
N/A

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Department of the Navy Strategic Systems Programs
U.S. Department of the Army Rapid Capabilities and Critical Technologies Office

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT

12. DISTRIBUTION/AVAILABILITY STATEMENT

DISTRIBUTION STATEMENT A: Approved for public release: distribution is unlimited.

13. SUPPLEMENTARY NOTES

N/A

14. ABSTRACT

This Joint Flight Campaign Supplemental EA/OEA provides additional analysis for new launch locations at the Pacific Missile Range Facility (PMRF) and the Pacific Spaceport Complex Alaska (PSCA) for up to six joint test operations per year until 2032, after the Finding of No Significant Impact is signed, if approved. The addition of the new launch locations in this Supplemental EA/OEA does not change the total number of flight tests analyzed in the 2022 JFC EA/OEA. The additional Alternatives include launch activities of the Long Range Hypersonic Weapon (LRHW) system at PMRF and PSCA with booster splashdown and payload impact locations within new Pacific Broad Ocean Areas not evaluated in the 2022 JFC EA/OEA.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Mr. David G. Fuller
Unclassified	Unclassified	Unclassified	SAR (Same As Report)	Vol I: 120 Vol II: 260	19b. TELEPHONE NUMBER *(include area code)* (256) 955-5585

This page intentionally left blank

Table of Contents

Acronyms and Abbreviations vii

1.0 Purpose of and Need for the Proposed Action 1-1

1.1 Introduction 1-1
1.2 Purpose of and Need for the Proposed Action 1-1
1.3 Scope of Environmental Analysis 1-2
1.3.1 Key Documents 1-3
1.4 Relevant Laws and Regulations 1-3
1.5 Cooperating Agencies, Public and Agency Participation and Intergovernmental Coordination 1-3

2.0 Description of the Proposed Action and Alternatives 2-1

2.1 Proposed Action 2-1
2.1.1 Pre-Flight Activities 2-7
2.1.2 Launch Site Preparations and Operations 2-7
2.1.3 Terminal Location Preparations and Operations 2-11
2.1.4 Flight Test 2-12
2.1.5 Post Flight Test 2-12
2.2 Locations 2-12
2.3 Screening Factors 2-15
2.4 No Action Alternative 2-16

3.0 Affected Environment 3-1

3.1 Pacific Missile Range Facility 3-1
3.1.1 Water Resources – PMRF 3-3
3.1.1.1 Regulatory Setting 3-3
3.1.1.2 Region of Influence 3-3
3.1.2 Cultural Resources – PMRF 3-4
3.1.2.1 Regulatory Setting 3-4
3.1.2.2 Region of Influence 3-4
3.1.3 Biological Resources – PMRF 3-5
3.1.3.1 Regulatory Setting 3-5
3.1.3.2 Region of Influence 3-5
3.1.4 Public Health and Safety – PMRF 3-9
3.1.4.1 Regulatory Setting 3-9
3.1.4.2 Region of Influence 3-9
3.1.5 Hazardous Materials and Wastes – PMRF 3-10
3.1.5.1 Regulatory Setting 3-10
3.1.5.2 Region of Influence 3-11
3.2 Pacific Spaceport Complex Alaska 3-11
3.2.1 Air Quality and Climate Change – PSCA 3-14

3.2.1.1 Regulatory Setting 3-14
3.2.1.2 Region of Influence....3-14
3.2.2 Water Resources – PSCA 3-15
3.2.2.1 Regulatory Setting 3-15
3.2.2.2 Region of Influence....3-15
3.2.3 Biological Resources – PSCA....3-16
3.2.3.1 Regulatory Setting 3-16
3.2.3.2 Region of Influence....3-16
3.2.4 Public Health and Safety – PSCA....3-22
3.2.4.1 Regulatory Setting 3-22
3.2.4.2 Region of Influence....3-22
3.2.5 Hazardous Materials and Wastes – PSCA....3-24
3.2.5.1 Regulatory Setting 3-24
3.2.5.2 Region of Influence....3-24
3.2.6 Socioeconomics/Environmental Justice – PSCA 3-25
3.2.6.1 Regulatory Setting 3-25
3.2.6.2 Region of Influence....3-25
3.2.6.2.1 Kodiak Island 3-25
3.2.6.2.2 Village of Old Harbor....3-27
3.3 Pacific Ocean 3-28
3.3.1 Water Resources – Pacific Ocean 3-30
3.3.1.1 Regulatory Setting 3-30
3.3.1.2 Region of Influence....3-30
3.3.2 Biological Resources – Pacific Ocean 3-31
3.3.2.1 Regulatory Setting 3-31
3.3.2.2 Region of Influence....3-31
3.3.3 Hazardous Materials and Waste – Pacific Ocean 3-41
3.3.3.1 Regulatory Setting 3-41
3.3.3.2 Region of Influence....3-41

4.0 Environmental Consequences 4-1

4.1 Pacific Missile Range Facility.... 4-1
4.1.1 Water Resources – PMRF....4-1
4.1.1.1 No Action Alternative – PMRF 4-1
4.1.1.2 Proposed Action – PMRF 4-1
4.1.2 Cultural Resources – PMRF 4-1
4.1.2.1 No Action Alternative – PMRF 4-1
4.1.2.2 Proposed Action – PMRF 4-2
4.1.3 Biological Resources – PMRF 4-2
4.1.3.1 No Action Alternative – PMRF 4-2
4.1.3.2 Proposed Action – PMRF 4-3
4.1.4 Public Health and Safety – PMRF 4-6
4.1.4.1 No Action Alternative – PMRF 4-6

4.1.4.2 Proposed Action – PMRF 4-6
4.1.5 Hazardous Materials and Wastes – PMRF 4-7
4.1.5.1 No Action Alternative – PMRF 4-7
4.1.5.2 Proposed Action – PMRF 4-7
4.2 Pacific Spaceport Complex Alaska 4-8
4.2.1 Air Quality and Climate Change – PSCA 4-8
4.2.1.1 No Action Alternative – PSCA....4-8
4.2.1.2 Proposed Action – PSCA....4-8
4.2.2 Water Resources – PSCA 4-11
4.2.2.1 No Action Alternative – PSCA....4-11
4.2.2.2 Proposed Action – PSCA....4-11
4.2.3 Biological Resources – PSCA....4-12
4.2.3.1 No Action Alternative – PSCA....4-12
4.2.3.2 Proposed Action – PSCA....4-12
4.2.4 Public Health and Safety – PSCA....4-14
4.2.4.1 No Action Alternative – PSCA....4-14
4.2.4.2 Proposed Action – PSCA....4-14
4.2.5 Hazardous Materials and Wastes – PSCA....4-15
4.2.5.1 No Action Alternative – PSCA....4-15
4.2.5.2 Proposed Action – PSCA....4-15
4.2.6 Socioeconomics/Environmental Justice – PSCA 4-16
4.2.6.1 No Action Alternative – PSCA....4-16
4.2.6.2 Proposed Action – PSCA....4-16
4.3 Pacific Ocean 4-17
4.3.1 Water Resources – Pacific Ocean 4-17
4.3.1.1 No Action Alternative – Pacific Ocean....4-17
4.3.1.2 Proposed Action – Pacific Ocean....4-17
4.3.2 Biological Resources – Pacific Ocean 4-18
4.3.2.1 No Action Alternative – Pacific Ocean....4-18
4.3.2.2 Proposed Action – Pacific Ocean....4-18
4.3.3 Hazardous Materials and Waste – Pacific Ocean 4-26
4.3.3.1 No Action – Pacific Ocean 4-26
4.3.3.2 Proposed Action – Pacific Ocean....4-26
5.0 Cumulative Impact Analysis.... 5-1
5.1 Definition of Cumulative Impacts 5-1
5.2 Scope of Cumulative Impacts Analysis 5-1
5.3 Past, Present, and Reasonably Foreseeable Actions 5-1
5.3.1 Past Actions 5-2
5.3.1.1 PMRF 5-2
5.3.1.2 PSCA....5-2
5.3.1.3 Pacific Ocean 5-2
5.3.2 Present and Reasonably Foreseeable Actions 5-2

5.3.2.1 PMRF 5-2
5.3.2.2 PSCA....5-2
5.3.2.3 Pacific Ocean 5-2
5.4 Cumulative Impact Analysis.... 5-2
5.4.1 PMRF 5-3
5.4.2 PSCA 5-3
5.4.3 Pacific Ocean 5-4
6.0 Reference List 6-1
7.0 List of Preparers.... 7-1
8.0 Distribution List.... 8-1

Figures

Figure 2-1. Additional Supplemental Launch and Impact Locations 2-2
Figure 2-2. LRHW Launch Vehicle All-Up-Round....2-3
Figure 2-3. TEL Launch Configuration 2-5
Figure 2-4. LRHW AUR Support Vehicles Characteristics....2-6
Figure 2-5. PMRF Launch and Launch Support Locations 2-8
Figure 2-6. Location Map for PSCA Launch Sites 2-9
Figure 2-7. PSCA Area 1 2-10
Figure 2-8. PSCA Launch Pad 2 (LP-2) 2-11
Figure 2-9. Proposed Activity Locations for PMRF-Launched Tests....2-13
Figure 2-10. Proposed Activity Locations for PSCA-Launched Tests 2-14
Figure 3-1. Biological Resources in the PSCA ROI 3-19
Figure 3-2. Location of Communities in and near the PSCA ROI 3-26
Figure 3-3. Biological Resources in the PMRF Stage 1 Booster Drop Zone 3-32
Figure 3-4. Biological Resources in the PSCA Stage 1 Booster Drop Zone 3-33
Figure 3-5. Pacific BOA Comparison for JFC Supplemental and JFC EA/OEA Evaluations ...3-34
Figure 3-6. Biologically Important Areas for Cetaceans in the PSCA Stage 1 Booster Drop Zone 3-39
Figure 4-1. Maximum Acoustic Isopleths and Habitat Areas in the PMRF ROI....4-4

Tables

Table 1-1. Summary of the Anticipated Impacts to the Environmental Resources in the Region of Influence....1-2
Table 1-2. Newspaper Publications for the Notice of Availability and Repositories for Draft EA/OEA Copies....1-4
Table 2-1. Launch Vehicle Characteristics....2-4
Table 2-2. Payload System Characteristics....2-4
Table 2-3. TEL System Characteristics....2-6
Table 2-4. All Proposed Launch Sites and Impact Area Locations....2-15
Table 3-1. ESA and State of Hawai`i Listed Species with the Potential to Occur in the PMRF ROI....3-7
Table 3-2. Threatened and Endangered Species with the Potential to Occur in the PSCA ROI....3-18
Table 3-3. ESA-Listed Species with the Potential to Occur in the Pacific Ocean Booster Drop and Payload Impact Zones....3-36
Table 4-1. Minuteman III Solid Propellant Rocket Motors....4-9
Table 4-2. LRHW AUR Rocket Motors....4-9
Table 4-3. Historical Estimated Emissions for Minuteman III Launches (Tons per Year)....4-9
Table 4-4. Estimated Emissions for LRHW AUR Launches from FY 2022 – FY 2032 (Tons per Year)....4-10
Table 4-5. Maximum Density and Estimated Number of Animal Exposures to Direct Contact from LRHW AUR Component Splashdown in the Pacific BOA....4-20
Table 4-6. Distance to Effect Thresholds in Wildlife for Elevated In-Water Sound Levels Resulting from LRHW AUR Component Splashdown or Impact....4-22

Appendices (Volume II)

Appendix A – Agency Correspondence
Appendix B – Comments and Responses on the Draft Supplemental EA/OEA
Appendix C – Key Documents
Appendix D – Relevant Laws and Regulations
Appendix E – Mitigation Measures
Appendix F – Other Considerations Required by NEPA
Appendix G – Biological Evaluations and Assessments

This page intentionally left blank

Acronyms and Abbreviations

AAC	Alaska Aerospace Corporation
ADEC	Alaska Department of Environmental Conservation
ADFG	Alaska Department of Fish and Game
AMMPS	Advanced Medium Mobile Power Source
AUR	All-Up-Round
BIA	Biologically Important Area
BOA	Broad Ocean Area
BOC	Battery Operations Center
BSV	Battery Operations Center Support Vehicle
BTU/H	British Thermal Unit per Hour
CFR	Code of Federal Regulations
cm	Centimeter(s)
CO_2e	Carbon Dioxide Equivalent
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
DOD	Department of Defense
DOE	Department of Energy
DON	Department of Navy
DPS	Distinct Population Segment
EA/OEA	Environmental Assessment/ Overseas Environmental Assessment
EFH	Essential Fish Habitat
EO	Executive Order
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FE-1	Flight Experiment-1
FE-2	Flight Experiment-2
FONSH	Finding of No Significant Harm
FONSI	Finding of No Significant Impact
FR	Federal Register
ft	Foot/Feet
FT-2	Flight Test-2
FT-3	Flight Test-3
FY	Fiscal Year
GHG	Greenhouse Gases
HCl	Hydrogen Chloride
Hz	Hertz
in.	Inch(es)
JFC	Joint Flight Campaign
kg	Kilogram(s)
km	Kilometer(s)
KTF	Kaua`i Test Facility
kW	Kilowatt(s)
lb	Pound(s)
LP	Launch Pad
LRHW	Long Range Hypersonic Weapon
LxWxH	Length by Width by Height
m	Meter(s)
MBTA	Migratory Bird Treaty Act
mi	Mile(s)
MMPA	Marine Mammal Protection Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
N/A	Not Applicable
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
nm	Nautical Mile(s)
NMFS	National Marine Fisheries Service
NOTAM	Notice to Air Mission
NTM	Notice to Mariners
PAEL	Pre-Approved Emission Limits
$PM_{2.5}$	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
PMRF	Pacific Missile Range Facility
PSCA	Pacific Spaceport Complex Alaska
PSD	Prevention of Significant Deterioration
RCCTO	U.S. Army Rapid Capabilities and Critical Technologies Office
ROI	Region of Influence
SNL	Sandia National Laboratories

SSP	Strategic Systems Programs
TEL	Transporter Erector Launcher
THAAD	Terminal High Altitude Area Defense
U.S.	United States
USASMDC	United States Army Space and Missile Defense Command
U.S.C.	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
V	Volt

1.0 Purpose of and Need for the Proposed Action

1.1 Introduction

The Joint Flight Campaign (JFC) flight tests are sponsored by the Office of the Under Secretary of Defense for Research and Engineering, which has designated the Department of the Navy (Navy, or DON) Strategic Systems Programs (SSP) as one of two lead agencies for the Proposed Action. The United States Department of the Army (U.S. Army) has designated the U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) as the second lead agency. Together SSP and RCCTO form the joint Action Proponents for this Supplemental Environmental Assessment/Overseas Environmental Assessment (EA/OEA).

This Supplemental JFC EA/OEA provides additional analysis for new launch locations at the Pacific Missile Range Facility (PMRF) and the Pacific Spaceport Complex Alaska (PSCA) for up to six joint test operations per year until 2032, after the Finding of No Significant Impact /Finding of No Significant Harm (FONSI/FONSH) is signed, if approved. The addition of the new launch locations in this Supplemental EA/OEA does not change the total number of flight tests analyzed in the 2022 JFC EA/OEA. The proposed JFC joint test operations evaluated in the Supplemental EA/OEA include the options to (1) launch from the Terminal High Altitude Area Defense (THAAD) launch pad at PMRF, (2) launch from PSCA, and (3) Pacific Broad Ocean Area (BOA) payload impact down range of PSCA.

SSP, RCCTO, and the United States Army Space and Missile Defense Command (USASMDC) have prepared this Supplemental EA/OEA in accordance with the National Environmental Policy Act (NEPA) (42 United States Code [U.S.C.] § 4321, as amended), the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (Title 40 Code of Federal Regulations [CFR] §§ 1500-1508), the Department of the Army Procedures for Implementing NEPA (32 CFR § 651), and the Chief of Naval Operations Instruction M-5090.1.

1.2 Purpose of and Need for the Proposed Action

The purpose of the Proposed Action is to perform the JFC land-based test launches at PMRF and PSCA, with payload impacts in the Pacific BOA, to collect data to verify Long Range Hypersonic Weapon (LRHW) performance.

The Proposed Action is needed to prove that the Conventional Prompt Strike weapon system and Army LRHW system meet all key performance requirements within the capabilities of the All-Up-Round (AUR) missile used by both systems. To meet the Conventional Prompt Strike and LRHW program objectives, test events must satisfy certain critical objectives. Critical objectives include demonstrating weapon system effectiveness, demonstrating applicable design features, and establishing effective operating procedures, which also ensure the safety of the warfighter and the public.

1.3 Scope of Environmental Analysis

This Supplemental EA/OEA includes an analysis of potential environmental impacts resulting from proposed launch activities at the THAAD launch site at PMRF; proposed launch activities at Area 1 (Long Range Radar Area) or Launch Pad 2 (LP-2) at PSCA; and proposed terminal impact activities in the Pacific BOA. The No Action Alternative is also analyzed.

The 2022 JFC EA/OEA (DON and U.S. Army 2022) analyzed potential environmental impacts from launch at the Sandia National Laboratories/Kaua`i Test Facility (SNL/KTF) Launch Pad 42, over-ocean vehicle flight in the Pacific, booster splashdown in the Pacific BOA, and payload impact in the Pacific BOA. Handling, loadout, launch activities, and impact areas analyzed in the JFC EA/OEA (DON and U.S. Army 2022) are referenced throughout the Supplemental EA/OEA, but are not analyzed in this Supplemental EA/OEA. The scope (i.e., Proposed Action) of the environmental analysis for this Supplemental EA/OEA is limited to the following differences (aka deltas) from the 2022 JFC EA/OEA (DON and U.S. Army 2022):

- Launch activities of the LRHW system at PMRF's THAAD launch site and PSCA's Area 1 and LP-2
- Pacific BOA booster splashdown and payload impact locations not evaluated in the JFC EA/OEA

The environmental resource areas evaluated in detail in this Supplemental EA/OEA are depicted in **Table 1–1**. The resources that were not evaluated in detail were determined to have potential impacts at negligible or nonexistent levels.

Table 1-1. Summary of the Anticipated Impacts to the Environmental Resources in the Region of Influence

Proposed Action			
Resource	**PMRF**	**PSCA**	**Pacific Ocean**
Air Quality and Climate Change		E	
Airspace Management			
Water Resources	E	E	E
Geology and Soils			
Cultural Resources	E		
Biological Resources	E	E	E
Land Use			
Noise and Vibration			
Infrastructure and Utilities			
Transportation/Traffic			
Public Health and Safety	E	E	
Hazardous Materials and Wastes	E	E	E
Socioeconomics, Environmental Justice		E	
Aesthetics and Visual Resources			

Note: Shaded boxes marked E indicate areas that were evaluated in detail.

1.3.1 Key Documents

Key documents are sources of information incorporated into this Supplemental EA/OEA. These documents are considered to be key because they address similar actions, analyses, or impacts that may apply to this Proposed Action. See **Appendix C** for the list of Key Documents.

1.4 Relevant Laws and Regulations

The JFC Action Proponents have prepared this Supplemental EA/OEA based on federal and state laws, statutes, regulations, and policies that are pertinent to the implementation of the Proposed Action. See **Appendix D** for a list of the laws and regulations relevant to the Proposed Action.

1.5 Cooperating Agencies, Public and Agency Participation and Intergovernmental Coordination

Seventeen Agencies/groups were requested to participate as Coordinating Agencies in the preparation of this Supplemental EA/OEA (40 CFR § 1501.6; refer to **Chapter 8.0** for the distribution list and **Appendix A** for Agency/Group correspondence). Regulations from the Council on Environmental Quality (40 CFR § 1506.6) direct agencies to involve the public in preparing and implementing their NEPA procedures.

United States Fish and Wildlife Service (USFWS) Coordination and Consultation – The Action Proponents have determined that the Proposed Action, specifically launch activities from the THAAD launch site and booster splashdown offshore of Kodiak Island, may affect Endangered Species Act (ESA)-listed species and designated critical habitats under the jurisdiction of the USFWS. The Action proponents prepared a Biological Evaluation to evaluate the potential effects of the Proposed Action on ESA-listed species under the jurisdiction of the USFWS (U.S. Army and DON 2023a; **Appendix G**). The Action Proponents initiated consultation with the USFWS under Section 7 of the ESA for potential effects to ESA-listed species on August 29, 2023. On October 30, 2023, the USFWS issued a letter of concurrence that proposed activities may affect but are not likely to adversely affect ESA-listed species in the Gulf of Alaska (**Appendix A**). On December 14, 2023, the USFWS issued a letter of concurrence that proposed launch activities at PMRF may affect but are not likely to adversely affect ESA-listed species or designated critical habitat (**Appendix A**).

National Marine Fisheries Service (NMFS) Coordination and Consultation – The Action Proponents have coordinated with NMFS regarding the potential effects of the Proposed Action on marine ESA-listed species and designated critical habitats, species protected under the Marine Mammal Protection Act (MMPA), and essential fish habitat (EFH). The effects of over-ocean flight, booster splashdown, and payload impact in a Pacific BOA were evaluated in the JFC EA/OEA for flight tests from SNL/KTF and the Action Proponents consulted with NMFS on the potential effects of those activities on ESA-listed species (see NMFS 2021). Because proposed JFC Supplemental activities may affect ESA-listed species and designated critical habitats not considered in the 2021

JFC consultation, the Action Proponents prepared a Marine Biological Evaluation (U.S. Army and DON 2023b; **Appendix G**) and requested an amended consultation for JFC activities from NMFS on July 7, 2023. On November 14, 2023, NMFS issued a letter of concurrence that proposed JFC supplemental activities may affect but are not likely to adversely affect ESA-listed species (**Appendix A**). The Action Proponents also prepared an EFH Assessment (U.S. Army and DON 2023c; **Appendix G**) to support consultation with NMFS on the potential effects of the Proposed Action on EFH. The NMFS provided a conservation recommendation to ensure that potential adverse effects to EFH are avoided and minimized on December 20, 2023 (**Appendix A**) and consultation was concluded on December 22, 2023, with the Action Proponent's commitment to implement the conservation recommendation (**Appendix A**).

Public and Intergovernmental Coordination – The Action Proponents coordinated with Alaskan agencies and Stakeholders relative to Kodiak. These include United States Environmental Protection Agency (USEPA) Region 10, Sun'aq Tribe of Kodiak, Alutiiq Tribe of Old Harbor, Alaska Department of Fish and Game (ADFG), Alaska State Historic Preservation Office, Alaska Department of Transportation & Public Facilities, and the Alaska Aerospace Corporation (AAC).

A Notice of Availability for the Draft Supplemental EA/OEA and Draft FONSI/FONSH was published, indicating where copies could be obtained or reviewed; the duration of the comment period; and where comments could be sent. During the public comment period, comments could be submitted via the project website or mailed to a USASMDC address. The Notice of Availability was published in the newspapers shown in **Table 1-2**.

Table 1-2. Newspaper Publications for the Notice of Availability and Repositories for Draft EA/OEA Copies

Launch Location	City/Town	Newspaper	Library
PMRF, Kaua`i, Hawai`i	Kekaha, Hawai`i Waimea, Hawai`i	The Garden Island	Waimea Public Library, Waimea, HI Hanapepe Public Library, Hanapepe, HI
PSCA, Kodiak, Alaska	Kodiak, Alaska Anchorage, Alaska	Kodiak Daily Mirror Anchorage Daily News	Kodiak Public Library, Kodiak, AK Anchorage Public Library (Z.J. Loussac Public Library), Anchorage, AK

In accordance with Council on Environmental Quality and Department of Defense (DOD) regulations for implementing NEPA, the Navy and the U.S. Army circulated the Draft Supplemental EA/OEA for public review from December 1–31, 2023. Substantive comments received on the Draft Supplemental EA/OEA and responses to those comments are provided in **Appendix B**. Copies of the Draft Supplemental EA/OEA and Draft FONSI/FONSH were placed in local repositories for public access and made available over the Internet at https://jfceaoea.govsupport.us. Agencies, organizations, and repositories that were directly notified about the NOA or received a copy of the document are listed in **Chapter 8.0**.

Following the public review period, the JFC Action Proponents decided to sign the FONSI/FONSH, which allows the Proposed Action to be implemented. The Final Supplemental EA/OEA includes both the written comments (i.e., letters and electronic messages received) and their resolutions. The Final Supplemental EA/OEA and FONSI/FONSH were made accessible on the internet at https://jfceaoea.govsupport.us.

This page intentionally left blank

2.0 Description of the Proposed Action and Alternatives

2.1 Proposed Action

The Navy SSP and U.S. Army RCCTO are considering up to three launch locations at PMRF and PSCA, and payload impact areas in the Pacific BOA for the JFC Flight Tests Supplemental EA/OEA Proposed Action. Since the 2022 JFC EA/OEA was published (DON and U.S. Army 2022), the Action Proponents have identified two additional JFC launch locations and one additional impact location that meet the JFC EA/OEA purpose and need and the screening criteria/evaluation factors highlighted in **Section 2.3**. These two launch locations and the additional impact location encompass the Proposed Action that is analyzed in this Supplemental EA/OEA against the No Action Alternative (**Section 2.4**).

The Proposed Action would add potential launch and impact locations to the JFC EA/OEA selected actions of up to six flight tests per year over 10 years designed to prove various aspects of the JFC system's capabilities. The analyzed additional launch and impact locations consist of two test scenarios: (1) launch from PMRF's THAAD launch site with payload impact in the Pacific BOA; and (2) launch from PSCA's Area 1 or LP-2 with a payload impact in the Pacific BOA (**Figure 2-1**).

Flight tests are designed to prove various aspects of the LRHW system's capabilities. The LRHW launch vehicle consists of a two-stage booster system and payload known as an AUR missile (**Figure 2-2**). The AUR is approximately 1 meter (m; 3 feet [ft]) in diameter and 10 m (30 ft) in length. The first and second stage include up to approximately 9,000 kilograms (kg; 20,000 pounds [lb]) of rocket propellant.

All transportation, handling, and storage of the rocket motors and other ordnance at PMRF and PSCA would occur in accordance with DOD, Navy, U.S. Army, and U.S. Department of Transportation policies and regulations to safeguard the materials from fire or other mishap. All shipments to Hawai`i would be inspected to prevent the introduction of alien species of plants and animals into the environment.

The Proposed Action entails standard ground preparations and pre-flight activities for the test at the proposed launch sites; launch from the THAAD launch site and PSCA Area 1 or LP-2; post launch operations at proposed launch sites; booster splashdown in the Pacific BOA; and payload impact in the Pacific BOA. These standard preparations and preflight activities are covered under other NEPA analyses (DON and U.S. Army 2022, DOD 2017).

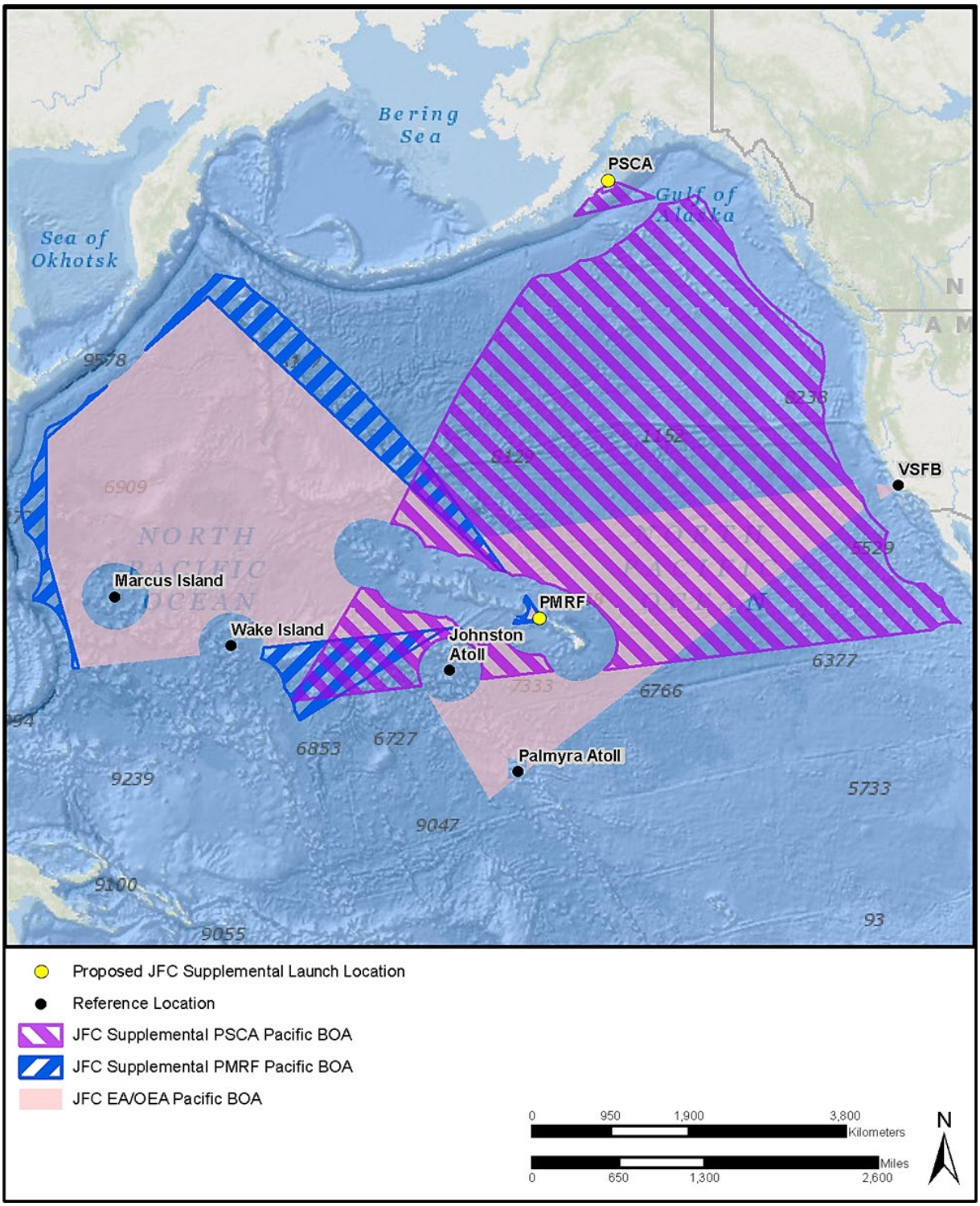


Figure 2-1. Additional Supplemental Launch and Impact Locations

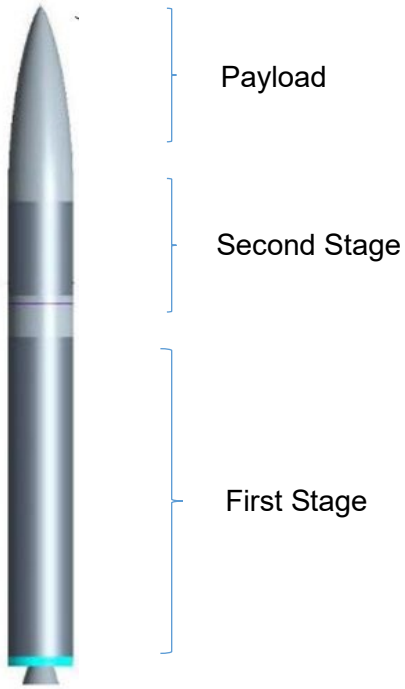


Figure 2-2. LRHW Launch Vehicle All-Up-Round

Routine pre-flight support activities such as base support, range safety, flight test support, test instrumentation, ground equipment checks, weapon system vehicle and booster assembly and checks would occur prior to every JFC flight test. Pre-flight activities would adhere to guidance set by each installation's certified oversight and existing, up-to-date standard operating procedures will be followed to ensure the safety of workers and members of the public. No facility alterations are planned, and all activities would use existing facilities and infrastructure. PMRF or PSCA will issue Notices to Air Missions (NOTAMs) and Notices to Mariners (NTMs) ahead of any JFC flight test, in accordance with range safety and Federal Aviation Administration (FAA) requirements.

The phases of the JFC flight tests include launch; first-stage booster burn, separation, and descent into the pre-identified booster drop zone; second-stage booster burn, separation, and descent into the pre-identified booster drop zone; and payload flight and impact into the pre-identified payload impact zone in the Pacific BOA.

Characteristics of the launch vehicle are presented in **Table 2-1**. The payload system characteristics are presented in **Table 2-2**. The physical characteristics of the AUR are identical to the launch vehicle and payload systems analyzed in the 2022 JFC EA/OEA.

Table 2-1. Launch Vehicle Characteristics

Major Components	Rocket motors, propellant, magnesium thorium, nitrogen gas, halon, asbestos, battery electrolytes (lithium-ion, silver zinc)
Communications	Various 5- to 20-watt radio frequency transmitters; one maximum 400-watt radio frequency pulse
Power	Up to nine lithium ion polymer and silver zinc batteries, each weighing between 1.3 and 18 kg (3 and 40 lb)
Propulsion/Propellant	Rocket propellant and approximately 1.3 kg (3 lb) of pressurized nitrogen gas
Other	Small Class C (1.4) electro-explosive devices for flight termination

Table 2-2. Payload System Characteristics

Structure	Aluminum, steel, titanium, magnesium and other alloys, copper, fiberglass, chromate coated hardware, tungsten, plastic, Teflon, quartz, room temperature vulcanizing silicone
Communications	Two up-to 20-watt radio frequency transmitters
Power	Up to three lithium ion polymer batteries, each weighing between 1 and 23 kg (3 and 50 lb)
Propulsion	None
Other	Class C (1.4) electro-explosive devices for safety and payload system subsystems operations

The AUR would be launched from a Transporter Erector Launcher (TEL) as shown in **Figure 2-3**. Technical specifications for the TEL are located in **Table 2-4.** Positioning may require 2.7 m (9 ft) grounding rods to be hammered in to 1.8 m (6 ft) below the ground surface. Support vehicles such as the Battery Operations Center (BOC) and BOC Support Vehicle (BSV) and their specifications are shown in **Figure 2-4**. The BOC is the TEL's mobile command, control, and communications center which integrates and controls the TEL, executes firing, and communicates the health and status of the weapon system to the operators and Higher Echelon Units. The BOC would be connected to the TEL via a tactical fiber optic cable, and can be located up to 2 kilometers (km; 6,561 ft) from the TEL. The BSV is an equipment trailer which transports the BOC's external items, such as the Tactical Fiber Optic Cable assembly, between the TEL and the BOC.

If the launch vehicle deviates from its course or should other problems occur during the flight test that might jeopardize public safety, the onboard Flight Termination System would be activated. This action would initiate an explosive charge to vent the motor chamber, release pressure, and significantly reduce propellant combustion. The Flight Termination System is designed to stop the booster's forward thrust, causing the launch vehicle to fall along a ballistic trajectory into the ocean. The Flight Termination System would be designed to prevent any debris from falling into marine protected areas, or inhabited land areas. Computer-monitored destruct lines are pre-programmed in the flight safety software to avoid any debris falling on inhabited areas, as per Space System Software Safety Engineering protocols and U.S. range operation standards and practices (Range Commanders Council 2020).

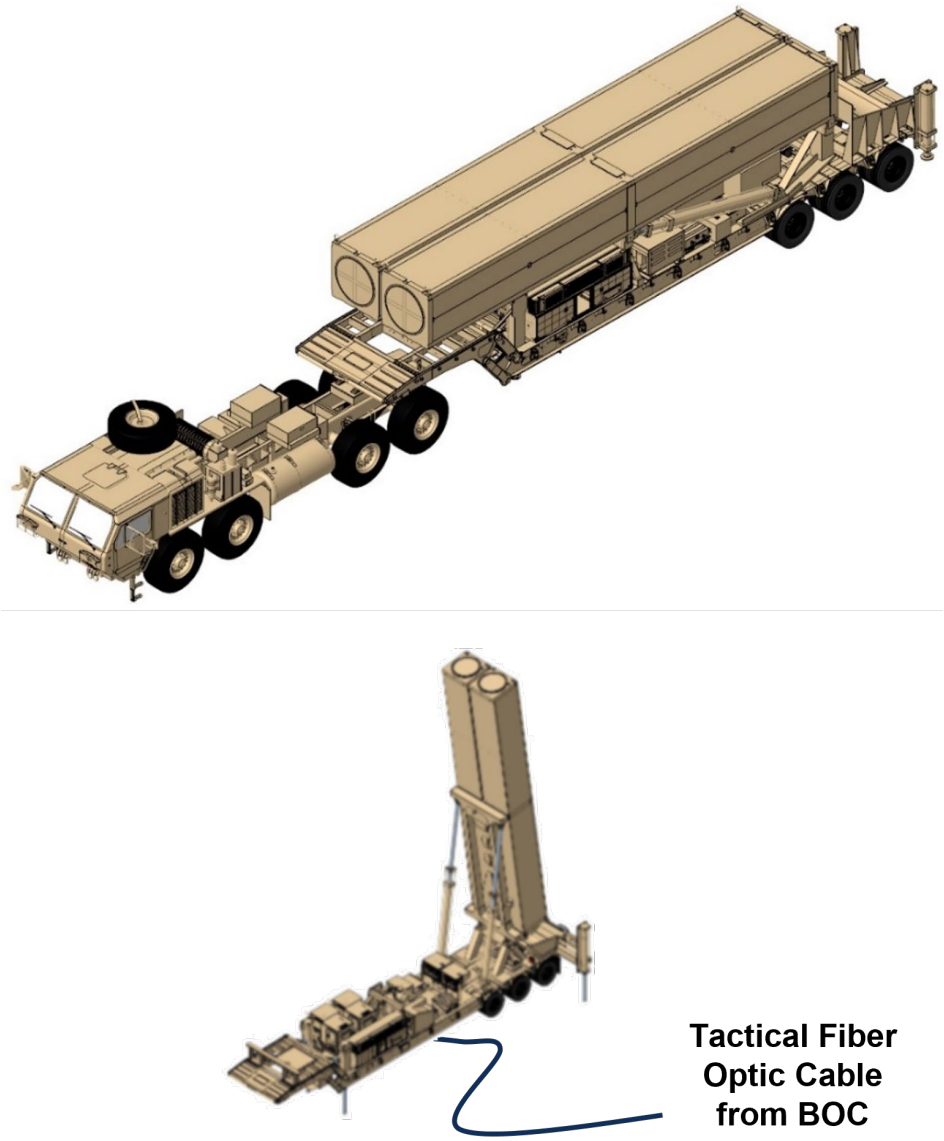


Figure 2-3. TEL Launch Configuration

Table 2-3. TEL System Characteristics

Gross Launcher Weight	104,700 lb
Payload	(2) AUR+C (44,000 lb)
Dimensions (LxWxH)	581.3” x 101.9” x 141.3” (transport) 573.5” x 194” x 540” (emplaced)
Launch Angle	80° ± 2°
Electrical Power	(2) MEP-1040 AMMPS 10kW generators
Hydraulic Power	6 to 15 gallons per minute @ 3,000 pounds per square inch Actuation via tethered controller
Environmental Control	Dual 18K BTU/H cooling / 14 BTU/H heating units
Four Point Stabilization	Level on 5% (3°) grades
Air Transportable	C-17 – Full payload





BSV Assembly	
Gross Weight	13,000 lb (estimated)
Overall Dimensions (LxWxH)	327 in. x 86 in. x 99 in.
Prime Mover	2320-01-518-7332, HMMWVA-M1152A2
Air Transport	Yes
Highway Transport	Yes
Road March	Yes

BOC Assembly	
Gross Weight	27,500 lb (estimated)
Overall Dimensions (LxWxH)	351.3 in. x 99.5 in. x 147.5 in.
Prime Mover	2320-01-447-3891, M-1085 A1
Electrical Power	15 kW, 208 VAC, 3 PH
Environmental Control Unit	13627647-9, Applied Companies
Air Transport	Yes
Highway Transport	Yes
Road March	Yes

Figure 2-4. LRHW AUR Support Vehicles Characteristics

The proposed Pacific BOA payload impact would occur in deep ocean waters. No residual debris is expected following impact; however, a recovery team would be sent to inspect the impact location as soon as range safety clears the area. Visible debris on the surface of the ocean would be recovered and removed. The self-stationing rafts described in the 2022 JFC EA/OEA (DON and U.S. Army 2022) would be recovered, and the data analyzed.

2.1.1 Pre-Flight Activities

Various other Government facilities would participate in pre-flight support operations related to the Proposed Action (see DON and U.S. Army 2022, Table 1-1). Those additional locations maintain NEPA documentation and/or regulatory permitting for their ongoing activities. As such, analysis of these support operations is not included in this Supplemental EA/OEA.

2.1.2 Launch Site Preparations and Operations

The primary existing facilities that would support the Proposed Action at PMRF are shown in **Figure 2-5**. Refer to the JFC EA/OEA (DON and U.S. Army 2022, Section 2.5.3.1, Pages 2-6 through 2-8) for a description of the various support services that PMRF would perform for JFC flight tests with launch from the THAAD launch site. The THAAD launch site contains a 45.7 m by 45.7 m (150 ft by 150 ft) concrete pad encircled by a chain-link fence.

At PSCA, JFC flight tests would launch from Area 1 or LP-2. **Figures 2-6, 2-7**, and **2-8** show the various support facilities and launch pads to be utilized at PSCA. Area 1 features that are compatible with the LRHW system launch needs include a 0.9-m (3-ft) thick compacted gravel pad, 70-m by 76-m (200-ft by 250-ft) security fencing, one 208 volts (V) in, 120V out at 60 hertz (Hz; 208/120V @ 60 Hz) 750 kilovolt-ampere transformer, light-emitting diode lighting, and 10 access pedestals for fiber optic and Ethernet access. LP-2 features that are compatible with the LRHW system launch needs include a flat pad with retractable environmental structure, inside security fencing, shore-based power and grounding, light-emitting diode lighting, and connections for fiber optics and Ethernet. Refer to the Flight Test-3 (FT-3) EA/OEA (U.S. Army 2021, Section 2.5.3, Pages 2-4 through 2-5) for a description of the launch site preparations and operations of support services that PSCA would perform prior to the JFC flight tests with the exception of there is no motor and payload assembly and integration at the Test Range. The assembled AUR will be in the canister, loaded on the emplaced TEL, and be ready for launch. Also there will be no use of Launch Pad 3, Payload Processing Facility, Rocket Motor Storage Facility, or Launch Pad 1.



Figure 2-5. PMRF Launch and Launch Support Locations



Figure 2-6. Location Map for PSCA Launch Sites



Figure 2-7. PSCA Area 1

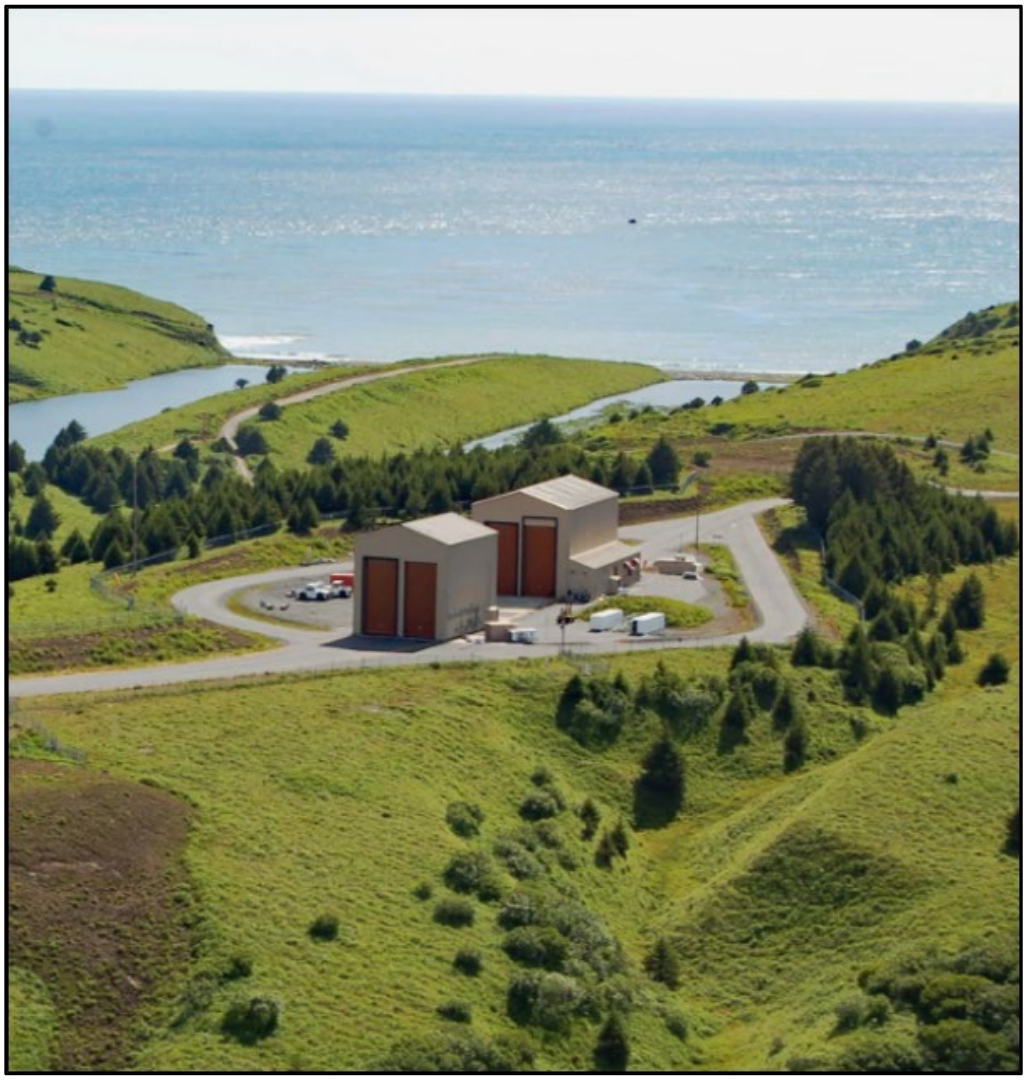


Figure 2-8. PSCA Launch Pad 2 (LP-2)

2.1.3 Terminal Location Preparations and Operations

For a nominal mission, it is anticipated that up to 4 weeks of increased activities would be required in the BOA. Various test support will be deployed in the BOA (i.e., self-stationing sensor rafts, support ship/vessel, telemetry assets). It is expected that the support ship would remain on station for up to 2 weeks while waiting for the test to occur. Vessel operations, particularly in the BOA, would only occur when weather and sea conditions are acceptable for safe travel. Vessel operations would not involve any intentional ocean discharges of fuel, toxic wastes, or plastics and other solid wastes that could potentially harm marine life. Refer to the JFC EA/OEA (DON and U.S. Army 2022, Section 2.5.4.1, Pages 2-15 through 2-16) for a thorough description of the various test support.

NOTAMs and NTMs would be published and circulated in accordance with established procedures to provide warning to personnel and local residents concerning any potential hazard areas that should be avoided.

2.1.4 Flight Test

Flight test activities may include launch from the THAAD launch site and impact of the payload in the Pacific BOA. Following motor ignition and liftoff from the launch location, the first-stage motor would burn out down range and separate from the second stage with the inter-stage assembly also being jettisoned. The first-stage motor would splash down in the stage 1 booster drop zone, which would be located more than 5.5 km (3.0 nautical miles [nm]) from shore. Farther into flight, the second-stage would burn out and separate, with the payload adapter also being jettisoned from the payload. The payload would fly toward predesignated sites in the BOA. Splashdown of the spent motor stage, inter-stage, payload adaptor and payload would occur at different points in the open ocean within the stage 2 booster drop/payload impact zone, all of which would be greater than 22 km (12 nm) from shore. Jettison of the inter-stage and separation of the payload would occur outside the atmosphere, and all anticipated impacts would be outside any Marine National Monuments. Refer to the JFC EA/OEA for a thorough description of the flight test, flight safety measures, and sensor coverage from PMRF (DON and U.S. Army 2022; Section 2.5.5.1, Pages 2-16 through 2-18).

Flight test activities may include launch from PSCA's Area 1 or LP-2 and impact of the payload in the Pacific BOA. Motor ignition and liftoff from the launch location, and stage separations would essentially be the same as summarized above. Refer to the FT-3 EA/OEA (U.S. Army 2021, Section 2.5.5, Pages 2-10 through 2-13) for descriptions of the flight test from motor ignition to payload impact, sensor coverage, and details regarding the onboard Flight Termination System.

2.1.5 Post Flight Test

Refer to the JFC EA/OEA for a thorough description of post flight test activities that would occur at PMRF (DON and U.S. Army 2022; Section 2.5.6.1, Page 2-25). At PSCA, after the last flight test, any mobile equipment brought to PSCA would be dismantled and packed for shipment back to its original location. Any waste materials generated would be disposed of according to applicable regulations and range procedures and policy by PSCA, depending on whether the material is determined to be hazardous or solid waste. (DOD 2017)

2.2 Locations

The Navy SSP and U.S. Army RCCTO are considering up to three launch locations at PMRF and PSCA, and payload impact areas in the Pacific BOA for the JFC Flight Tests Supplemental EA/OEA Proposed Action (**Table 2-4)**. Actions covered in the 2022 JFC EA/OEA (DON and U.S. Army 2022) is not analyzed in this Supplemental EA/OEA. Locations in the Proposed Action Region of Influence (ROI) are shown in **Figure 2-5** through **Figure 2-10**.

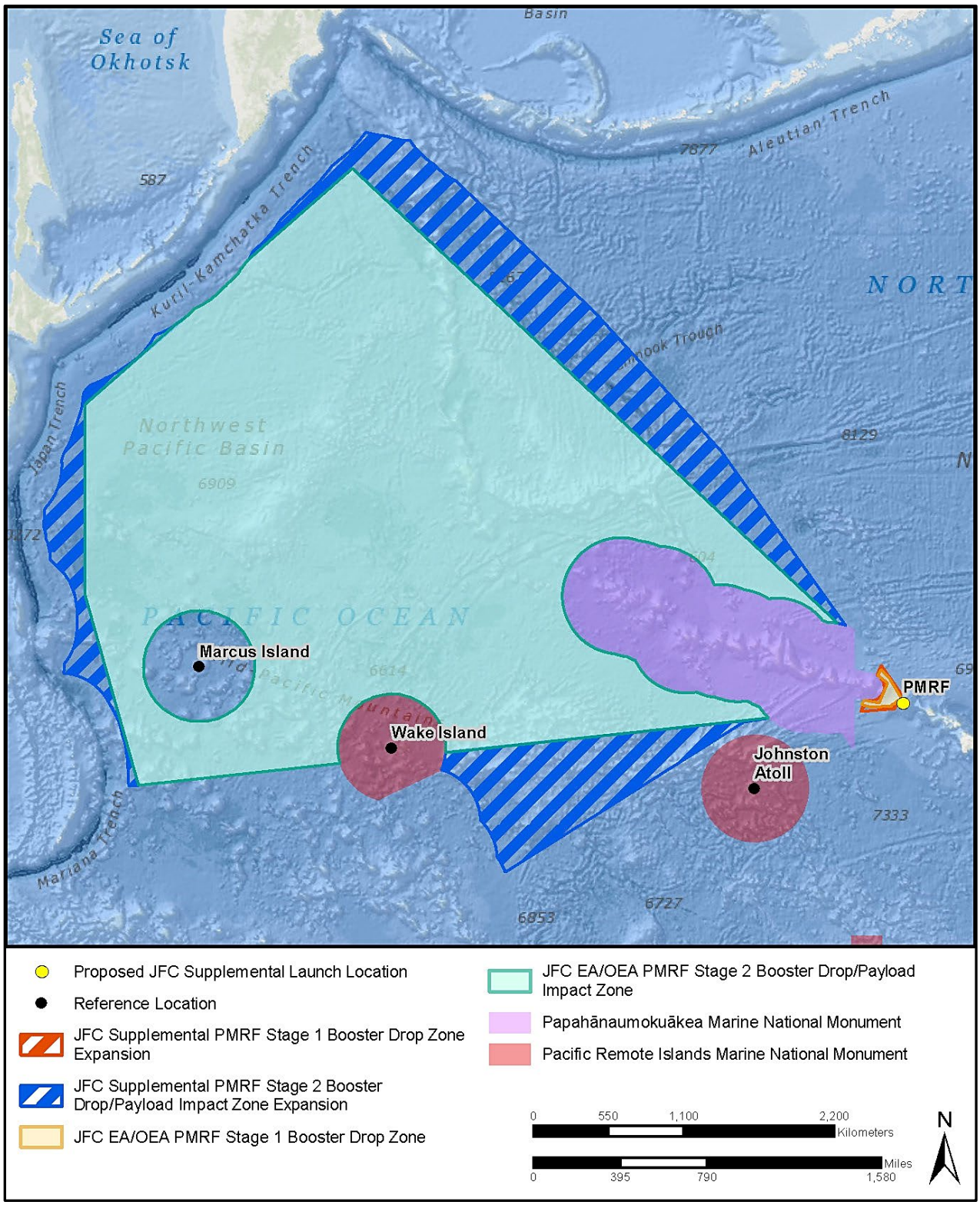


Figure 2-9. Proposed Activity Locations for PMRF-Launched Tests

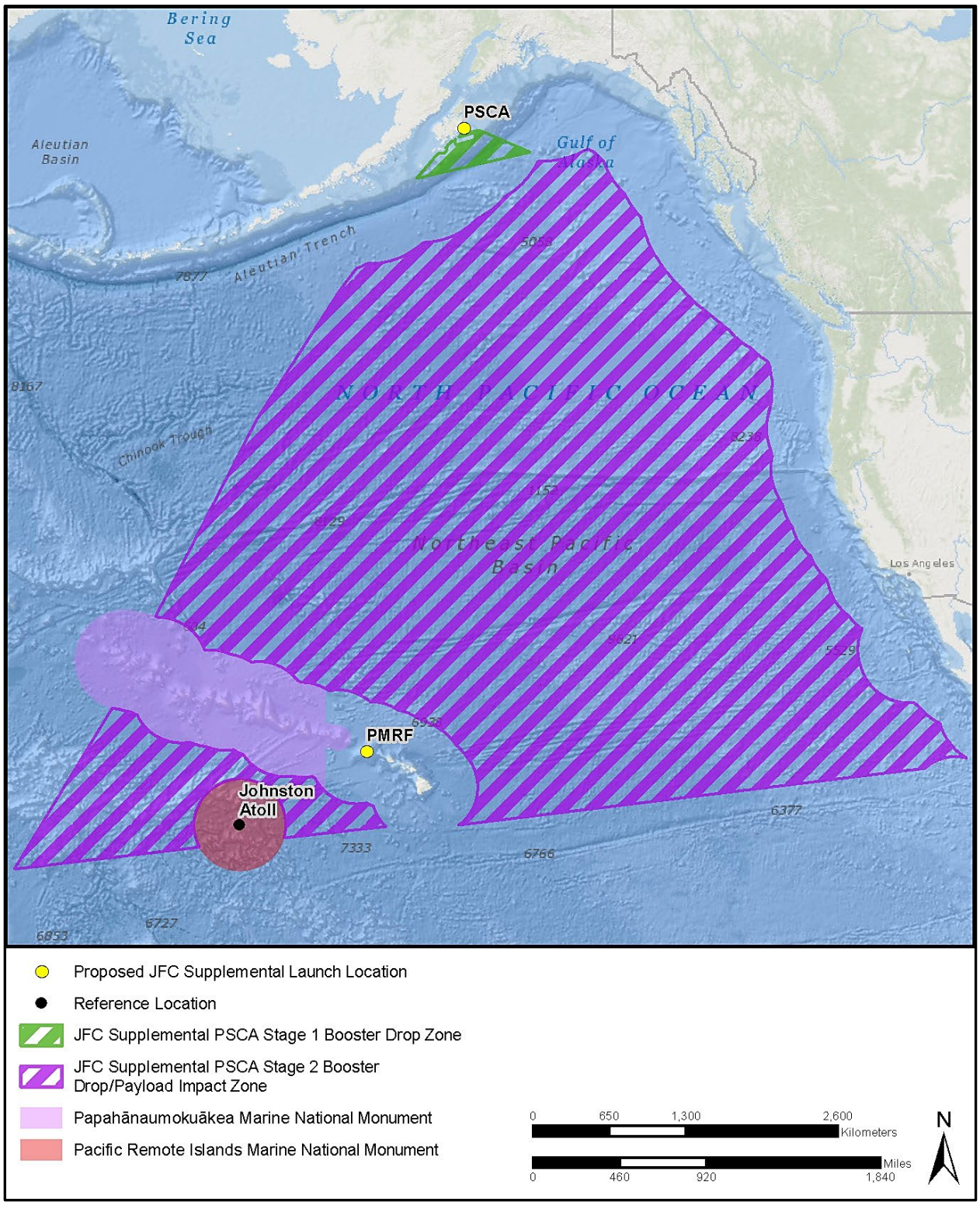


Figure 2-10. Proposed Activity Locations for PSCA-Launched Tests

Table 2-4. All Proposed Launch Sites and Impact Area Locations

Pacific Missile Range Facility	
Launch Site	**Impact Area**
Launch from Terminal High Altitude Area Defense Launch Site	Impact in Pacific Ocean Broad Ocean Area
Pacific Spaceport Complex Alaska	
Launch Site	**Impact Area**
Area 1 (Long Range Radar Area)	Impact in Pacific Ocean Broad Ocean Area
Launch Pad 2	

PMRF's THAAD launch site was selected as an alternative test range for the JFC flight tests because of its launch pad infrastructure and suitability, data collection and storage capabilities, booster and explosive materials storage capabilities, available timeframe for test launches, range and explosive safety record, and ability to meet security requirements for conducting the Proposed Action.

PSCA's Area 1 and LP-2 have been designated by PSCA to accommodate mobile systems with launchers because of their connections to range infrastructure (i.e., fiber, communications, etc.), lightning protection, and flat surface. Area 1 is a gravel pad. LP-2 is a concrete pad. Area 1 was previously used by the THAAD launch system and Patriot weapon systems, and LP-2 has been used for Strategic Target System missions. See the Spaceport Master Plan (AAC 2021), Page 2-16, for a thorough description of LP-2; and Page 2-24 for a thorough description of Area 1.

The Pacific BOA sites will be pre-selected as booster drop zones and payload impact zones and monitored to ensure that there would be no vessels or aircraft in the vicinity.

2.3 Screening Factors

The NEPA implementing regulations provide guidance on the consideration of alternatives to a federally proposed action and require rigorous exploration and objective evaluation of reasonable alternatives. Only those alternatives determined to be reasonable and that meet the purpose and need require detailed analysis. Alternatives analyzed in this Supplemental EA/OEA meet all screening factors.

Refer to the JFC EA/OEA (DON and U.S. Army 2022) for the full screening criteria/evaluation factors. For the deltas presented in this JFC Flight Tests Supplemental EA/OEA, the screening factors are as follows:

1. The launch and impact location must be available for and capable of conducting JFC flight tests within the required timeframes.
2. The launch pad is capable of supporting the TEL launch configuration.

3. The launch pad is capable of supporting the weight of the TEL and supporting equipment.
4. The equipment and personnel required to support the test will be available when required.
5. Capable of incorporating the additional locations for flight tests beginning in first quarter Fiscal Year (FY) 2025.
6. Launch and impact locations must meet security requirements.

2.4 No Action Alternative

The Navy SSP and U.S. Army RCCTO have been directed by the U.S. DOD to perform the JFC flight testing. In accordance with NEPA and the Navy and Army implementing regulations, the No Action Alternative is an alternative that must also be analyzed.

Under the No Action Alternative, the Action Proponents could not test the AUR at the analyzed locations, which would adversely impact national security and the United States' strategic deterrence mission. The Proposed Action would not occur and the Action Proponents would not pursue the JFC flight tests at PMRF's THAAD launch site or PSCA's Area 1 or LP-2. Under the No Action Alternative, JFC flight tests would not impact the Pacific BOAs not analyzed in the 2022 JFC EA/OEA. The actions analyzed in the JFC EA/OEA (DON and U.S. Army 2022) would still occur under the No Action Alternative, including JFC launches from SNL/KTF Launch Pad 42 with impact in the Pacific BOA.

The No Action Alternative would not meet the purpose and need for the Proposed Action; however, as required by NEPA, the No Action Alternative is carried forward for analysis in this Supplemental EA/OEA and provides a baseline for measuring the environmental consequences of the action alternatives at each proposed location.

3.0 Affected Environment

This chapter includes a discussion of the current environment that could be affected by the Proposed Action and No Action Alternatives. In compliance with NEPA (42 U.S.C. § 4321, as amended), Council on Environmental Quality Regulations (Title 40 CFR §§ 1500-1508), and Army Procedures for Implementing NEPA (32 CFR § 651), the information and data presented are commensurate with the importance of the potential impacts to provide the proper context for evaluating such impacts (DON and U.S. Army 2022).

3.1 Pacific Missile Range Facility

This Supplemental EA/OEA focuses on the potential for environmental impacts to water resources, cultural resources, biological resources, public health and safety, and hazardous materials and wastes at PMRF.

The Navy's PMRF at Barking Sands, Kaua`i is the world's largest instrumented, multi-environment, military test range capable of supporting subsurface, surface, air, and space operations. PMRF consists of over 1,100 square miles of instrumented underwater ranges, over 42,000 square miles of controlled airspace and a Temporary Operating Area covering 2.1 million square nautical miles of ocean area. PMRF's mission includes providing training for Navy and other DOD personnel using existing equipment and technologies to meet real world requirements to maintain and achieve required states of readiness. PMRF's mission also includes providing support to Research, Development, Test, and Evaluation programs being developed by the DOD (DON 2017a).

The potential environmental impacts to the following resource areas are considered to be negligible or nonexistent at PMRF, so they were not analyzed in detail in this Supplemental EA/OEA:

Air Quality and Climate Change: There would be no changes to potential impacts to air quality because the February 2022 JFC EA/OEA discussed potential impacts to air quality at the PMRF ROI, which includes both the THAAD and KTF launch sites, and the Proposed Action under the Supplement does not increase the count of flight tests.

Airspace Management: Vehicle launches are a common activity/procedure from the THAAD launch site at PMRF. All aircraft flights and operations in support of launch activities would comply with current airport and airspace policies and procedures. There would be no changes to potential impacts to airspace management because the potential launches of the AUR do not require the use of or restriction on airspace outside the currently established warning areas (i.e., W-189, W-187, and W-190). PMRF will continue to coordinate with the FAA prior to a vehicle launch. The FAA acts as the U.S. agent for aeronautical information to the International Civil Aviation Organization, and air traffic in the ROI is managed by the Honolulu Control Facility and Oakland

Air Route Traffic Control Center. PMRF publishes dedicated warning NOTAMs 1 week before hazardous operations; this is a notice containing information essential to personnel concerned with flight operations but not known far enough in advance to be publicized by other means.

Geology and Soils: Kaua`i is a shield volcano, probably formed 5 million years ago (DOE 2018). PMRF stretches 12.9 km (8 mi) along the western edge of a low-lying coastal terrace called the Mānā Plain, from Kokole Point on the south to Nohili Point on the North (DOE 2018). Local relief is formed by low beach barrier dunes, mildly undulating blanket sands, and the more prominent Nohili Dune located in the northern portion of PMRF, adjacent to the northwestern side of KTF at Nohili Point (DOE 2018). The LRHW system positioning will require the use of 2.7 m (9 ft) long grounding rods to go 1.8 m (6 ft) below ground surface. Because of the positioning of the JFC test equipment at PMRF's THAAD launch site, and because the soil has previously been disturbed, the soils at PMRF would be affected temporarily for the duration of the JFC flight test. Up to six flight tests per year until 2032 are possible at PMRF, and no permanent changes are required for JFC flight tests. Therefore, as a result of the Proposed Action, impacts to geological resources would be expected to be negligible.

Land Use: The Hawaii Range Complex Environmental Impact Statement / Overseas Environmental Impact Statement (DON 2008b; Section 3.3.2.1.8, Page 3-152) describes in depth the land uses for the Main Base Complex and adjacent areas on the Mana Plain. There would be no changes to potential impacts to land use because the JFC flight test represents activities that are consistent with the mission and well within the limits of current operations of both PMRF and the THAAD launch site. No impacts to land use resources would be expected because of the Proposed Action.

Noise and Vibration: There have been no changes to potential noise receptors as discussed in the February 2022 JFC Final EA/OEA. Typical launches at PMRF/Main Base result in high-intensity, short-duration sound events. After launch, vehicles would ascend quickly, and sound pressures are expected to remain elevated above ambient sound levels for less than 60 seconds (Kahle et al. 2021). It is anticipated that the JFC flight tests would result in the same short-term sound event during the liftoff of the vehicle, and the noise would be expected to be within the limits less than 60 seconds sound durations.

Infrastructure and Utilities: PMRF's THAAD launch site was selected as an alternative test range for the JFC flight tests because of its launch pad infrastructure; therefore, the Proposed Action is not expected to impact PMRF's infrastructure or utility resources beyond the limits of current operations.

Transportation/Traffic: Vehicle launches are a common activity/procedure from the THAAD launch site at PMRF. There would be no changes to potential impacts to transportation/traffic because the continuing use of on-installation roadways, parking areas, and access control points leading to the THAAD launch site in preparation of a vehicle launch is not anticipated to permanently alter the day-to-day traffic patterns on the installation and would be barely noticeable.

All transportation of the vehicle components and other ordnance on PMRF and to PMRF would occur in accordance with DOD, Navy, U.S. Army, and U.S. Department of Transportation policies and regulations to safeguard the materials.

Socioeconomics: There have been no changes to temporary personnel requirements at PMRF as a result of JFC flight tests and as discussed in the February 2022 JFC Final EA/OEA. No foreseeable negative impacts to socioeconomic resources would be expected as a result of the Proposed Action. See the Environmental Justice discussion below as it relates to impacts to minority and low-income populations.

Environmental Justice: The JFC flight test includes a launch trajectory, range safety regulations and procedures, and dispersing of noise over a wide area that avoids disproportionate impacts to minority populations and low-income populations under Executive Order (EO) 12898, and to child populations under EO 13045. No impacts to environmental justice would be expected as a result of the Proposed Action.

Aesthetics and Visual Resources: There would be no changes to potential impacts to aesthetics and visual resources because the JFC flight tests do not require any new construction at PMRF; however, a temporary TEL, which requires 2.7 m (9 ft) grounding rods to be hammered in to 1.8 m (6 ft) below the ground surface, would be installed and removed when the flight tests are complete.

3.1.1 Water Resources – PMRF

The following water resource discussions provide a description of the existing conditions for surface water and groundwater resources at PMRF.

3.1.1.1 Regulatory Setting

Refer to **Appendix D, Section D.1.1** for the regulatory setting.

3.1.1.2 Region of Influence

Surface Water

Surface water and storm water runoff drain onto former Amfac Sugar-Kaua`i lands and agricultural ponds below the Mana cliffs. The Mana Plain is drained by canals that flow seaward. Surface waters within PMRF are in the canals that drain the agricultural areas to the east. There are numerous drains in low-lying areas and several irrigation ponds in the agricultural land. Apart from these drainages, no surface drainage has been established because the rain sinks into the permeable sand.

Groundwater

Bedrock, alluvium, and sand dunes make up hydraulically connected aquifers within the ROI. The volcanic basalt bedrock is highly permeable, containing brackish water that floats on top of seawater (DON 2019). Overlying sediments are saturated, but not exploitable as an aquifer

because of unfavorable hydraulic characteristics. Groundwater in the sediments originates as seepage from irrigation percolation and rainfall, especially where the sediments are thin near the inland margin of the Mana Plain.

The dune sand aquifer at PMRF has moderate hydraulic conductivity and moderate porosity of about 20% (DON 2019). It consists of a lens of brackish groundwater that floats on seawater and is recharged by rainfall and by seepage from the underlying sediments.

As part of Navy policy, sampling for perchlorate has been conducted at two drinking water supply locations since 2006 (DON 2019). DOD has established 15 parts per billion as the current level of concern for managing perchlorate (DON 2019). Perchlorate concentrations at both sites were less than the initial screening level of 4.0 parts per billion (DON 2019). Based on guidance PMRF received from Navy Region Hawai`i, since the two consecutive samples were less than 4 parts per billion, no further analysis was required (DON 2019).

Flood Hazard Areas

PMRF is within the tsunami evacuation area along the coastline. However, the primary flood hazard is from overflow of the drainage ditches throughout the Mana Plain. Extended periods of heavy rainfall have resulted in minor flooding of low-lying areas of PMRF (DON 2019).

3.1.2 Cultural Resources – PMRF

Cultural resources include prehistoric-archaeological, historic, architectural, Native American resources, and any physical evidence of human presence considered important to a culture, subculture, or community for scientific, traditional, religious or any other reasons. Areas potentially impacted include properties, structures, landscapes, or traditional cultural sites that qualify for listing in the National Register of Historic Places.

3.1.2.1 Regulatory Setting

Refer to **Appendix D, Section D.1.2** for the regulatory setting.

3.1.2.2 Region of Influence

The ROI for potential impacts includes work areas associated with JFC flight test launch operations, including payload processing, transport, and launch.

The Hawaii Range Complex Environmental Impact Statement / Overseas Environmental Impact Statement (DON 2008b; Section 3.3.2.1.4, Page 3-139) describes in depth the cultural resources at PMRF, Main Base, and KTF PMRF/Main Base.

Large portions of PMRF, surrounding KTF, have been surface surveyed for archaeological resources, and some areas have included subsurface investigations such as conducting excavations and monitoring ground disturbance (DOE 2018). Identified resources include burials, cemeteries, heiaus (temples), campsites, traditional house foundations, lithic (stone tools and

tool-making debris) scatters, aquaculture ponds, and plantation-era resources (DOE 2018). Many of these resources also have traditional cultural significance for Native Hawaiians. Burial sites have been identified throughout the Mana Plain and are the most significant cultural concern in the area (DOE 2018). Identified burials include individuals from both Native Hawaiian and Plantation-era periods (DOE 2018). The Nohili Dune, adjacent to KTF to the north, has been determined to be a site eligible for the National Register as a traditional cultural property for its importance to Native Hawaiians (DOE 2018).

3.1.3 Biological Resources – PMRF

For the purposes of this Supplemental EA/OEA, biological resources are defined as native or naturalized vegetation and wildlife and the habitats in which they occur. Plant and plant communities are referred to as vegetation and animal species are referred to as wildlife. Habitat is defined as the biotic and abiotic conditions that support plant or animal species. Within this EA/OEA, biological resources are divided into five major categories: (1) terrestrial vegetation, (2) terrestrial wildlife, (3) marine vegetation, (4) marine wildlife, and (5) environmentally sensitive habitats. Within each category, resource descriptions focus on important or special-status species. Special-status species refers to those species listed by federal or state agencies including those afforded protection under the regulations listed in **Section D.1.3**. Environmentally sensitive habitats are those areas designated by the USFWS or NMFS as critical habitat for ESA listed species or other sensitive habitats such as wetlands, habitats limited in distribution, or important seasonal use areas for wildlife (e.g., breeding areas, feeding areas, or migration routes).

Biological resources within the affected environment for the Proposed Action are described with the purpose of evaluating the effects of the Proposed Action and in proportion to the magnitude of potential effects.

3.1.3.1 Regulatory Setting

Refer to **Appendix D, Section D.1.3** for the regulatory setting.

3.1.3.2 Region of Influence

The ROI for biological resources at PMRF includes the areas subject to effects of the Proposed Action including:

- The locations of the THAAD launch site and test support facilities at PMRF to be used for the Proposed Action (see **Figure 2-5**);
- The over-ocean flight corridor over U.S. territorial waters (within 22 km or 12 nm of shore) near PMRF; and
- Terrestrial and marine areas in the vicinity of these sites which may be subject to effects of the Proposed Action including elevated noise levels.

Biological resources in the PMRF ROI are substantially the same as those described in the JFC EA/ OEA (DON and U.S. Army 2022, Section 3.1.2.2, Page 3-7), as well as in the SNL/KTF Site-wide EA (DOE 2018, Section 3.8, Page 40) and the Flight Experiment 2 (FE-2) EA/OEA (DON 2019, Section 3.1.3.2, Page 3-13). While these documents focus on resources at SNL/KTF, the THAAD launch site is only approximately 300 m (980 ft) from KTF, and the biological resources are primarily the same. Therefore, the descriptions in these referenced documents remain the best available information for the ROI and are incorporated by reference. This section provides a brief summary of biological resources in the ROI with focus on any differences pertaining specifically to the THAAD launch site and the presence of special-status species. Detailed descriptions can be found in the JFC EA/OEA (DON and U.S. Army 2022), SNL/KTF Site-wide EA (DOE 2018), and the FE-2 EA/OEA (DON 2019). ESA and State of Hawai`i listed species that may be present in the ROI at or near PMRF are listed in **Table 3-1**.

Terrestrial Vegetation

The area around the THAAD launch site is covered primarily with landscaped vegetation that is managed by mowing. Patches of vegetation with taller trees are located at least 165 m (540 ft) southeast and east of the launch site. These patches of vegetation are dominated by introduced and invasive species with stands of kiawe (*Prosopis pallida*) trees that have patches of koa haole (*Leucaena leucocephala*), guinea grass (*Panicum maximum*), and lantana (*Lantana camara*) within them (DOE 2018). Coastal dune habitats occur to the north and west of the THAAD launch site. No threatened or endangered plants have been observed at PMRF (DOE 2018, DON 2019). Designated critical habitat for the ESA listed endangered plant lau'ehu (*Panicum niihauense*) occurs at least 720 m (2,360 ft) to the north of the THAAD launch pad and is discussed in the Environmentally Sensitive Habitats subsection.

Terrestrial Wildlife

Terrestrial wildlife in the ROI is primarily as described in the JFC EA/OEA (DON and U.S. Army 2022, Section 3.1.2.2, Page 3-10). Hawaiian hoary bats (*Lasiurus cinereus semotus*) occur in the ROI and are likely to forage at the THAAD launch site. The closest potential Hawaiian hoary bat roosting habitat is at least 165 m (540 ft) east of the launch pad.

Most of the native birds (and some non-native species) present on PMRF are protected under the Migratory Bird Treaty Act (MBTA). A complete list of birds observed during PMRF bird surveys is available in Appendix B2 of the PMRF Integrated Natural Resources Management Plan (DON 2010). Nine ESA-listed bird species may occur in the ROI (**Table 3-1**). The threatened Hawaiian goose or nēnē (*Branta sandvicensis*) is known to occur on PMRF (DOE 2018), including in habitats surrounding the THAAD launch site (PMRF Environmental Office 2021). In FY 2021, several nēnē nests were recorded in the ROI including a nest with no eggs approximately 90 m (295 ft) from the launch site and active nests at approximately 360 m (1,180 ft) and 500 m (1,640 ft; PMRF Environmental Office 2021). The FY 2021 nēnē nests have been the closest recorded nests to the THAAD launch site; all other nests recorded between FY 2017 and October 2023 have been more than 550 m (1,800 ft) from the launch site (PMRF Environmental Office 2023).

Table 3-1. ESA and State of Hawai`i Listed Species with the Potential to Occur in the PMRF ROI

Common Name	Scientific Name	U.S. ESA Listing Status	State Listing Status	Area of Occurrence at PMRF
Terrestrial Mammals				
Hawaiian hoary bat	*Lasiurus cinereus semotus*	E	E	Forages throughout PMRF, roosts in trees
Marine Mammals				
Humpback whale – Hawai`i DPS	*Megaptera novaeangliae*	-	E	Offshore waters
Hawaiian monk seal	*Neomonachus schauinslandi*	E	E	Nearshore and offshore waters, hauls out on PMRF beaches
False killer whale – Main Hawaiian Islands Insular DPS	*Pseudorca crassidens*	E	E	Offshore waters
Birds				
Hawaiian duck	*Anas wyvilliana*	E	E	Ditches, ponds, and wetlands
Pueo or Hawaiian short-eared owl	*Asio flammeus sandwichensis*	-	E[1]	Grassland, shrub, and forest habitats
Hawaiian goose or nēnē	*Branta sandvicensis*	T	E	Mowed grass, nests in a variety of habitats
Hawaiian coot	*Fulica alai*	E	E	Ditches, ponds, and wetlands
Hawaiian gallinule	*Gallinula galeata sandvicensis*	E	E	Ditches, ponds, and wetlands
Hawaiian stilt	*Himantopus mexicanus knudseni*	E (PT)	E	Ditches, ponds, wetlands, and beach
Band-rumped storm-petrel – Hawai`i DPS	*Oceanodroma castro*	E	E	Flies through ROI
Short-tailed albatross	*Phoebastria albatrus*	E	E	Very rarely observed
Black-footed albatross	*Phoebastria nigripes*	-	T	Rarely observed
Hawaiian petrel	*Pterodroma sandwichensis*	E	E	Flies through ROI
Newell's shearwater	*Puffinus auricularis newelli*	T	T	Flies through ROI
Reptiles				
Loggerhead turtle – North Pacific Ocean DPS	*Caretta caretta*	E	T	Nearshore and offshore waters
Green turtle or honu – Central North Pacific DPS	*Chelonia mydas*	T	T	Nearshore waters, hauls out and nests on PMRF beaches
Leatherback turtle	*Dermochelys coriacea*	E	E	Offshore waters
Hawksbill turtle	*Eretmochelys imbricata*	E	E	Offshore waters
Olive ridley turtle	*Lepidochelys olivacea*	T	T	Offshore waters

Abbreviations: DPS = Distinct Population Segment, E = endangered, PMRF, Pacific Missile Range Facility, PT = proposed threatened T = threatened.

[1] The pueo is listed as endangered by the state of Hawai'i on the island of O'ahu. While the pueo is not listed as state endangered on Kaua'i, this endemic species is still considered a special-status species because of its importance and listing status elsewhere in the state.

Four endangered waterbirds (**Table 3-1**) occur in the ROI but primarily use wetland habitats on PMRF including man-made ditches and ponds (DON 2010, DOE 2018). The closest wetland habitat is 480 m (1,570 ft) from the launch site. Short-tailed albatross (*Phoebastria albatrus)* are unlikely to occur at PMRF as there have been no sightings of this species on the installation for decades. Three ESA-listed seabird species (**Table 3-1**) may fly through the ROI at night as they transit between mountain nesting colonies and the ocean.

Hawaiian monk seals (*Neomonachus schauinslandi*) haul out on beaches and rock coastlines of PMRF. The closest beach habitat is at least 100 m (328 ft) west of the THAAD launch site. While these marine animals have the potential to occur west of the THAAD launch site, the closest observed Hawaiian monk seal haul-out area is approximately 260 m (800 ft) southwest of the THAAD launch site at the mouth of Nohili Ditch.

Green sea turtles (*Chelonia mydas*) also haul out and occasionally nest on PMRF beaches. Sea turtle nesting at PMRF is not a common occurrence, but green sea turtles have regularly nested along the beachfront on PMRF (DON 2010) including two successful nests near the airfield in 2020 (PMRF Environmental Office 2021), one in 2022, and one in 2023. Green sea turtles occasionally haul out near the mouth of Nohili Ditch, approximately 260 m (850 ft) from the THAAD launch site.

Marine Wildlife

Marine wildlife in the ROI at PMRF are the same as those described in the JFC EA/OEA (DON and U.S. Army 2022, Section 3.1.2.2, Page 3-13). Additional descriptions of marine resources at PMRF can be found in the FE-2 EA/OEA (DON 2019), the SNL/KTF EA (DOE 2018), and the PMRF Integrated Natural Resources Management Plan (DON 2010), all incorporated here by reference. ESA-listed marine species that have the potential to occur in the nearshore PMRF ROI are listed in **Table 3-1**.

Hawaiian monk seals, humpback whales (*Megaptera novaeangliae*), and spinner dolphin (*Stenella longirostris*) are the most likely marine mammals to be observed within 22 km (12 nm) of the PMRF coastline (DON 2019). All marine mammals in the ROI are protected under the MMPA and two species likely to occur in nearshore waters are listed under the ESA (**Table 3-1**), Hawaiian monk seals, and the Main Hawaiian Islands Insular Distinct Population Segment (DPS) of false killer whales (*Pseudorca crassidens*).

Of the five sea turtle species that have the potential to occur near PMRF (**Table 3-1**), green and hawksbill turtles (*Eretmochelys imbricata*) are the most common sea turtles in nearshore waters around the Main Hawaiian Islands, as they prefer reef-type environments that are less than about 100 m (328 ft) in depth (DON 2019).

Environmentally Sensitive Habitats

As described in the JFC EA/OEA (DON and U.S. Army 2022, Section 3.1.2.2, Page 3-14), designated critical habitat for the endangered lau`ehu occurs in sand dune and coastal shrubland

habitats on the northern part of PMRF (DOE 2018, 68 Federal Register [FR] 9116 [February 27, 2003]). This designated critical habitat is at least 540 m (1,770 ft) north of the THAAD launch site and is unoccupied critical habitat.

The flight path for JFC Supplemental activities crosses over waters designated as EFH near the Hawaiian Islands and may cross over designated marine critical habitat for Hawaiian monk seal and the Insular Hawaiian DPS of false killer whales (see **Section 3.3.2**).

3.1.4 Public Health and Safety – PMRF

Refer to JFC EA/OEA Section 3.1.3, Pages 3-15 through 3-16 for an in-depth description of the importance of health and safety of the public and personnel and background on PMRF safety regulations.

If the launch vehicle deviates from its course or should other problems occur during the flight test that might jeopardize public safety, the onboard Flight Termination System would be activated. See **Section 2.1** for a description of the Flight Termination System procedure.

3.1.4.1 Regulatory Setting

Refer to **Appendix D, Section D.1.4** for the regulatory setting.

3.1.4.2 Region of Influence

The ROI for potential impacts related to the health and safety of workers includes work areas associated with JFC flight test launch operations. The population of concern includes the workers employed at PMRF, including the THAAD launch site, but also other personnel directly involved with range operation and training activities currently occurring at PMRF/THAAD. The ROI for potential impact related to public health and safety also includes the areas of Kaua`i County adjacent to the THAAD launch site that could be affected by the proposed launch. These areas include the PMRF overwater training areas. The population of concern consists of visitors to Kaua`i and permanent residents living in Kaua`i County (DON and U.S. Army 2022).

Missile Flight Analysis

PMRF conducts missile flight safety in accordance with Naval Air Warfare Center Weapons Division Instruction. Refer to JFC EA/OEA Section 3.1.3, Page 3-16 for analysis.

Ground Safety

Range safety at PMRF is controlled by Range Control, which is responsible for hazard area surveillance and clearance and control of all PMRF operational areas. Range Control maintains real time surveillance, clearance, and safety at all PMRF areas including the THAAD launch site. PMRF sets requirements for minimally acceptable risk criteria to occupational and non-occupational personnel, test facilities, and nonmilitary assets during range operations. For all range operations at PMRF, the Range Control Officer requires a safety plan. A Range Safety Operation Plan is generated by PMRF range safety personnel prior to range operations.

Refer to JFC EA/OEA Section 3.1.3, Pages 3-16 through 3-17 for more information on range safety's responsibilities and processes.

Ordnance Management and Safety

Ordnance safety includes procedures to prevent premature, unintentional, or unauthorized detonation of ordnance. Refer to JFC EA/OEA Section 3.1.3, Pages 3-17 through 3-18 for Range Control's responsibilities and PMRF's procedures. Rocket motors and other ordnance components would be stored at specialized facilities and then taken to the processing facility for assembly, and ultimately moved to the designated launch site. The THAAD launch site rocket motors and other ordnance components are stored in explosive storage magazines by PMRF, except when needed by the THAAD launch site for processing, assembly, and launch.

Ocean Area Clearance

Range safety officials manage operational safety for projectiles, targets, missiles, and other hazardous activities into PMRF operational areas. Refer to JFC EA/OEA Section 3.1.3, Page 3-18 for more background on PMRF's Ocean Area Clearance safety. PMRF publishes dedicated warning NOTAMs and NTMs 1 week before flight tests. In addition, a 24-hour recorded message is updated on the hotline daily by Range Operations to inform the public when and where hazardous operations will take place. Pre-launch NOTAMs and NTMs will be issued 24 hours before launch in the ocean and flight areas defined, and the areas will be actively monitored prior to launch.

Transportation Safety

Refer to JFC EA/OEA Section 3.1.3, Pages 3-18 through 3-19 for an in-depth description of the transportation procedures at PMRF.

Fire and Crash Safety

PMRF provides fire protection and firefighting services to the THAAD launch site and enforces base safety regulations and programs. PMRF Crash/Fire is in the base of the Air Traffic Control Tower, Building 300 (DON 2017a). For a thorough description of Fire and Crash safety procedures at PMRF, refer to JFC EA/OEA Section 3.1.3, Page 3-19.

3.1.5 Hazardous Materials and Wastes – PMRF

The 2022 JFC EA/EOA defined and described the types of hazardous wastes and materials that have the potential to affect the environment local to PMRF and SNL/KTF. This Supplemental EA/OEA builds on that analysis, focusing on the added scope since the 2022 JFC EA/OEA was published.

3.1.5.1 Regulatory Setting

Refer to **Appendix D, Section D.1.5** for the regulatory setting.

3.1.5.2 Region of Influence

The ROI for hazardous materials and hazardous waste storage and handling would be limited to the THAAD launch site and PMRF support buildings to be used for launch preparation, launch, and post-launch activities.

The descriptions provided in DON and U.S. Army 2022 (Section 3.1.4, Pages 3-20 through 3-23) remain current and applicable to the Supplemental JFC Proposed Action at the THAAD launch site and support buildings in the potentially affected environment.

Characteristics of the launch vehicle are presented in **Table 2-1**. The payload system characteristics are presented in **Table 2-2**. The physical characteristics of the AUR are identical to the launch vehicle and payload systems analyzed in the 2022 JFC EA/OEA.

3.2 Pacific Spaceport Complex Alaska

PSCA is located on Narrow Cape of Kodiak Island, Alaska. Located in the temperate coastal Alaska Peninsula Mountains ecoregion of the state, this area has a predominantly maritime climate influence with higher precipitation and relatively more stable air temperatures compared to inland areas (Gallant et al. 1995). PSCA, formerly Kodiak Launch Complex, is a commercial launch site which has been used by federal agencies and commercial launch companies since 1998 (FAA 2016). The site has been used for DOD target and intercept missile launches for missile defense testing and also for space vehicle launches (FAA 2016).

This Supplemental EA/OEA focuses on the potential for environmental impacts to air quality and climate change, water resources, biological resources, public health and safety, hazardous materials and wastes, and socioeconomics at PSCA.

The potential for environmental impacts to the following resource areas is considered to be negligible or nonexistent at PSCA, so they were not analyzed in detail in this Supplemental EA/OEA:

Airspace Management: Vehicle launches are a common activity/procedure from Area 1 and Launch Pad 2 at PSCA. The JFC flight tests would be similar to previous launches as described and analyzed in the 2017 Final EA for PSCA Ballistic Missile Defense Flight Test Support. All aircraft flights and operations in support of launch activities would comply with current airport and airspace policies and procedures.

Close coordination with the FAA Anchorage Air Route Traffic Control Center and Kodiak Air Traffic Control Tower by the launch operations manager would minimize the potential for any adverse impacts on airspace use in the vicinity of Kodiak Island. Aircraft within the region would be subject to a NOTAM to advise avoidance of weapon system radar operations, the launch of interceptors, and missile intercepts. Direct coordination with Air Traffic Control and the U.S. Coast Guard would be maintained to verify that there is no air traffic in these areas. In addition, airspace would be

monitored by AAC air and surface search radar during launch operations, as well as by U.S. Coast Guard aircraft. Airspace closures would be temporary (lasting approximately 8 hours for each flight test event). Thus, impacts on airspace or air traffic by the Proposed Action would be not significant.

Cultural Resources: Cultural resource surveys were done by the Alaska Department of Natural Resources – Office of History and Archaeology in 1994 for the original construction of the Kodiak Launch Complex, and again in 2005 in the Launch Pad 3 construction area (FAA 2016). No evidence of new cultural resources was found during any of these surveys; however, two archaeological sites (KOD-81 and KOD-441) and one historic World War II era bunker complex (KOD-456) are within approximately 1.6 km (1 mi) from PSCA (FAA 2016).

Subsistence is an important aspect of social, cultural, and economic life on Kodiak Island, especially in the isolated traditional villages (Akhiok, Karluk, Larsen Bay, Old Harbor, Ouzinkie, and Port Lions) (FAA 2016). Kodiak Island subsistence resources include finfish, crab, and shrimp fisheries, all of which require permits from the ADFG (ADFG 2020). Safety zone closures resulting from launch operations would have the potential to adversely affect local sport, subsistence, and commercial fisherman for up to 8 hours on launch days (FAA 2016). The JFC flight tests do not have the potential to cause direct or indirect effects on historical, architectural, archaeological, or traditional resources. No impacts to cultural resources would be expected as a result of the Proposed Action.

Geology and Soils: The 1996 Kodiak Launch Complex EA comprehensively explains the geology and soils around PSCA (AADC 1996). The soils at Narrow Cape generally consist of a weathered bedrock subsurface, covered by volcanic ash (AAC 2021). Topsoil in the area is composed of a thin layer of decayed vegetation, well-drained, and strongly acidic (AAC 2021). The pH changes to area streams and lakes from acid deposition are expected to be small and transitory, and local topography generally mitigates possible impacts of acid deposition from rocket combustion products (AAC 2021). The LRHW system positioning would require the use of 2.7 m (9 ft) long grounding rods to go 1.8 m (6 ft) below ground surface, or other acceptable means of grounding test equipment at pre-existing concrete structures. Because of the positioning of the JFC test equipment at Area 1 (gravel pad) and LP-2 (concrete pad), the soils at PSCA would be affected temporarily for the duration of the JFC flight test. Up to six flight tests per year until 2032 would be possible at PSCA, and no permanent changes are required for JFC flight tests. Therefore, as a result of the Proposed Action, impacts to geological resources would be expected to be negligible.

Land Use: The JFC flight test path would avoid populated land masses with their associated assigned land uses. There would be no changes, and therefore, no impacts, from the JFC flight test.

Noise and Vibration: Noise levels at PSCA vary greatly depending on the level of work happening at the facility. Launch-related noise effects are infrequent (up to nine times per year)

and short lived, with a return to ambient noise levels within 2 minutes of a launch. Based on measured data and the level of activity at PSCA, sound levels are well below 65 A-weighted decibels Day-Night Level for all nearby noise sensitive areas and all nearby land uses are fully compatible with noise from the launch activities (FAA 2016). As analyzed in the 2017 Final EA for PSCA Ballistic Missile Defense Flight Test Support there would be no appreciable sources of noise during system transportation and pre-flight preparations. There would be some minor noise from the use of vehicles and from test equipment operations, primarily from multiple generators. Launches would generate individual acoustical events that would be very loud near the launch pad but would attenuate rapidly with distance. These events would be relatively short in duration, lasting approximately 20 seconds each. Personnel working near the area at the time of launch would be required to wear appropriate hearing protection in accordance with all federal health and safety requirements. In addition, public access areas near the launch sites would be restricted to about 3.2 km (2 mi) from the launch sites to ensure public safety and minimize unnecessary exposures. Noise levels generated during post-launch operations would be similar to those generated during pre-flight preparations, but for a shorter duration. Each launch (i.e., flight test) from PSCA is a separate event, and the potential for up to six annual JFC flight tests would not occur at the same time as any other flight test. Therefore, impacts to the noise environment from these activities (pre- and post-launch) would be negligible. The potential for launch noise effects on any protected wildlife species is discussed in **Section 4.2.3**.

Infrastructure and Utilities: Existing facilities at PSCA include the Launch Control Center, the Maintenance Support Facility, the Instrumentation Field, the Payload Processing Facility, the Rocket Motor Storage Facility, the Integration and Processing Facility, the Launch Service Structure, and the Spacecraft and Assemblies Transfer Building (FAA 2016). Supporting infrastructure for these facilities includes a site-wide public water system, Pasagshak Point Road, several access roads leading from Pasagshak Point Road to the various installations, and other utilities (FAA 2016). The Proposed Action does not propose any new developments in PSCA's infrastructure and would utilize existing Government and commercial infrastructure and utility resources.

Transportation/Traffic: Vehicle launches are a common activity/procedure from Area 1 and Pad 2 at PSCA. The continuing use of on-installation roadways, parking areas, and access control points leading to the locations in preparation of a vehicle launch is not anticipated to permanently alter the day-to-day traffic patterns on the installation and would be barely noticeable. All transportation of the vehicle components and other ordnance on PSCA and to PSCA would occur in accordance with DOD, Navy, ACC, and U.S. Department of Transportation policies and regulations to safeguard materials.

Aesthetics and Visual Resources: The JFC flight test does not require any new construction at PSCA; however, a temporary TEL which requires 2.7 m (9 ft) grounding rods to be hammered in to 1.8 m (6 ft) below the ground surface, would be installed and removed when the flight tests are complete.

3.2.1 Air Quality and Climate Change – PSCA

Air quality is measured by the concentration of criteria pollutants in the atmosphere. The air quality in a region is a result not only of the types and quantities of atmospheric pollutants and pollutant sources in an area, but also surface topography, the size of the topological "air basin," and the prevailing meteorological conditions in that region.

3.2.1.1 Regulatory Setting

Refer **to Appendix D, Section D.2.1** for the regulatory setting.

3.2.1.2 Region of Influence

Because air quality is measured and regulated on a regional level, the ROI for air quality at PSCA is Kodiak Island and the South Central Alaska Interstate Air Quality Control Region 247 (40 CFR § 81.247).

The USEPA has designated Kodiak Island as in attainment for all criteria pollutants (USEPA 2022a). The USEPA monitors levels of criteria pollutants at representative sites in regions throughout Alaska; however, no air quality monitoring facilities are in the vicinity of Kodiak Island. Because Kodiak Island is located within an attainment area for all criteria pollutants, the General Conformity Rules do not apply to the Proposed Action.

Kodiak Electric Association provides power to the existing PSCA facilities. Backup diesel generators are also available at PSCA. The generators operate as backup for 5 hours during launches, 1 hour per week for testing during non-launch periods, and during commercial power outages (estimated maximum total 262 hours per year). The intermittent usage contributes to annual pollutant emissions far less than the Alaska Department of Environmental Conservation (ADEC) Title V permitting threshold of 100 tons (FAA 2016).

Changes to the ADEC Air Quality Control Regulations (18 AAC 50) were adopted in October 2004, which affected Pre-Approved Emission Limits (PAELs). As of February 7, 2005, ADEC certified that PSCA was no longer subject to monitoring, record keeping, and reporting requirements established in their PAEL #00485. PAEL #00485 was rescinded at that time because stationary emission sources at PSCA were within ADEC-established thresholds. PSCA is not currently required to operate under a PAEL or Minor Permit. There are low levels of emissions at and near PSCA because of the sporadic use of generators, the low volume of vehicle traffic, and extremely sparse residential population, which generates low levels of emissions from building heating. There are no rocket engine static tests at PSCA (FAA 2016).

The launching of solid-propellant rockets produces emissions primarily of hydrogen chloride (HCl), carbon monoxide, carbon dioxide, oxides of nitrogen, black carbon and aluminum oxide. HCl, oxides of nitrogen, carbon dioxide, and carbon monoxide emissions are gaseous; aluminum oxide and black carbon are emitted as particulates as large as 4 millimeters. The primary emissions from liquid-propellant vehicles include carbon monoxide, carbon dioxide, hydrogen,

water vapor, and oxygen. Exhaust plumes are concentrated within the geographic area near the launch pad (known as the near field) where the ground cloud forms and begins its thermal rise process. The far field is considered to be the geographic area where the stabilized and neutrally buoyant cloud material mixes back to the ground. Because of the rapid acceleration of the rocket, the vast bulk of rocket exhaust products are expelled above the mixing layer where they disperse quickly, reducing ground-level impacts.

On the global scale, the key greenhouse gases (GHGs) emitted by human activities are carbon dioxide, methane, nitrous oxide, and fluorinated gases. Carbon dioxide accounts for 65% of global GHG emissions, with the United States contributing 15% of these global emissions. (USEPA 2022b) In the United States greenhouse gas emissions decreased by 11% from 2019 to 2020; in 2020, U.S. GHG emissions total 5,222 million metric tons of carbon dioxide (USEPA 2022c). In 2015 the gross emissions for Alaska were approximately 41 million metric tons (ADEC 2018). The launch vehicle/rocket emissions of carbon dioxide and black carbon are GHGs contributing to global climate change and their emissions of HCl can cause short-term localized damage to the stratospheric ozone layer. HCl emitted from launch vehicles remains in the stratosphere and is transported throughout the Northern Hemisphere where it continues to destroy ozone for about 6 years (FAA 2016).

Climatic conditions at Narrow Cape (the location of PSCA) affect the dissipation of exhaust plumes from rocket launches. The climate at Narrow Cape is characterized as maritime, with long, mild winters and short, cool summers. Average annual precipitation is high at approximately 195.5 centimeters (cm; 77 inches [in.]). The monthly average of precipitation ranges from 10 to 23 cm (4 to 9 in.). The average annual wind speed is 17.7 kilometers per hour (11 miles per hour) with prevailing wind directions from the northeast and southwest. Wind speeds are greatest in the winter months, between November and March, and lowest May through September; however, even during the summer months the mean wind speed is 8 kilometers per hour (5 miles per hour) or greater, which is sufficient for good dispersion of air pollutants (FAA 2016).

3.2.2 Water Resources – PSCA

The FT-3 EA/OEA provides a substantial resource for PSCA's water resources definitions and descriptions of the local environment at Kodiak (U.S. Army 2021). This Supplemental EA/OEA builds on that analysis, focusing on the potentially affected environment of Area 1 and Launch Pad 2.

3.2.2.1 Regulatory Setting

Refer to **Appendix D, Section D.2.2** for the regulatory setting.

3.2.2.2 Region of Influence

Groundwater

Bedrock wells supply much of Kodiak Island's water supply (DOD 2017). No one geologic unit supplies the majority of the water; instead, many types of surficial materials—such as fill, till, sand,

gravel, volcanic ash—may yield groundwater (U.S. Army 2021). PSCA uses groundwater sourced from the wells to fill the 568,000-liter (150,000-gallon) storage tank located adjacent to the Payload Processing Facility (AAC 2021). Groundwater is used at PSCA facilities and for emergency fire suppression (AAC 2021). The water system at PSCA is classified as a "Non-Transient Non-Community Class A Public Water System" certified by ADEC, and the Alaska Department of Natural Resources issued a Certificate of Appropriation which permits AAC to use 1.03 acre-feet (335,627 gallons) of groundwater per year (AAC 2021). Per the most Spaceport Master Plan from AAC (2020-2030), PSCA uses an average of 416,400 liters (110,000 gallons) of groundwater per year but recommends groundwater storage capacity be increased by 50% up to 852,000 liters (225,000 gallons) to accommodate increased water use of deluge systems at the spaceport.

Surface Water and Wetlands

PSCA is located within the Kodiak-Afognak Islands Watershed (HUC 19020701) with seasonally affected streams, rivers, and lakes (U.S. Army 2021). Surface water features are covered with ice for much of the year, but snowmelt drainage does occur either inland towards the northwest or southeast to the Pacific Ocean, depending on the hydraulic gradient (U.S. Army 2021). Freshwater lakes, named East and West Twin Lakes, are located southwest of LP-1 and south of Area 3. Winds from the north/northeast during launches could result in deposition of small amounts of HCl from solid propellant rockets or carbon dioxide from liquid propellant rockets on the lake surfaces (AAC 2021). However, the 1996 and 2016 EAs concluded that the potential of a launch causing measurable change in surface water quality is minimal.

Under the Clean Water Act Section 303(d) there are no impaired waters at PSCA. Soil at Narrow Cape is acidic and receives substantial rainfall and snowmelt. Residual propellant that may reach the surface is therefore diluted and would be expected to be below regulatory limits.

Wetlands are scattered across the entire surface area of PSCA (see AAC 2021, Figure 7-1, Page 7-8). The wetlands at PSCA are saturated/seasonally flooded, geographically small meadow or forested/shrub, and emergent, Palustrine (U.S. Army 2021). Reference the FT-3 EA/OEA for more information (U.S. Army 2021, Section 3.1.2.2, Page 3-11).

3.2.3 Biological Resources – PSCA

Biological resources are defined as in **Section 3.1.3**.

3.2.3.1 Regulatory Setting

Refer to **Appendix D, Section D.2.3** for the regulatory setting.

3.2.3.2 Region of Influence

The ROI for biological resources at PSCA includes the areas subject to effects of the Proposed Action including:

- The locations of the launch sites (Area 1 and LP-2) at PSCA to be used for the Proposed Action (see **Figure 2-6**);
- The over-ocean flight corridor over U.S. territorial waters (within 22 km [12 nm] of shore) near PSCA; and
- Terrestrial and marine areas in the vicinity of these sites which may be subject to effects of the Proposed Action including elevated noise levels.

Biological resources in the PSCA ROI are substantially the same as those described in the FT-3 EA/OEA (U.S. Army 2021, Section 3.1.3.2, Page 3-14) which is incorporated here by reference. Biological resources in the PSCA launch ROI were also described in the Kodiak Launch Complex Launch Pad 3 EA (FAA 2016). The descriptions of biological resources in these documents remain the best available information for the ROI. This section provides a brief summary of biological resources in the ROI with focus on any differences pertaining specifically to the PSCA launch sites and the presence of special-status species. ESA listed species that may be present in the ROI at or near PSCA are listed in **Table 3-2**.

Terrestrial Vegetation

Vegetation at PSCA is dominated by grass-forb meadows and low scrub communities with interspersed taller scrub communities and forest communities (FAA 2016, Gallant et al. 1995). The areas immediately surrounding the proposed launch pads consist of grass-forb meadows and low scrub habitats. No ESA-listed or other special status plant species are known to occur in the ROI (USASMDC/ARSTRAT 2014, FAA 2016).

Terrestrial Wildlife

Terrestrial wildlife in the ROI includes terrestrial mammals, hauled out marine mammals, terrestrial birds, and nesting seabirds. A few freshwater streams and two freshwater lakes occur within PSCA and support a number of freshwater and anadromous fish species (FAA 2016); however, no effects of the Proposed Action are expected to impact these freshwater habitats or species.

Eleven terrestrial mammals may occur near the proposed launch pad and launch support facilities, all common species or introduced species on Kodiak. Two pinniped species haul out in terrestrial habitats of the ROI: harbor seals (*Phoca vitulina*) and ESA-endangered Steller sea lions (*Eumetopias jubatus*). Harbor seals have a number of rookeries on Kodiak Island (Alaska Fisheries Science Center 2022) and haul out on Ugak Island year-round (**Figure 3-1**; AAC 2016). During August 2017 surveys, the USFWS estimated that 2,502 harbor seals were hauled out on Ugak Island (Alaska Fisheries Science Center 2022). The majority of harbor seals using Ugak Island haul out on the eastern shore approximately 8 km (5 mi) from LP-2 (AAC 2016). While Steller sea lions have been known to haul out on Ugak Island (Fritz et al. 2015, AAC 2016), there were no observations of Steller sea lions there during the three most recent NMFS summer surveys (Sweeny et al. 2022, Sweeny et al. 2019, Sweeny et al. 2017). Steller sea lions have been observed regularly at Gull Point (approximately 16 km [10 mi] southwest of proposed launch locations) during these surveys.

Table 3-2. Threatened and Endangered Species with the Potential to Occur in the PSCA ROI

Common Name	Scientific Name	ESA Listing Status	Occurrence in ROI
Marine Mammals			
Blue whale	*Balaenoptera musculus*	E	Potential in offshore waters
Fin whale	*Balaenoptera physalus*	E	Likely in offshore waters
Northern sea otter – Southwest DPS	*Enhydra lutris kenyoni*	E	Likely in nearshore waters
Gray whale – Western North Pacific DPS[1]	*Eschrichtius robustus*	E	Potential in offshore waters
North Pacific right whale	*Eubalaena japonica*	E	Potential in offshore waters
Steller sea lion – Western DPS	*Eumetopias jubatus*	E	Likely in nearshore and offshore waters
Humpback whale[2]	*Megaptera novaeangliae*		
Mexico DPS[2]		T	Potential in offshore waters
Western North Pacific DPS[2]		E	Potential in offshore waters
Sperm whale	*Physeter macrocephalus*	E	Likely in offshore waters
Birds			
Short-tailed albatross	*Phoebastria albatrus*	E	Likely in offshore waters
Steller's eider – Alaska Breeding DPS	*Polysticta stelleri*	T	Potential in nearshore and offshore waters
Reptiles			
Leatherback turtle	*Dermochelys coriacea*	E	Potential in offshore waters
Fishes			
Chum salmon – Hood Canal Summer-run ESU/DPS[3]	*Oncorhynchus keta*	T	Potential in offshore waters
Coho salmon – Lower Columbia River ESU/DPS[3]	*Oncorhynchus kisutch*	T	Potential in offshore waters
Steelhead[3]	*Oncorhynchus mykiss*		
Lower Columbia River ESU/DPS		T	Potential in offshore waters
Middle Columbia River ESU/DPS		T	Potential in offshore waters
Snake River Basin ESU/DPS		T	Potential in offshore waters
Upper Columbia River ESU/DPS		T	Potential in offshore waters
Upper Willamette River ESU/DPS		T	Potential in offshore waters
Sockeye salmon – Snake River ESU/DPS[3]	*Oncorhynchus nerka*	E	Potential in offshore waters
Chinook salmon[3]	*Oncorhynchus tshawytscha*		
Lower Columbia River ESU/DPS		T	Likely in offshore waters
Puget Sound ESU/DPS		T	Potential in offshore waters
Snake River Fall ESU/DPS		T	Potential in offshore waters
Snake River Spring/Summer ESU/DPS		T	Likely in offshore waters
Upper Columbia River Spring ESU/DPS		E	Likely in offshore waters
Upper Willamette River ESU/DPS		T	Likely in offshore waters

Sources: U.S. Army 2021, FAA 2016, NOAA 2023a, AAC 2016, AADC 1996, Rone et al. 2017, DON 2016

Note: Species for which the ROI is considered extralimital (i.e., very few confirmed sightings and the area is outside the normal range for the species) are not included in this table.

[1] Gray whales in the ROI are likely from the Eastern Population which is not listed under the ESA. It is possible that a small (but unknown) number of gray whales in the ROI would be from the ESA-endangered Western DPS.

[2] Humpback whales in the ROI may include whales from three DPSs (Barlow et al. 2011, Bettridge et al. 2015, Calambokidis et al. 2001). Wade et al. (2016) reported the probability of humpback whales feeding in the Gulf of Alaska being from a given DPS as 89% for the Hawai`i DPS, 10.5% for the Mexico DPS, and 0.5% for the Western North Pacific DPS.

[3] These fish species spawn elsewhere but may occur in the Gulf of Alaska during the marine phase of their life cycles (NOAA 2023a). Occurrence for these species is based on general patterns of migration for these species; no specific occurrence data for ESA listed ESUs in the ROI are known.

Abbreviations/Definitions: DPS = Distinct Population Segment, ESA = Endangered Species Act, ESU = Evolutionarily Significant Unit, E = Endangered; T = Threatened, Likely = regularly observed, Potential = rare, with few or no confirmed observations.

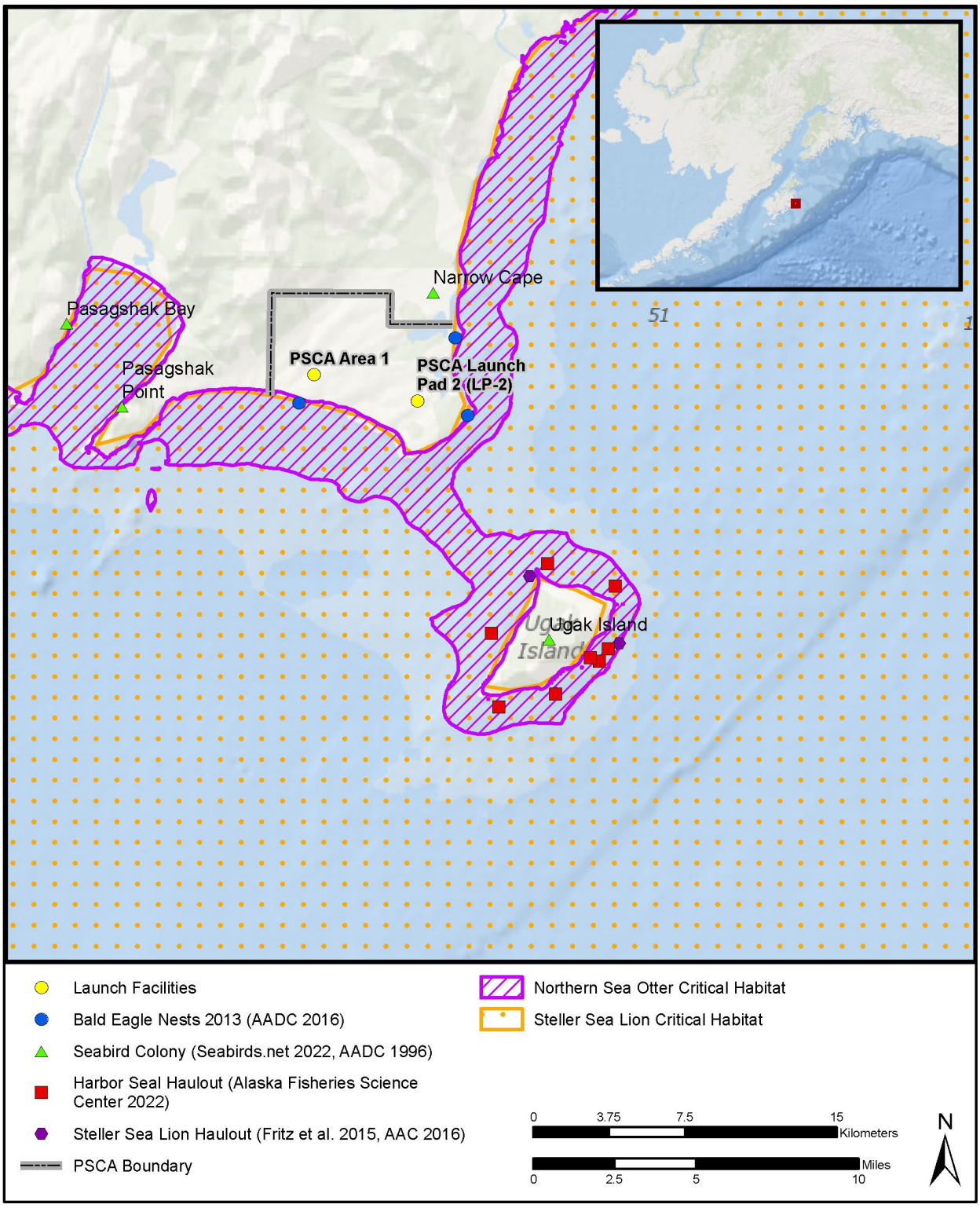


Figure 3-1. Biological Resources in the PSCA ROI

At least 221 bird species have been documented on Kodiak Island (FAA 2016, AADC 1996). All native bird species occurring in the ROI are protected under the MBTA. Other special status bird species in the ROI include a number of species listed as Birds of Conservation Concern (USFWS 2021, AADC 1996), bald eagles (protected under the Bald and Golden Eagle Protection Act), and two ESA-listed species (**Table 3-2**). Bald eagles nest in coastal habitats on Narrow Cape. The most recent available survey for bald eagle nests at PSCA was conducted in 2013 (Appendix E in FAA 2016), during which a total of seven bald eagles and three nests were recorded (**Figure 3-1**). Based on these surveys, it is anticipated that the closest eagle nesting might occur 1.6 km (1.0 mi) from the proposed launch sites.

The coastal and nearshore habitats within the ROI support a large number and diversity of both resident and migrant birds including a great concentration of seabirds. Seabird nesting colonies have been recorded in the vicinity of PSCA (**Figure 3-1**), the closest of which is approximately 5.5 km (3.4 mi) from proposed launch facilities. Seabirds nesting at these colonies on Narrow Cape and Ugak Island are protected under the MBTA and some are listed as Birds of Conservation Concern species.

Marine Wildlife

The coastal and pelagic waters offshore of Kodiak Island provide a diversity of highly productive habitats for marine organisms. The relatively deep and broad continental shelf offshore of Kodiak Island has gravel, sand, silt, mud, and rocky substrates (Fautin et al. 2010). Biodiversity studies in Gulf of Alaska waters have documented hundreds of species in plankton assemblages as well as hundreds of pelagic and benthic invertebrate species (Fautin et al. 2010). Waters of the Aleutian Islands host the highest diversity and abundance of cold-water corals in the world (Fautin et al. 2010) and several species of shellfish important to commercial and subsistence fisheries (ADFG 2020). Marine vertebrate diversity and abundance are also high in Alaska waters. Over half of the commercial fish landings from U.S. waters come from Alaskan fisheries and Gulf of Alaska waters support large feeding congregations of many seabirds and marine mammals (Fautin et al. 2010).

All marine mammals in the ROI are protected under the MMPA, and eight ESA-listed species have the potential to occur in the waters offshore of Kodiak Island (**Table 3-2**). ESA-endangered northern sea otters (*Enhydra lutris kenyoni*) occur in nearshore waters of the ROI where they are primarily found off rocky coasts or in large bays with kelp beds where waters are less than 100 m (328 ft) deep (USFWS 2009). Three species of pinniped are likely to occur in marine habitats near PSCA. MMPA protected harbor seals are considered the most abundant marine mammal in waters near PSCA. Steller sea lions from the ESA-endangered Western DPS are likely to occur in nearshore and offshore waters where they may dive up to several hundred feet to catch fish and cephalopods (NMFS 2008). Cetacean such as blue whales (*Balaenoptera musculus*), fin whales (*Balaenoptera physalus*), and sperm whales (*Physeter macrocephalus*) are most commonly observed in deeper offshore waters; however, these species feed in the highly productive continental shelf waters seasonally (Rone et al. 2017). Gray whales (*Eschrichtius*

robustus), North Pacific right whales (*Eubalaena japonica*), and humpback whales are found in the nearshore shelf waters near Kodiak Island, a primary feeding ground for these species (NMFS 2017, Rone et al. 2015).

During surveys of marine waters near PSCA, an abundance and diversity of birds were observed in the Ugak Pass, the strait between Narrow Cape and Ugak Island, including ESA-listed Steller's eiders (*Polysticta stelleri*; AADC 1996). Steller's eiders are commonly observed off Narrow Cape, but it is unclear if these birds belong to the ESA-threatened Alaska Breeding DPS (U.S. Army 2021). The waters offshore of Kodiak are part of the core habitat for immature short-tailed albatross (*Phoebastria albatrus*; USFWS 2014a). ESA-listed short-tailed albatross are considered rare in nearshore areas of the ROI (FAA 2016) but likely occur in outer shelf waters. All the seabird species in the ROI are protected under the MBTA.

The only species of sea turtle with the potential to occur in the ROI is the leatherback sea turtle (*Dermochelys coriacea*). The Gulf of Alaska is not a high-use area for leatherback turtles (Benson et al. 2011), but leatherbacks may be present in the ROI in the summer to fall months in extremely low numbers.

Over 100 marine fish species are native to near-shore and offshore waters around Kodiak Island, including a number of species important in commercial, recreational, and subsistence fisheries (ADFG 2020). Fourteen ESA-listed evolutionarily significant units of five salmon and steelhead species (**Table 3-2**) have the potential to occur in the ROI (NOAA 2023a). These anadromous fish evolutionarily significant units may occur in the Gulf of Alaska during the marine phase of their life cycles (NOAA 2023a). While it is possible, and even likely that fish from these ESA listed salmon and steelhead populations may occur in the ROI, the number of ESA-listed fish in the ROI is likely very low.

Environmentally Sensitive Habitats

As described in the FT-3 EA/OEA (U.S. Army 2021, Section 3.1.3.2.4, Page 3-25), designated critical habitat occurs offshore of PSCA for northern sea otters, Steller sea lions, and North Pacific right whales (**Figure 3-1**).

Biologically Important Areas (BIAs) are areas considered important to a species for all or part of the year. These areas are generally based on compilation of the best available information from scientific literature, unpublished species accounts, and expert knowledge to identify areas shoreward of the U.S. Exclusive Economic Zone that are important reproductive, feeding, or migratory areas for species or groups. BIAs have been identified for seabirds and four cetacean species in the ROI. BIAs for gray whale feeding and migration, humpback whale feeding, and North Pacific right whale feeding occur offshore of Kodiak Island (Ferguson et al. 2015). The nearshore waters off Kodiak Island within the ROI are also considered a biologically important feeding area for seabirds due to abundant food resources (i.e., forage fish and krill; Smith et al. 2012, ADFG 2015).

The flight path for JFC Supplemental activities crosses over waters designated as EFH near Kodiak Island. In the ROI, EFH has been designated for all life stages of groundfish of the Gulf of Alaska; immature, juvenile, and mature salmon species; and late juvenile and adult weathervane scallops (*Patinopecten caurinus*) and other scallop species (see Figure 3-4 in U.S. Army 2021).

3.2.4 Public Health and Safety – PSCA

Refer to JFC EA/OEA Section 3.1.3, Pages 3-15 through 3-16 for an in-depth description of the importance of health and safety of the public and personnel.

The objective of the PSCA safety program is to protect the public, range activity participants, and site workers from any threats or risks in preparation for, during, and after the proposed launch (USASMDC/ARSTRAT 2014). According to the Flight Test-2 (FT-2) EA (USASMDC/ARSTRAT 2014), the PSCA safety procedures center on protecting workers and members of the public, as well as equipment and structures.

3.2.4.1 Regulatory Setting

Refer to **Appendix D, Section D.2.4** for the regulatory setting.

3.2.4.2 Region of Influence

At PSCA, the ROI for health and safety is limited to the U.S. transportation network used in the transport of weapon systems to the range, and off-range areas within the missile flight paths and launch hazard area. The health and safety ROI includes AAC and military personnel, contractors, and the public (DOD 2017).

Site security consists of an Intrusion Detection System, building access via a cipher and combination spin locks, magnetic card readers, and photo identification badges with color-coded access for authorized personnel, security guards, and visitors. A 2.4-m (8-ft) fence encloses individual facilities, with physical barricades at established check points when hazardous operations require them (AAC 2015).

The Range Safety Manual sets forth the PSCA safety policy and criteria governing all launch support operations and is applicable to all AAC personnel, contractors, tenants, and range users (DOD 2017).

A hazard potential is present during prelaunch transport, prelaunch processing, and launch of rockets due to the significant amount of propellant contained in the rocket engines. The exposure to launch mishaps is greatest within the early portions of the flight after launch. If the launch vehicle deviates from its course or should other problems occur during the flight test that might jeopardize public safety, the onboard Flight Termination System would be activated. See **Section 2.1** for a description of the Flight Termination System procedure. Measures currently in place to limit the number of personnel involved in launch operations include Occupational Safety and Health Administration and Department of Transportation regulations and U.S. Air Force

procedures (for transporting hazardous materials), and DOD procedures (for handling explosives, and the DOD Range Safety program for the processing and launch of rockets; USASMDC/ ARSTRAT 2014).

Missile Flight Analysis

Missile flight safety includes analyses of flight performance capacity and limitations, of hazards inherent in operation and destruct systems, and of the electronic attributes of the technology and instrumentation.

Ground Safety

On arrival at PSCA, support equipment and material hazards are placed in secure storage until assembly and launch preparations. Explosive Safety Quantity Distances are established around ordnance storage and missile assembly buildings (USASMDC/ARSTRAT 2014). Access is limited to trained and authorized mission critical personnel. Pasagshak Point Road is closed at the site boundary and monitored during launch day to ensure that no unauthorized personnel enter the Ground Hazard Area. If the safety zone is compromised, the launch is delayed until the area is confirmed clear.

Ordnance Management and Safety

Rocket motors and other ordnance components would be stored at specialized facilities and then taken to the processing facility for assembly, and ultimately moved to the designated launch site.

Ocean Area Clearance

The launch trajectory is intended to minimize potential adverse effects on populated areas. Prelaunch NOTAMs and NTMs will be issued 24 hours before launch in the ocean and flight areas defined, and the areas will be actively monitored prior to launch. PSCA will publish NOTAMs and NTMs, coordinate security closures of lands and waters around PSCA and with the U.S. Coast Guard, FAA, and the Alaska Department of Transportation and Public Facilities (USASMDC/ ARSTRAT 2014). Launches will be announced on the local radio as well as in the newspaper.

Transportation Safety

During the arrival of hazardous components, PSCA manages the safety aspects for handling and storage of rocket components, the booster and rocket components, explosives, and other hazardous materials (USASMDC/ARSTRAT 2014).

Fire and Crash Safety

PSCA has a fire truck and a 946-liter (250-gallon) pumper mounted on a 1-ton truck chassis to fight brush fires that may occur during a launch (USASMDC/ARSTRAT 2014). The PSCA water system includes a 568,000-liter (150,000-gallon) storage tank that can be used to supply fire-fighting operations (USASMDC/ARSTRAT 2014). PSCA also has an ambulance to transport injured patients. During missions, Emergency Medical Technicians are present at PSCA with the

oversight of Northwest Medical. During launch day operations an Emergency Medical Technician-3 is in attendance at PSCA (USASMDC/ARSTRAT 2014).

3.2.5 Hazardous Materials and Wastes – PSCA

Generally, the definitions provided in **Section 3.1.5** apply to PSCA. Refer to U.S. Army 2021, Section 3.1.7, Page 3-40 for additional definitions, explanation of the management of hazardous materials and waste, pollution prevention, and solid waste management at PSCA.

3.2.5.1 Regulatory Setting

Refer to **Appendix D, Section D.2.5** for the regulatory setting.

3.2.5.2 Region of Influence

According to the Spaceport Master Plan (2020-2030), PSCA currently uses over 20,000 gallons of petroleum-based products ranging from gasoline and lubricating fluids to diesel fuel per year. Alaska Aerospace predicts that the use of petroleum-based products will increase to a maximum of 189,270 liters (50,000 gallons) and is planning to replace the existing fuel storage tanks with new, increased capacity tanks that will remain in the existing locations (AAC 2021). PSCA would install a fuel spill secondary containment system that meets or exceeds state of Alaska requirements at all locations where fuel is stored (AAC 2021).

Since 2014, AAC has received millions of dollars in limited federal funding under the Spaceport Infrastructure Enhancement Program for DOD infrastructure improvements throughout PSCA (AAC 2021). These funds have been used for a variety of projects that included modifying LP-2 for liquid fuel launch operations (AAC 2021). No changes are proposed to Area 1 in the Spaceport Master Plan through 2030 (AAC 2021).

PSCA currently has a 2,100-liter (550-gallon) hazardous fuel tank at the Payload Processing Facility to store small quantities of hydrazine-based hypergolics and is approved to store up to 4,505 liters (1,190 gallons) of hydrazine (AAC 2021).

Solid waste is properly containerized at PSCA, collected by a local commercial vendor, and disposed of at the Kodiak Island Borough Landfill (AAC 2021).

3.2.6 Socioeconomics/Environmental Justice – PSCA

3.2.6.1 Regulatory Setting

Refer to **Appendix D, Section D.2.6** for the regulatory setting.

3.2.6.2 Region of Influence

The ROI for socioeconomics includes Kodiak Island and the near-shore waters that would be affected by flight test. As indicated in **Figure 3-2** a portion of the off-shore area of the village of Old Harbor is within the stage 2 booster drop zone.

3.2.6.2.1 Kodiak Island

Seafood Industry. The island has the largest resident seafood processing workforce in the state. Kodiak consistently ranks as one of the busiest seafood ports in Alaska and the nation. In 2019, it ranked third nationally for pounds landed and sixth in value, according to the National Oceanic and Atmospheric Administration. In 2020, Kodiak landed 290.4 million pounds of seafood, valued at $84.3 million. Kodiak seafood industry paid out $46.5 million to workers in 2021, making it the largest private-sector contributor to local wages. It is also the borough's largest employer. While the highest employment months are during the summer, Kodiak's seafood processing industry provides year-round jobs for locals, who live and spend their incomes in Kodiak. (Alaska Economic Trends Magazine 2022)

Fishing. The closest salmon stream to Narrow Cape is the Pasagshak River approximately 9.7 km (6 miles [mi]) west of PSCA, which has small commercial and subsistence salmon fisheries (FAA 2016). Pasagshak River is considered one of the outstanding sport fishing streams on Kodiak Island, supporting sockeye, pink, chum, Dolly Varden, and silver salmon fishing. The Pasagshak Bay area supports land, coastal and marine wildlife, including whales, seals, dolphins, sea bird colonies, eagles, overwintering waterfowl, brown bear, shrimp, and crab. (Roadtrippers 2022)

Tourism. Many outdoor experiences attract tourists to Kodiak, including wildlife viewing, hunting, hiking, and fishing. The visitor industry is seasonal, with most tourists arriving in the summer and early fall. Visitors who make it as far as Kodiak tend to stay longer and spend more than the average visitor to Alaska. The year before COVID-19 Kodiak hosted 64,000 out-of-state visitors: 26,000 cruise passengers, and 38,000 independent travelers. Tourism generated about 810 jobs in 2019. (Alaska Economic Trends Magazine 2022)

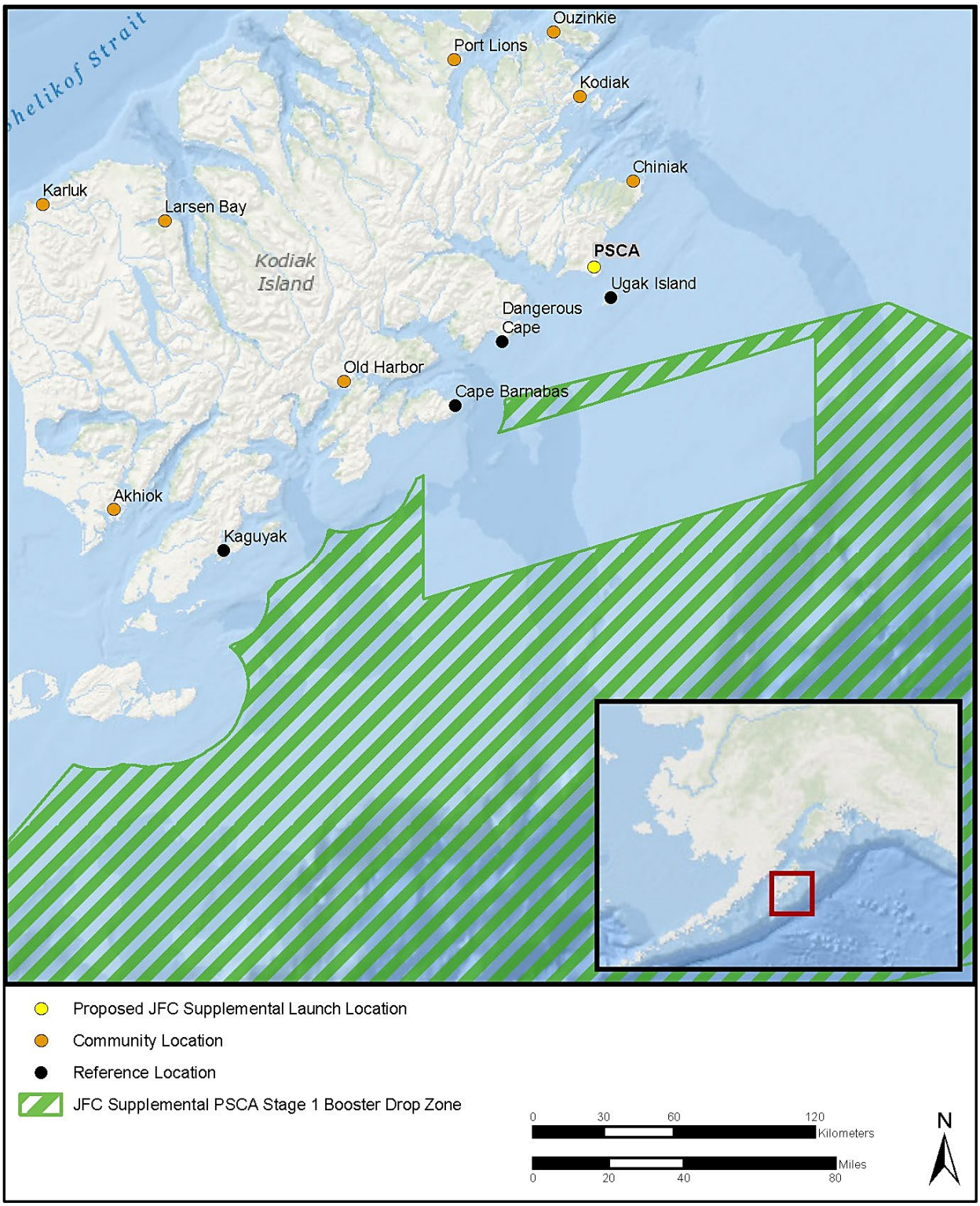


Figure 3-2. Location of Communities in and near the PSCA ROI

Demographics. The Kodiak Island Borough includes multiple smaller areas. In 2021, its approximately 12,900 residents were spread across a dozen communities, most accessible only by plane or boat. Although 43% of borough residents live in Kodiak, the broader population still lives relatively close together on the road system. The Alaska Native percentage has increased slightly in recent years, and most of Kodiak's rural communities are majority Alaska Native: Old Harbor, Larson Bay, Ouzinkie, and Akhiok. (Alaska Economic Trends Magazine 2022, U.S. Census Bureau 2021)

Economics. The average income of a Kodiak resident is $28,592 a year. The U.S. average is $28,555 a year. Population occupations include 17.8% manufacturing, 10.1% healthcare and social assistance, 9.6% retail trade, 7.85% transportation and warehousing, 6.5% agriculture, forestry, fishing and hunting, and the remaining percentage varies.

Schools. Kodiak Island Borough School District contains 12 schools and 2,294 students. The district's minority enrollment is 60%. Within Kodiak Island Borough School District, 100.0% of teachers are licensed, and 95.9% have three or more years of experience. The student-to-teacher ratio is lower than the state average, at 14:1. The district has five full-time counselors on staff. Kodiak Island Borough School District spends $21,261 per student each year. It has an annual revenue of $48,772,000. Overall, the district spends $24.2 million on instruction, $23.2 million on support services and $1.4 million on other expenses. (U.S. News and World Report 2023)

3.2.6.2.2 Village of Old Harbor

The village of Old Harbor is to the south of the PSCA. It is one of the island's six Alutiiq villages and is primarily inhabited by an Alutiiq population. The economy historically is based on commercial fishing and is supplemented by ecotourism. Sport fishing guides, three lodges, and several bed and breakfasts are some of the businesses that have been developed to serve visitors. The protected waters of Sitkalidak Strait, which borders Old Harbor, is home to abundant salmon, herring, halibut and cod harvested by commercial and sports fishermen as well as subsistence use (Old Harbor Native Corporation 2022).

Fishing. The ADFG Division of Commercial Fisheries has Old Harbor state-managed fisheries under the Kodiak management area. The prime fishing time is from July – September. Old Harbor is a part of the Kodiak Remote Area (anything outside the Road System) which provides excellent opportunities for salmon, Dolly Varden, and fall-run steelhead trout.

Tourism/Recreation. Old Harbor is home to fishing lodges that lead saltwater and freshwater fishing charters, targeting king salmon, silver salmon, halibut, lingcod, rockfish, and Dolly Varden. Several fishing lodges offer packages that include lodging in scenic waterfront settings, meals, and charter fishing or other activities such as hunting, photography, wildlife viewing, and hiking. Old Harbor is accessible via small plane or boat from Kodiak. Regular scheduled air service is available from Anchorage to Kodiak. From there, a 30-minute air taxi flight brings visitors to Old Harbor. (Alaska Travel Industry Association 2022)

Demographics. Old Harbor is a community of about 216 residents with 63.13% Native American, 19.82% two or more races, 15.67% white, and 1.38% Native Hawaiian or Pacific Islander. (World Population Review 2022).

Economics. Approximately 45% of household income is from fishing and trapping (ADFG 2018). The average household income in Old Harbor is $52,244 with a poverty rate of 45.93%. The median age in Old Harbor is 25.8 years, 37.8 years for males, and 23.9 years for females.

Schools. The school is a part of the Kodiak Island Borough School District. Over 50% of the teachers have been at the school for 5 or more years. The school serves K-12 with a total of 29 students and 6 teachers. (Alaska Department of Education and Early Development 2022)

Subsistence. The taking of fish, wildlife, and other wild resources has been a way of life for many Alaska cultural groups for millennia. These practices are carried on in hundreds of Alaska communities by tens of thousands of Alaskans, who continue to rely on subsistence hunting, fishing, and gathering economically as well as culturally. Old Harbor practices its traditional Alutiiq culture and subsistence lifestyle. Fishing provides income to the community. In 2018 Old Harbor harvested approximately 53,325 kg (117,562 lb) of fish. Salmon was the most harvested resource category in each community, followed by non-salmon fish and large land mammals. (ADFG 2018).

3.3 Pacific Ocean

This Supplemental EA/OEA focuses on the potential for environmental impacts to water resources and biological resources in the Pacific BOA.

The potential for environmental impacts to the following resource areas is considered to be negligible or nonexistent in the Pacific BOA, so they were not analyzed in detail in this Supplemental EA/OEA:

Air Quality and Climate Change: The description and condition of the Pacific Ocean global upper atmosphere as discussed in the 2022 JFC EA/OEA has not changed. For PSCA, the LRHW AUR vehicle would launch from the selected launchpad and travel along a predetermined flight corridor over the Pacific BOA before first stage booster, second stage booster, inter-stage, and payload adapter would splash down in predetermined drop zones. The LRHW AUR flight emissions would occur in the over-ocean flight corridor as propellant is burned until exhausted from the rocket motor boosters. The active flight time over the ROI would be measured in minutes. Exhaust emissions would contain both chlorine compounds, free chlorine, produced primarily as HCl at the nozzle, and nitrogen oxide as the temperature of the exhaust decreases with increasing altitude. On a global scale, the quantity of chlorine, HCl, and nitrogen oxide emissions from the JFC flight tests would represent a negligible fraction of these emissions.

Previous NEPA analyses for missile tests at PMRF and PSCA, respectively, have determined that there would be no impact to air quality in the Pacific Ocean Flight Corridor as a result of their

Proposed Actions (DON 2017a, DON 2019, USASMDC/ARSTRAT 2014, USASMDC/ARSTRAT 2011, USASDC 1992; USAF 2004, USAF 2006, USASMDC/ARSTRAT 2013). Due to the evidence that the aforementioned NEPA analyses present regarding a lack of environmental effects to air quality in the Pacific BOA, the smaller physical scale of the LRHW AUR vehicle than those vehicles previously analyzed, and the small quantity of potential flight emissions from the LRHW AUR, it can be reasonably determined that this Proposed Action would not impact air quality in the Pacific Ocean flight corridor ROI.

Airspace Management: The over-ocean flight corridor is located over international airspace and, therefore, has no formal airspace restrictions governing it. Over-ocean flight tests must comply with DOD Instruction 4540.01, *Use of International Airspace by US Military Aircraft and for Missile/Projectile Firings*. Commercial and private aircraft would be notified through NOTAMs issued through the FAA in advance of the JFC flight test launch at the request of PMRF and PSCA as part of their routine operations. Flight test operations would be conducted in accordance with Western Range procedures and would not expand or alter currently controlled airspace. The flight tests would be infrequent and short-term events, after which the airspace is returned to the control of the responsible Air Route Traffic Control Center. There would be no impacts to airspace from the JFC flight test.

Cultural Resources: Cultural resources are material remains of human activity that are significant in the history, prehistory, architecture, or archaeology. They include prehistoric resources (produce by preliterate indigenous people) and historic resources (produced since the advent of written records). There are no cultural resources in the area of the JFC flight tests in the Pacific BOA, hence there would be no impacts on cultural resources.

Geology and Soils: Individual rocket booster stages would splash down hundreds of miles apart into the ocean along the flight path and slowly sink thousands of feet as they come to rest on the sea floor. There would be slight sediment disturbance as a result of the settling, but no expected impacts to geological resources in the over-ocean flight corridor from the JFC flight tests.

Land Use: The JFC flight test path would avoid populated land masses with their associated assigned land uses. There would be no changes, and therefore, no impacts, from the JFC flight test to the Pacific BOA.

Noise: The JFC flight would occur at high altitude where it would be generally undetected by aircraft or vessels at the ocean's surface. Sonic booms are generated following launch and during terminal flight and impact. Noise impacts to biological receptors are discussed in **Section 4.3.2**. There are no expected sensitive noise receptors within the over-ocean flight corridor. Therefore, aside from the potential noise impacts to biological receptors discussed in **Section 4.3.2**, there would be no impacts to noise receptors within the over-ocean flight corridor from the JFC flight test.

Infrastructure and Utilities: No changes would occur to infrastructure from the JFC flight test; therefore, there would be no impacts to infrastructure or utilities in the Pacific BOA.

Socioeconomics: Overflight of the Pacific Ocean does not alter the socioeconomic characteristics of any local or regional population, economy, housing, or community general services (i.e., health, police, and fire services). Therefore, there would be no impacts to socioeconomics in the Pacific Ocean from the execution of the Proposed Action.

Transportation/Traffic: Transportation services would be unaffected by the JFC flight test over the open ocean. The payload flight would occur at high altitude where it would be generally undetected by vessels or aircraft. Public NOTAMs and NTMs would be issued along the flight path to ensure the safety of both aircraft and vessels. Components would drop within predetermined open ocean areas to ensure, along with the public notices, that there would be no vessels or aircraft in the vicinity. There would be no impacts from the JFC flight test to transportation along the flight path over the open ocean.

Environmental Justice: No minority, low-income, children, or elderly populations have been identified in the flight corridor. Range safety regulations and procedures protective of health and safety would be applied throughout the flight corridor (i.e., booster drop, flight trajectory, flight termination, payload load impact zones) for all populations. Therefore, there would be no disproportionate impacts to minority populations or low-income populations under EO 12898 from the JFC flight test.

Aesthetics and Visual Resources: As described in **Section 2.1**, for tests with Pacific BOA payload impact, the proposed impact would occur in deep ocean waters (see **Figures 2-8** and **2-9**). No residual debris is expected following impact; however, a recovery team would be sent to inspect the impact location as soon as range safety clears the area. Visible debris on the surface of the ocean would be recovered and removed.

3.3.1 Water Resources – Pacific Ocean

This section highlights the water resources potentially affected by the Proposed Action as a result of post-launch vehicle overflight and splashdown from PMRF and PSCA.

3.3.1.1 Regulatory Setting

Refer to **Appendix D, Section D.3.1** for the regulatory setting.

3.3.1.2 Region of Influence

The United Nations has a goal to conserve and sustainably use the oceans, sea, and marine resources by encouraging prevention of and reporting on human activity that endangers the oceans and seas. Per the United Nations' 2022 Sustainable Development Goals Report (United Nations 2022), which consists of more than 50 international and regional agencies' data from over 200 countries/territories, the following issues are noteworthy in 2022:

- Continuing ocean acidification and rising ocean temperatures are threatening marine species and negatively affecting marine ecosystem services. Between 2009 and 2018, the world lost about 14% of coral reefs.
- In 2021, more than 17 million metric tons of plastic entered the world's ocean, making up 85% of marine litter. The volume of plastic pollution entering the ocean each year is expected to double or triple by 2040.
- The global coverage of marine protected areas stood at 8% of global coastal waters and oceans in 2021.
- More than a third (35.4%) of global fish stocks were overfished in 2019, up from 34.2% in 2017 and 10% in 1974. However, the rate of decline has recently slowed.
- Almost half a billion people depend at least partially on small-scale fisheries, which account for 90% of employment in fisheries worldwide.

The United Nations targets for addressing the above issues are located at https://www.un.org/sustainable development/oceans/.

Classification of the Pacific Ocean zones is based on depth and proximity to land (U.S. Army 2021). Using this methodology, there are four major divisions or zones in the ocean: the littoral zone, the coastal zone, the offshore zone, and the pelagic zone (U.S. Army 2021). Spanning across all zones is the benthic environment, or sea floor (U.S. Army 2021). The pelagic zone is commonly referred to as the open ocean (U.S. Army 2021).

3.3.2 Biological Resources – Pacific Ocean

Biological resources are defined as in **Section 3.1.3**.

3.3.2.1 Regulatory Setting

Refer to **Appendix D, Section D.3.2** for the regulatory setting.

3.3.2.2 Region of Influence

The ROI for biological resources in the Pacific Ocean includes the BOA areas subject to effects of the Proposed Action including:

- The Pacific over-ocean flight corridors beyond territorial seas (22 km [12 nm] from shore);
- The stage 1 booster drop zones within U.S. Exclusive Economic Zones near PMRF (**Figure 3-3**) and PSCA (**Figure 3-4**); and
- The stage 2 booster drop/payload impact zones (primarily in international waters) for PMRF (**Figures 2-8** and **3-5**) and PSCA (**Figures 2-9** and **3-5**) launched tests.

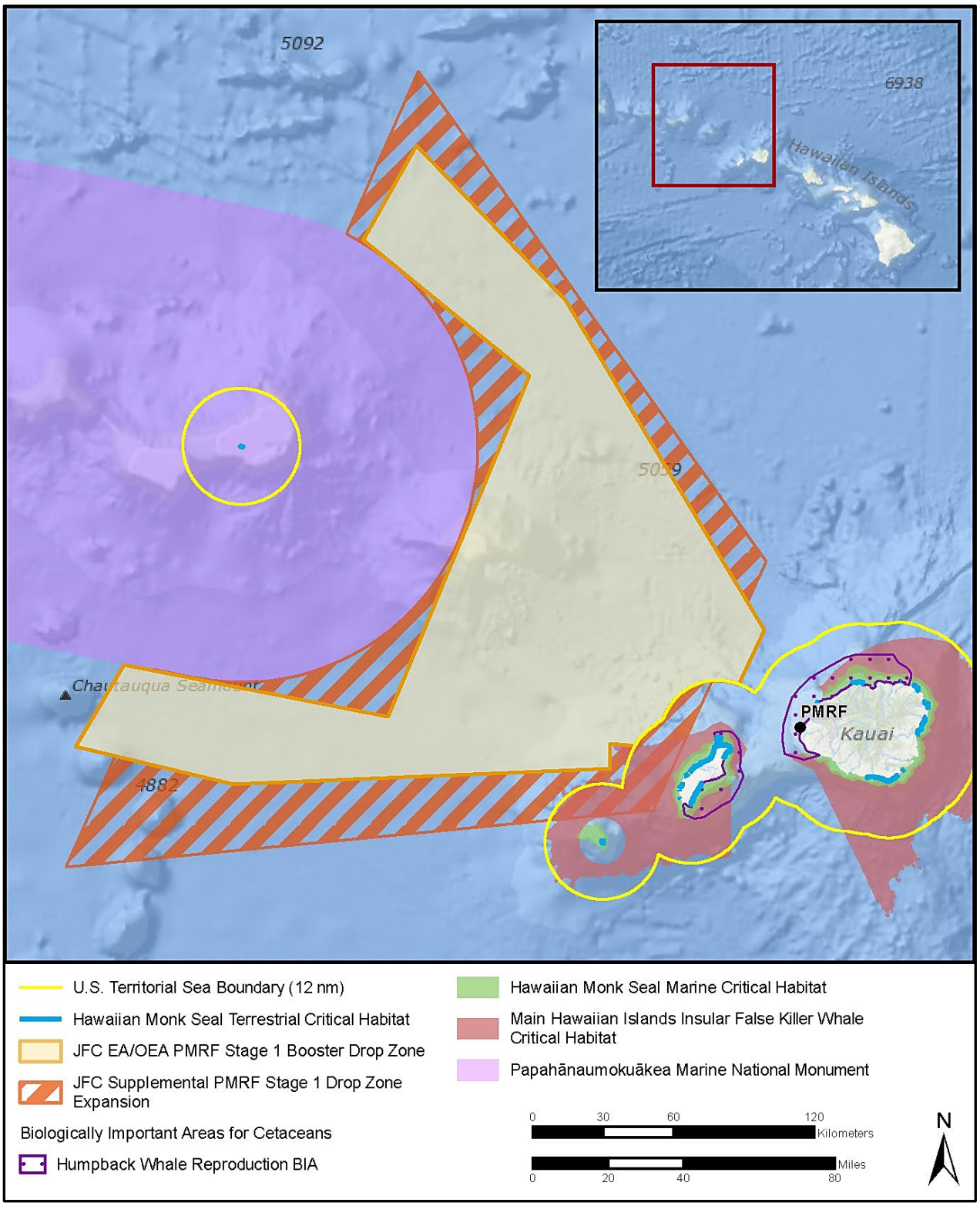


Figure 3-3. Biological Resources in the PMRF Stage 1 Booster Drop Zone

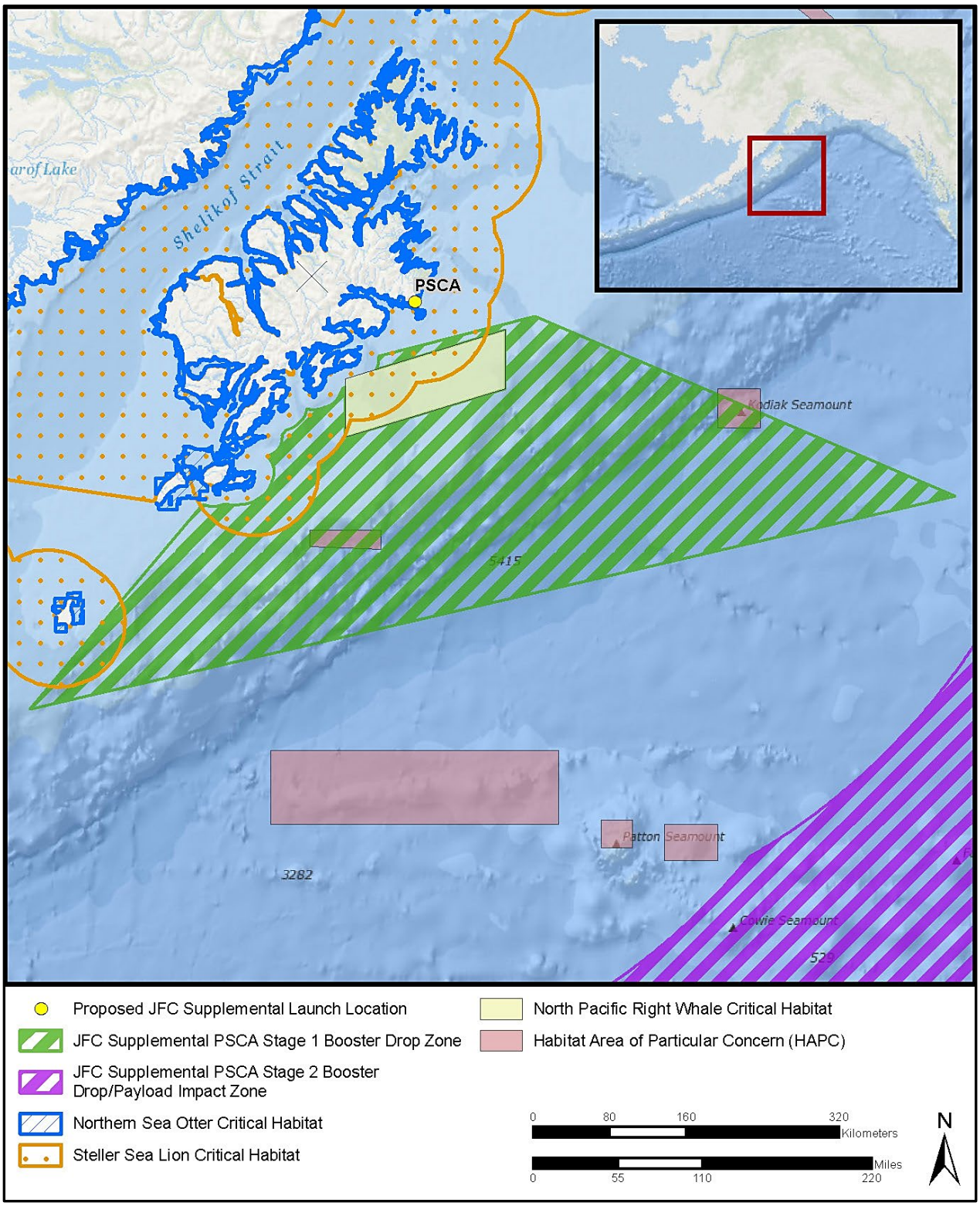


Figure 3-4. Biological Resources in the PSCA Stage 1 Booster Drop Zone

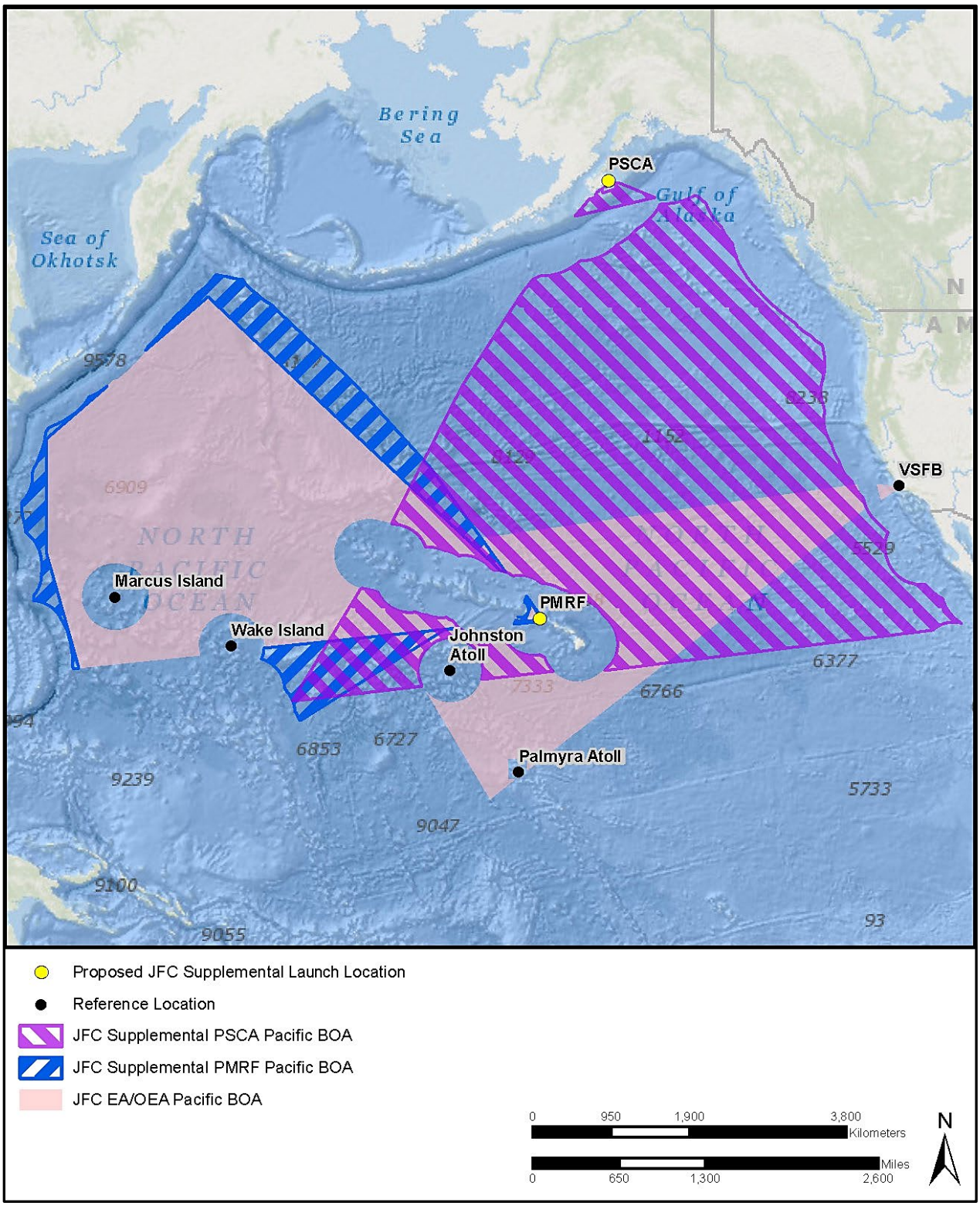


Figure 3-5. Pacific BOA Comparison for JFC Supplemental and JFC EA/OEA Evaluations

A large portion of the JFC Supplemental Pacific BOA ROI overlaps or is directly adjacent to the BOA areas evaluated in the JFC EA/OEA (**Figures 3-3** and **3-5**). The proposed PMRF BOAs are larger than the areas evaluated in the JFC EA/OEA; however, biological resources in the PMRF Pacific BOA ROI are substantially the same as those described in the JFC EA/OEA (DON and U.S. Army 2022, Section 3.5.2, Page 3-89) which is incorporated here by reference. The proposed PSCA Stage 2 BOA overlaps BOA areas evaluated in the JFC EA/OEA for both Vandenberg Space Force Base launches and PMRF launches. The biological resources in the PSCA Pacific BOA ROI are substantially the same as those described in the JFC EA/OEA (DON and U.S. Army 2022, Section 3.5.2.2, Page 3-90) and in the FT-3 EA/OEA (U.S. Army 2021, Section 3.2.2.2, Page 3-49) which are incorporated here by reference. This section focuses on any resource differences between the proposed Pacific BOA ROI and the BOA ROIs in aforementioned documents and focuses on special-status species which might respond to stressors resulting from the Proposed Action.

PMRF Stage 1 Booster Drop Zone

Biological resources in the PMRF stage 1 booster drop zone (**Figure 3-3**) are substantially the same as those described in the JFC EA/OEA (DON and U.S. Army 2022, Section 3.5.2.3, Page 3-90). The only difference in biological resources in the JFC Supplemental activities stage 1 ROI is in environmentally sensitive habitats. ESA-listed species likely to occur in the PMRF stage 1 booster drop zone are listed in **Table 3-3**.

Environmentally Sensitive Habitats. Designated critical habitat for the Main Hawaiian Islands Insular DPS of the false killer whale occurs within the proposed PMRF stage 1 booster drop zone (**Figure 3-3**). This designated habitat includes waters from the 45-m (148-ft) depth contour to the 3,200-m (10,500-ft) depth contour around the Main Hawaiian Islands (83 FR 35062 [24 July 2018]). The physical or biological features of this habitat that are essential to the conservation of insular false killer whales are: (1) island-associated marine false killer whale habitat; (2) sufficient quantity, quality, and availability of prey species; (3) waters free of harmful pollutants; and (4) habitat free of anthropogenic noise that would significantly impair the value of the habitat for false killer whale use or occupancy.

PSCA Stage 1 Booster Drop Zone

Biological resources in the PSCA stage 1 booster drop zone (**Figure 3-4**) are substantially the same as those described in the FT-3 EA/OEA (U.S. Army 2021, Section 3.1.3.2, Page 3-14). The proposed JFC Supplemental drop zone is larger and incorporates more diversity in marine habitat. Therefore, this section provides a summary of differences from baseline biological conditions as described in the FT-3 EA/OEA.

Marine Wildlife. The inshore waters above the continental shelf and slope are extremely productive waters that provide seasonal habitat for an abundance of marine wildlife including many protected under the ESA, MMPA, and MBTA (see detailed descriptions in U.S. Army 2021). ESA-listed marine wildlife with the potential to occur in the PSCA stage 1 booster drop zone are

listed in **Table 3-3**. Some marine mammals occur in the Gulf of Alaska year-round; however, many migratory species also use the Gulf of Alaska, and the greatest numbers of marine mammals are present in the ROI between spring and fall (Rone et al. 2014). During the summer months, higher densities of marine mammals are expected in inshore shelf and slope waters than in offshore waters with the highest densities of several species occurring on Albatross Bank (within and near the North Pacific right whale critical habitat; Rone et al. 2017).

Table 3-3. ESA-Listed Species with the Potential to Occur in the Pacific Ocean Booster Drop and Payload Impact Zones

Common Name	Scientific Name	Federal Listing Status	Likelihood of Occurrence		
			PMRF Stage 1 Booster Drop Zone	PSCA Stage 1 Booster Drop Zone	Pacific Stage 2 Booster Drop/ Payload Impact Zones
Marine Mammals					
Guadalupe fur seal	*Arctocephalus townsendi*	T	-	-	P
Sei whale	*Balaenoptera borealis*	E	P	P	L
Blue whale	*Balaenoptera musculus*	E	P	P	L
Fin whale	*Balaenoptera physalus*	E	P	L	L
Northern sea otter – Southwest DPS	*Enhydra lutris kenyoni*	E	-	L	-
Gray whale – Western North Pacific DPS[1]	*Eschrichtius robustus*	E	-	P[1]	P[1]
North Pacific right whale	*Eubalaena japonica*	E	-	L	L
Steller sea lion – Western DPS	*Eumetopias jubatus*	E	-	L	-
Humpback whale	*Megaptera novaeangliae*				
Mexico DPS		T	U[2]	P	L
Western North Pacific DPS		E	U[2]	P	L
Hawaiian monk seal	*Neomonachus schauinslandi*	E	P	-	-
Sperm whale	*Physeter macrocephalus*	E	L	L	L
False killer whale – Main Hawaiian Islands Insular DPS	*Pseudorca crassidens*	E	P	-	-
Birds					
Band-rumped storm-petrel - Hawai`i DPS	*Oceanodroma castro*	E	P	-	P
Short-tailed albatross	*Phoebastria albatrus*	E	P	L	L
Steller's eider – Alaska Breeding DPS	*Polysticta stelleri*	T	-	P	
Hawaiian petrel	*Pterodroma sandwichensis*	E	L	-	L
Newell's shearwater	*Puffinus auricularis newelli*	T	P	-	P

Common Name	Scientific Name	Federal Listing Status	Likelihood of Occurrence		
			PMRF Stage 1 Booster Drop Zone	PSCA Stage 1 Booster Drop Zone	Pacific Stage 2 Booster Drop/ Payload Impact Zones
Sea Turtles					
Loggerhead turtle – North Pacific Ocean DPS	*Caretta caretta*	E	P	L	L
Green turtle	*Chelonia mydas*				
Central North Pacific DPS		T	L	-	L
Central West Pacific DPS		E	-	-	L
East Pacific DPS		T	-	L	L
Leatherback turtle	*Dermochelys coriacea*	E	P	P	L
Hawksbill turtle	*Eretmochelys imbricata*	E	L	P	L
Olive ridley turtle	*Lepidochelys olivacea*	T	P	P	L
Fish					
Oceanic whitetip shark	*Carcharhinus longimanus*	T	L	-	L
Oceanic giant manta ray	*Manta birostris*	T	P	-	L
Chum salmon[3]	*Oncorhynchus keta*	T[3]	-	P	-
Coho salmon[3]	*Oncorhynchus kisutch*	T[3]	-	P	-
Steelhead[3]	*Oncorhynchus mykiss*	T[3]	-	P	-
Sockeye Salmon[3]	*Oncorhynchus nerka*	E[3]	-	P	-
Chinook salmon[3]	*Oncorhynchus tshawytscha*	E, T[3]	-	L	-
Scalloped hammerhead shark	*Sphyrna lewini*				
Eastern Pacific DPS		E	-[4]	-	L
Indo-West Pacific DPS		T	-[4]	-	L

Notes: Species for which the ROI is considered extralimital (i.e., very few confirmed sightings and the area is outside the normal range for the species) are not included in this table.

[1] Gray whales in the ROI are likely from the Eastern Population which is not listed under the ESA. It is possible that a small (but unknown) number of gray whales in the ROI would be from the ESA-endangered Western DPS.

[2] Humpback whales are likely to occur in the PMRF stage 1 booster drop zone but are likely part of the Hawai`i DPS which is not listed under the ESA.

[3] Fourteen ESA listed Evolutionarily Significant Units (ESUs) of salmon and steelhead have the potential to occur in the ROI seasonally during the marine phase of their life cycle (see DON and U.S. Army 2022, NOAA 2023a). Occurrence for these species is based on general patterns of migration for these species; no specific occurrence data for ESA listed ESUs in the ROI are known.

[4] Scalloped hammerhead sharks may occur in the PMRF stage 1 booster drop zone but would be part of the Central Pacific DPS which is not listed under the ESA.

Abbreviations: DPS = Distinct Population Segment, E = federal endangered, T = federal threatened, L = Likely, P = Potential, U = Unlikely.

Environmentally Sensitive Habitats. Waters of the PSCA stage 1 booster drop zone include areas designated as critical habitat under the ESA, EFH under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), Habitat Areas of Particular Concern under the MSA, and BIAs for cetacean feeding and migration. Essential features and importance of these areas are described in the FT-3 EA/OEA (U.S. Army 2021, Section 3.1.3.2.5, Page 3-25). The PSCA stage 1 booster drop zone is at least 11 km (6 nm) from any land areas and therefore, does not include northern sea otter critical habitat (**Figure 3-4**). The Action Proponents have excluded designated North Pacific right whale critical habitat from the proposed booster drop zone.

Designated critical habitat for Steller sea lions occurs within the PSCA stage 1 booster drop zone (**Figure 3-4**). The essential component of this Steller sea lion aquatic critical habitat is adequate food resources (NMFS 1993), especially for lactating adult females, young-of-the-year, and juveniles.

The ROI includes seasonal BIAs for cetaceans, as identified by the National Oceanic and Atmospheric Administration Cetacean Density and Distribution Mapping Working Group (Ferguson et al. 2015). BIAs in the PSCA stage 1 booster drop zone include areas important for humpback whale, fin whale, North Pacific right whale, and gray whale feeding and for gray whale migration (**Figure 3-6**; Ferguson et al. 2015). The nearshore waters off Kodiak Island within the ROI are also considered a biologically important feeding area for seabirds due to abundant food resources (i.e., forage fish and krill; Smith et al. 2012, ADFG 2015).

In the PSCA stage 1 booster drop zone, EFH has been designated for all life stages of groundfish of the Gulf of Alaska; immature, juvenile, and mature salmon species; and late juvenile and adult scallops. Gulf of Alaska groundfish include species such as pollock, cod, sole, rockfish, sharks, skates, octopuses, and squids (NMFS 2018). More detailed descriptions of EFH and the species included in specific Fisheries Management Plans are incorporated here by reference to these plans and their amendments (NPFMC 2012, NPFMC 2014, NPFMC 2018, NMFS 2018).

Habitat Areas of Particular Concern are areas within EFH that are of particular ecological importance to the long-term sustainability of managed species, are of a rare type, or are especially susceptible to degradation or development (NPFMC 2018). Two designated Habitat Area of Particular Concern for groundfish occur in the proposed stage 1 booster drop zone (**Figure 3-4**). The Albatross Bank Habitat Area of Particular Concern is a Gulf of Alaska Slope Habitat Conservation Area and the Kodiak Seamount is an Alaska Seamount Habitat Protection Area (NPFMC 2018). The Alaska Fisheries Management Plan (Appendix F of NPFMC 2018) details non-fishing activities that may affect EFH including introduction of potentially hazardous materials and marine debris.

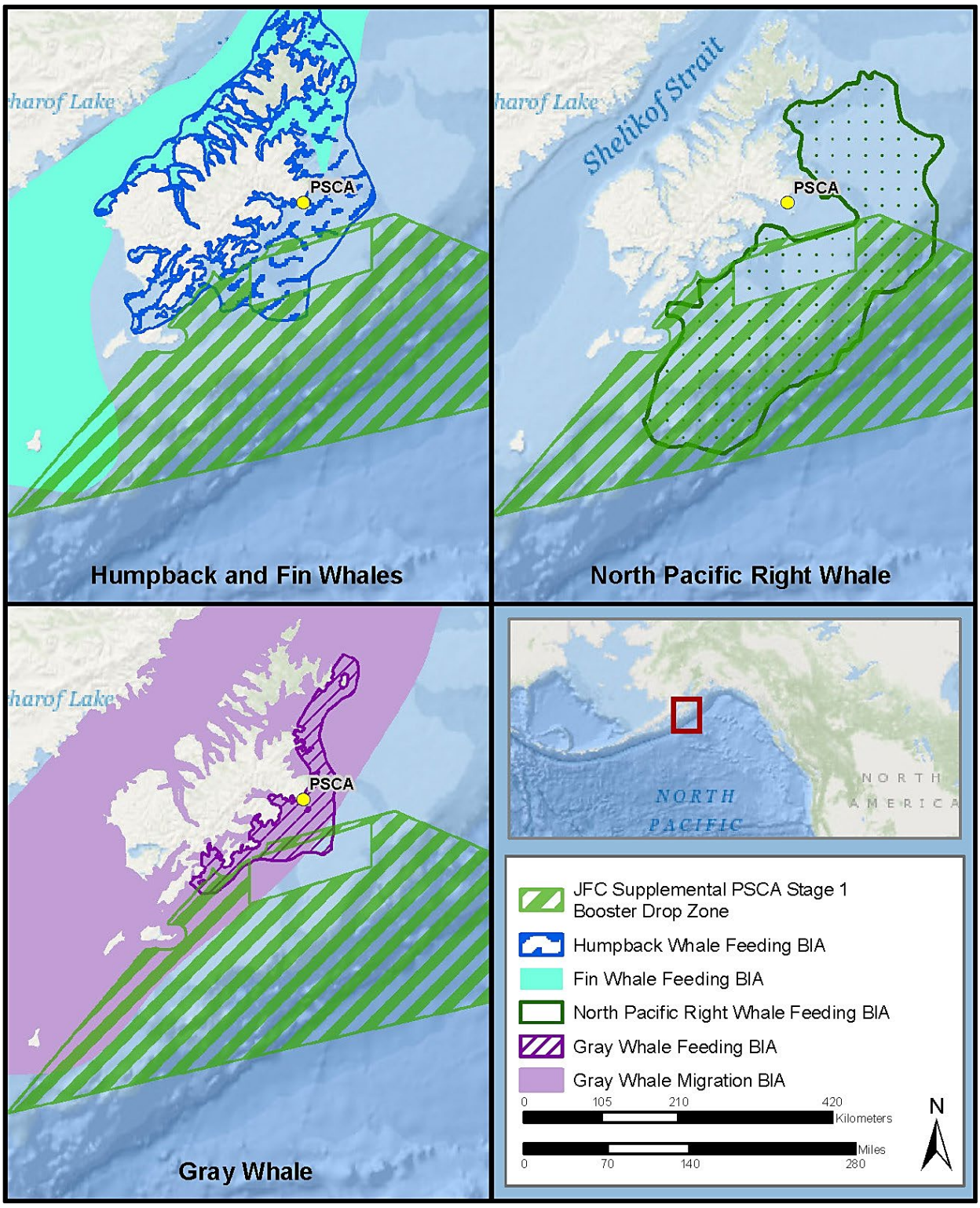


Figure 3-6. Biologically Important Areas for Cetaceans in the PSCA Stage 1 Booster Drop Zone

Stage 2 Booster Drop/Payload Impact Zones

The stage 2 booster drop/payload impact zones in the BOA of the North Pacific Ocean include only waters outside of the Exclusive Economic Zones of the United States and other countries (**Figure 3-5**). The waters of the stage 2 booster drop/payload impact zone consist of deep ocean waters with both pelagic and benthic habitats. **Table 3-3** lists the ESA-listed species with the potential to occur in the ROI. As discussed above, these zones overlap the ROI evaluated in the JFC EA/OEA and for other flight test programs (**Figure 3-5**). Biological resources in the stage 2 booster drop/payload impact zones are primarily the same as those described in the JFC EA/OEA (DON and U.S. Army 2022, Section 3.5.2.5, Page 3-101) and in the FT-3 EA/OEA (U.S. Army 2021, Section 3.2.2.2, Page 3-49), which are incorporated here by reference. Since evaluations for these programs already describe resources in large areas of the Pacific Ocean, the primary differences in biological resources are location-specific differences in the abundance or density of species, differences in species assemblages, and differences in seasonal occurrence. This section focuses on special-status biological resources in the ROI within the Eastern Pacific Subarctic (as defined in Sutton et al. 2017) in areas not described in the aforementioned documents.

Marine Wildlife. Areas of the central North Pacific such as the North Pacific Transition Zone and seamounts are known to be biological hotspots due to dynamic ocean conditions and currents. There is a diversity of oceanic habitats for fish and other marine wildlife in the ROI. The stage 2 booster drop/payload impact zones include the range of three ESA-listed fish species and five sea turtle species (**Table 3-3**).

Common seabirds in pelagic habitats of the Eastern Pacific Subarctic include sooty shearwaters (*Puffinus griseus*), short-tailed shearwaters (*Puffinus tenuirostris*), Leach's storm-petrels (*Oceanodroma leucorhoa*), fork-tailed storm-petrels (*Oceanodroma furcata*), and tufted puffins (*Lunda cirrhata*; Springer et al. 1999). All these seabirds are migratory birds protected under the MBTA. Four ESA-listed birds have the potential to occur in the stage 2 booster drop/payload impact zones (**Table 3-3**).

At least 22 marine mammal species occur in the pelagic areas of the Eastern Pacific Subarctic (Springer et al. 1999). The most abundant species are likely to be Dall's porpoise (*Phocoenoides dalli*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), Northern right whale dolphins (*Lissodelphis borealis*), and sperm whales (Springer et al. 1999). Only two pinniped species (Northern fur seals and Northern elephant seals) are likely to use pelagic habitats in the ROI. All marine mammal species in the ROI are protected under MMPA, and seven species are listed under the ESA (**Table 3-3**).

Environmentally Sensitive Habitats. Since the stage 2 booster drop/payload impact zones are outside of Exclusive Economic Zones, no designated critical habitat, EFH, or other designated marine protected areas occur in the ROI. The vehicle flight path may cross over cross over Papahānaumokuākea and Pacific Remote Islands Marine National Monuments (**Figures 2-8** and

2-9). No LRHW AUR components would fall into these marine national monuments and no part of the Proposed Action would impact the monuments.

3.3.3 Hazardous Materials and Waste – Pacific Ocean

3.3.3.1 Regulatory Setting

Refer to **Appendix D, Section D.2.5** for the regulatory setting.

3.3.3.2 Region of Influence

The ROI Pacific study area is divided into affected areas for PMRF and PSCA as indicated on **Figures 2-9** and **2-10**.

Overall, the Pacific Ocean is the largest and deepest ocean basin on Earth, covering more than 155 million square km (60 million square mi) and averaging a depth of approximately 4,000 meters (13,000 ft) (NOAA 2023b).

The "Ring of Fire" is a circular region that surrounds the Pacific Ocean with exceptionally high volcanic and earthquake activity. Most of the active volcanoes on Earth are located underwater, along the Ring of Fire. Made up of more than 450 volcanoes, the Ring of Fire stretches for approximately 40,000 km (25,000 mi), running in the shape of a horseshoe (as opposed to an actual ring) from the southern tip of South America, along the west coast of North America, across the Bering Strait, down through Japan, and into New Zealand. It also includes the shores of Japan, Russia, Alaska, Canada, Oregon, Washington state, California, Mexico, Southeast Asia, and many South Pacific islands. (NOAA 2023c)

The "Great Pacific Garbage Patch" refers to an area in the North Pacific Ocean, between Hawai`i and California, containing a high concentration of marine debris. Wind and waves continuously mix this debris, dispersing it over huge surface areas and throughout the top portion of the water column. The ocean features are a moving target and the borders and content of the area continually change with ocean wind and currents. (NOAA 2023d) Biological resources that would be affected by hazardous materials and waste in the Pacific BOA are discussed in **Section 3.3.2**.

This page intentionally left blank

4.0 Environmental Consequences

This chapter discusses the potential direct and indirect effects of implementing the Proposed Action and No Action Alternative on the affected environmental resource areas highlighted in **Chapter 3.0**.

4.1 Pacific Missile Range Facility

4.1.1 Water Resources – PMRF

4.1.1.1 No Action Alternative – PMRF

Under the No Action Alternative, the proposed Supplemental JFC activities would not occur. However, previously evaluated launch/support activities for JFC at PMRF and KTF would continue, as planned (DON and U.S. Army 2022). No significant impacts to water resources would be expected to occur under the No Action Alternative.

4.1.1.2 Proposed Action – PMRF

Similar to the JFC EA/OEA (DON and U.S. Army 2022), an estimation of the JFC flight tests potential releases, current regulations and infrastructure specific to PMRF leads to the conclusion that any impacts to water resources from the JFC flight tests would not have adverse impacts on hydrologic function or quality at PMRF. Because the existing drainage ditches are designed to move water away from the agricultural fields during irrigation and rainfall, no residual effects of past launches are expected (DON 2019). Turbidity may temporarily increase due to grounding rods temporarily being installed up to 1.8 m (6 ft) below ground surface, although suspended matter would settle out and return to base levels post-test removal. No permanent impacts to water resources would be expected as a result of the Proposed Action.

4.1.2 Cultural Resources – PMRF

Analysis of potential impacts to cultural resources considers both direct and indirect impacts. Direct impacts may be the result of physically altering, damaging, or destroying all or part of a resource, altering characteristics of the surrounding environment that contribute to the importance of the resource, introducing visual, atmospheric, or audible elements that are out of character for the period the resource represents (thereby altering the setting), or neglecting the resource to the extent that it deteriorates or is destroyed.

4.1.2.1 No Action Alternative – PMRF

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to cultural resources from the baseline conditions described in **Section 3.1.2**. Therefore, no significant impacts to cultural resources would occur with implementation of the No Action Alternative.

4.1.2.2 Proposed Action – PMRF

The Proposed Action would not require construction at the THAAD Launch Site. There are no properties eligible for listing on the National Register of Historic Places at either launch site. No impacts on cultural resources would be expected as a result of this Proposed Action. Therefore, no Section 106 consultation (Protection of Historic Properties 2004) with the Hawai`i State Historic Preservation Division is required for the Proposed Action.

Should human remains or cultural artifacts be encountered, work would cease immediately in accordance with Section 3(d) of the Native American Graves Protection and Repatriation Act (Native American Graves Protection and Repatriation Regulations 1995). If during the performance of an undertaking, historic properties, including submerged archaeological sites and traditional cultural properties, are discovered or unanticipated effects are found, or a previously unidentified property which may be eligible for listing on the National Register of Historic Places is discovered, the Commander, Navy Region would take all reasonable measures to avoid harm to the property until it concludes consultation with the State Historic Preservation Officer and any Native Hawaiian organization, including Oahu Council of Hawaiian Civic Clubs, which has made known to Commander, Navy Region Hawai`i that it attaches religious and cultural significance to the historic property (DON 2018a). See **Appendix D, Section D.1.2** for cultural regulatory descriptions and requirements.

4.1.3 Biological Resources – PMRF

Environmental consequences of the Proposed Action on biological resources are evaluated based on the best available information about species distributions and in the context of the regulatory setting discussed in **Section 3.1.3**.

Determination of the significance of potential impacts to biological resources is based on (1) the importance of the resource (i.e., threatened or endangered species; critical habitats; recreationally, commercially, ecologically, culturally, or scientifically important species); (2) the sensitivity of the resource to proposed activities; (3) the proportion of the resource that would be affected relative to its occurrence in the region; and (4) the duration of ecological ramifications. For example, impacts to terrestrial wildlife would be considered significant if species or habitats of concern were substantially affected over relatively large areas or activities resulted in reductions in the population size or distribution that might limit the ability of a local or regional population to sustain itself. Impacts to environmentally sensitive habitats would be considered significant if these habitats were destroyed or substantially modified.

4.1.3.1 No Action Alternative – PMRF

Under the No Action Alternative, proposed JFC Supplemental activities would not occur; however, previously evaluated launch and support activities for JFC (as in DON and U.S. Army 2022) and other programs at PMRF, including at KTF, would continue. The No Action Alternative would result in no impacts to biological resources that were not evaluated in previous NEPA documents.

Therefore, no significant impacts to biological resources would occur with implementation of the No Action Alternative.

4.1.3.2 Proposed Action – PMRF

The Proposed Action has the potential to impact biological resources in the PMRF ROI through exposure to elevated sound pressure levels, wildfire risk from launch, launch emissions, artificial lighting, and increased human activity and equipment operation. **Appendix E**, **Section E.2.1** lists avoidance, minimization, and conservation measures to be implemented to minimize the potential effects of the Proposed Action on biological resources.

Launches of the LRHW AUR as part of the Proposed Action testing would be the same as launches evaluated in the JFC EA/OEA (DON and U.S. Army 2022). While the evaluation of the Proposed Action includes up to six test launches per year from supplemental launch facilities, these tests would not be an addition to those evaluated in the JFC EA/OEA. The six test launches per year could be from any combination of launch sites considered in the JFC EA/OEA preferred alternative and those proposed in this Supplemental EA/OEA. The potential environmental impacts of JFC launch and support activities on biological resources at PMRF would be the same as those concluded for JFC activities in the JFC EA/OEA (DON and U.S. Army 2022, Section 4.1.2.2, Page 4-3) and analysis details are incorporated here by reference.

Terrestrial Vegetation

JFC activities would have no long-term adverse impact on vegetation at PMRF. Vegetation near the launch pad is maintained by mowing, which limits the potential for wildfire resulting from launch. Fire and emergency crews are present at every PMRF launch to quickly extinguish any fire ignited at or near the launch pad during launch, and risk of wildfire would be extremely low.

Terrestrial Wildlife

Terrestrial wildlife species at PMRF such as birds as well as marine organisms that haul out on land have the potential to be impacted by elevated sound pressure levels from launch as well as by launch emissions, artificial lighting, and human activity and equipment operation. Overall, terrestrial wildlife would not be significantly impacted by these JFC Supplemental launch and launch support activities at PMRF. As detailed in the JFC EA/OEA (DON and U.S. Army 2022, Section 4.1.2.2, Page 4-3), impacts to terrestrial wildlife, including ESA-listed species, are expected to be negligible to minor and would be short-term.

The primary stressor of concern to most wildlife species is launch noise. Since the distributions of ESA-listed species are slightly different for the THAAD launch site ROI than they were in the KTF launch ROI, potential impacts of launch noise are summarized here. Based on the expected distribution of ESA-listed species and the expected maximum sound pressures from launch (**Figure 4-1**), there would be no risk of auditory injury to Hawaiian hoary bats, Hawaiian waterbirds, hauled out Hawaiian monk seals, or hauled out or nesting sea turtles. Animals might

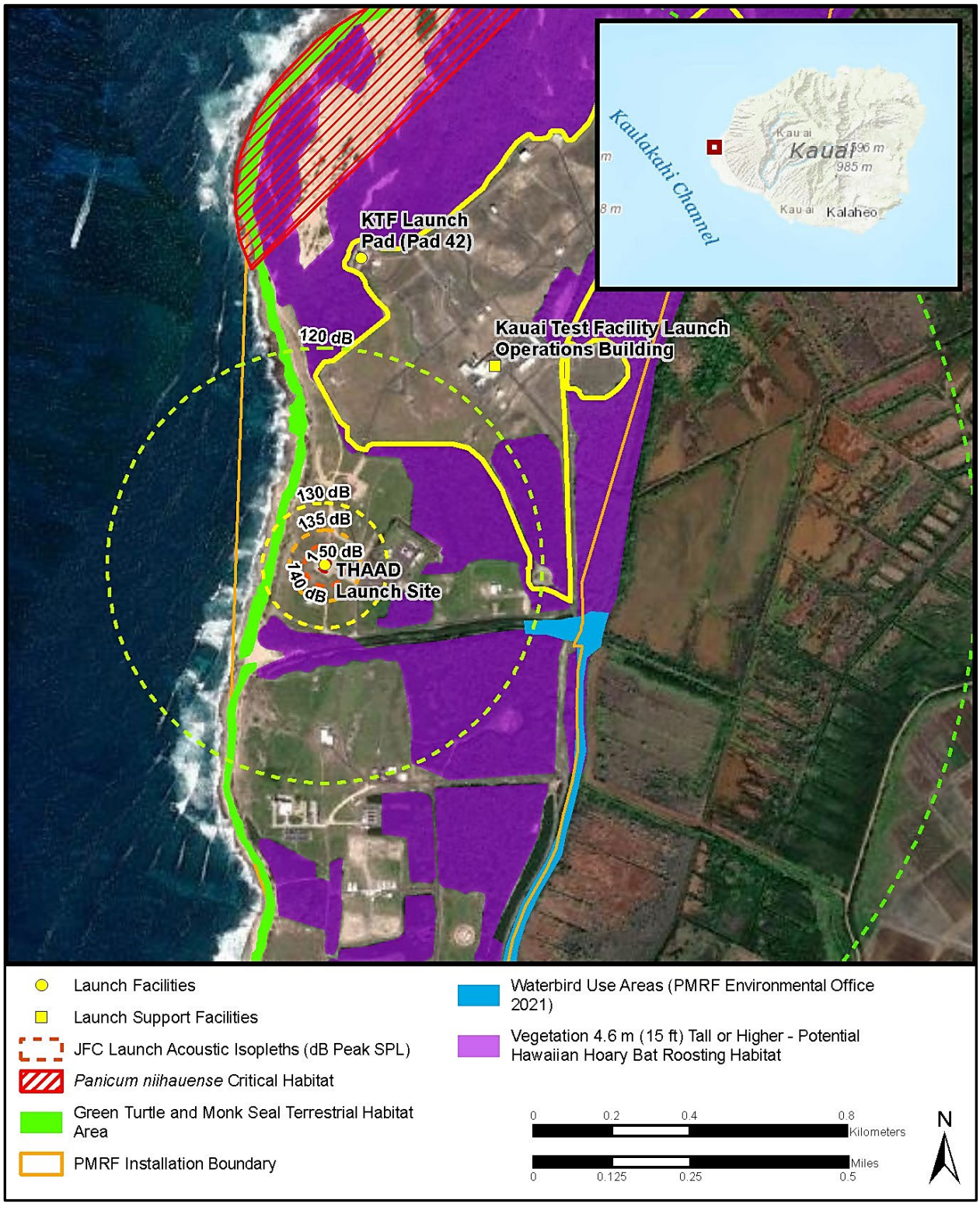


Figure 4-1. Maximum Acoustic Isopleths and Habitat Areas in the PMRF ROI

be temporarily startled by launch noise, but any effects would be short term behavioral disturbance and animals would be expected to return to normal behaviors within minutes of launch (U.S. Army and DON 2023a). Nēnē within 53 m (174 ft) of launch have the potential to be injured by elevated noise levels; however, mitigation measures would be in place to reduce the risk to nēnē (See **Appendix E**, **Section E.2.1**), potentially including hazing of birds by authorized personnel in accordance with the reclassification of the Hawaiian goose with a Section 4(d) Rule or as determined under a Section 7 consultation, and Navy PMRF Environmental Office protocols. With implementation of mitigation measures, injury to nēnē is unlikely. Therefore, the impact of launch noise on ESA-listed species would be negligible to minor and short-term.

Marine Wildlife

Marine wildlife would not to be impacted by JFC activities in the PMRF ROI. Vehicle launch and overflight would result in elevated noise levels in air, but based on expected sound pressure levels in marine habitats, there would be no effects to marine wildlife.

Environmentally Sensitive Habitats

No impacts to EFH nor to designated critical habitat for lau`ehu are expected due to launch activities at PMRF.

ESA Protected Resources

Because the Proposed Action may affect some terrestrial ESA-listed species, the Action Proponents consulted with the USFWS under Section 7 of the ESA (**Appendix A**). The potential effects of launch lighting on ESA-listed seabirds and the effects of base-wide management of ESA-listed species have been evaluated in the Navy consultations and subsequent Biological Opinions on base-wide operations and maintenance at PMRF (USFWS 2018, USFWS 2014b). The Navy is currently consulting with the USFWS on the effects of proposed future changes to base-wide management of ESA-listed species, including proposed hazing of nēnē at launch sites. All JFC Supplemental activities which would be covered under Biological Opinions for PMRF base-wide activities would be conducted under the terms of those Biological Opinions as implemented by the Navy at PMRF. For the Proposed Action, the potential effects of launch from the THAAD launch site were not covered under any of those previous consultation documents. Therefore, the U.S. Army and Navy prepared a Biological Evaluation (U.S. Army and DON 2023a) to fully evaluate the potential effects of the Action on ESA-listed species and designated critical habitats. Based on the analyses in the Biological Evaluation, JFC Supplemental activities may affect but are not likely to adversely affect four Hawaiian waterbird species, nēnē, Hawaiian hoary bats, hauled out green sea turtles, or designated critical habitat for lau'ehu. The U.S. Army and Navy consulted with the USFWS under Section 7 of the ESA for JFC Supplemental launch activities at the THAAD launch site and the USFWS issued a letter of concurrence on December 14, 2023 (**Appendix A**).

4.1.4 Public Health and Safety – PMRF

Public health and safety would be deemed impacted if the Proposed Action would introduce materials or operations in the ROI that would cause a potential public or occupational health hazard; or the Proposed Action would create an unmanageable human-health and/or safety hazard in the ROI.

A growing body of scientific knowledge demonstrates that children may suffer disproportionately from environmental health risks and safety risks; therefore, federal agencies shall make it a high priority to identify and assess environmental health risk and safety risk that may disproportionately affect children (EO 13045, Protection of Children from Environmental Health and Safety Risks). The JFC flight tests would be conducted on DOD controlled property or in the open ocean. Tests of this nature have been performed for decades, and no additional protections for health and safety of children have been enacted previously. This Supplemental EA/OEA has not identified any environmental health and safety risks that may disproportionately affect children.

4.1.4.1 No Action Alternative – PMRF

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to public health and safety. Previously evaluated launch/support activities for JFC at PMRF and KTF would continue, as planned. Federal, state, and local regulations as well as PMRF standard operating procedures would be followed for launch site preparation, booster handling, and all hazardous operations. PMRF missile flight analysis, ground safety, range safety, ocean clearance, transportation safety, and fire and crash safety procedures would be followed to ensure the safety of workers and members of the public. PMRF would issue NOTAMs and NTMs ahead of any JFC flight test, in accordance with range safety and FAA requirements (DON and U.S. Army 2022). Therefore, no significant impacts to Public Health and Safety would occur with implementation of the No Action Alternative.

4.1.4.2 Proposed Action – PMRF

The JFC flight test would include the launch of a two-stage booster AUR vehicle from PMRF. The LRHW AUR is still in development, so it is compared to similar tests that have launched from PMRF. The Flight Experiment-1 (FE-1), FE-2, and Strategic Target System missile tests are used as a comparison for effects on regional public health and safety since the testing of vehicles at the same site would have a similar potential health and safety impact (DON 2017a, DON 2019). The proposed rocket propellants would be similar to past launches, although a smaller quantity. For example, the FE-2 total weight of propellant was 13,608 kg (30,000 lb) and the LRHW AUR will contain up to approximately 9,000 kg (20,000 lb) of propellant. Additionally, the FE-2 vehicle was wider (1.4 m [4.5 ft] versus 1 m [3 ft]) and had three stages whereas the LRHW AUR has two stages. The JFC mission personnel would follow the same health and safety procedures developed under existing plans at PMRF. Federal, state, and local regulations as well as PMRF standard operating procedures would be followed for launch site preparation, booster handling, and all hazardous operations. PMRF missile flight analysis, ground safety, range safety, ocean

clearance, transportation safety, and fire and crash safety procedures would be followed to ensure the safety of workers and members of the public. PMRF would issue NOTAMs and NTMs ahead of any JFC flight test, in accordance with range safety and FAA requirements. Previous NEPA analyses for missile tests at PMRF have determined that there would be no impact to public health and safety as a result of their Proposed Action (DON 2017a, DON 2019, USASMDC/ARSTRAT 2014, USASMDC/ARSTRAT 2011, USASDC 1992). Due to the significantly smaller size of the LRHW AUR in comparison to the FE-1, FE-2, and Strategic Target System missile tests, implementation of the Proposed Action would result in no impacts to public health and safety in the PMRF ROI. In accordance with EO 13045, *Protection of Children from Environmental Health and Safety Risks*, the Navy has determined that since the JFC flight tests would be conducted on DOD property and out in the open ocean, the JFC flight test has no environmental health and safety risks that may disproportionately affect children.

4.1.5 Hazardous Materials and Wastes – PMRF

Impacts on hazardous materials and wastes at PMRF would be considered environmentally significant if an increase of hazardous materials and wastes as a result of the Proposed Action exceeded PMRF's capacity to manage, store, or dispose of them in accordance with federal, state, or local laws; or, if the hazardous materials and wastes as a result of the Proposed Action increased the risk of, or created new, human and environmental health risks.

4.1.5.1 No Action Alternative – PMRF

Under the No Action Alternative, the proposed Supplemental JFC activities would not occur. However, previously evaluated launch/support activities for JFC at PMRF and KTF would continue, as planned (DON and U.S. Army 2022). Hazardous material usage and waste generation would continue to be managed by PMRF under appropriate federal, state, local, and DOD requirements that are well within the purview and capability of PMRF and KTF. Therefore, no significant impacts to hazardous materials and waste management would occur with implementation of the No Action Alternative

4.1.5.2 Proposed Action – PMRF

The Proposed Action includes additional launch and impact locations for the up to six JFC flight test launches annually at various launch locations. This Supplemental EA/OEA would enable PSCA to be selected as one of the alternative test ranges. The Proposed Action would add flight tests (up to six total joint test operations per year until 2032) launched from PMRF's THAAD launch site. The LRHW launch vehicle is identical to that analyzed in the JFC EA/OEA (DON and U.S. Army 2022). The AUR consists of a two-stage booster system and payload approximately 1 m (3 ft) in diameter and 10 m (30 ft) in length. The first and second stage include up to approximately 9,000 kg (20,000 lb) of rocket propellant. Transportation, handling, and storage of the rocket motors and ordnance at PMRF would occur in accordance with DOD, Navy, U.S. Army, and U.S. Department of Transportation policies and regulations to safeguard the materials from fire or other mishap. Routine pre-flight, launch, and post-flight ground preparations at the THAAD launch site would occur. Standard pre-flight support activities such as base support, range safety,

flight test support, and test instrumentation, ground equipment checks, weapon system vehicle and booster assembly and checks would occur prior to every JFC flight test and have the potential to generate hazardous materials and waste. No permanent facility alterations are planned, and all activities would use existing facilities and infrastructure. Any hazardous materials and waste generated in support of the Proposed Action would not be expected to exceed PMRF's capacity to manage, store, or dispose of them in accordance with federal, state, or local laws; nor would the Proposed Action be expected to increase the risk of, or create new, human and environmental health risks.

4.2 Pacific Spaceport Complex Alaska

4.2.1 Air Quality and Climate Change – PSCA

4.2.1.1 No Action Alternative – PSCA

Under the No Action Alternative, the Proposed Action would not occur and there would be no change associated with air quality or measurable climate change impacts at PSCA. Therefore, no significant impacts would occur with implementation of the No Action Alternative.

4.2.1.2 Proposed Action – PSCA

Because the LRHW AUR missile is still in development, there are no estimated emissions; therefore, this analysis uses the emissions from a Minuteman III launch as a surrogate. The analysis used the prevention of significant deterioration (PSD) permitting threshold of 250 tons per year for all criteria pollutants. Under the Clean Air Act, the indicator of significance for criteria pollutants in an attainment area is the PSD threshold. These PSD values are being used for NEPA purposes as first-tier air quality significance indicators. Generally, minor emissions of criteria pollutants (i.e., particulate matter less than or equal to 10 microns in diameter [PM_{10}], particulate matter less than or equal to 2.5 microns in diameter [$PM_{2.5}$], oxides of nitrogen, oxides of sulfur, volatile organic compounds, and carbon monoxide) and GHGs (i.e., mostly carbon dioxide equivalent [CO_2e]) during the proposed action activities would be expected. There are no site preparation, construction, or demolition components to the Proposed Action; therefore, the project-specific direct and indirect emissions would primarily be driven by the following activities:

- Pre-test preparation and support
- Flight test
- Post-launch operations

As indicated in **Chapter 2.0**, there could be up to 6 flight tests per year for a total of 60 flight tests over a 10-year period. The following analysis uses the emissions from a Minuteman III launch as a LRHW AUR surrogate. The propellant information for Minuteman III and LRHW AUR is provided in **Table 4-1** and **Table 4-2**.

The LRHW AUR is approximately 10 m (30 ft) in length and 1 m (3 ft) in diameter. The first and second stage include up to approximately 9,000 kg (20,000 lb) of rocket propellant.

Table 4-1. Minuteman III Solid Propellant Rocket Motors

Dimensions			Propellant Weight (~ pounds)	Main Chemical Components
Stage	Diameter (feet)	Length (feet)		
1	5.5	18.6	45,700	• Ammonium perchlorate • Aluminum • Polybutadiene-acrylic acid-acrylonitrile
2	4.3	9.1	13,750	• Ammonium perchlorate • Aluminum • Polybutadiene-carboxyl terminated
3	4.3	5.5	7,300	

Source: USAF 2004

Table 4-2. LRHW AUR Rocket Motors

Approximate Dimensions			Estimated Propellant Weight (~ pounds)	Commonly Used Chemical Components
Stage	Diameter (feet)	Length (feet)		
1 and 2 combined	3	30	20,000	• Ammonium perchlorate • Aluminum • HTPB (hydroxyl-terminated polybutadiene) polymer

DON and U.S. Army 2022

Table 4-3 shows the historical estimated annual emissions for a Minuteman III (LRHW AUR Surrogate) launch. **Table 4-4** shows the estimated annual emissions for six flight tests per year over a 10-year period.

Table 4-3. Historical Estimated Emissions for Minuteman III Launches (Tons per Year)

Activity Source	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	Pb	NH_3	CO_2e
Pre-Test Preparation and Support	0.07	0.001	0.13	0.62	0.01	0.01	N/A	N/A	N/K
Launch Activities	0.00	0.002	0.18	0.01	1.84	1.29	N/A	N/A	N/K
Post-Launch Operations	0.06	0.000	0.01	0.07	0.00	0.00	N/A	N/A	N/K
Total (Single Launch)	**0.13**	**0.003**	**0.32**	**0.70**	**1.85**	**1.30**	N/A	N/A	N/K
Significant Indicator Levels (tpy)	250	250	250	250	250	250	25	250	N/K

Source: USAF 2019

Abbreviations: CO = carbon monoxide, CO_2e = carbon dioxide equivalent, NH_3 = ammonia, N/A = not applicable, N/K = Not Known, NO_x = oxides of nitrogen, Pb = lead, $PM_{2.5}$ = 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, SO_x = oxides of sulfur, tpy = tons per year, VOC = volatile organic compound

Table 4-4. Estimated Emissions for LRHW AUR Launches from FY 2022 – FY 2032 (Tons per Year)

Year	Number of Flights	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	Pb	NH_3	CO_2e
FY 2022	6	0.78	0.018	1.92	4.2	11.1	7.8	N/A	N/A	N/K
FY 2023	6	0.78	0.018	1.92	4.2	11.1	7.8	N/A	N/A	N/K
FY 2024	6	0.78	0.018	1.92	4.2	11.1	7.8	N/A	N/A	N/K
FY 2025	6	0.78	0.018	1.92	4.2	11.1	7.8	N/A	N/A	N/K
FY 2026	6	0.78	0.018	1.92	4.2	11.1	7.8	N/A	N/A	N/K
FY 2027	6	0.78	0.018	1.92	4.2	11.1	7.8	N/A	N/A	N/K
FY 2028	6	0.78	0.018	1.92	4.2	11.1	7.8	N/A	N/A	N/K
FY 2029	6	0.78	0.018	1.92	4.2	11.1	7.8	N/A	N/A	N/K
FY 2030	6	0.78	0.018	1.92	4.2	11.1	7.8	N/A	N/A	N/K
FY 2031	6	0.78	0.018	1.92	4.2	11.1	7.8	N/A	N/A	N/K
Significant Indicator Levels (tpy)		250	250	250	250	250	250	25	250	N/K

Source: USAF 2019
Note:

[1] Only 1st-stage rocket emissions occur within the ROI for Vandenberg Space Force Base.

Abbreviations: CO = carbon monoxide, CO_2e = carbon dioxide equivalent, FY = fiscal year, N/A = not applicable, N/K = Not Known, NH_3 = ammonia, NO_x = oxides of nitrogen, Pb = lead, $PM_{2.5}$ = 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, SO_x = oxides of sulfur, tpy = tons per year, VOC = volatile organic compound

Based on **Table 4-3** and **Table 4-4,** the estimated annual emissions do not exceed the PSD significant indicator levels for pollutants of concern. Therefore, no significant impacts to air quality are anticipated from flight tests.

After each flight test a safety check and cleanup of the launch site is completed (i.e., removal of equipment from the launch site). All estimated emissions from post-test operation are below the significant indicator levels for pollutants of concern and therefore no significant impacts to air quality are anticipated (see **Table 4-3)**.

Climate Change – Considerations for GHG (CO_2e)

As noted by the Council on Environmental Quality, climate change is a particularly complex challenge given its global nature and the inherent interrelationships among its sources, causation, mechanisms of action, and impacts. The Council on Environmental Quality published updated guidance on January 6, 2023, regarding how to evaluate GHG emissions and climate change under NEPA, which states that agencies should quantify reasonably foreseeable direct and indirect gross and net GHG emissions increases or reductions, both for individual pollutants and aggregated in terms of CO_2e. The guidance further suggests that agencies can provide comparisons of a project's GHG emissions to metrics that may be more familiar to the public.

The USEPA established/proposed GHG permitting thresholds at 75,000 tons per year. This threshold is USEPA's common-sense, phased-in approach to greenhouse gas permitting under the Clean Air Act. This value of 75,000 tons per year of CO_2e is only used as a NEPA significance indicator. This threshold established under the GHG Tailoring Rule defines when permits under the New Source Review PSD and Title V Operating Permit programs are required for new and existing industrial facilities. (USEPA 2014, USEPA 2022d). Although there is a potential for the release of GHG emissions, the estimated tons per year are unknown or unqualifiable because the LRHW AUR missile is still in development and there are no estimated emissions for GHG (CO_2e). Additionally, due to the small amount of carbon monoxide produced in the LRHW AUR surrogate, the increase in emissions is anticipated to be under the comparable USEPA presumptive effects threshold of 75,000 tons per year. Therefore, the Proposed Action would not be expected to result in a significant contribution to global climate change.

4.2.2 Water Resources – PSCA

Environmental consequences of the Proposed Action on water resources are evaluated based on the best available information about PSCA's environment, the Proposed Action detailed in **Chapter 2.0**, and in the context of the regulatory setting discussed in **Section D.2.2**.

4.2.2.1 No Action Alternative – PSCA

Under the No Action Alternative, the proposed Supplemental JFC activities at PSCA would not occur; however, space and missile launch, support activities, and planned infrastructure improvements would continue at PSCA (AAC 2021). The No Action Alternative would result in no impacts to water resources in the ROI since Supplemental JFC launch activities would not occur.

4.2.2.2 Proposed Action – PSCA

The potential for water resource impacts related to launch activities at PSCA was evaluated in the FAA 2016 EA, which analyzed up to nine annual launches from PSCA. Impacts to water resources in the FAA EA were determined to have negligible effects. For analysis purposes in this Supplemental EA/OEA, the environmental impacts of up to six launches per year are described.

Short-term, minor, impacts on water resources would occur as a result of LRHW AUR missile launches. Effects from launch operations would occur only during launches as a result of rocket exhaust product deposition. Exhaust emissions resulting from missile launches include aluminum oxide, carbon monoxide, HCl, hydrogen, nitrogen, and water. The principal product of combustion of potential concern is HCl, which combines with water or water vapor to form hydrochloric acid. The primary water quality concerns are the potential changes in pH from acid deposition and the potential for accumulation of combustion byproducts in localized surface waters. Impacts on water resources from acid deposition are expected to be small and transitory due to the relatively high pH (6.8 to 7.5 in streams and 7.1 to 7.3 in lakes) and buffering capacity of the local streams and lakes. The release of HCl as a result of rocket launches would not result in measurable degradation of surface water quality because the exhaust and associated chemical compounds

would be dispersed over a large area and immediately diluted and/or neutralized by receiving waters. These effects would be temporary and are not anticipated to affect local water quality. This finding is supported by water chemistry studies conducted at PSCA (FAA 2016), which indicated no adverse water quality effects (including pH, specific conductivity, and aluminum levels) from prior launches of rockets much larger than the proposed missiles.

No impacts on water resources are anticipated as a result of post-flight operations. Any waste materials generated would be disposed of according to applicable regulations and range procedures and policy by PSCA, and would not impact groundwater, surface waters, or wetlands.

4.2.3 Biological Resources – PSCA

Environmental consequences of the Proposed Action on biological resources are evaluated based on the best available information about species distributions, based on the impact criteria presented in **Section 4.1.3**, and in the context of the regulatory setting discussed in **Section 3.2.3**.

4.2.3.1 No Action Alternative – PSCA

Under the No Action Alternative, proposed JFC Supplemental activities at PSCA would not occur; however, space and missile launch and support activities would continue at PSCA (AAC 2021). The No Action Alternative would result in no impacts to baseline biological resources since launch activities would continue to occur at PSCA for other programs. Therefore, no significant impacts to biological resources would occur with implementation of the No Action Alternative.

4.2.3.2 Proposed Action – PSCA

The Proposed Action has the potential to impact biological resources in the PSCA ROI through exposure to elevated sound pressure levels, heat and wildfire risk from launch, launch emissions, and increased human activity and equipment operation.

Based on the characteristics of the proposed LRHW launch vehicle, proposed launch activities would be within the launch activities envelope evaluated in the Kodiak Launch Complex Launch Pad 3 EA (FAA 2016) and environmental consequences would be the same. Environmental consequences of proposed launch activities at PSCA are detailed in the Kodiak Launch Complex Launch Pad 3 EA (FAA 2016, Section 4.1.4, Page 4-5) and the FT-3 EA/OEA (U.S. Army 2021, Section 4.1.3.2, Page 4-5), which are incorporated here by reference. A brief summary of potential impacts is included in this section. Overall, the Proposed Action would have less than significant impacts on biological resources in the PSCA ROI.

Terrestrial Vegetation

Plants near the launch pads may be temporarily affected by heat and emissions from vehicle launch. However, based on studies of vegetation conducted after launches from PSCA, no long-term effects on vegetation would be expected (FAA 2016). Vegetation would be expected to return

to normal within a year of the launch and there would be no adverse impacts to special-status, rare, or otherwise important vegetation.

Terrestrial Wildlife

As evaluated in the Kodiak Launch Complex Launch Pad 3 EA (FAA 2016) any launch-related effects to birds and terrestrial mammals in the ROI would be minor and temporary. Terrestrial birds and seabirds may flush in response to launch noise but previous monitoring during launches has shown little startle response and no long-term effects or next abandonment (FAA 2016). Launch activities have occurred at PSCA since 1998 and bald eagles have continued to successfully use nest sites on and near PSCA (FAA 2016). Impacts on terrestrial wildlife would be negligible to minor and short-term.

The potential exists for launch noise to cause behavioral disturbance of pinnipeds hauled out in terrestrial habitats; however, based on expected noise levels and previous monitoring during launches, impacts would be minor. Based on monitoring of hauled out pinnipeds during launch, the AAC and NMFS have determined that launch activities at PSCA do not result in take of these species and that no permitting under the MMPA is required (Hodum personal communication 2023). In addition, NMFS has determined that PSCA launch activities would not reach the level of take for any cetaceans (whales and dolphins) and that any noise that could reach these species would be discountable (76 FR 16311 [23 March 2011]). Launches conducted under the Proposed Action are not expected to result in take of any MMPA listed species (including harbor seals) and would have negligible to no impact on these species.

Marine Resources

The FAA and U.S. Army have evaluated the effects of ongoing launch activities, including sonic booms, on marine wildlife offshore of PSCA. Sonic booms are unlikely to affect marine wildlife and as concluded in previous analyses of sonic booms and other flight associated noises for launches from PSCA (FAA 2016, DOD 2017), noise impacts from sonic booms would be nonexistent or negligible for marine biological resources including ESA-listed species.

Environmentally Sensitive Habitats

There would be no impacts to EFH nor to any designated critical habitat due to launch activities at PSCA.

ESA Protected Resources

Proposed launch activities would either have no effect on or would not adversely affect ESA-listed species at PSCA and impacts would be nonexistent to negligible. AAC and FAA have consulted with NMFS and the USFWS on the effects of PSCA launch activities on ESA-listed species in the past. In 2017, AAC concluded that ongoing space and missile launch activities at PSCA would not affect ESA-listed marine species in the action area (i.e., Stellar sea lions, gray whales, and humpback whales) (AAC 2016). NMFS concurred that proposed activities would not affect Steller

sea lions (or any other ESA-listed species) and that no consultation with NMFS was required under the ESA (82 FR 14996 [24 March 2017]).

In 2012, the FAA consulted with the USFWS on the effects of PSCA programmatic launch activities on ESA-listed species and critical habitats under USFWS jurisdiction. The USFWS determined that programmatic launch activities were not likely to adversely affect northern sea otters or Steller's eiders, would have no effect on short-tailed albatross, and would have no effect on designated critical habitat for northern sea otters (FAA 2016). In 2016, the FAA evaluated the effects of launch activities for small-lift and medium-lift rockets at PSCA and determined that these conclusions remained valid for these modifications to launch activities.

The Army and Navy have determined that the above consultations evaluated all potential effects of the Proposed Action, that the consultation conclusions remain valid for Proposed Action launch activities, and that no further consultation under Section 7 of the ESA is necessary for proposed launch-related activities at PSCA.

4.2.4 Public Health and Safety – PSCA

See **Section 4.1.4** for evaluation criteria.

4.2.4.1 No Action Alternative – PSCA

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 impacts would occur with implementation of the No Action Alternative.

4.2.4.2 Proposed Action – PSCA

The Proposed Action would be conducted under strict adherence to all safety policies and procedures, and would cover ground safety, flight safety, range clearance and surveillance, sea surface area clearance and surveillance, and commercial air traffic control (USASMDC/ARSTRAT 2014). PSCA will coordinate with the U.S. Coast Guard and the FAA. PSCA range safety and mission management personnel will work jointly to establish potential hazard areas over ground and water to assure that the Proposed Action will not endanger life or property (USASMDC/ARSTRAT 2014).

All transportation, handling, and storage of the rocket motors and other ordnance at PMRF and PSCA would occur in accordance with DOD, Navy, U.S. Army, and U.S. Department of Transportation policies and regulations to safeguard the materials from fire or other mishap.

The Proposed Action entails standard ground preparations for the test at the PSCA Area 1 and LP-2; PSCA Area 1 or LP-2; post launch operations at the PSCA Area 1 or LP-2; booster splashdown in the Pacific BOA; and payload impact in the Pacific BOA.

Routine pre-flight support activities such as base support, range safety, flight test support, and test instrumentation, ground equipment checks, weapon system vehicle and booster assembly and checks would occur prior to every JFC flight test. Pre-flight activities would adhere to guidance set by each installation's certified oversight and existing, up-to-date standard operating procedures will be followed to ensure the safety of workers and members of the public. No permanent facility alterations are planned, and all activities would use existing facilities and infrastructure. PMRF or PSCA will issue NOTAMs and NTMs ahead of any JFC flight test, in accordance with range safety and FAA requirements.

PSCA has abundant procedures and policies in place to prevent any threats to public health and safety and can mitigate any potential hazards from a nominal or off-nominal launch. The Proposed Action would not introduce materials or operations in the ROI that would cause a potential public or occupational health hazard, nor would the Proposed Action create an unmanageable human health and/or safety hazard in the ROI.

4.2.5 Hazardous Materials and Wastes – PSCA

Refer to **Section 4.1.5** for a description of the criteria of analysis for potential environmental consequences of the Proposed Action.

4.2.5.1 No Action Alternative – PSCA

Under the No Action Alternative, the proposed Supplemental JFC activities at PSCA would not occur; however, space and missile launch, support activities, and planned infrastructure improvements would continue at PSCA (AAC 2021). The No Action Alternative would result in no impacts to hazardous materials and waste resources in the ROI since Supplemental JFC launch activities would not occur.

4.2.5.2 Proposed Action – PSCA

The Proposed Action entails up to six flight test launches annually at various launch locations over the next 10 years. This Supplemental EA/OEA would enable PSCA to be selected as one of the alternative test ranges. The Proposed Action would include flight tests (up to six total joint test operations per year until 2032) launched from either Area 1 or/and LP-2. The LRHW launch vehicle is identical to that analyzed in the JFC EA/OEA (DON and U.S. Army 2022). The AUR consists of a two-stage booster system and payload approximately 1 m (3 ft) in diameter and 10 m (30 ft) in length. The first and second stage include up to approximately 9,000 kg (20,000 lb) of propellant. Transportation, handling, and storage of the rocket motors and ordnance at PSCA would occur in accordance with State of Alaska, DOD, Navy, U.S. Army, and U.S. Department of Transportation policies and regulations to safeguard the materials from fire or other mishap. Routine pre-flight, launch, and post-flight ground preparations at PSCA would occur. Standard pre-flight support activities such as base support, range safety, flight test support, and test instrumentation, ground equipment checks, weapon system vehicle and booster assembly and checks would occur prior to every JFC flight test and have the potential to generate hazardous materials and waste. No permanent facility alterations are planned, and all activities would use

existing facilities and infrastructure. Any hazardous materials and waste generated in support of the Proposed Action would not be expected to exceed PSCA's capacity to manage, store, or dispose of them in accordance with federal, state, or local laws; nor would the Proposed Action be expected to increase the risk of, or create new, human and environmental health risks.

4.2.6 Socioeconomics/Environmental Justice – PSCA

4.2.6.1 No Action Alternative – PSCA

Under the No Action Alternative, the Proposed Action would not occur and there would be no change associated with socioeconomic characteristics at PSCA. Therefore, no significant impacts would occur with implementation of the No Action Alternative.

4.2.6.2 Proposed Action – PSCA

The Proposed Action would restrict commercial and tourist activities to the offshore waters near PSCA (lasting approximately 8 hours for each flight test event), which could reduce commercial fishing and tourism related opportunities (fishing, sightseeing, aircraft trips, hunting). Additionally, some of the project related personnel are expected to use local hotels thus reducing the number of rooms available for tourists.

Activities could be disrupted during flight test activities as marine vessel restrictions would be issued prior to all launches. The NTM establishes a closed "safety zone" offshore of the PSCA and Ugak Island, as well as a larger "hazard zone" down range where mariners would be discouraged from entering. The "down range" locations are the areas southwest of the launch site which would include Old Harbor, and both the safety and hazard zones. The NTM would be issued for a window of time in which a launch may take place and remain in effect down range until canceled or expired (for up to 8 hours on the launch day). Any effects would depend on which fishery was open at the time and where those fishing grounds are located. These closures are in effect under the current FAA license for the PSCA. The PSCA would work with commercial and sports fishermen on a case-by-case basis to minimize the impact of sea lane closure during flight test activities.

Regarding subsistence resources, the Proposed Action is the continuation of testing activities that have been ongoing for more than a decade. The proposed six annual JFC fight tests have the potential to occur from a total of four different launch sites (i.e., three sites included in the 2022 JFC EA/OEA), which reduced the potential for continuous use of PSCA. In 2018 Old Harbor subsistence harvest was approximately 53,325 kg (117,562 lb) of fish. It is not anticipated that the potential use of the PSCA as a launch site would significantly impact the ability of the Old Harbor community to continue a subsistence harvest of approximately 53,325 kg (117,562 lb) of fish. Although fishing is allowed year-round, the Navy is aware of the major fishing season for Old Harbor (the prime fishing time is from July – September) and to mitigate impact to the fishing community associated with Old Harbor, to the extent possible the Navy would avoid testing during the fishing season.

As closure during flight tests would be infrequent and temporary (lasting approximately 8 hours for each flight test event) impacts to daily fishing limits (commercial and subsistence) would be negligible. The PSCA would continue to hire local fishing vessels to serve as boundary boats during the safety closure periods. These boats warn other mariners of the hazard area and notify the PSCA and the U.S. Coast Guard of any craft within the hazard area (FAA 2016). Fishing related activities would not be restricted during post-flight operations.

A NOTAM would be issued concurrently with the NTM, imposing flight restrictions in the overhead safety and hazard zones for approximately 8 hours. These closures could temporarily affect private pilots and air taxi companies serving both tourism and air travel needs. These effects would be temporary and would not differ from those already permitted at the PSCA (FAA 2016). Because most commercial air routes are to the north of the PSCA, there would be negligible adverse socioeconomic impacts from launches to commercial air traffic.

4.3 Pacific Ocean

4.3.1 Water Resources – Pacific Ocean

4.3.1.1 No Action Alternative – Pacific Ocean

Under the No Action Alternative, the Proposed Action would not occur; however, JFC activities as evaluated in the 2022 JFC EA/OEA would continue in the Pacific BOA. No impacts to baseline water resources would be expected to occur with the No Action Alternative because it would not change the relative magnitude or extent of current and future activities in the Pacific BOA.

4.3.1.2 Proposed Action – Pacific Ocean

There are no groundwater or surface water resources along the over-ocean flight corridor that would be affected by the JFC flight test. There would be no disturbance to ocean waters beyond the settling of the individual booster stages hundreds of kilometers (miles) apart as they come to rest on the sea floor after splashing down into the ocean along the flight path and slowly sinking thousands of meters (feet). No impacts would occur to water resources within the over-ocean flight corridor from the JFC flight test.

Turbidity may be temporarily increased. Some payload debris, including small amounts of metals and other contaminants may be released into the ocean area. The National Aeronautics and Space Administration (NASA) conducted a thorough study of the seawater quality effects of missile components deposited in ocean waters in 1998 (DON 2017a). In the 1998 study NASA concluded that the release of hazardous materials from missiles into seawater would not be significant. The materials would be rapidly diluted and, except in the immediate vicinity of the debris, would not be found at concentrations that produce adverse effects. The relatively small amounts of payload materials are insoluble, and the depth of the Pacific Ocean is thousands of feet where light does not penetrate, levels of oxygen that might interact with materials at the surface are too low for that to occur, and water temperature differences from the upper water

layers hamper any mixing between them. Any area on the ocean bottom affected by the slow dissolution of the payload debris would be relatively small, due to the size of the payload debris pieces as compared relative to the volume of surrounding seawater. (NASA 2014) Because the LRHW AUR missile is still in development there are no known estimated or exact mass of insoluble hazardous materials available, but based on the 1998 study it is anticipated that the slow dissolution of the payload debris would be relatively small. Therefore, adverse water quality effects from the payload are expected to be minimal to insignificant.

There are no plans to monitor deep water impacts in the BOA, where no mixing with upper layers of water occurs. Vessel operations would not involve intentional discharges of fuel, toxic wastes, or plastics or other solid wastes that could harm marine life. (DAF 2021)

4.3.2 Biological Resources – Pacific Ocean

Environmental consequences of the Proposed Action on biological resources are evaluated based on the best available information about species distributions, based on the impact criteria presented in **Section 4.1.3**, and in the context of the regulatory setting discussed in **Section 3.3.2**.

4.3.2.1 No Action Alternative – Pacific Ocean

Under the No Action Alternative, proposed JFC Supplemental activities would not occur; however, JFC activities as evaluated in the JFC EA/OEA would continue as would other military training and testing activities in the Pacific BOA. The No Action Alternative would result in no impacts to baseline biological resources since implementation of the No Action Alternative would not change the relative magnitude or extent of current and future activities in the BOA.

4.3.2.2 Proposed Action – Pacific Ocean

The Proposed Action has the potential to impact biological resources in the Pacific Ocean ROI through exposure to elevated sound levels, direct contact from launch vehicle components, exposure to hazardous materials, and increased vessel activity. JFC Supplemental flight test activities would be the same as those described in the JFC EA/OEA (DON and U.S. Army 2022). The assumptions for potential JFC stressors to biological resources in the BOA and analysis methodology are detailed in the JFC EA/OEA (DON and U.S. Army 2022, Section 4.5.2.2, Page 4-39). **Appendix E**, **Section E.2.2** lists avoidance, minimization, and conservation measures to be implemented to minimize the potential effects of the Proposed Action on biological resources.

The JFC flight tests are not expected to have a discernable or measurable impact on benthic or planktonic invertebrates because of their abundance, their wide distribution, and the protective influence of the mass of the ocean around them. The potential exists, however, for impacts to larger vertebrates in the open ocean area, particularly those that must come to the surface to breathe (e.g., marine mammals and sea turtles) or that feed at the surface (e.g., seabirds). The following subsections focus on environmental consequences for larger vertebrates in proportion to the magnitude of potential impacts and focus on special-status species and sensitive habitats.

PMRF Stage 1 Booster Drop Zone

Marine Wildlife. Environmental consequences for marine wildlife in the PMRF stage 1 booster drop zone would be the same as those described in the JFC EA/OEA (DON and U.S. Army 2022, Section 4.5.2.3, Page 4-41) and analysis details are incorporated here by reference. JFC Supplemental activities-specific density and animal exposure estimates to direct contact are presented in **Table 4-5**. Overall, marine mammals, sea turtles, seabirds, and fish are not expected to be significantly impacted by any JFC activities in the PMRF stage 1 booster drop zone. Any effects, if realized, would likely be limited to short-term startle reactions, and marine wildlife would be expected to return to normal behaviors within minutes (U.S. Army and DON 2023a, U.S. Army and DON 2023b, NMFS 2021).

The Proponents have concluded that the Proposed Action would not result in incidental take of any marine mammal species protected under the MMPA or of birds protected under the MBTA in the BOA.

Environmentally Sensitive Habitats. EFH for bottomfish and crustaceans as well as designated critical habitat for the Main Hawaiian Islands Insular DPS of false killer whales occurs within the deep waters of the stage 1 booster drop zone. The Proposed Action involves up to six tests per year over 10 years; however, JFC tests utilizing the supplemental stage 1 area would be a subset of total JFC tests. Given the limited size and characteristics of components and the time between tests, direct contact and hazardous chemicals from the stage 1 boosters would have negligible and likely undetectable adverse effects on EFH. The Proposed Action would not adversely affect EFH to the extent that it would significantly reduce the quality and/or quantity of EFH. Due to the potential for adverse effects on EFH in the Hawaiian exclusive economic zone, the Action Proponents prepared an EFH Assessment (U.S. Army and DON 2023c; **Appendix G**) and consulted with the NMFS under Section 305(b)(2) of the MSA. The NMFS provided a conservation recommendation to ensure that potential adverse effects to EFH are avoided and minimized on December 20, 2023 (**Appendix A**) and consultation was concluded on December 22, 2023, with the Action Proponent's commitment to implement the conservation recommendation (**Appendix A**).

Stage 1 boosters would not alter the physical or biological features of false killer whale designated critical habitat essential to the species and no impacts are expected.

The flight path would cross over the Papahānaumokuākea Marine National Monument. However, the stage 1 booster drop zone does not occur in the monument and no part of the Proposed Action would impact the monument.

Table 4-5. Maximum Density and Estimated Number of Animal Exposures to Direct Contact from LRHW AUR Component Splashdown in the Pacific BOA

Common Name	Scientific Name	PMRF Launch				PSCA Launch			
		Maximum Density (/km²)		Estimated Number of Exposures to Direct Contact		Maximum Density (/km²)		Estimated Number of Exposures to Direct Contact	
		Stage 1 Drop Zone[1]	Stage 2 and Payload Drop Zone[1]	Per Test	6 Tests	Stage 1 Drop Zone[2]	Stage 2 and Payload Drop Zone[2]	Per Test	6 Tests
Cetaceans									
Sei whale	*Balaenoptera borealis*	0.0002	0.0002	1.97E-07	1.18E-06	0.0001	0.0002	1.27E-07	7.63E-07
Blue whale	*Balaenoptera musculus*	0.0001	0.0001	8.70E-08	5.22E-07	0.0014	0.0020	2.99E-06	1.80E-05
Fin whale	*Balaenoptera physalus*	0.0001	0.0235	1.64E-05	9.82E-04	0.0710	0.0235	6.16E-05	3.70E-04
Gray whale[3]	*Eschrichtius robustus*					0.0486	<0.0001	2.18E-05	1.26E-04
North Pacific right whale	*Eubalaena japonica*	-	<0.0001	4.31E-09	2.59E-08	<0.0001	<0.0001	8.63E-09	5.18E-08
Humpback whale[3]	*Megaptera novaeangliae*	0.0211	0.0025	1.14E-05	6.83E-05	0.1290	0.0042	6.41E-05	3.85E-04
Sperm whale	*Physeter macrocephalus*	0.0016	0.0018	1.41E-06	8.44E-06	0.0030	0.0113	6.01E-06	3.61E-05
False killer whale – Main Hawaiian Islands Insular DPS	*Pseudorca crassidens*	0.0002	-	3.65E-08	1.80E-07				
Pinnipeds									
Guadalupe fur seal	*Arctocephalus townsendi*					-	0.0278	3.14E-06	1.89E-05
Steller sea lion[3]	*Eumetopias jubatus*					0.0098	0.0098	3.02E-06	1.81E-05
Hawaiian monk seal	*Neomonachus schauinslandi*	<0.0001	–	4.69E-09	2.81E-08				
Sea Turtles									
Turtle guild[4]		0.0043	0.0043	1.02E-06	6.12E-06	-	0.00430	4.50E-07	2.70E-06

[1] Density estimates from Navy's Marine Species Density Databases for the Hawai'i-Southern California (DON 2017b) and Mariana Islands (DON 2018b) Training and Testing Areas except for North Pacific right whales, for which density estimates were from the Gulf of Alaska Training and Testing Area (DON 2014).
[2] Density estimates from the Navy's Marine Species Density Databases for the Hawai'i- Southern California (DON 2017b) and Gulf of Alaska (DON 2014) Training and Testing Areas.
[3] Density and exposure estimates for gray whales, humpback whales, and Steller sea lions include animals from all DPSs, not just the ESA-listed DPSs.
[4] The sea turtle guild, as defined in DON 2017b, is composed of primarily green and hawksbill turtles but in theory also encompasses leatherback, olive ridley, and loggerhead turtles. Density and exposure estimates include turtles from all DPSs and are not specific to ESA-listed populations.
Abbreviations: DPS = Distinct Population Segment, km² = square kilometers, PMRF = Pacific Missile Range Facility, PSCA = Pacific Spaceport Complex Alaska

ESA Listed Resources. Based on the analyses in this section and in the Marine Biological Evaluation for JFC Supplemental Activities (U.S. Army and DON 2023b; **Appendix G**), the Navy and U.S. Army have concluded that activities in the PMRF stage 1 booster drop zone would not result in any effects to ESA listed species that were not already considered in the 2021 JFC Marine Biological Evaluation (U.S. Army and DON 2021) and consultation with NMFS (NMFS 2021). The magnitude of effect and conclusions for ESA-listed species considered in the original consultation has not changed with addition of JFC Supplemental activities (U.S. Army and DON 2023b). In 2021, NMFS concurred with the determination that JFC activities may affect but are not likely to adversely affect ESA-listed species (NMFS 2021). Designated critical habitat for the Main Hawaiian Islands Insular DPS of false killer whales was not considered in the 2021 consultation with NMFS. The Action Proponents have concluded that the Proposed Action may affect but is not likely to adversely affect designated critical habitat for false killer whales (U.S. Army and DON 2023b) and requested an amended consultation for JFC activities from NMFS. A letter of concurrence was issued by NMFS on November 14, 2023 (**Appendix A**).

PSCA Stage 1 Booster Drop Zone

Marine Wildlife. Environmental consequences for marine wildlife in the PSCA stage 1 booster drop zone would be very similar to those described in the JFC EA/OEA (DON and U.S. Army 2022, Section 4.5.2.3, Page 4-41) and the FT-3 EA/OEA (U.S. Army 2021, Section 4.1.3.2, Page 4-5). Analysis details from these documents are incorporated here by reference and any JFC Supplemental activities-specific differences are presented in this section. Overall, marine mammals, sea turtles, seabirds, and fish would not be significantly impacted by any JFC activities in the PSCA stage 1 booster drop zone. Any effects, if realized, would likely be limited to short-term startle reactions, and marine wildlife would be expected to return to normal behaviors within minutes (U.S. Army and DON 2023a, U.S. Army and DON 2023b, NMFS 2021).

Marine wildlife near the surface might be exposed to elevated noise levels from splashdown of vehicle components. Detailed information about the characteristics of sound, the potential effects of sound on marine wildlife, and methodology for estimation of impacts is available in the JFC EA/OEA (DON and U.S. Army 2022) and the JFC Supplemental Activities Marine Biological Evaluation (U.S. Army and DON 2023b) and is incorporated by reference. Splashdown of the stage 1 booster may create sound pressures above the injury threshold for wildlife but only over small areas (**Table 4-6**). Some common wildlife such as common fish species may be exposed to elevated sound pressures high enough to cause temporary injury or behavioral disturbance. However, elevated sound pressures would not change the population size or distribution of any species because of the discrete nature and low frequency of Proposed Action sounds and the temporary nature of potential effects on marine wildlife. Based on their low densities in the ROI, no special-status species are expected to be injured by elevated sound pressures. While unlikely, based on the low density of special-status species in the ROI and the small number of tests (no more than six per year), any effects of elevated sound levels would be limited to short-duration behavioral responses. Animals would be expected to return to normal behaviors within minutes of the short-duration (no more than a few seconds) sound and no lasting effects are expected

(U.S. Army and DON 2023b, NMFS 2021). Overall, elevated noise levels would not significantly impact marine wildlife in the ROI.

Direct contact from splashdown of the stage 1 booster is not expected to impact marine mammals, sea turtles, seabirds, or fish in the ROI. Direct contact would not change the population size or distribution of any common wildlife species because the calculated chances of any special-status individual being injured are extremely low (**Table 4-5**) and no animals are expected to be injured. The estimated number of marine mammal exposures to direct contact from all falling components for a flight test from PSCA is substantially less than one for all species (**Table 4-5**; e.g., maximum of 0.0001 individuals for short-beaked common dolphins). Even if the maximum number of six flight tests per year over 10 years is assumed, the number of animal exposures is less than 0.007 animals for all marine mammal species. Therefore, no direct contact of marine mammals is expected as a result of the Proposed Action. Similarly, the estimated number of sea turtle exposures to direct contact from falling LRHW vehicle components in the BOA for a PSCA test is less than 0.000003 per test and 0.00003 individuals summed across all possible tests.

Table 4-6. Distance to Effect Thresholds in Wildlife for Elevated In-Water Sound Levels Resulting from LRHW AUR Component Splashdown or Impact

Functional Hearing Group	Permanent Threshold Shift (PTS)		Temporary Threshold Shift (TTS)			
	Threshold (dB SPL_{peak})	Radial Distance to Threshold from Stage 1 Splashdown meters (feet)	Threshold (dB SPL_{peak})	Radial Distance to Threshold from Splashdown meters (feet)		
				Stage 1	Stage 2	Payload
Low-frequency Cetaceans (*Balaenoptera*, *Eubalaena*, and *Megaptera* whales)	219 dB	-	213 dB	2 (6)	-	-
Mid-frequency Cetaceans (dolphins and *Feresa*, *Globicephala*, *Hyperodon*, *Mesoplodon*, *Orcinus*, *Peponocephala*, *Physeter*, *Pseudorca*, and *Ziphius* whales)	230 dB	-	224 dB	-	-	-
High-frequency Cetaceans (*Kogia* whales and porpoises)	202 dB	6 (21)	196 dB	13 (41)	2 (6)	-
Phocid Pinnipeds (elephant, monk, gray, harbor, harp, and hooded seals)	218 dB	-	212 dB	2 (7)	-	-
Otariid Pinnipeds (fur seals, sea lions)	232 dB	-	226 dB	-	-	-
Sea Turtles	230 dB(1)	-	224 dB	-	-	-
Fish	229 dB(2)	-	186 dB SEL_{cum}(2)	40 (131)	6 (18)	2 (6)

Sources: DON 2019, NOAA 2018, Finneran and Jenkins 2012, Popper et al. 2014
Notes: All sound pressures in this table are in dB SPL_{peak} referenced to 1 µPa unless indicated.
(1) The PTS threshold listed for sea turtles is based on the non-lethal injury threshold in Finneran and Jenkins 2012.
(2) The PTS threshold for fish with swim bladders is based on the mortality/mortal injury threshold in NMFS 2015 and Popper et al. 2014. Thresholds in fish are not specific to auditory injury.
Abbreviations: dB = decibels, SEL = Sound Exposure Level, SPL = Sound Pressure Level

Density data are not available for special-status fish or seabirds in the ROI, but these species are likely to have very low densities and patchy distributions. Given the small direct contact affect area and the low density and patchy distribution of special-status seabirds and fish in the stage 1 booster drop zone, it is very unlikely that special-status fish would be subject to direct contact from LRHW vehicle components. Overall, no direct contact of special-status wildlife is expected, and wildlife would not be significantly impacted by direct contact from vehicle components in the BOA.

Hazardous material release in the stage 1 booster drop zone is not likely to adversely impact marine mammals, sea turtles, seabirds, or fish. The area affected by the dissolution of chemicals would be relatively small because of the size of the launch vehicle components and the minimal amount of residual materials they contain. The principal source of potential impacts on water and sediment quality would be unburned rocket propellant residue and batteries. Each of the two rocket motor boosters would exhaust onboard propellant before dropping into the ocean. Based on USEPA and other studies evaluating munitions constituents at military sites where explosives and propellants have been used, the USEPA concluded that perchlorate (a primary constituent of rocket propellant) was generally not detected at ranges and that perchlorate is so soluble in water that surface accumulation (on land) does not occur (DON 2018c). Studies have concluded that the motors used in rockets and missiles are highly efficient, consuming over 99 percent of the rocket propellant perchlorate during use (DON 2018c). 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 2018c). Any residual chemicals introduced to the water column would be quickly diluted and dispersed and components would sink to the ocean bottom, where depths in the BOA reach thousands of feet and most special-status marine wildlife and their prey are not likely to occur. Due to the low density and patchy distribution of special-status species in the BOA, the likelihood of an animal coming into contact with hazardous materials from JFC activities in quantities or concentrations high enough to cause harm is extremely low and no impacts are expected.

The Proponents have concluded that the Proposed Action would not result in incidental take of any marine mammal species protected under the MMPA or of birds protected under the MBTA in the BOA.

Environmentally Sensitive Habitats. The Proposed Action would not significantly impact designated critical habitats, BIAs, or EFH in the ROI. The Proposed Action would only involve stage 1 boosters splashing down into the waters offshore of Kodiak Island. Any residual chemicals introduced to the water would be quickly diluted and dispersed and components would sink to the ocean bottom. Introduction of these limited quantities of debris and chemicals would not destroy or alter any of the primary constituent elements of designated critical habitat for Steller sea lions. Similarly, the Proposed Action would not alter the suitability of these areas as BIAs for marine mammals or seabirds and would not significantly reduce the quality and/or quantity of EFH or Habitat Areas of Particular Concern in the ROI.

ESA Listed Resources. Based on the analyses in this section and in the Marine Biological Evaluation for JFC Supplemental Activities (U.S. Army and DON 2023b), the Navy and U.S. Army have concluded that activities in the PSCA stage 1 booster drop zone may affect but are not likely to adversely affect marine ESA listed species and designated critical habitats. The Action Proponents have prepared a biological evaluation (U.S. Army and DON 2023b; **Appendix G**) and requested an amended consultation for JFC activities from NMFS (NMFS 2021) to include JFC Supplemental activities. A letter of concurrence was issued by NMFS on November 14, 2023 (**Appendix A**).

Based on the analyses in this section and in the JFC Supplemental Activities Terrestrial Biological Evaluation (U.S. Army and DON 2023a), the Navy and U.S. Army have concluded that activities in the PSCA stage 1 booster drop zone may affect but are not likely to adversely affect ESA listed seabird species in the ROI but would have no effect on northern sea otters. The Action Proponents prepared a biological evaluation (U.S. Army and DON 2023a; **Appendix G**) and consulted with the USFWS for JFC Supplemental activities at PSCA. A letter of concurrence was issued by the USFWS on October 30, 2023 (**Appendix A**).

Stage 2 Booster Drop/Payload Impact Zones

Marine Wildlife. Environmental consequences for marine wildlife in the stage 2 booster drop/payload impact zones would be very similar as those described in the JFC EA/OEA (DON and U.S. Army 2022, Section 4.5.2.3, Page 4-41) and the FT-3 EA/OEA (U.S. Army 2021, Section 4.1.3.2, Page 4-5). Analysis details from these documents are incorporated here by reference and any JFC Supplemental activities-specific differences are presented in this section. Overall, marine mammals, sea turtles, seabirds, and fish are not expected to be significantly impacted by any JFC activities in the stage 2 booster drop/payload impact zones. Any effects, if realized, would likely be limited to short-term startle reactions, and marine wildlife would be expected to return to normal behaviors within minutes (U.S. Army and DON 2023b, NMFS 2021).

Marine wildlife near the surface might be exposed to elevated noise levels from splashdown of vehicle components. Splashdown of the stage 2 booster and payload may create sound pressures above the temporary injury threshold for wildlife but only over small areas (**Table 4-6**). Some common wildlife such as common fish species may be exposed to elevated sound pressures high enough to cause temporary injury or behavioral disturbance. However, no special-status species are expected to be injured by elevated sound pressures. Any effects of elevated sound levels would be limited to short-duration behavioral responses and animals would be expected to return to normal behaviors within minutes of the short-duration (no more than a few seconds) sound. Overall, elevated noise levels would not significantly impact marine wildlife in the ROI.

Direct contact from splashdown of the stage 2 booster and impact of the payload is not expected to impact marine mammals, sea turtles, seabirds, or fish in the ROI. Direct contact would not change the population size or distribution of any common wildlife species. As for the stage 1 drop zones, the calculated chances of any special-status individual being injured are extremely low (**Table 4-5**) and no animals are expected to be injured. The maximum estimated number of marine

mammal exposures to direct contact from a JFC Supplemental flight test is substantially less than one for all species (**Table 4-5**; maximum of 0.0001 individuals for short-beaked common dolphins). Even if the maximum number of six flight tests per year over 10 years is assumed, the number of animal exposures is less than 0.03 animals for all marine mammal species combined. Therefore, no direct contact of marine mammals is expected as a result of the Proposed Action. Similarly, the estimated number of sea turtle exposures to direct contact from falling LRHW AUR components in the BOA is less than 0.000001 per test and 0.0001 individuals summed across all possible tests. Similarly, it is very unlikely that special-status fish or birds would be subject to direct contact from LRHW AUR components. Overall, no direct contact of special-status wildlife is expected, and wildlife would not be significantly impacted by direct contact from vehicle components in the BOA.

Hazardous material release is not likely to adversely impact marine wildlife and no impacts to special-status species are expected.

The Proponents have concluded that the Proposed Action would not result in incidental take of any marine mammal species protected under the MMPA or of birds protected under the MBTA in the BOA.

Environmentally Sensitive Habitats. The flight path would cross over the Papahānaumokuākea Marine National Monument and may cross over portions of the Remote Pacific Islands Marine National Monument. However, the stage 2 booster drop/payload impact zone does not occur in either of these marine national monuments and no part of the Proposed Action would impact these monuments.

ESA Listed Resources. Based on the analyses in this section and in the JFC Supplemental Activities Marine Biological Evaluation (U.S. Army and DON 2023b), the Navy and U.S. Army have concluded that activities in the BOA may affect but are not likely to adversely affect marine ESA listed species and designated critical habitats. Because the Proposed Action may affect some ESA-listed species not considered in the 2021 JFC consultation with NMFS (NMFS 2021), the Action Proponents have prepared a biological evaluation (U.S. Army and DON 2023b; **Appendix G**) and have requested an amended consultation for JFC activities from NMFS (NMFS 2021) to include JFC Supplemental activities. A letter of concurrence was issued by NMFS on November 14, 2023 (**Appendix A**).

Based on the analyses in this section and in the JFC Supplemental Activities Terrestrial Biological Evaluation (U.S. Army and DON 2023a), the Navy and U.S. Army have concluded that activities in the Stage 2 BOA would have no effect on ESA listed seabird species.

4.3.3 Hazardous Materials and Waste – Pacific Ocean

4.3.3.1 No Action – Pacific Ocean

Under the No Action Alternative, proposed JFC Supplemental activities would not occur; however, JFC activities as evaluated in the JFC EA/OEA would continue as would other military training and testing activities in the Pacific BOA. The No Action Alternative would result in no impacts to baseline biological resources since implementation of the No Action Alternative would not change the relative magnitude or extent of current and future activities in the BOA.

4.3.3.2 Proposed Action – Pacific Ocean

A maximum of six payload impacts would be scheduled each year for splashdown in the Pacific Ocean. The rocket propellant is expected to be completely expended prior to splashdown. All payload materials are expected to sink to the ocean floor. Visible debris on the surface of the ocean would be recovered and removed after each flight test (up to six joint test operations per year until 2032) and would not pose a significant source of solid or hazardous waste. Therefore, overall impacts from hazardous materials and waste in the Pacific Ocean is anticipated to be negligible. Biological resources that would be affected by hazardous materials and waste in the Pacific BOA are discussed in **Section 4.3.2**.

5.0 Cumulative Impact Analysis

Cumulative effects are caused by an aggregate of past, present, and reasonably foreseeable future actions. Both direct and indirect effects of a Proposed Action must be meaningfully analyzed in terms of the resource area and human community being affected and may last for years past the life of the action which caused the effects.

5.1 Definition of Cumulative Impacts

Per 40 CFR § 1508.1, cumulative effects are effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

Direct effects are caused by the action and occur at the same time and place, whereas indirect effects are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable.

5.2 Scope of Cumulative Impacts Analysis

The scope of cumulative impact analysis is based on both the geographic ROI and the time frame in which the effects could occur. For the geographic extent, refer to the areas previously identified in **Chapters 3.0** and **4.0** for each resource area. The time frame for cumulative impacts is tied to the timing of the Proposed Action: the initial flight test in the second half of FY 2023 and up to six joint test operations per year until 2032.

5.3 Past, Present, and Reasonably Foreseeable Actions

The 2022 JFC EA/OEA (DON and U.S. Army 2022) analyzed past, present, and reasonably foreseeable future actions at and near PMRF, Wallops Flight Facility, Vandenberg Space Force Base, Cape Canaveral Space Force Base, the Pacific flight corridor and booster/payload impact zones, and the Atlantic flight corridor and booster/payload impact zones. The analyses of past, present, and reasonably foreseeable actions in this Supplemental EA/OEA are therefore limited to the following deltas:

- Launch activities of the LRHW system at PMRF's THAAD launch site and PSCA's Area 1 and LP-2
- Pacific BOA booster splashdown and payload impact locations not evaluated in the JFC EA/OEA

5.3.1 Past Actions

5.3.1.1 PMRF

See DON and U.S. Army 2022, Table 5-1, Page 5-3; and Section 5.3.1.1.

5.3.1.2 PSCA

See U.S. Army 2021, Table 5-1, Page 5-3; and Section 5.3.1, Page 5-4.

5.3.1.3 Pacific Ocean

Past Actions in the Pacific Ocean ROI include overflights of multiple DOD weapon systems including Strategic Target System Launches, Navy FE-1 and FE-2 flight tests, Navy Testing and Training Program, Hawaii-Southern California Testing and Training Activities, U.S. Air Force Air-Launched Rapid Response, Minuteman III flight testing, and Army FT-3.

5.3.2 Present and Reasonably Foreseeable Actions

5.3.2.1 PMRF

See DON and U.S. Army 2022, Section 5.3.2.1, Page 5-5.

5.3.2.2 PSCA

See AAC 2021, Chapter Six – Preferred Development Plan, Page 6-2.

5.3.2.3 Pacific Ocean

See DON and U.S. Army 2022, Sections 5.3.2.1 and 5.3.2.3 for present and reasonably foreseeable actions from PMRF and Vandenberg Space Force Base. Vandenberg Space Force Base is included because of its overlap between this Supplemental EA/OEA and the JFC EA/OEA Pacific ROI.

5.4 Cumulative Impact Analysis

Cumulative effects are impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. The purpose of the cumulative analysis is to allow decision makers to better understand the potential impacts that might result from approval of past, present, and reasonably foreseeable future projects in conjunction with the proposed project addressed in this Supplemental EA/OEA. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. (40 CFR § 1508.7)

5.4.1 PMRF

The cumulative impacts detailed in the JFC EA/OEA have not changed. See DON and U.S. Army 2022, Section 5.4.1, Page 5-6.

5.4.2 PSCA

Air Quality and Climate Change

The State of Alaska takes into account the effects of all past, present, and reasonably foreseeable emissions during the development of the State Implementation Plan. The state accounts for all significant stationary, area, and mobile emission sources in the development of this plan. Estimated emissions generated by the Proposed Action would be *de minimis* and temporary, and it is understood that activities of this limited size and nature would not contribute significantly to adverse cumulative effects to air quality. Emissions from AUR launches dissipate after each launch and short-term effects are minor and temporary in nature.

As it relates to recent Council on Environmental Quality guidance on GHG emissions (CO_2e) requirements, the proposed launch operations would increase GHG emissions compared to the No Action Alternative. However, due to the small amount of carbon monoxide produced in the LRHW AUR surrogate, the increase in emissions is anticipated to be under the comparable USEPA presumptive effects threshold of 75,000 tons per year. Therefore, the Proposed Action would not be expected to result in a significant contribution to global climate change.

Water Resources

If every JFC flight test in the Proposed Action were to occur from PSCA, then the JFC Program may have the potential to have temporary additive effects to chemicals in local surface water resources. However, Kodiak's annual rainfall, snowfall, and snowmelt would continue to dilute any potential pollutants in surface and groundwater resources.

Biological Resources

Test program launches have the potential to have additive effects on sensitive species such as hauled-out pinnipeds. However, the FAA and AAC have evaluated the impacts of the entire set of launch activities from PSCA and determined that there would be no significant impacts to biological resources, including protected species, resulting from long-term PSCA launch activities. After years of launch activity at PSCA, no cumulative impacts on rare or special status species populations have been observed. The Proposed Action would have no significant impacts on biological resources at PSCA and there would be no significant cumulative impacts.

Public Health and Safety

PSCA's procedures and policies prevent threats to public health and safety. No cumulative impacts would be anticipated because the Proposed Action would not introduce materials or operations to Kodiak that would reasonably cause a public or occupational health hazard.

Hazardous Materials and Wastes

Hazardous materials and waste generated for JFC Test Program launches would not be expected to exceed PSCA's capacity to manage, store, or dispose of them in accordance with federal, state, or local laws. There are no anticipated cumulative impacts to human and environmental health.

Socioeconomics/Environmental Justice

Flight test activities would bring upwards of 300 temporary workers to Kodiak Island during each test event. These actions, in conjunction with other PSCA activities, would increase localized use of the Kodiak economy. However, the number of personnel likely would be below 1,000 per year, which would not be large enough to have a substantial effect on Kodiak community resources or infrastructure as compared to the approximate 30,000 tourists each year. Pre-flight preparation and flight test activities also could provide a short-term economic benefit to the island economy in the form of retail and possible tourist activities. As it relates to daily fishing (commercial and subsistence) air taxi, and private pilots, there could be a total of 480 hours of closure during the 10 years of flight testing. These closures are in effect under the current FAA license for PSCA. PSCA would work with commercial and sports fishermen on a case-by-case basis to minimize the impact of sea lane closure during flight test activities. JFC flight tests would be similar to other activities at PSCA, which were determined to have a negligible impact to commercial fishing and tourist related activities (FAA 2016). As no other activities would result in temporary restriction of commercial fishing and tourist activities, little or no cumulative impacts would occur.

5.4.3 Pacific Ocean

Water Resources

The JFC Test Program as a whole could introduce up to six vehicle components per year until 2032 into the BOA. Due to the components being insoluble at depth, and due to the large volume of dilution, there would be no anticipated cumulative impacts to BOA water quality.

Biological Resources

No significant cumulative impacts to biological resources in the BOA are anticipated from implementation of the Proposed Action. The Proposed Action would have no significant impacts on biological resources in the BOA and no additive or interactive effects with other actions (including long-term addition of man-made objects to the ocean) have been identified which would significantly contribute to cumulative impacts.

Hazardous Materials and Waste

All remaining visible payload debris would be removed or expected to sink to the bottom of the ocean. No significant cumulative impacts from hazardous materials are anticipated in the BOA.

6.0 Reference List

AAC (Alaska Aerospace Corporation). 2015. *Pacific Spaceport Complex–Alaska Range User's Manual*. July 2015.

AAC. 2016. Application for a Five-Year Programmatic Permit for Small Takes of Marine Mammals Incidental to Launching of Space Launch Vehicles, Long Range Ballistic Target Missiles, and Smaller Missile Systems at Pacific Spaceport Complex Alaska, Kodiak Island, Alaska. Submitted to the National Marine Fisheries Service, Office of Protected Resources.

AAC. 2021. Pacific Spaceport Complex-Alaska Spaceport Master Plan 2020-2030. March 2021.

AADC (Alaska Aerospace Development Corporation). 1996. *Environmental Assessment of the Kodiak Launch Complex – Kodiak Island, Alaska*. May 1996.

ADEC (Alaska Department of Environmental Conservation). 2018. Division of Air Quality-Alaska Greenhouse Gas Emissions Inventory.

ADFG (Alaska Department of Fish and Game). 2015. Alaska Wildlife Action Plan. Juneau, Alaska. Available online: <https://www.adfg.alaska.gov/static/species/wildlife_action_plan/2015_alaska_wildlife_action_plan.pdf>. Accessed Jun 2023.

ADFG. 2018. Sport Fishing Regulations Summary. Available online: <https://adfg.alaska.gov/static/regulations/fishregulations/PDFs/Southwest/2018sw_sfregs_complete.pdf>. Accessed June 2023.

ADFG. 2020. Fishing in Alaska. Commercial, Sport, and Subsistence Fishery Information. Available online: <https://www.adfg.alaska.gov/index.cfm?adfg=fishing.main>. Accessed January 2020.

Alaska Department of Education and Early Development. 2022. Old Harbor School Profile. Available online: <https://education.alaska.gov/compass/ParentPortal/SchoolProfile?SchoolID=280100>. Accessed June 2023.

Alaska Economic Trends Magazine. 2022. Kodiak, an Atypical Fishing Town – by Neal Fried, Available online: <https://laborstats.alaska.gov/trends/may22art2.pdf>. Accessed May 2022.

Alaska Fisheries Science Center. 2022. Alaska Harbor Seal Haul-out Locations. Available online: <https://www.fisheries.noaa.gov/inport/item/26760>. Accessed November 2022.

Alaska Travel Industry Association. 2022. Old Harbor. Available online: <https://www.travelalaska.com/Destinations/Cities-Towns/Old-Harbor>. Accessed May 2022.

Barlow, J., J. Calambokidis, E. A. Falcone, C. S. Baker, A. M. Burdin, P. J. Clapham, J. K. B. Ford, and C. M. Gabriele. 2011. Humpback whale abundance in the North Pacific estimated by photographic capture-recapture with bias correction from simulation studies. Marine Mammal Science 27 (4):793-818.

Benson, S. R., T. Eguchi, D. G. Foley, K. A. Forney, H. Bailey, C. Hitipeuw, B. P. Samber, R. F. Tapilatu, V. Rei, P. Ramohia, J. Pita, and P. H. Dutton. 2011. Large-scale movements and high-use areas of western Pacific leatherback turtles, *Dermochelys coriacea*. Ecosphere 2(7): article 84. doi:10.1890/ES11-00053.1

Bettridge, S., C. S. Baker, J. Barlow, P.J. Clapham, M. Ford, D. Gouveia, D. K. Mattila, R. M. Pace III. P. E. Rosel, G. K. Silber, and P. R. Wade. 2015. Status review of the humpback whale (*Megaptera novaeangliae*) under the endangered species act. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center.

Calambokidis, J., G. H. Steiger, J. M. Straley, L. M. Herman, S. Cerchio, D. R. Salden, et al. 2001. Movements and population structure of humpback whales in the North Pacific. Marine Mammal Science, 17(4):769-794.

Council on Environmental Quality 2023. National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change - Notice of interim guidance. Available online: <https://www.govinfo.gov/content/pkg/FR-2023-01-09/pdf/2023-00158.pdf>. Accessed May 2023.

DAF (Department of the Air Force). 2021. *Final Ground Based Strategic Deterrent Test Program Environmental Assessment / Overseas Environmental Assessment*. Volume 1. June 2021.

DOD (Department of Defense). 2017. *Pacific Spaceport Complex Alaska Ballistic Missile Defense Flight Test Support Final Environmental Assessment*. April 2017.

DOE (Department of Energy). 2018. *Site Wide Environmental Assessment, Sandia National Laboratories, Kaua`i Test Facility*. National Nuclear Security Administration, Sandia Field Office. DOE/EA-2089. November 2018.

DON (Department of the Navy). 2008a. Final Range Condition Assessment (RCA) Hawai`i Land-Based Operational Range Complex Decision Point 1 Recommendations Report – Pearl Harbor Complex, Naval Magazine Pearl Harbor, Oahu, Hawai`i and PMRF Barking Sands, Ka`ula Rock, Kaua`i, Hawai`i. May 2008. Available online: <https://www.denix.osd.mil/sri/policy/reports/unassigned/hawaii/04_Final-Hawaii-DP1-ES-Official.pdf>. Accessed Jun 2023.

DON. 2008b. *Hawaii Range Complex Final Environmental Impact Statement / Overseas Environmental Impact Statement (EIS/OEIS)*. May 2008.

DON. 2010. Integrated Natural Resources Management Plan Pacific Missile Range Facility. November 2010.

DON. 2014. Commander Task Force 3rd and 7th Fleet Navy Marine Species Density Database. NAVFAC Pacific Technical Report. Naval Facilities Engineering Command Pacific, Pearl Harbor, HI.

DON. 2016. *Gulf of Alaska Navy Training Activities Supplemental Environmental Impact Statement/Overseas Environmental Impact Statement.* Final. July 2016.

DON. 2017a. *Navy Environmental Assessment / Overseas Environmental Assessment Navy Flight Experiment-1 (FE-1)*. August 2017.

DON. 2017b. U.S. Navy Marine Species Density Database Phase III for the Hawaii-Southern California Training and Testing Study Area. NAVFAC Pacific Technical Report. Naval Facilities Engineering Command Pacific, Pearl Harbor, HI.

DON. 2018a. *Hawaii-Southern California Training and Testing Environmental Impact Statement / Overseas Environmental Impact Statement*. October 2018.

DON. 2018b. U.S. Navy Marine Species Density Database Phase III for the Mariana Islands Training and Testing Study Area. Authors: S. Hanser, E. Becker, and M. Zickel. U.S. Pacific Fleet Technical Report. Pearl Harbor, HI.

DON. 2018c. *Atlantic Fleet Training and Testing Final Environmental Impact Statement/Overseas Environmental Impact Statement*. September 2018.

DON. 2019. *Final Environmental Assessment / Overseas Environmental Assessment Navy Flight Experiment-2 (FE-2)*. December 2019.

DON. 2021. *OPNAV M-5090.1 Environmental Readiness Program Manual*. 25 June 2021. Available online: <https://www.secnav.navy.mil/doni/SECNAV%20Manuals1/5090.1.pdf>. Accessed 2023.

DON and U.S. Army. 2022. *Joint Flight Campaign Environmental Assessment / Overseas Environmental Assessment*. February 2022.

FAA. 2016. *Final Environmental Assessment, Finding of No Significant Impact/Record of Decision for the Kodiak Launch Complex Launch Pad 3*. April 2016.

Fautin, D., Dalton, P., Incze, L. S., Leong, J. C., Pautzke, C., Rosenberg, A., Sandifer, P., Sedberry, G., Tunnell Jr., J. W., Abbott, I., Brainard, R. E., Brodeur, M., Eldredge, L. G., Feldman, M., Moretzohn, F., Vroom, P. S., Wainstein, M., and Wolff, N. 2010. An Overview of Marine Biodiversity in United States Waters. PLoS ONE, 5(8): e11914. Available online: <https://doi.org/10.1371/journal.pone.0011914>. Accessed May 2023.

Ferguson, M. C., C. Curtice, and J. Harrison. 2015. Biologically Important Areas for Cetaceans Within U.S. Waters – Gulf of Alaska Region. Aquatic Mammals 41(1):65-78.

Finneran, J. J., and A. K. Jenkins. 2012. Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis. San Diego, CA: SPAWAR Systems Center Pacific.

Fritz, L.; K. Sweeney, R. Towell, and T. Gelatt. 2015. Steller sea lion haulout and rookery locations in the United States for 2016-05-14 (NCEI Accession 0129877). NOAA National Centers for Environmental Information. Dataset. Available online: <https://doi.org/10.7289/v58c9t7v>. Accessed January 2020.

Gallant, A. L., E. F. Binnian, J. M. Omernik, and M. B. Shasby. 1995. Ecoregions of Alaska. United States Geological Survey Professional Paper 1567.

Hodum, A. 2023. Personal communication regarding Pacific Spaceport Complex Alaska launch activities and consultation with the National Marine Fisheries Service. February 2023.

Kahle, W., P. Phillips, D. Rodney, and G. Krik. 2021. Launch at KTF Acoustic Study. REV 4. Johns Hopkins Applied Physics Lab.

McCormick, E. and A. Wortzel. 2023. CEQ issues Notice of Interim Guidance on Greenhouse Gas Emissions in NEPA Reviews. Environmental Law and Policy Monitor. February 2023. Available online: <https://www.environmentallawandpolicy.com/2023/02/ceq-issues-notice-of-interim-guidance-on-greenhouse-gas-emissions-in-nepa-reviews/>. Accessed May 2023.

NASA (National Aeronautics and Space Administration). 2014. *Final Environmental Impact Statement for the Mars 2020 Mission*. Available online: <https://mars.nasa.gov/mars2020/files/mep/Mars2020_Final_EIS.pdf>. Accessed June 2023.

Native American Graves Protection and Repatriation Regulations. 1995. Part 10—Native American Graves Protection and Repatriation Regulations. Available online: <https://www.govinfo.gov/content/pkg/CFR-2012-title43-vol1/xml/CFR-2012-title43-vol1-part10.xml#seqnum10.5>. Accessed August 2023.

NMFS (National Marine Fisheries Service). 1993. Designated Critical Habitat; Steller Sea Lion. 58 FR 45269. August 1993.

NMFS. 2008. Recovery Plan for the Steller Sea Lion Eastern and Western Distinct Population Segments (*Eumetopias jubatus*). March 2008.

NMFS. 2015. Biological Opinion and Conference Report on Navy Northwest Training and Testing Activities and National Marine Fisheries Service Marine Mammal Protection Act Incidental Take Authorization. November 2015.

NMFS. 2017. North Pacific Right Whale (*Eubalaena japonica*) Five-Year Review: Summary and Evaluation. December 2017.

NMFS. 2018. *Final Environmental Assessment for Essential Fish Habitat (EFH) Omnibus Amendments*. National Marine Fisheries Service Alaska Region. June 2018.

NMFS. 2021. Programmatic Concurrence Letter for the Department of Defense Joint Flight Campaign Activities in the Atlantic and Pacific Oceans. October 2021.

NOAA (National Oceanic and Atmospheric Administration). 2018. 2018 Revision to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) – Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts. April 2018.

NOAA. 2022. Path to Recovery of Ozone Layer passes a Significant Milestone. Available online: <https://research.noaa.gov/article/ArtMID/587/ArticleID/2900/Path-to-recovery-of-ozone-layer-passes-a-significant-milestone>. Accessed March 2023.

NOAA. 2023a. Endangered, Threatened, and Candidate Species in Alaska. Species under NOAA Fisheries Authority. Available online: <https://www.fisheries.noaa.gov/alaska/endangered-species-conservation/endangered-threatened-and-candidate-species-alaska>. Accessed March 2023.

NOAA. 2023b. How big is the Pacific Ocean? Available online: <https://oceanexplorer.noaa.gov/facts/pacific-size.html>. Accessed June 2023.

NOAA. 2023c. What is the Ring of Fire? Available online: <https://oceanexplorer.noaa.gov/facts/rof.html>. Accessed June 2023.

NOAA. 2023d. What is the Great Pacific Garbage Patch? Available online: <https://oceanexplorer.noaa.gov/facts/garbagepatch.html>. Accessed June 2023.

NPFMC (North Pacific Fishery Management Council). 2012. Fishery Management Plan for the Salmon Fisheries in the Exclusive Economic Zone off Alaska. June 2012.

NPFMC. 2014. Fishery Management Plan for the Scallop Fishery off Alaska. February 2014.

NPFMC. 2018. Fishery Management Plan for Groundfish of the Gulf of Alaska. October 2018.

Old Harbor Native Corporation. 2022. Community. Available online: <https://www.oldharbornativecorp.com/ community/>. Accessed May 2023.

PMRF (Pacific Missile Range Facility) Environmental Office. 2021. Personal communication providing data regarding ESA-listed species presence and reproduction on PMRF. Provided by the PMRF Environmental Office. January through April 2021.

PMRF Environmental Office. 2023. Personal communication providing data regarding nēnē nest locations on PMRF between fiscal year 2017 and October 2023. Provided by the PMRF Environmental Office. October 2023.

Popper, A. N., A. D. Hawkins, R. R. Fay, D. A. Mann, S. M. Bartol, T. Carlson, S. Coombs, W. T. Ellison, R. L. Gentry, M. Halvorsen, S. Løkkeborg, P. H. Rogers, B. Southall, D. G. Zeddies, and W. N. Tavolga. 2014. Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI. DOI: 10.1007/978-3-319-06659-2_7.

Protection of Historic Properties. 2004. Protection of Historic Properties 36 CFR Part 800. Available online: <https://www.achp.gov/sites/default/files/regulations/2017-02/regs-rev04.pdf>. Accessed August 2023.

Range Commanders Council. 2020. Common Risk Criteria Standards for National Test Ranges. May 2020.

Roadtrippers. 2022. Pasagshak River State Recreation Site, Kodiak, Alaska USA. Available online: <https://maps.roadtrippers.com/us/kodiak-ak/nature/pasagshak-river-state-recreation-site>.

Rone, B. K., A. B. Douglas, T. M. Yack, A. N. Zerbini, T. N. Norris, E. Ferguson, and J. Calambokidis. 2014. Report for the Gulf of Alaska Line-Transect Survey (GOALS) II: Marine Mammal Occurrence in the Temporary Maritime Activities Area (TMAA). Submitted to Naval Facilities Engineering Command (NAVFAC) Pacific, Honolulu, Hawai`i under Contract No. N62470-10-D-3011, Task Order 0022, issued to HDR Inc., San Diego, California. Prepared by Cascadia Research Collective, Olympia, Washington; Alaska Fisheries Science Center, Seattle, Washington; and Bio-Waves, Inc., Encinitas, California. April 2014.

Rone, B. K., P. J. Clapham, D. W. Weller, J. L. Crance, and A. R. Lang. 2015. North Pacific right whale visual and acoustic survey in the northwestern Gulf of Alaska. Final Report. Submitted to Marine Mammal Commission, Bethesda, Maryland. Prepared by National Marine Mammal Laboratory, Seattle, Washington; and Southwest Fisheries Science Center, La Jolla, California. October 2015.

Rone, B. K., A. N. Zerbini, A. B. Douglas, D. W. Weller, and P. J. Clapham. 2017. Abundance and distribution of cetaceans in the Gulf of Alaska. Marine Biology 164:23.

Seabirds.net. 2022. Global Seabird Data Portal. Available online: <http://axiom.seabirds.net>. Accessed November 2022.

Smith, M., N. Walker, C. Free, M. Kirchhoff, N. Warnock, A. Weinstein, T. Distler, and I. Stenhouse. 2012. Marine Important Bird Areas in Alaska: Identifying Globally Significant Sites Using Colony and At-sea Survey Data. Audubon Alaska: Anchorage.

Springer, A. M., J. F. Piatt, V. P. Shuntov, G. B. Van Vliet, V. L. Vladimirov, A. E. Kuzin, and A. S. Perlov. 1999. Marine Birds and Mammals of the Pacific Subarctic Gyres. Progress in Oceanography 43:443-487.

Sutton, T. T. et al. 2017. A Global Biogeographic Classification of the Mesopelagic Zone. Deep-Sea Research Part I 126:85-102.

Sweeny, K., L. Fritz, R. Towell, and T. Gelatt. 2017. Results of Steller Sea Lion Surveys in Alaska, June-July 2017. Memorandum to the Record. National Marine Fisheries Service November 2017.

Sweeny, K., B. Birkemeier, K. Luxa, and T. Gelatt. 2019. Results of Steller Sea Lion Surveys in Alaska, June-July 2019. Memorandum to the Record. National Marine Fisheries Service December 2019.

Sweeny, K., B. Birkemeier, K. Luxa, and T. Gelatt. 2022. Results of Steller Sea Lion Surveys in Alaska, June-July 2021. Memorandum to the Record. National Marine Fisheries Service February 2022.

United Nations. 2012. United Nations – Office of Legal Affairs Division for Ocean Affairs and the Law of the Sea. Available online: <https://www.un.org/depts/los/convention_agreements/convention_historical_perspective.htm>. Accessed May 2023.

United Nations. 2022. Sustainable Development Goals Report. Available online: <https://unstats.un.org/sdgs/report/2022/>. Accessed June 2023

U.S. Army. 2021. *Final Environmental Assessment/Overseas Environmental Assessment for Hypersonic Flight Test-3 (FT-3)*. April 2021.

U.S. Army and DON. 2021. *Joint Flight Campaign Marine Biological Evaluation*. May 2021.

U.S. Army and DON. 2023a. *Terrestrial Biological Evaluation for Joint Flight Campaign Supplemental Activities*. June 2023.

U.S. Army and DON. 2023b. *Marine Biological Evaluation for Joint Flight Campaign Supplemental Activities*. July 2023.

U.S. Army and DON. 2023c. *Essential Fish Habitat Assessment for Joint Flight Campaign Activities*. December 2023.

U.S. Census Bureau. 2021. Quick Facts – Kodiak Island Borough, Alaska. Available online: <https://www.census.gov/quickfacts/fact/table/kodiakislandboroughalaska,AK/EDU635221#EDU635221>. Accessed May 2023.

U.S. News and World Report. 2023. Kodiak Island Borough School District. Available online: <https://www. https://www.usnews.com/education/k12/alaska/districts/kodiak-island-borough-school-district-108545>. Accessed June 2023.

USAF (United States Air Force). 2004. *Final Environmental Assessment for Minuteman III Modification*. December 2004.

USAF. 2006. *Final Environmental Assessment—Minuteman III ICBM Extended Range Flight Testing*. February 2006.

USAF. 2019. *Supplemental Environmental Assessment for Minuteman III Modification and Fuze Modernization.* July 2019.

USASDC (United States Army Strategic Defense Command). 1992. *Environmental Impact Statement for the Strategic Target System*. May 1992.

USASMDC/ARSTRAT (United States Army Space and Missile Defense Command / Army Forces Strategic Command). 2011. *Advanced Hypersonic Weapon Program Environmental Assessment*. June 2011.

USASMDC/ARSTRAT. 2013. *Final Supplemental Environmental Assessment for Minuteman III Extended Range Flight Testing*. August 2013.

USASMDC/ARSTRAT. 2014. *Advanced Hypersonic Weapon Flight Test-2 (FT-2), Hypersonic Technology Test Environmental Assessment*. July 2014.

USEPA (United States Environmental Protection Agency). 2014. US EPA Memorandum Withdraws Permitting Requirements for GHS-Only Sources While confirming 75,000 TPY Threshold for “Anyway” Sources. Available online: <https://www.freshlawblog.com/2014/07/30/usepa-memorandum-withdraws-permitting-requirements-for-ghg-only-sources-while-confirming-75000-tpy-threshold-for-anyway-sources/>. Accessed May 2023.

USEPA. 2022a. Current Nonattainment Counties for Criteria Pollutants. Last updated November 20, 2022. Available online: <https://www3.epa.gov/airquality/greenbook/ancl.html>.

USEPA. 2022b. Global Greenhouse Gas Emissions Data. Available online: <https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data>. Accessed May 2023.

USEPA. 2022c. Inventory of U.S. Greenhouse Gas Emissions and Sinks. Available online: <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks>. Accessed May 2023.

USEPA. 2022d. Clean Air Act Permitting for Greenhouse Gases. Available online: <https://www.epa.gov/nsr/clean-air-act-permitting-greenhouse-gases>. Accessed May 2023.

USEPA. 2023. Learn About the Greenhouse Gas Reporting Program (GHGRP). Available online: <https://www.epa.gov/ghgreporting/learn-about-greenhouse-gas-reporting-program-ghgrp>. Accessed May 2023.

USFWS (United States Fish and Wildlife Service). 2009. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Southwest Alaska Distinct Population Segment of the Northern Sea Otter; Final Rule. 74 FR 51988-52012. October 2009.

USFWS. 2014a. Short-tailed Albatross (*Phoebastria albatrus*) 5-year Review: Summary and Evaluation. USFWS, Anchorage Fish and Wildlife Field Office.

USFWS. 2014b. Biological and Conference Opinion on Pacific Missile Range Facility Base-wide Infrastructure, Operations, and Maintenance, Kaua`i. Letter from USFWS, Pacific Islands Fish and Wildlife Office. September 2014

USFWS. 2018. Biological Opinion of the U.S. Fish and Wildlife Service for the Proposed Base-wide Infrastructure, Operations, and Maintenance Activities at the Pacific Missile Range Facility, Island of Kaua`i, Hawai`i. August 2018.

USFWS. 2021. *Birds of Conservation Concern 2021*. United States Department of Interior, Fish and Wildlife Service, Migratory Bird Program, Falls Church, Virginia.

Wade, P. R., T. J. Quinn II, J. Barlow, C. S. Baker, A. M. Burdin, J. Calambokidis, P. J. Clapham, E. Falcone, J. K. B. Ford, C. M. Gabriele, R. Leduc, D. K. Mattila, L. Rojas-Bracho, J. Straley, B. L. Taylor, J. Urbán R., D. Weller, B. H. Witteveen, and M. Yamaguchi. 2016. Estimates of abundance and migratory destination for North Pacific humpback whales in both summer feeding areas and winter mating and calving areas. Paper SC/66b/IA21 submitted to the Scientific Committee of the International Whaling Commission, June 2016, Bled, Slovenia.

World Population Review. 2023. Old Harbor Alaska Population 2023. Available online: <https://worldpopulationreview.com/us-cities/old-harbor-ak-population>. Accessed June 2023.

This page intentionally left blank

7.0 List of Preparers

GOVERNMENT PREPARERS

USASMDC

David Fuller, NEPA Program Manager

CONTRACTOR PREPARERS

KFS, LLC

Dr. Karen Charley-Barnes, Senior Project Manager

Karen M. Hoksbergen, Biologist

Mark E. Hubbs, Cultural Resources Specialist

Edd Joy, Senior Technical Advisor

Hannah McCarty, Environmental Scientist II

Amy McEniry, Technical Editor

Kristin Miller, Environmental Scientist II

Wesley S. Norris, Senior Technical Advisor

Sydney Reed, Environmental Scientist I

Susan Pearsall Thornton, KFS EPCARTS Program Manager

William Wells, KFS EPCARTS Task Order Manager

This page intentionally left blank

8.0 Distribution List

This chapter lists the agencies, organizations, and repositories that were directly notified about the NOA or received a copy of the Draft Supplemental EA/OEA.

Pacific Missile Range Facility / Kaua`i Test Facility

Jessica Behnke, PMRF Installation Environmental Program Director

Brooke McFarland, PMRF Natural Resources Manager

Tara del Fierro Duran, PMRF Cultural Resources Manager

Gordon Willson-Naranjo, PMRF Environmental Protection Specialist

Pat Ruiz, PMRF Environmental Protection Specialist

LCDR Terrence White, PMRF Public Works Officer

Bob Kay, PMRF Technical Director

CDR Eli Marshall, PMRF Range Operations Officer

Stu Butts, PMRF Deputy Range Operations Officer

Tim Ashby, Range Complex Sustainment Coordinator

Fred Styer, Range Complex Sustainment Coordinator

April Teekell, NAVFAC HI Planning Supervisor

Sherri Eng, Navy Region Hawai`i N45

Capt. Joan Malik, Department of the Navy

Trish Morris, Navy Region Hawai`i Counsel

Federal

James Kwon, DOD Coordinator, USFWS Pacific Islands Fish and Wildlife Office

Douglass Cooper, Branch Chief, Ecological Services, USFWS Southern Alaska Fish and Wildlife Field Office

Dr. Lisamarie Carrubba, Acting Chief, Interagency Cooperation Division, NMFS Office of Protected Resources

Dr. Steve Kolinski, NMFS Pacific Island Regional Office

Howard Goldstein, ESA Interagency Cooperation Division, NMFS Office of Protected Resources

Steven Thornton, ESA Interagency Cooperation Division, NMFS Office of Protected Resources

David Jorgenson, U.S. Army Corps of Engineers

Leslie Gray, Federal Aviation Administration

U.S. Department of Transportation Federal Aviation Administration

Andrew Baca, USEPA Region 10, Alaska

Theogene Mbabaliye, USEPA Region 10, Alaska

Karen Vitulano, USEPA Region 9, Hawai`i

State

Ron Benkert, Alaska Department of Fish and Game

Judith Bittner, Alaska State Historic Preservation Office

Douglas Kolwaite, Alaska Department of Transportation & Public Facilities

Others

Milton Keeter, Alaska Aerospace Corporation

Jeannine Marsh, Sun'aq Tribe of Kodiak

Annie May Lewis, Alutiiq Tribe of Old Harbor

Repositories

Kodiak Public Library, AK

Anchorage Public Library, AK

Hanapepe Public Library, HI

Waimea Public Library, HI









Supplemental Environmental Assessment/Overseas Environmental Assessment

Joint Flight Campaign Flight Tests

Final

Department of the Navy Strategic Systems Programs

U.S. Department of the Army Rapid Capabilities and Critical Technologies Office

VOLUME II – APPENDICES

January

2024

DISTRIBUTION STATEMENT A: Approved for public release: distribution is unlimited.

This page intentionally left blank

Volume II – Appendices
Table of Contents

Acronyms and Abbreviations ..... **iii**

Appendix A. Agency Correspondence **A-1**

Appendix B. Comments and Responses on the Draft Supplemental EA/OEA **B-1**

Appendix C. Key Documents **C-1**

Appendix D. Relevant Laws and Regulations **D-1**

D.1 Pacific Missile Range Facility D-2
D.1.1 Water Resources – PMRF D-2
D.1.2 Cultural Resources – PMRF D-3
D.1.3 Biological Resources – PMRF D-3
D.1.4 Public Health and Safety – PMRF D-5
D.1.5 Hazardous Materials and Waste – PMRF D-5
D.2 Pacific Spaceport Complex Alaska D-6
D.2.1 Air Quality and Climate Change – PSCA D-6
D.2.2 Water Resources – PSCA D-9
D.2.3 Biological Resources – PSCA D-9
D.2.4 Public Health and Safety – PSCA D-10
D.2.5 Hazardous Materials and Wastes – PSCA D-10
D.2.6 Socioeconomics/Environmental Justice – PSCA D-10
D.3 Pacific Ocean D-11
D.3.1 Water Resources – Pacific Ocean D-11
D.3.2 Biological Resources – Pacific Ocean D-11
D.3.3 Hazardous Materials and Waste – Pacific Ocean D-12

Appendix E. Mitigation Measures **E-1**

E.1 Air Quality and Climate Change E-1
E.2 Biological Resources E-1
E.2.1 PMRF Biological Conservation and Mitigation Measures E-1
E.2.2 Pacific Ocean Biological Conservation and Mitigation Measures E-3
E.3 Public Health and Safety E-4
E.3.1 PMRF Public Health and Safety Mitigation Measures E-4
E.3.2 PSCA Public Health and Safety Mitigation Measures E-4
E.4 Hazardous Materials and Wastes E-4
E.4.1 PMRF Hazardous Materials and Waste Mitigation Measures E-4
E.4.2 PSCA Hazardous Materials and Waste Mitigation Measures E-5
E.4.3 Pacific Ocean Hazardous Material and Waste Mitigation Measures E-5
E.5 Socioeconomics/Environmental Justice Mitigation Measures E-5

Appendix F. Other Considerations Required by NEPA F-1
F.1 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (EO 12898) F-1
F.2 Federal Actions to Address Protection of Children from Environmental Health Risks and Safety Risks (EO 13045, as Amended by EO 13229 and 13296) F-1
F.3 Coastal Zone Management F-3
F.3.1 Pacific Missile Range Facility F-3
F.3.2 Pacific Spaceport Complex Alaska F-3
F.4 Relationship Between Short-Term Use of the Environment and Long-Term Productivity F-4
Appendix G. Biological Evaluations and Assessments G-1

Table

Table F-1. Principal Federal and State Laws Applicable to the Proposed Action F-2

Acronyms and Abbreviations

AAC	Alaska Aerospace Corporation
ADEC	Alaska Department of Environmental Conservation
ADFG	Alaska Department of Fish and Game
AMMPS	Advanced Medium Mobile Power Source
AUR	All-Up-Round
BIA	Biologically Important Area
BOA	Broad Ocean Area
BOC	Battery Operations Center
BSV	Battery Operations Center Support Vehicle
BTU/H	British Thermal Unit per Hour
CFR	Code of Federal Regulations
cm	Centimeter(s)
CO_2e	Carbon Dioxide Equivalent
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
DOD	Department of Defense
DOE	Department of Energy
DON	Department of Navy
DPS	Distinct Population Segment
EA/OEA	Environmental Assessment/ Overseas Environmental Assessment
EFH	Essential Fish Habitat
EO	Executive Order
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FE-1	Flight Experiment-1
FE-2	Flight Experiment-2
FONSH	Finding of No Significant Harm
FONSI	Finding of No Significant Impact
FR	Federal Register
ft	Foot/Feet
FT-2	Flight Test-2
FT-3	Flight Test-3
FY	Fiscal Year
GHG	Greenhouse Gases
HCl	Hydrogen Chloride
Hz	Hertz
in.	Inch(es)
JFC	Joint Flight Campaign
kg	Kilogram(s)
km	Kilometer(s)
KTF	Kaua`i Test Facility
kW	Kilowatt(s)
lb	Pound(s)
LP	Launch Pad
LRHW	Long Range Hypersonic Weapon
LxWxH	Length by Width by Height
m	Meter(s)
MBTA	Migratory Bird Treaty Act
mi	Mile(s)
MMPA	Marine Mammal Protection Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
N/A	Not Applicable
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
nm	Nautical Mile(s)
NMFS	National Marine Fisheries Service
NOTAM	Notice to Air Mission
NTM	Notice to Mariners
PAEL	Pre-Approved Emission Limits
$PM_{2.5}$	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
PMRF	Pacific Missile Range Facility
PSCA	Pacific Spaceport Complex Alaska
PSD	Prevention of Significant Deterioration
RCCTO	U.S. Army Rapid Capabilities and Critical Technologies Office
ROI	Region of Influence
SNL	Sandia National Laboratories

SSP	Strategic Systems Programs
TEL	Transporter Erector Launcher
THAAD	Terminal High Altitude Area Defense
U.S.	United States
USASMDC	United States Army Space and Missile Defense Command
U.S.C.	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
V	Volt

A

Agency Correspondence

This page intentionally left blank.

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF

Environmental Division 22 August 2023

From: Weldon H. Hill, Jr., Deputy Chief of Staff for Engineering, U.S. Army Space and Missile Defense Command, Redstone Arsenal, AL

Subj: JOINT FLIGHT CAMPAIGN FLIGHT TESTS COORDINATING DRAFT SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW

Encl: Coordinating Draft Joint Flight Campaign Flight Tests Supplemental Environmental Assessment/Overseas Environmental Assessment

Dear Coordinating Agency Representative,

Joint Action Proponents, the Department of the Navy, Strategic Systems Programs (SSP) and the U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) have prepared a Supplemental Environmental Assessment/Overseas Environmental Assessment (Supplemental EA/OEA) to evaluate potential environmental impacts from the proposed Joint Flight Campaign (JFC) Flight Tests.

This Supplemental JFC EA/OEA to the 2022 JFC EA/OEA provides additional analysis for new launch locations at Pacific Missile Range Facility (PMRF) and Pacific Spaceport Complex Alaska (PSCA) for up to six joint test operations per year until 2032, after an approved Finding of No Significant Impact is signed. The addition of the new launch locations in this Supplemental EA/OEA does not change the total number of flight tests analyzed in the 2022 JFC EA/OEA. The Proposed Action is to perform up to six flight tests per year until 2032 of the JFC land-based test launches from the Terminal High Altitude Area Defense (THAAD) launch pad at PMRF and launch from PSCA's Area 1 or LP-2, with payload impacts in the Pacific Broad Ocean Area downrange of PSCA. The six test launches per year could be from any combination of launch sites considered in the 2022 JFC EA/OEA preferred alternative and those proposed in this Supplemental EA/OEA.

The purpose of the Proposed Action is to collect data required to prove that weapon system development has been successful, thereby enabling the Long Range Hypersonic Weapon (LRHW) weapon system to be fielded by the warfighter. The Proposed Action is needed to prove that the Conventional Prompt Strike (CPS) weapon system and Army LRHW system meet all key performance requirements within the capabilities of the All-Up-Round missile used by both systems. To meet the CPS and LRHW program

objectives, test events must satisfy certain critical objectives. Critical objectives include demonstrating weapon system effectiveness, demonstrating applicable design features, and establishing effective operating procedures, which also ensure the safety of the warfighter and the public.

Your organization is among several federal and state regulatory and resource management agencies, and Alaska Native organizations, invited to participate in this coordinating draft review. Please review and provide comments using the provided comment matrix to Mr. David Fuller, SMDC-EN, at david.g.fuller6.civ@army.mil by September 22, 2023. After the agencies and organizations coordination effort concludes, we will then revise and publish for public review a Draft Supplemental EA/OEA and Draft Finding of No Significant Impact (as appropriate) for an additional 30-day public review period.

If you have questions regarding this information, please contact Mr. David Fuller at (256) 425-2016, or david.g.fuller6.civ@army.mil.

V.R.,

HILL.WELDON.H.JR.1216862682 Digitally signed by HILL.WELDON.H.JR.1216862682
Date: 2023.08.21 11:24:18 -05'00'

Weldon H. Hill, Jr.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense Command

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF

Environmental Division 1 December 2023

From: Weldon H. Hill, Jr., Deputy Chief of Staff for Engineering, U.S. Army Space and Missile Defense Command, Redstone Arsenal, AL

Subj: JOINT FLIGHT CAMPAIGN FLIGHT TESTS DRAFT SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REVIEW REQUEST

Encl: Draft Joint Flight Campaign Flight Tests Supplemental Environmental Assessment/Overseas Environmental Assessment

Dear Agency or Organization Representatives,

Joint Action Proponents, the Department of the Navy, Strategic Systems Programs (SSP) and the U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) have prepared a Draft Supplemental Environmental Assessment/Overseas Environmental Assessment (Supplemental EA/OEA) to evaluate potential environmental impacts from proposed Joint Flight Campaign (JFC) Flight Tests.

This Draft JFC Supplemental EA/OEA to the 2022 JFC EA/OEA provides additional analysis for new launch locations at Pacific Missile Range Facility (PMRF) and Pacific Spaceport Complex Alaska (PSCA) for up to six joint test operations per year until 2032, after an approved Finding of No Significant Impact/Finding of No Significant Harm (FONSI/FONSH) is signed. The addition of the new launch locations in this Supplemental EA/OEA does not change the total number of flight tests analyzed in the 2022 JFC EA/OEA. The Proposed Action is to perform JFC flight test land-based launches from the Terminal High Altitude Area Defense (THAAD) launch pad at PMRF and from PSCA's Area 1 or Launch Pad-2, with payload impacts in the Pacific Broad Ocean Area. The six JFC flight test launches per year could be from any combination of launch sites considered in the 2022 JFC EA/OEA preferred alternative and those proposed in this Supplemental EA/OEA.

The purpose of the Proposed Action is to collect data required to prove that weapon system development has been successful, thereby enabling the Long Range Hypersonic Weapon (LRHW) system to be fielded by the warfighter. The Proposed Action is needed to prove that the Conventional Prompt Strike (CPS) weapon system and Army LRHW system meet all key performance requirements within the capabilities of the All-Up-Round missile used by both systems. To meet the CPS and LRHW program objectives,

test events must satisfy certain critical objectives. Critical objectives include demonstrating weapon system effectiveness, demonstrating applicable design features, and establishing effective operating procedures, which also ensure the safety of the warfighter and the public.

Your agency or organization is among several federal and state regulatory and resource management agencies, and Alaska Native organizations, invited to participate in this 30-day public review period. The 30-day public review period is from 1–31 December 2023. The Draft JFC Supplemental EA/OEA and Draft FONSI/FONSH are available at https://jfceaoea.govsupport.us. Please review and provide comments using the provided comment matrix to Mr. David Fuller, SMDC-EN, at david.g.fuller6.civ@army.mil by December 31, 2023. After your review, we will then revise and create the Final Supplemental EA/OEA and Final FONSI/FONSH (as appropriate).

If you have questions regarding this information, please contact Mr. David Fuller at (256) 425-2016, or david.g.fuller6.civ@army.mil.

V.R.,

HILL.WELDON.H.JR.1216862682

Digitally signed by HILL.WELDON.H.JR.1216862682
Date: 2023.12.04 08:01:38 -06'00'

Weldon H. Hill, Jr.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense Command

From:	Fuller, David G CIV USARMY SMDC (USA)
To:	Carrubba, Lisamarie CIV DOC (USA); Thornton, Steven W CIV (USA); Goldstein, Howard H CIV (USA)
Cc:	Hasley, David C CIV USARMY SMDC (USA); Jamiyo Mack; Karen Barnes - KFS; Karen Hoksbergen -KFS; Susan Thornton - KFS; McElreath, Henry W CIV USARMY SMDC (USA); Hangartner, Scott A CTR USARMY HQDA RCCTO (USA)
Subject:	Joint Flight Campaign action modifications and ESA Section 7 programmatic consultation amendment; NMFS Reference Number OPR-2021-02470
Date:	Friday, July 7, 2023 9:27:05 AM
Attachments:	Final Marine BE for JFC Supplemental Activities 20230612.pdf

Subject: Joint Flight Campaign action modifications and ESA Section 7 programmatic consultation amendment; NMFS Reference Number OPR-2021-02470

Dr. Carrubba,

After our coordination conversation with you on 28 June 2023 regarding Joint Flight Campaign (JFC) supplemental activities, we request an amended Endangered Species Act (ESA) Section 7 consultation for the JFC action (National Marine Fisheries Service [NMFS] Reference Number OPR-2021-02470, 14 October 2021).

As we discussed with you and your team on 28 June, the U.S. Army Space and Missile Defense Command is assisting the U.S. Department of the Navy Strategic Systems Programs and the U.S. Army Rapid Capabilities and Critical Technologies Office, the Action Proponents, in evaluating the effects of proposed JFC supplemental activities. The Action Proponents consulted with your office on the effects of the JFC action under Section 7 of the ESA in 2021, and your office issued a programmatic letter of concurrence that the JFC action may affect but was not likely to adversely affect ESA listed species and designated critical habitats (NMFS Reference Number OPR-2021-02470).

Since completion of the 2021 JFC consultation with your office, the Action Proponents have determined that additional launch capabilities from the Pacific Missile Range Facility's Terminal High Altitude Area Defense launch pad (on Kaua'i Island, Hawai'i) and from the Pacific Spaceport Complex Alaska (on Kodiak Island, Alaska), as well as an expansion of the Pacific Broad Ocean Area, are required to meet the purpose and need of the JFC action. Based on preliminary analyses of the potential effects, the Action Proponents have determined that these proposed JFC supplemental activities may affect ESA-listed species and designated critical habitats that were not considered in the 2021 consultation with NMFS.

The Action Proponents prepared a Biological Evaluation to fully evaluate the effects of proposed JFC supplemental activities on marine species listed under the ESA and on designated critical habitat. We provided your office with a copy of the JFC Marine Biological Evaluation on 13 June and have attached it to this communication. Based on analyses of all the potential stressors resulting from the Proposed Action, the Action Proponents have determined that the Proposed Action may affect but is not likely to adversely affect the ESA-listed species considered in the Biological Evaluation. We have determined that the effects of the Proposed Action would be insignificant or discountable for the Western North Pacific distinct population segment (DPS) of gray whales (*Eschrichtius robustus*), the Western DPS of Steller sea lions (*Eumetopias jubatus*), the Hood Canal Summer run evolutionary significant unit (ESU) of chum salmon (*Oncorhynchus keta*), the Lower Columbia River ESU of coho

salmon (*Oncorhynchus kisutch*), the Snake River ESU of sockeye salmon (*Oncorhynchus nerka*), and six ESUs of chinook salmon (*Oncorhynchus tshawytscha*) (Lower Columbia River, Puget Sound, Snake River Fall, Snake River Spring/Summer, Upper Columbia River Spring, and Upper Willamette River ESUs).

Due to supplemental activities expansion of the Broad Ocean Area, critical habitat not considered in the 2021 consultation occurs in the JFC Action Area. The Action Proponents have concluded that the Proposed Action may affect but is not likely to adversely affect designated critical habitat for the Western North Pacific DPS of humpback whales (*Megaptera novaeangliae*), the Mexico DPS of humpback whales, the Main Hawaiian Islands Insular DPS of false killer whales (*Pseudorca crassidens*), and the Western DPS of Steller sea lions. Furthermore, the Action Proponents have determined that the Proposed Action would have no effect on designated critical habitats for Hawaiian monk seals (*Neomonachus schauinslandi*) or North Pacific right whales (*Eubalaena japonica*).

Our supporting analysis is provided in the attached Biological Evaluation. We request your written concurrence in the form of an amended letter of concurrence for JFC programmatic activities (NMFS Reference Number OPR-2021-02470) if you agree with our determinations.

We thank you for your time and coordination on this project.

V/r,
David

David Fuller
NEPA Program Manager
Environmental Division/NEPA Branch
U.S. Army Space & Missile Defense Command
Redstone Arsenal, AL
(c) 256.425.2016
(o) 256.955.5585

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1315 East-West Highway
Silver Spring, Maryland 20910

11/14/2023
Refer to NMFS No: OPR-2023-02234

Weldon H. Hill, Jr.
Deputy Chief of Staff for Engineering
U.S Army Space and Missile Defense Command
Department of the Army
Post Office Box 1500
Huntsville, AL 35807-3801

RE: Reinitiation of Consultation for the Programmatic Concurrence Letter for the Department of Defense Joint Flight Campaign Activities in the Atlantic and Pacific Oceans

Dear Mr. Hill:

The National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) Endangered Species Act (ESA) Interagency Cooperation Division received the United States (U.S.) Department of the Army's July 7, 2023 request for reinitiation of consultation and concurrence with your determination that the proposed action may affect, but is not likely to adversely affect, any species listed or critical habitat designated since the issuance of our letter of concurrence on October 14, 2021. This response to your request was prepared by NMFS ESA Interagency Cooperation Division pursuant to section 7(a)(2) of the ESA, implementing regulations at 50 C.F.R. §402, and agency guidance for preparation of letters of concurrence and programmatic consultation documents.

This letter underwent pre-dissemination review using standards for utility, integrity, and objectivity in compliance with agency guidelines issued under section 515 of the Treasury General Government Appropriations Act of 2001 (Data Quality Act; 44 U.S.C. 3504(d)(1) and 3516). A complete record of this consultation is on file at NMFS Office of Protected Resources in Silver Spring, Maryland.

Consultation History

On May 4, 2023, we were notified by the U.S. Army Space and Missile Defense Command that a biological evaluation was being prepared for supplemental Joint Flight Campaign (JFC) activities and an expanded action area that were not included in the original consultation. On June 13, 2023, we were provided with a biological evaluation that included information on the revised proposed action and action area to review before a future coordination meeting. On June 28, 2023, we met and discussed the supplemental JFC activities with the U.S. Army Space and Missile Defense Command, which is assisting the U.S. Department of the Navy Strategic

Systems Programs and the U.S. Army Rapid Capabilities and Critical Technologies Office with the ESA section 7 consultation. On July 7, 2023, we received a request from the U.S. Army Space and Missile Defense Command for reinitiation of consultation and for concurrence that the revisions to the proposed action to be conducted under the programmatic letter of concurrence on the JFC activities may affect, but are not likely to adversely affect, any ESA-listed species and designated critical habitat. On July 17, 2023, we provided comments and questions on the biological evaluation to the U.S. Army Space and Missile Defense Command, and they responded on July 28, 2023. On September 21, 2023, we provided additional questions to the U.S. Army Space and Missile Defense Command, and they responded and provided additional documents on September 22 and October 16, 2023.

Proposed Action and Action Area

The previous 2021 letter of concurrence includes more detailed information on the JFC activities. The 2021 letter of concurrence is available online at: https://appscloud.fisheries.noaa.gov/suite/rest/a/content/latest/ioB889ZWo9hoegoGeHII0_XHPRlPQvBpv8LSl7umRzqBF96F3OfJ5MemWk/o. Under the program, the Department of the Army conducts up to 6 flight test launches from up to 4 different launch locations per year, over 10 years (until 2032), in the Atlantic and Pacific Oceans. Test flights can occur at any time of the year. A typical JFC test includes pre-launch ground preparations, launch and flight test, vehicle flight, payload flight, impact in the broad ocean area (BOA), and post-launch operations. The JFC activities occur at existing launch vehicle facilities at 4 installations, including the Wallops Flight Facility, Cape Canaveral Space Force Station, Pacific Missile Range Facility, and Vandenberg Air Force Base. A fifth installation at Pacific Spaceport Complex Alaska will be added for JFC activities and is discussed in this letter of concurrence. The number of flight test launches (i.e., 0 to 6) that will occur annually from each location is unknown. After launch, vehicle flights will occur over the Atlantic and/or Pacific Oceans. Expended or spent booster splashdown and hypersonic payload impact will occur in the BOA in the North Atlantic and North Pacific Oceans. The vehicle flights and splashdown and payload impacts will occur in U.S. waters within the Exclusive Economic Zone (EEZ) and in international waters. Details regarding the JFC activities such as JFC activities locations, characteristics of the launch vehicle and payload system, action area, affected ESA-listed species and designated critical habitat, programmatic consultation, and effects of the action were discussed in the 2021 letter of concurrence and will not be discussed further in this consultation.

Since 2021, the action proponents have determined that additional launch capabilities from the Pacific Missile Range Facility's Terminal High Altitude Area Defense launch pad (one site on Kauai, Hawaii) and from the Pacific Spaceport Complex Alaska (two sites on Kodiak Island, Alaska), as well as an expansion of the BOA in the Pacific Ocean, are required to meet the purpose and need of the proposed action. No changes have occurred for JFC activities and the BOA in the Atlantic Ocean. The addition of the Pacific Missile Range Facility's Terminal High Altitude Area Defense and Pacific Spaceport Complex Alaska launch pads will not increase the

total number of JFC test flights. At the Pacific Spaceport Complex Alaska, the launch vehicle is smaller than many of the other launch vehicles used for the JFC activities at other locations.

Details regarding avoidance and minimization measures were described in the 2021 letter of concurrence to minimize the potential effects of the proposed action on ESA-listed species and designated critical habitat. An additional avoidance and minimization measure will be implemented as part of the JFC activities, specifically:

- A recovery team will inspect the payload impact site after the test flight to recover and remove any visible marine debris present on the ocean surface.

For JFC activities, the vessels will be operated as part of the U.S. Navy fleet operations in the Atlantic and Pacific Oceans. The standard avoidance and minimization measures the U.S. Navy implements for training and testing operations (e.g., Atlantic, Gulf of Alaska, Hawaii and Southern California, Mariana Islands, and Northwest) will also apply to the JFC activities. Additional standard operating procedures and best management practices are discussed in the Wallops Flight Facility Site-wide Programmatic Environmental Impact Statement (NASA 2019) and Alaska Aerospace Corporation's application for a 5-year programmatic permit for small takes of marine mammals incidental to launching of space launch vehicles, long range ballistic target missiles, and smaller missile systems at Pacific Spaceport Complex Alaska, Kodiak Island, Alaska (Alaska Aerospace Corporation 2016).

The expanded action area for the JFC activities considered in this reinitiation includes the Terminal High Altitude Area Defense launch site at the Pacific Missile Range Facility (Figure 1) and Pacific Spaceport Complex Alaska (Area 1 and Launch Pad 2; Figure 2). The BOA consists mostly of the open ocean in deep water, as well as the airspace above those waters. After launch from one of the five existing launch vehicle facilities, the vehicle will fly over the ocean towards a terminal payload impact site in the Pacific BOA. The action area includes stage 1 (Figure 3) and stage 2 (Figure 4) booster drop zones in the BOA where components of the launch vehicles will impact (i.e., splashdown) in the open ocean and where the vehicle will fly over the Pacific Ocean. The stage 1 booster drop zones will mostly occur outside the territorial sea of U.S. waters (greater than 22 kilometers [km] [12 nautical miles (nmi)]), but mostly within the U.S. EEZ (out to 370 km [200 nmi]). The stage 2 booster drop zones (which include payload impact) will occur mostly outside the U.S. EEZ, in the high seas (international waters; Figure 5). The flight corridor over the Atlantic and Pacific Oceans is also part of the action area. The action area includes the transit routes of the support vessel(s) from a port on the coast to and from the terminal location of pre-launch and post-launch activities. The action area also includes the stressors of vessel noise and in-air noise and presence from uncrewed aerial or aircraft systems (UAS), which were not discussed in the 2021 letter of concurrence.

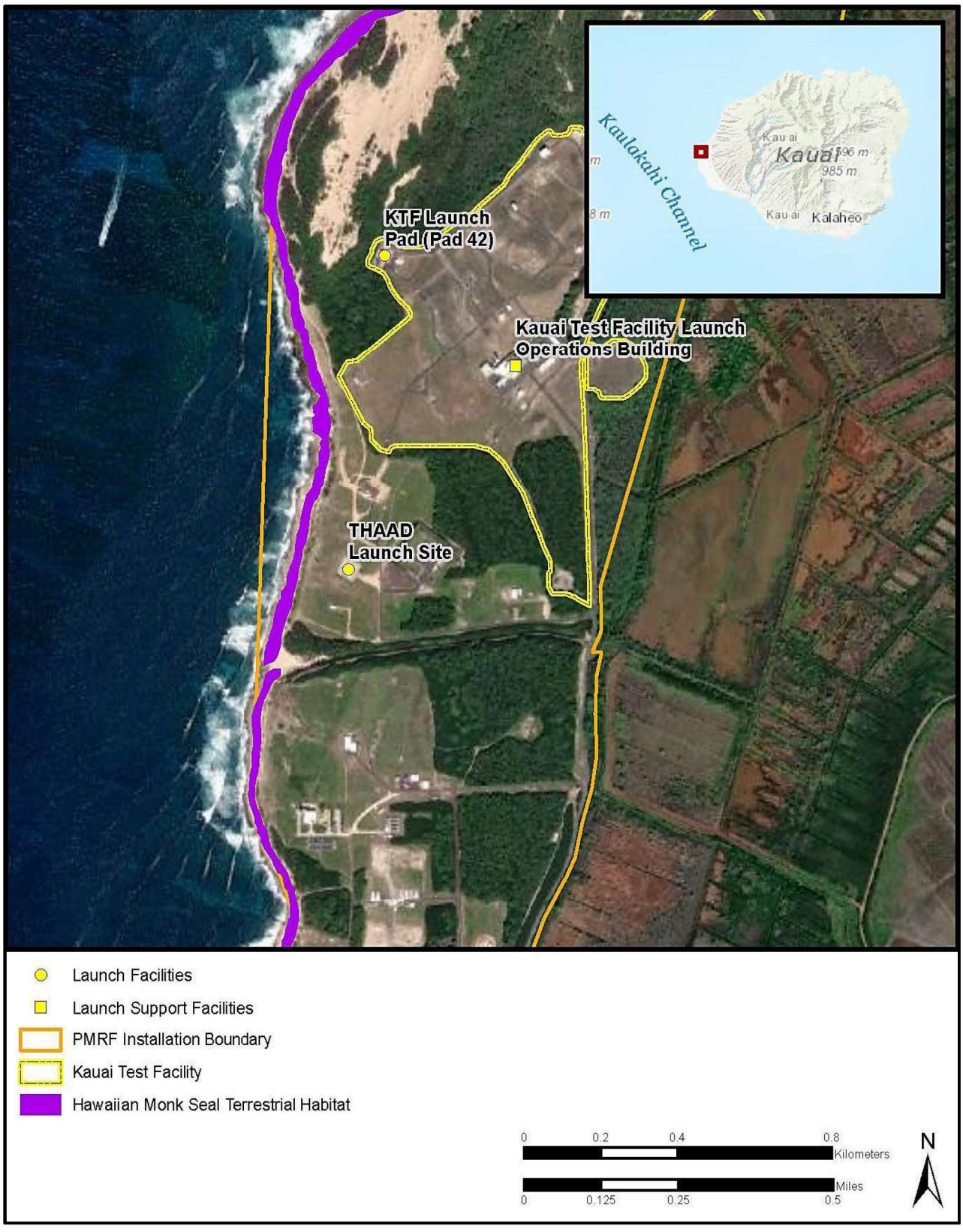


Figure 1. Joint flight campaign activity locations at Pacific Missile Range Facility, including the Terminal High Altitude Area Defense launch site

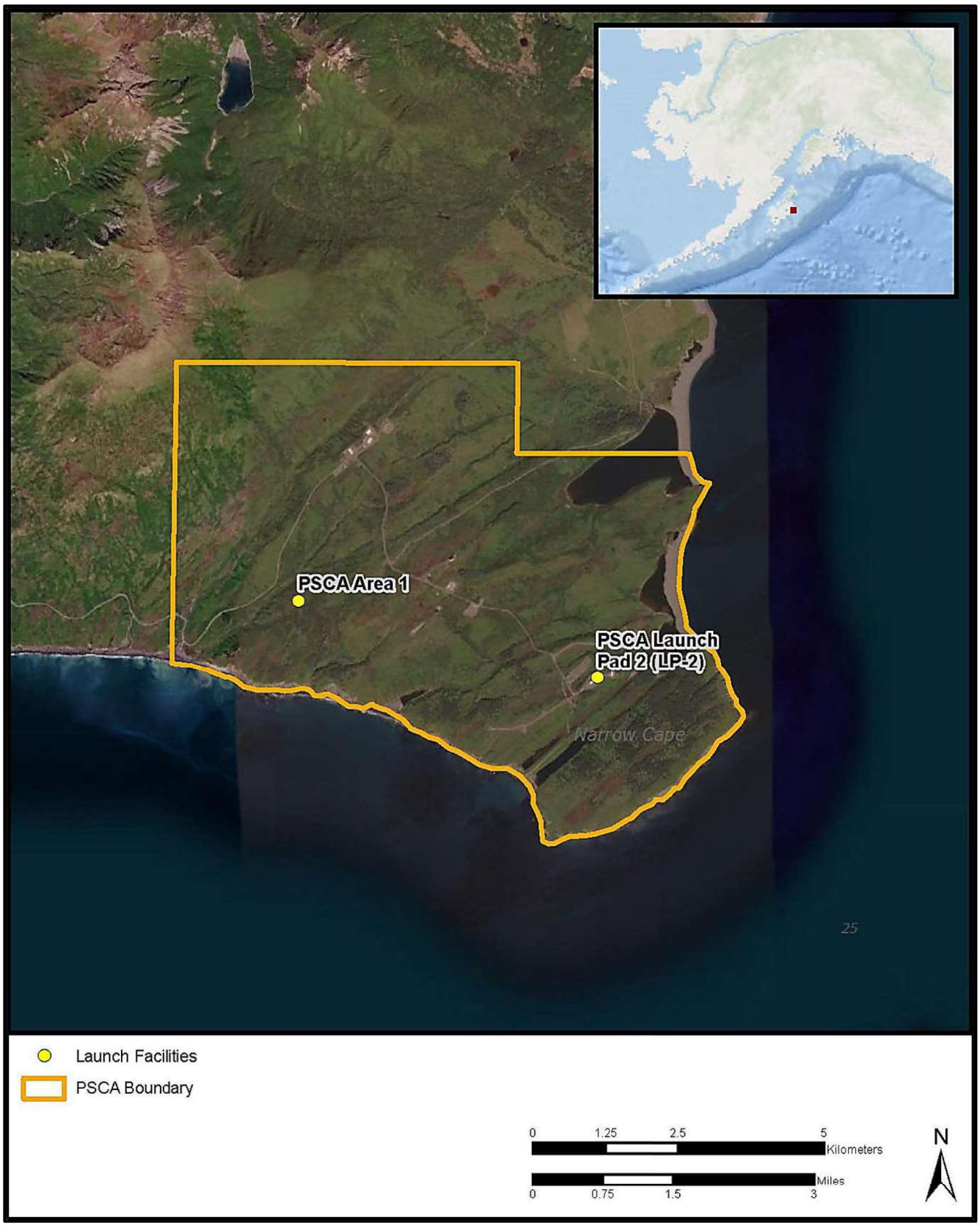


Figure 2. Joint flight campaign activity locations at Pacific Spaceport Complex Alaska

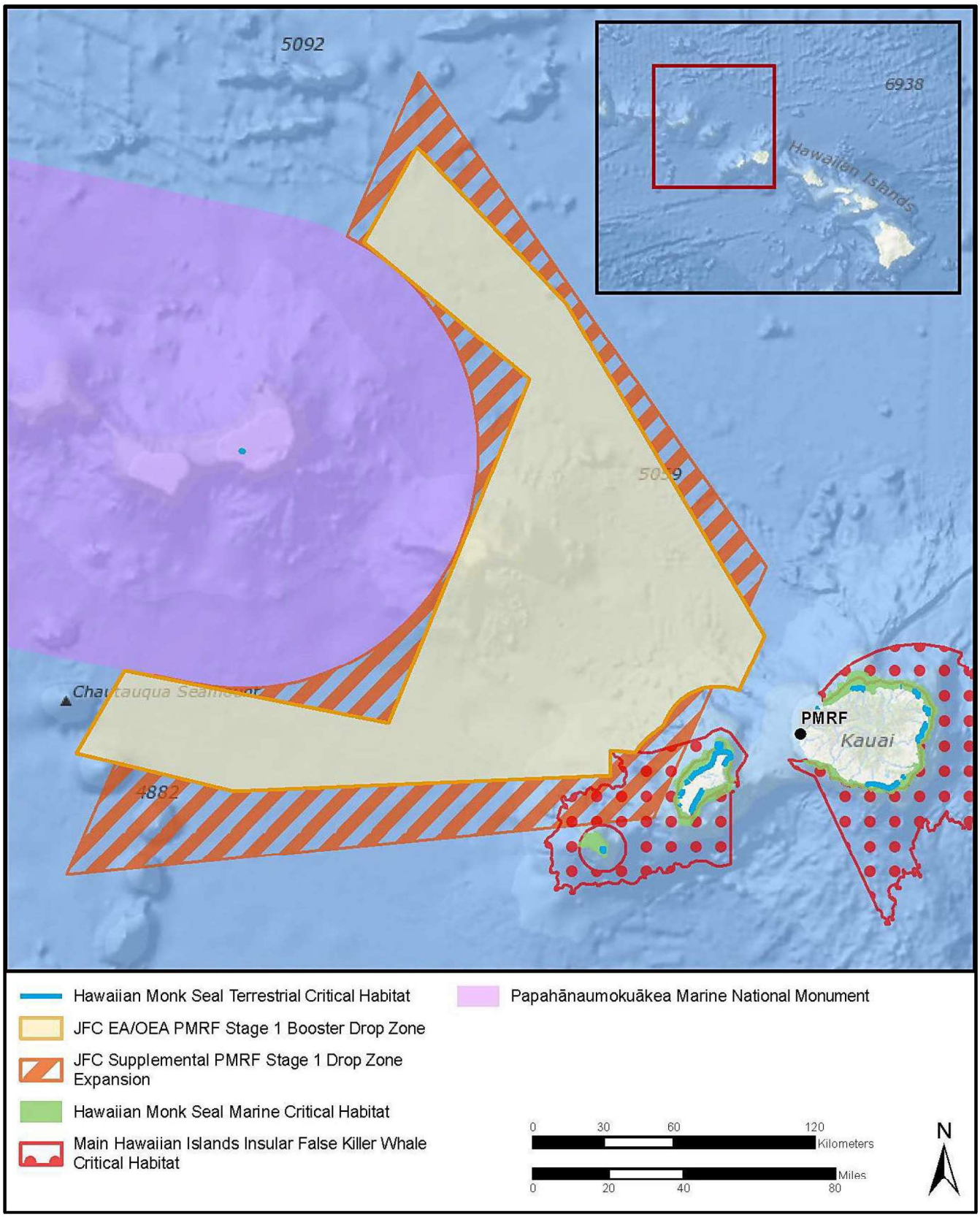


Figure 3. Joint flight campaign activity stage 1 drop zone at the Pacific Missile Range Facility

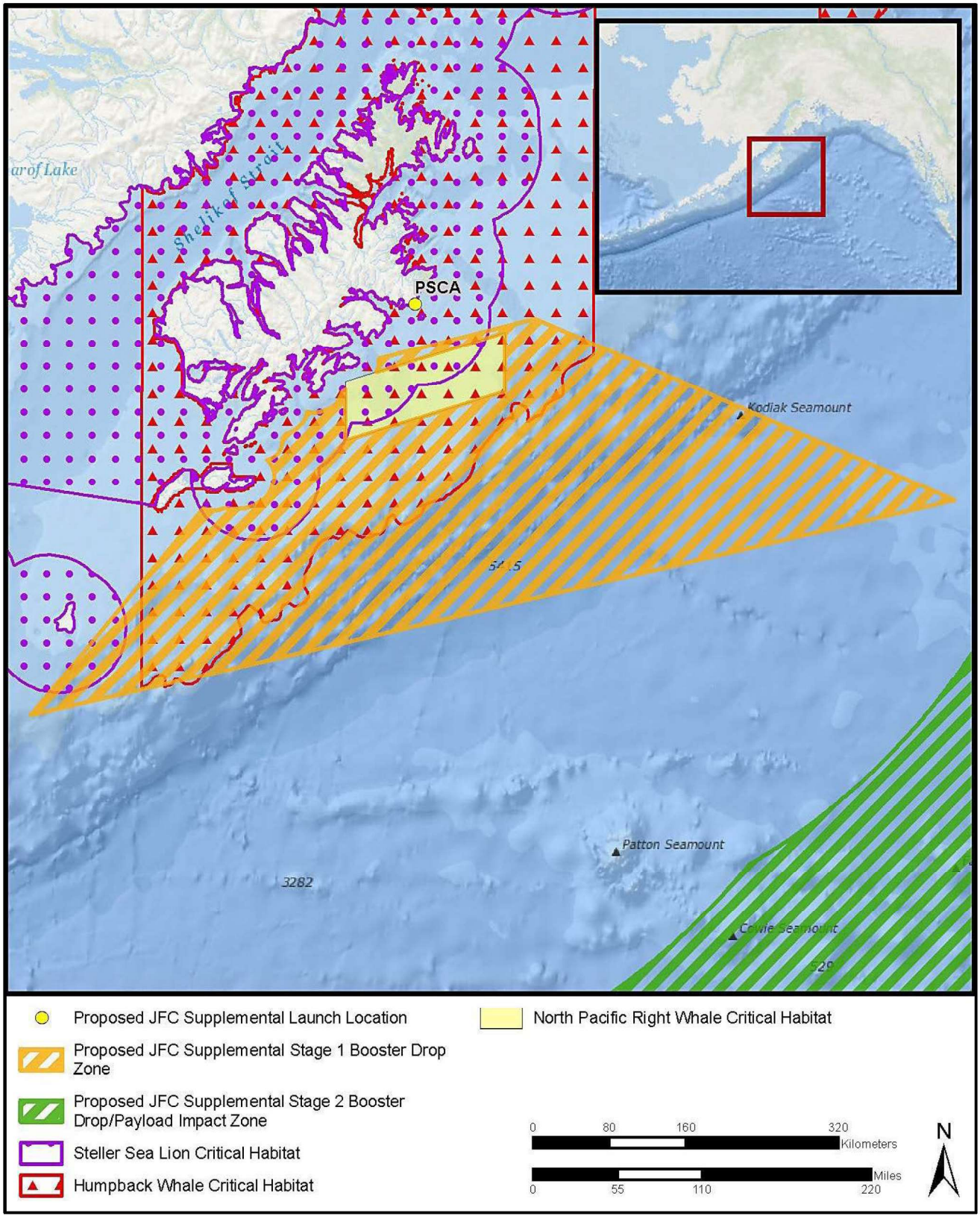


Figure 4. Joint flight campaign activity stage 1 drop zone at the Pacific Spaceport Complex Alaska

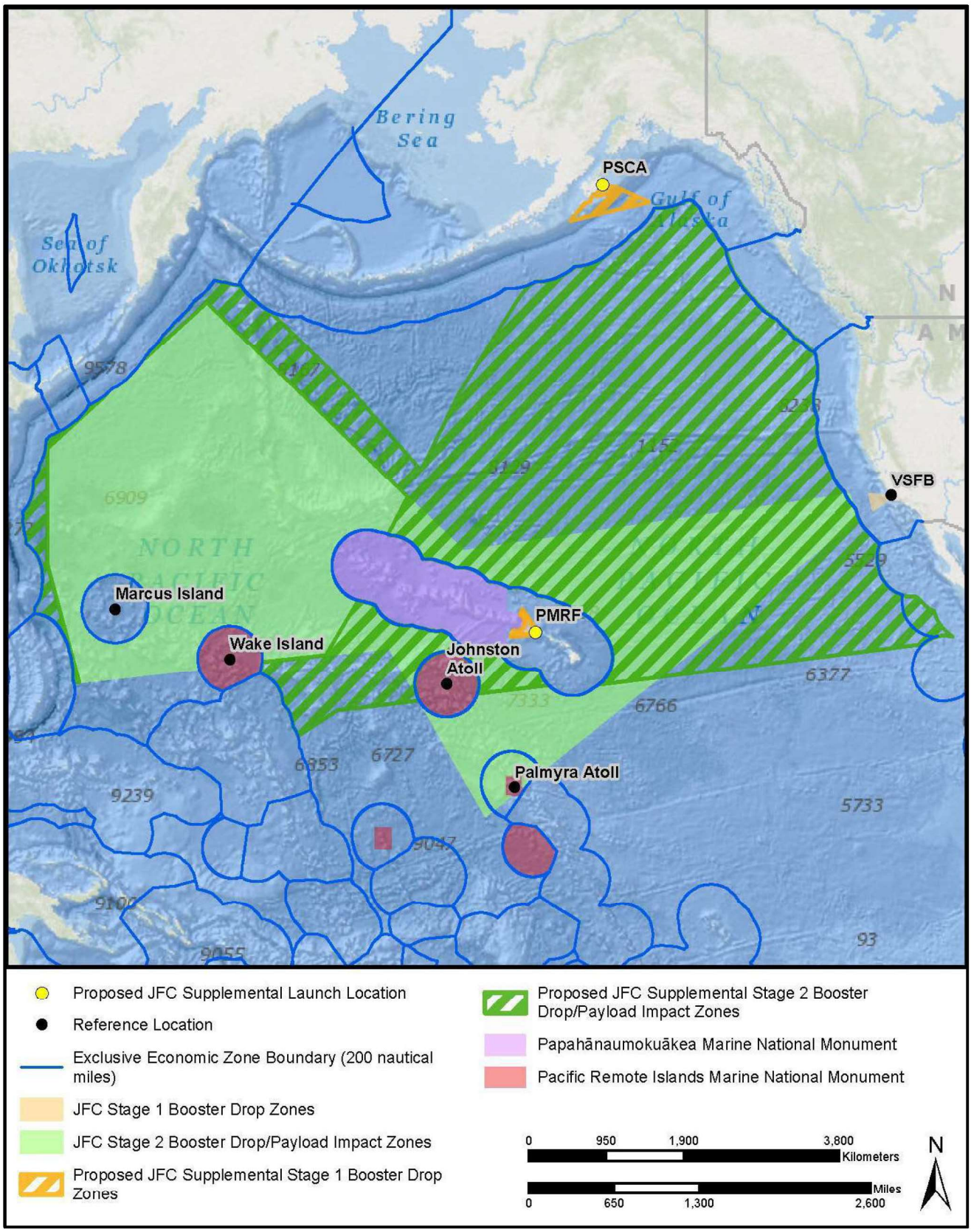


Figure 5. Joint flight campaign activity locations in the Pacific Ocean

Affected Endangered Species Act-listed Species and Designated Critical Habitat

The ESA-listed marine mammals (cetaceans and pinnipeds), sea turtles, and fish and designated critical habitat are present in the action area and may be affected by the proposed action (Table 1).

Table 1. Endangered Species Act-listed species and designated critical habitat that may be affected by the Department of the Army's proposed action

Species	Endangered Species Act Status	Critical Habitat	Recovery Plan
Marine Mammals - Cetaceans			
Blue Whale (*Balaenoptera musculus*)	E – 35 FR 18319	-- --	07/1998 11/2020
False Killer Whale (*Pseudorca crassidens*) – Main Hawaiian Islands Insular DPS	E – 77 FR 70915	88 FR 47453*	86 FR 60615 10/2021
Fin Whale (*Balaenoptera physalus*)	E – 35 FR 18319	-- --	75 FR 47538 07/2010
Gray Whale (*Eschrichtius robustus*) – Western North Pacific DPS	E – 35 FR 18319	-- --	-- --
Humpback Whale (*Megaptera novaeangliae*) – Cape Verde Islands/Northwest Africa DPS	E – 81 FR 62259	-- --	11/1991
Humpback Whale (*Megaptera novaeangliae*) – Central America DPS	E – 81 FR 62259	86 FR 21082*	11/1991 06/2022 (Outline)
Humpback Whale (*Megaptera novaeangliae*) – Mexico DPS	T – 81 FR 62259	86 FR 21082*	11/1991 06/2022 (Outline)
Humpback Whale (*Megaptera novaeangliae*) – Western North Pacific DPS	E – 81 FR 62259	86 FR 21082*	11/1991 06/2022 (Outline)
North Atlantic Right Whale (*Eubalaena glacialis*)	E – 73 FR 12024	81 FR 4837*	70 FR 32293 08/2004

Species	Endangered Species Act Status	Critical Habitat	Recovery Plan
North Pacific Right Whale (*Eubalaena japonica*)	E – 73 FR 12024	73 FR 19000	78 FR 34347 06/2013
Sei Whale (*Balaenoptera borealis*)	E – 35 FR 18319	-- --	12/2011
Sperm Whale (*Physeter macrocephalus*)	E – 35 FR 18319	-- --	75 FR 81584 12/2010
Marine Mammals - Pinnipeds			
Guadalupe Fur Seal (*Arctocephalus townsendi*)	T – 50 FR 51252	-- --	-- --
Hawaiian Monk Seal (*Neomonachaus schauinslandi*)	E – 41 FR 51611	80 FR 50925*	72 FR 46966 2007
Steller Sea Lion (*Eumetopias jubatus*) – Western DPS	E – 55 FR 49204	58 FR 45269*	73 FR 11872 2008
Marine Reptiles			
Green Turtle (*Chelonia mydas*) – North Atlantic DPS	T – 81 FR 20057	63 FR 46693 88 FR 46572* (Proposed)	10/1991 – U.S. Atlantic Ocean
Green Turtle (*Chelonia mydas*) – Central North Pacific DPS	T – 81 FR 20057	88 FR 46572* (Proposed)	63 FR 28359 01/1998
Green Turtle (*Chelonia mydas*) – Central West Pacific DPS	E – 81 FR 20057	88 FR 46572 (Proposed)	63 FR 28359 01/1998
Green Turtle (*Chelonia mydas*) – East Pacific DPS	T – 81 FR 20057	88 FR 46572 (Proposed)	63 FR 28359 01/1998
Hawksbill Turtle (*Eretmochelys imbricata*)	E – 35 FR 8491	63 FR 46693	57 FR 38818 08/1992 – U.S. Caribbean Sea, Atlantic Ocean, and Gulf of Mexico 63 FR 28359 05/1998 – U.S. Pacific Ocean
Kemp's Ridley Turtle (*Lepidochelys kempii*)	E – 35 FR 18319	-- --	09/2011
Leatherback Turtle (*Dermochelys coriacea*)	E – 35 FR 8491	44 FR 17710 and 77 FR 4170*	10/1991 – U.S. Caribbean Sea, Atlantic

Species	Endangered Species Act Status	Critical Habitat	Recovery Plan
			Ocean, and Gulf of Mexico 63 FR 28359 05/1998 – U.S. Pacific Ocean
Loggerhead Turtle (*Caretta caretta*) – Northeast Atlantic Ocean DPS	E – 76 FR 58868	-- --	-- --
Loggerhead Turtle (*Caretta caretta*) – Northwest Atlantic Ocean DPS	T – 76 FR 58868	79 FR 39855*	74 FR 2995 10/1991 – U.S. Caribbean Sea, Atlantic Ocean, and Gulf of Mexico 05/1998 – U.S. Pacific Ocean 01/2009 – Northwest Atlantic Ocean
Loggerhead Turtle (*Caretta caretta*) – North Pacific Ocean DPS	E – 76 FR 58868	-- --	63 FR 28359
Olive Ridley Turtle (*Lepidochelys olivacea*) – All Other Areas/Not Mexico's Pacific Coast Breeding Colonies	T – 43 FR 32800	-- --	-- --
Olive Ridley Turtle (*Lepidochelys olivacea*) – Mexico's Pacific Coast Breeding Colonies	E – 43 FR 32800	-- --	63 FR 28359
Fishes			
Atlantic Salmon (*Salmo salar*) – Gulf of Maine DPS	E – 74 FR 29344 and 65 FR 69459	74 FR 39903	70 FR 75473 and 81 FR 18639 (Draft) 11/2005 03/2016 (Draft) 02/2019 (Final)
Atlantic Sturgeon (*Acipensar oxyrinchus oxyrinchus*) – Carolina DPS	E – 77 FR 5913	82 FR 39160	02/2012 (Outline)
Atlantic Sturgeon (*Acipensar oxyrinchus oxyrinchus*) – Chesapeake DPS	E – 77 FR 5879	82 FR 39160	02/2012 (Outline)

Species	Endangered Species Act Status	Critical Habitat	Recovery Plan
Atlantic Sturgeon (*Acipensar oxyrinchus oxyrinchus*) – Gulf of Maine DPS	T – 77 FR 5879	82 FR 39160	02/2012 (Outline)
Atlantic Sturgeon (*Acipensar oxyrinchus oxyrinchus*) – New York Bight DPS	E – 77 FR 5879	82 FR 39160	02/2012 (Outline)
Atlantic Sturgeon (*Acipensar oxyrinchus oxyrinchus*) – South Atlantic DPS	E – 77 FR 5913	82 FR 39160	02/2012 (Outline)
Chinook Salmon (*Oncorhynchus tshawytscha*) – Lower Columbia River ESU	T – 70 FR 37160	70 FR 52629	78 FR 41911
Chinook Salmon (*Oncorhynchus tshawytscha*) – Puget Sound ESU	T – 70 FR 37160	70 FR 52629	72 FR 2493
Chinook Salmon (*Oncorhynchus tshawyt*scha) – Snake River Fall-Run ESU	T – 70 FR 37160	58 FR 68543	80 FR 67386 (Draft)
Chinook Salmon (*Oncorhynchus tshawytscha*) – Snake River Spring/Summer-Run ESU	T – 70 FR 37160	64 FR 57399	11/2017
Chinook Salmon (*Oncorhynchus tshawytscha*) – Upper Columbia River Spring-Run ESU	E – 70 FR 37160	70 FR 52629	72 FR 57303
Chinook Salmon (*Oncorhynchus tshawytscha*) – Upper Willamette River ESU	T – 70 FR 37160	70 FR 52629	76 FR 52317
Chum Salmon (*Oncorhynchus keta*) – Hood Canal Summer-Run ESU	T – 70 FR 37160	70 FR 52629	72 FR 29121
Coho Salmon (*Oncorhynchus kisutch*) – Lower Columbia River ESU	T – 70 FR 37160	81 FR 9251	78 FR 41911

Species	Endangered Species Act Status	Critical Habitat	Recovery Plan
Giant Manta Ray (*Manta birostris*)	T – 83 FR 2916	-- --	-- --
Oceanic Whitetip Shark (*Carcharhinus longimanus*)	T – 83 FR 4153	-- --	9/2018 (Outline)
Scalloped Hammerhead Shark (*Sphyrna lewini*) – Central and Southwest Atlantic DP	T – 79 FR 38213	-- --	-- --
Scalloped Hammerhead Shark (*Sphyrna lewini*) – Eastern Atlantic DPS	E – 79 FR 38213	-- --	-- --
Scalloped Hammerhead Shark (*Sphyrna lewini*) – Eastern Pacific DPS	E – 79 FR 38213	-- --	-- --
Scalloped Hammerhead Shark (*Sphyrna lewini*) – Indo-West Pacific DPS	T – 79 FR 38213	-- --	-- --
Sockeye Salmon (*Oncorhynchus nerka*) – Snake River ESU	E – 70 FR 37160	58 FR 68543	80 FR 32365
Steelhead Trout (*Oncorhynchus mykiss*) – California Central Valley DPS	T – 71 FR 834	70 FR 52487	79 FR 42504
Steelhead Trout (*Oncorhynchus mykiss*) – Central California Coast DPS	T – 71 FR 834	70 FR 52487	81 FR 70666
Steelhead Trout (*Oncorhynchus mykiss*) – Lower Columbia River DPS	T – 71 FR 834	70 FR 52629	78 FR 41911
Steelhead Trout (*Oncorhynchus mykiss*) – Middle Columbia River DPS	T – 71 FR 834	70 FR 52629	74 FR 50165
Steelhead Trout (*Oncorhynchus mykiss*) – Northern California DPS	T – 71 FR 834	70 FR 52487	81 FR 70666

Species	Endangered Species Act Status	Critical Habitat	Recovery Plan
Steelhead Trout (*Oncorhynchus mykiss*) – Puget Sound DPS	T – 72 FR 26722	81 FR 9251	84 FR 71379
Steelhead Trout (*Oncorhynchus mykiss*) – Snake River Basin DPS	T – 71 FR 834	70 FR 52629	11/2017
Steelhead Trout (*Oncorhynchus mykiss*) – South-Central California Coast DPS	T – 71 FR 834	70 FR 52487	78 FR 77430
Steelhead Trout (*Oncorhynchus mykiss*) – Southern California Coast DPS	E – 71 FR 834	70 FR 52487	77 FR 1669
Steelhead Trout (*Oncorhynchus mykiss*) – Upper Columbia River DPS	T – 71 FR 834	70 FR 52629	72 FR 57303
Steelhead Trout (*Oncorhynchus mykiss*) – Upper Willamette River DPS	T – 71 FR 834	70 FR 52629	76 FR 52317

DPS=distinct population segment, ESU=evolutionarily significant unit, E=endangered, T=threatened, FR=*Federal Register*
*=proposed or designated critical habitat in the action area

The Department of the Army determined that the JFC activities may affect, but are not likely to adversely affect most of the ESA-listed species and designated critical habitats in Table 1. The Department of the Army made a no effect determination for Main Hawaiian Islands insular DPS of false killer whale, Mexico DPS and Western North Pacific DPS of humpback whale, North Pacific right whale, Hawaiian monk seal, and Western DPS of Steller sea lion designated critical habitats. This consultation considers the effects of the proposed action on these ESA-listed species and designated critical habitats because we determined these animals and critical habitats are in the action area and may be affected by the proposed action.

Endangered Species Act-Listed Marine Mammals in the Action Area

Details regarding the status of the blue whale, Main Hawaiian Islands insular DPS of false killer whale, fin whale, Cape Verde Islands/Northwest Africa DPS of humpback whale, Western North Pacific DPS of gray whale, Central America DPS of humpback whale, Mexico DPS of humpback whale, Western North Pacific DPS of humpback whale, North Atlantic right whale, North Pacific right whale, sei whale, sperm whale, Guadalupe fur seals, and Hawaiian monk seals were discussed in the 2021 letter of concurrence and will not be discussed further in this consultation. These species may be present in the expanded action area and various life stages may be exposed to the stressors of elevated sound pressure levels from the vehicle launch, sonic

booms, and component splashdown, dispersion of vehicle components that may result in direct contact, ingestion, hazardous materials, vessel transit and strikes, vessel noise, and in-air noise and presence from UAS.

The Western DPS of Steller sea lion ranges from Alaska (central and western Gulf of Alaska and Aleutian Islands) to Russia and Japan. They are distributed around the coasts to the outer continental shelf along the rim of the North Pacific Ocean. Pupping and breeding occurs at numerous major rookeries from late May to early July. Females and pups disperse from rookeries by August to October. Juveniles and adults disperse widely, especially males. Their large aquatic ranges are used for foraging, resting, and traveling. Steller sea lions forage on a wide variety of demersal, semi-demersal, and pelagic prey, including fish and cephalopods. Thus, the species is present in the expanded action area and various life stages may be exposed to the stressors of elevated sound pressure levels from the vehicle launch, sonic booms, and component splashdown, dispersion of vehicle components that may result in direct contact, ingestion, hazardous materials, vessel transit and strikes, vessel noise, and in-air noise and presence from UAS.

Endangered Species Act-Listed Sea Turtles in the Action Area

Details regarding the status of the North Atlantic DPS of green turtle, Central North Pacific DPS of green turtle, Central West Pacific DPS of green turtle, East Pacific DPS of green turtle, hawksbill turtle, Kemp's ridley turtle, leatherback turtle, Northeast Atlantic Ocean DPS of loggerhead turtle, Northwest Atlantic Ocean DPS of loggerhead turtle, North Pacific Ocean DPS of loggerhead turtle, Mexico's Pacific Coast breeding colonies of olive ridley turtle, and all other areas/not Mexico's Pacific Coast breeding colonies of olive ridley turtle were discussed in the 2021 letter of concurrence and will not be discussed further in this consultation. These species may be present in the expanded action area and various life stages may be exposed to the stressors of elevated sound pressure levels from the vehicle launch, sonic booms, and component splashdown, dispersion of vehicle components that may result in direct contact, ingestion, hazardous materials, vessel transit and strikes, vessel noise, and in-air noise and presence from UAS.

Endangered Species Act-Listed Fishes in the Action Area

Details regarding the status of the Gulf of Maine DPS of Atlantic sturgeon, New York Bight DPS of Atlantic sturgeon, Chesapeake Bay DPS of Atlantic sturgeon, Carolina DPS of Atlantic sturgeon, South Atlantic DPS of Atlantic sturgeon, giant manta ray, oceanic whitetip shark, Central and Southwest Atlantic DPS of scalloped hammerhead shark, Eastern Atlantic DPS of scalloped hammerhead shark, Eastern Pacific DPS of scalloped hammerhead shark, Indo-West Pacific DPS of scalloped hammerhead shark, and California Central Valley DPS of steelhead trout, Central California Coast DPS of steelhead trout, Lower Columbia River DPS of steelhead trout, Middle Columbia River DPS of steelhead trout, Northern California DPS of steelhead

trout, Puget Sound DPS of steelhead trout, Snake River Basin DPS of steelhead trout, South-Central California Coast DPS of steelhead trout, Southern California Coast DPS of steelhead trout, Upper Columbia River DPS of steelhead trout, and Upper Willamette River DPS of steelhead trout were discussed in the 2021 letter of concurrence and will not be discussed further in this consultation. These species may be present in the expanded action area and various life stages may be exposed to the stressors of elevated sound pressure levels from the vehicle launch, sonic booms, and component splashdown, dispersion of vehicle components that may result in direct contact, ingestion, hazardous materials, vessel transit and strikes, vessel noise, and in-air noise and presence from UAS.

The Chinook salmon (Lower Columbia River ESU, Puget Sound ESU, Snake River Fall ESU, Snake River Spring/Summer ESU, Upper Columbia River Spring ESU, and Upper Willamette River ESU) is an anadromous (i.e., adults migrate from marine to freshwater streams and rivers to spawn) and semelparous (i.e., they spawn once and then die) fish species. The different populations vary in run timing depending on latitude and hydrological differences between watersheds. Chinook salmon spend 1 to 4 years in the Pacific Ocean, depending on gender and age at the time of ocean entry (Connor et al. 2005). Upon reaching the ocean, juvenile Chinook salmon feed voraciously on larval and juvenile fishes, plankton, and terrestrial insects (Healey et al. 1991; MacFarlane and Norton 2002). Chinook salmon grow rapidly in the ocean environment, with growth rates dependent on water temperatures and food availability. Thus, the species is present in the expanded action area and various life stages may be exposed to the stressors of elevated sound pressure levels from the vehicle launch, sonic booms, and component splashdown, dispersion of vehicle components that may result in direct contact, ingestion, hazardous materials, vessel transit and strikes, vessel noise, and in-air noise and presence from UAS.

The chum salmon (Hood Canal Summer-Run ESU) is an anadromous and semelparous fish species. Chum salmon have the widest natural geographic and spawning distribution of the Pacific salmonids. Most chum salmon mature and return to their birth stream between 3 and 5 years of age, with 60 to 90% of fish maturing at 4 years of age. Age at maturity appears to follow a latitudinal trend (i.e., greater in the northern portion of the species' range). Juveniles out-migrate to seawater almost immediately after emerging from the gravel covered redds (Salo 1991). Chum salmon spend 2 to 5 years in feeding areas in the northeast Pacific Ocean, which is a greater proportion of their life history compared to other Pacific salmonids. Chum salmon distributed throughout the North Pacific Ocean and Bering Sea, although North American chum salmon (as opposed to chum salmon originating in Asia), rarely occur west of 175º East longitude (Johnson et al. 1997). North American chum salmon migrate north along the coast in a narrow band that broadens in southeastern Alaska, although some data suggests that chum may travel directly offshore into the north Pacific Ocean (Johnson et al. 1997). Thus, the species is present in the expanded action area and various life stages may be exposed to the stressors of elevated sound pressure levels from the vehicle launch, sonic booms, and component

splashdown, dispersion of vehicle components that may result in direct contact, ingestion, hazardous materials, vessel transit and strikes, vessel noise, and in-air noise and presence from UAS.

The Coho salmon (Lower Columbia River ESU) is an anadromous and semelparous fish species. After entering the ocean, the immature Coho salmon initially remain in the nearshore waters close to their natal stream. They gradually move northward, generally staying over the continental shelf (Brown et al. 1994). Most juvenile Coho salmon migrate seaward as smolts in April through June, typically during their second year. They typically range throughout nearshore waters over the continental shelf off the Oregon and Washington coasts. After approximately 2 years at sea, adult Coho salmon move slowly homeward. Coho salmon are typically found in ocean waters north of the Columbia River mouth. Most Coho salmon sexually mature at age 3, except for a small percentage of males (called jacks), which return to natal waters at age 2, after only 5 to 7 months in the ocean (LCFRB 2010). Thus, the species is present in the expanded action area and various life stages may be exposed to the stressors of elevated sound pressure levels from the vehicle launch, sonic booms, and component splashdown, dispersion of vehicle components that may result in direct contact, ingestion, hazardous materials, vessel transit and strikes, vessel noise, and in-air noise and presence from UAS.

The sockeye salmon (Snake River ESU) is an anadromous and semelparous fish species, although some animals spend their entire lives (about 5 years) in freshwater. Sockeye salmon spawn once, generally in late summer and fall, and then die. Peak emigration to the ocean occurs in mid-April to early May in southern populations (lower than 52º North latitude) and as late as early July in northern populations (62º North latitude) (Burgner 1991). Adult sockeye salmon return to their natal lakes to spawn after spending 1 to 4 years at sea. The diet of sockeye salmon consists of amphipods, copepods, squid, and other fish. Thus, the species is present in the expanded action area and various life stages may be exposed to the stressors of elevated sound pressure levels from the vehicle launch, sonic booms, and component splashdown, dispersion of vehicle components that may result in direct contact, ingestion, hazardous materials, vessel transit and strikes, vessel noise, and in-air noise and presence from UAS.

Designated Critical Habitat in the Action Area

The action area includes designated critical habitat for ESA-listed species including Main Hawaiian Islands insular DPS of false killer whale, Central America DPS of humpback whale, Mexico DPS of humpback whale, Western North Pacific DPS of humpback whale, Hawaiian monk seal, Western DPS of Steller sea lion, leatherback turtle, and Northwest Atlantic Ocean DPS of loggerhead turtle. The designated critical habitat for ESA-listed marine mammals and sea turtles in the action area were not described in the 2021 letter of concurrence.

In 2018 (83 FR 35062), NMFS designated critical habitat for the Main Hawaiian Islands insular DPS of false killer whale, which includes waters from the 45 meter (m) (147.6 feet [ft]) to the

3,200 m (10,498.7 ft) depth contour around the Main Hawaiian Islands from Niihau east to the island of Hawaii (Figure 6). This area designated for critical habitat includes approximately 45,504 square km (13,266.8 square nmi) surrounding the Main Hawaiian Islands within the geographical area presently occupied by Main Hawaiian Islands insular DPS of false killer whales. Due to the unique ecology of this island associated population, habitat use is largely driven by depth. Thus, the features essential to the species' conservation are found in those depths that allow the false killer whales to travel throughout a majority of their range seeking food and opportunities to socialize and reproduce. The final rule excludes from the designation particular areas where they overlap with 45 m (147.6 ft) to the 3,200 m (10,498.7 ft) depth contour around the Main Hawaiian Islands from Niihau east to the island of Hawaii which include (1) the Bureau of Ocean Energy Management's Call Area offshore of the Island of Oahu (which includes 2 sites, 1 off Kaena Point and 1 off the south shore); (2) the U.S. Navy Pacific Missile Range Facilities Offshore ranges (including the Shallow Water Training Range, the Barking Sands Tactical Underwater Range, and the Barking Sands Underwater Range Extension (west of Kauai); (3) the U.S. Navy Kingfisher Range (northeast of Niihau); (4) Warning Area 188 (west of Kauai); (5) Kaula Island and Warning Area 187 (surrounding Kaula Island); (6) the U.S. Navy Fleet Operational Readiness Accuracy Check Site (west of Oahu); (7) the U.S. Navy Shipboard Electronic Systems Evaluation Facility (west of Oahu); (8) Warning Areas 196 and 191 (south of Oahu); (9) Warning Areas 193 and 194 (south of Oahu); (10) the Kaulakahi Channel portion of Warning Area 186 (the channel between Niihau and Kauai and extending east); (11) the area north of Molokai; (12) the Alenuihaha Channel; (13) Hawaii Area Tracking System; and (14) the Kahoolawe Training Minefield. In addition, the Ewa Training Minefield and the Naval Defensive Sea Area are precluded from designation under section 4(a)(3) of the ESA because they are managed under the Joint Base Pearl Harbor-Hickam Integrated Natural Resource Management Plan and we find provides a benefit to the Main Hawaiian Islands insular DPS of false killer whale.

The physical and biological features (PBFs) essential for the conservation of the Main Hawaiian Islands insular DPS of false killer whales include island-associated marine habitat for the Main Hawaiian Islands insular DPS of false killer whales. The following characteristics of this habitat support the Main Hawaiian Islands insular DPS of false killer whales ability to travel, forage, communicate, and move freely around and among the water surrounding the Main Hawaiian Islands: (1) adequate space for movement and use within shelf and slope habitat; (2) prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth; (3) waters free of pollutants of a type and amount harmful of Main Hawaiian Islands insular DPS of false killer whales; and (4) sound levels that will not significantly impair false killer whales' use or occupancy.

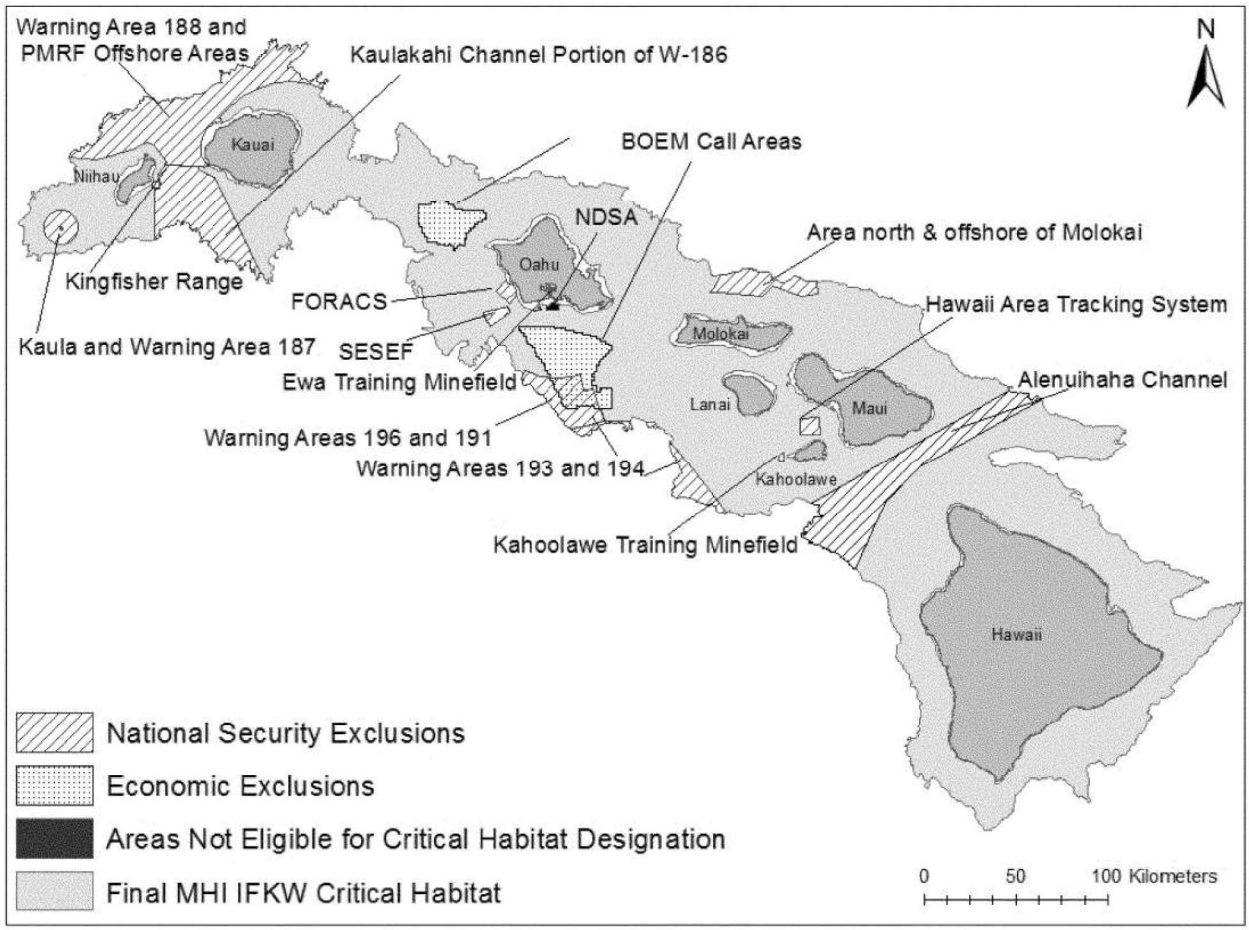


Figure 6. Map identifying designated critical habitat for the endangered Main Hawaiian Islands insular distinct population segment of false killer whale

In 2021, NMFS designated critical habitat for the Central America DPS, Mexico DPS, and Western North Pacific DPS of humpback whale (86 FR 21082). For the Central America DPS of humpback whale, the critical habitat includes marine waters in Washington, Oregon, and California (Figure 7). For the Mexico DPS of humpback whale, the critical habitat includes marine waters in Alaska, Washington, Oregon, and California (Figure 7). For the Western North Pacific DPS of humpback whale, the critical habitat includes marine waters in Alaska (Figure 7).

The PBFs essential to the conservation of Central America DPS of humpback whales include prey species, primarily euphausiids (*Thysanoessa*, *Euphausia*, *Nyctiphanes*, and *Nematoscelis*) and small pelagic fishes, such as Pacific sardine (*Sardinops sagax*), northern anchovy (*Engraulis mordax*), and Pacific herring (*Clupea pallasii*), of sufficient quality, abundance and accessibility within humpback whale feeding areas to support feeding and population growth. For the Mexico DPS of humpback whales, the PBFs also include small pelagic schooling fishes, such as capelin (*Mallotus villosus*), juvenile walleye pollock (*Gadus chalcogrammus*), and Pacific sand lance (*Ammondytes personatus*). For the Western North Pacific DPS of humpback whales, the PBFs include prey species, primarily euphausiids (*Thysanoessa* and *Euphausia*) and small pelagic

schooling fishes, such as Pacific herring, capelin, juvenile walleye pollock, and Pacific sand lance.

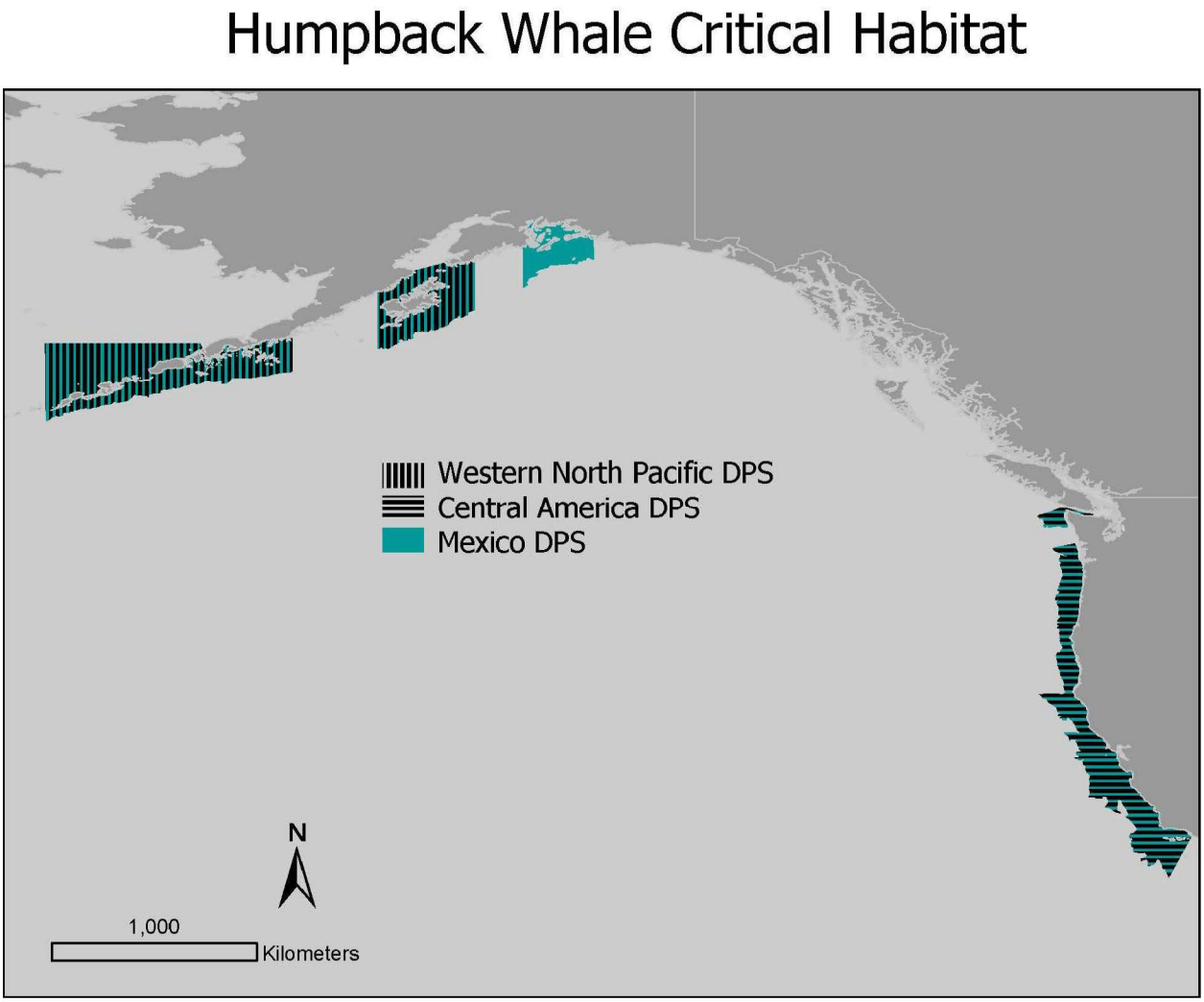


Figure 7. Map of critical habitat for the endangered Central America distinct population segment, threatened Mexico distinct population segment, and endangered Western North Pacific distinct population segment of humpback whales

In 1986, NMFS designated critical habitat for the Hawaiian monk seal (51 FR 16047) and then extended the area on May 26, 1988 to include all beach areas, sand spits, and islets (including all beach crest vegetation to its deepest extent inland), lagoon waters, inner reef waters, and ocean waters out to a depth of 37 m (121.4 ft) around the northwestern Hawaiian Islands breeding atolls and islands. The marine component of this habitat serves as foraging areas, while terrestrial habitat provides resting, pupping, and nursing habitat (Figure 9).

In 2015, NMFS published a final rule to revise designated critical habitat for Hawaiian monk seals (80 FR 50925), extending the previous designation in the northwestern Hawaiian Islands out to the 200 m (656.2 ft) depth contour (including Kure Atoll, Midway Islands, Pearl and

Hermes Reef, Lisianski Island, Laysan Island, Maro Reef, Gardner Pinnacles, French Frigate Shoals, Necker Island, and Nihoa Island). NMFS also designated 6 new areas in the Main Hawaiian Islands (i.e., terrestrial and marine habitat from 5 m [15.4 ft] inland from the shoreline extending seaward to the 200 m [656.2 ft] depth contour around Kaula, Niihau, Kauai, Oahu, Maui, Nui, and Hawaii) (Figure 9).

The PBFs identified for this area include adequate prey quality and quantity for juvenile and adult Hawaiian monk seal foraging (80 FR 50925).

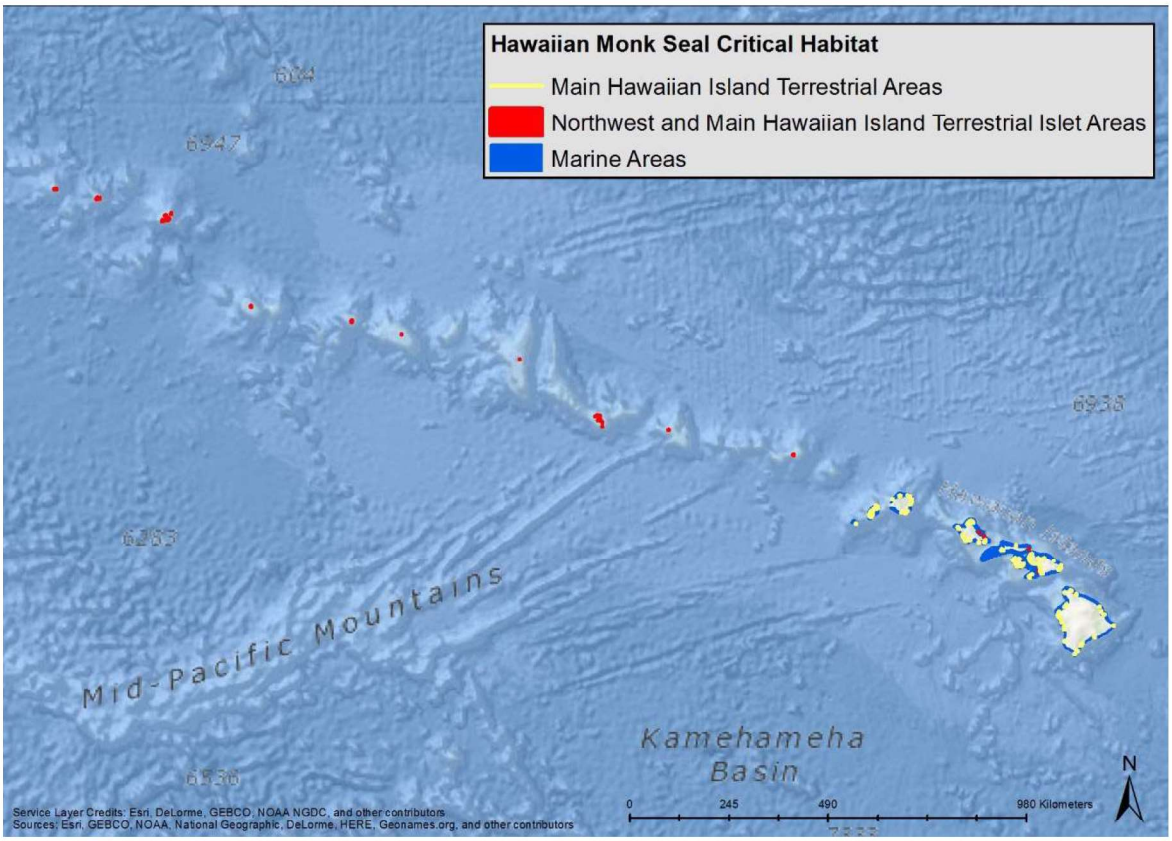


Figure 8. Map identifying designated critical habitat in the Northwest Hawaiian Islands and Main Hawaiian Islands for the endangered Hawaiian monk seal

In 1997, NMFS designated critical habitat for the Steller sea lion (58 FR 45269), which remains in effect for the Western DPS despite the Eastern DPS being delisted in 2013 (78 FR 66139). The designated critical habitat includes specific rookeries, haul-outs, and associated areas, as well as 3 marine foraging areas that are considered to be essential for health, continued survival, and recovery of the species. In Alaska, areas include major Steller sea lion rookeries, haul-outs and associated terrestrial, air, and aquatic zones. The aquatic zones extend 0.9 km (0.5 nmi) seaward from the major rookeries and haul-outs east of 144° West. In addition, NMFS designated special aquatic foraging areas as critical habitat for the Steller sea lion. These areas include the Shelikoff Strait (in the Gulf of Alaska), Bogoslof Island, and Seaguam Pass (the latter 2 are in the Aleutian Islands) (Figure 10). These sites are located near Steller sea lion

abundance centers and include important foraging areas, large concentrations of prey, and host large commercial fisheries that often interact with the species.

The PBFs identified for the aquatic areas of Steller sea lion designated critical habitat that occur within the action area are those that support foraging, such as adequate prey resources and available foraging habitat (58 FR 45269). While Steller sea lions do rest in aquatic habitat, there was insufficient information available at the time critical habitat was designated to include aquatic resting sites as part of the critical habitat designation (58 FR 45269).



Figure 9. Map identifying designated critical habitat for the endangered Western distinct population segment of Steller sea lion in Alaska

In 2012, NMFS revised designated critical habitat for the leatherback turtle by designating additional areas within the Pacific Ocean. This designation includes approximately 43,798 square km (12,769.4 square nmi) stretching along the California coast from Point Arena to Point Arguello east of the 3,000 meter (9,842.4 feet) depth contour; and 64,760 square km (18,880.9 square nmi) stretching from Cape Flattery, Washington to Cape Blanco, Oregon east of the 2,000 m (6,561.7 ft) depth contour. The designated areas comprise approximately 108,558 square km (31,650.4 square nmi) of marine habitat and include waters from the ocean surface down to a maximum depth of 80 m (262 ft) (Figure 11).

NMFS has identified 1 PBF for the conservation of leatherback turtles in marine waters off the U.S. West Coast that includes the occurrence of prey species, primarily scyphomedusae (i.e., jellyfish) of the order Semaeostomeae (e.g., *Chrysaora*, *Aurelia*, *Phacellophora*, and *Cyanea*), of sufficient condition, distribution, diversity, abundance, and density necessary to support individual as well as population growth, reproduction, and development of leatherback turtles (77 FR 4170).

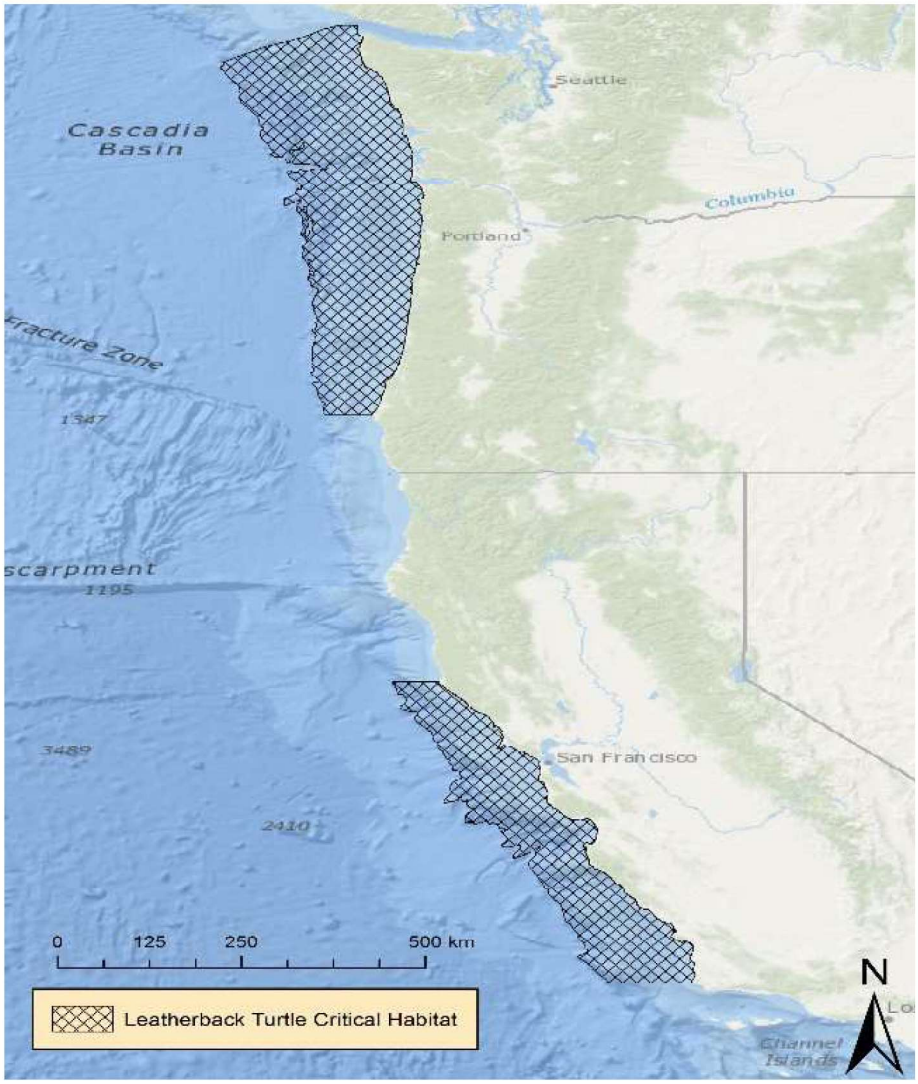


Figure 10. Map identifying designated critical habitat for the endangered leatherback turtle along the United States Pacific Coast

In 2014, NMFS and the U.S. Fish and Wildlife Service designated critical habitat for the Northwest Atlantic Ocean DPS of loggerhead turtle along the U.S. Atlantic and Gulf of Mexico coasts, from North Carolina to Mississippi (79 FR 39856) (Figure 12). The final rule designated five different units of critical habitat, each supporting an essential biological function of loggerhead turtles. These units include nearshore reproductive habitat, winter area, *Sargassum*,

breeding areas, and migratory corridors. In total, the critical habitat is composed of 38 occupied marine areas and 1,102.4 km (685 miles) of nesting beaches.

NMFS has identified PBFs for the conservation of loggerhead turtles in nearshore reproductive, winter, breeding, migratory, and *Sargassum* habitats (Table 2).

Table 2. Physical and biological features for loggerhead turtle designated critical habitat units

Loggerhead Turtle Designated Critical Habitat Unit	Physical or Biological Features
Nearshore Reproductive Habitat	1. Nearshore waters directly off the highest density nesting beaches and their adjacent beaches as identified in 50 C.F.R. 17.95(c) to 1.6 km (0.9 nmi) offshore. 2. Waters sufficiently free of obstructions or artificial lighting to allow transit through the surf zone and outward toward open water. 3. Waters with minimal manmade structures that could promote predators (i.e., nearshore predator concentration caused by submerged and emergent offshore structures), disrupt wave patterns necessary for orientation, and/or create excessive longshore currents.
Winter Habitat	1. Water temperatures above 10° Celsius from November through April. 2. Continental shelf waters in proximity to the western boundary of the Gulf Stream. 3. Water depths between 20 and 100 m (65.6 to 328.1 ft).
Breeding Habitat	1. High densities of reproductive male and female loggerheads. 2. Proximity to primary Florida migratory corridor. 3. Proximity to Florida nesting grounds.
Migratory Habitat	1. Constricted continental shelf area relative to nearby continental shelf waters but concentrate migratory pathways. 2. Passage conditions to allow for migration to and from nesting, breeding, and/or foraging areas.
Sargassum Habitat	1. Convergence zones, surface-water downwelling areas, the margins of major boundary currents (Gulf Stream), and other locations where there are concentrated components of the *Sargassum* community in water

Loggerhead Turtle Designated Critical Habitat Unit	Physical or Biological Features
	temperatures suitable for the optimal growth of *Sargassum* and inhabitance of loggerhead turtles. 2. *Sargassum* in concentrations that support adequate prey abundance and cover. 3. Available prey and other material associated with *Sargassum* habitat including, but not limited to, plants and cyanobacteria and animals native to the *Sargassum* community such as hydroids and copepods. 4. Sufficient water depth and proximity to available currents to ensure offshore transport (out of the surf zone), and foraging and cover requirements by *Sargassum* for post-hatchling loggerhead turtles, i.e., greater than 10 m (32.8 ft) depth.

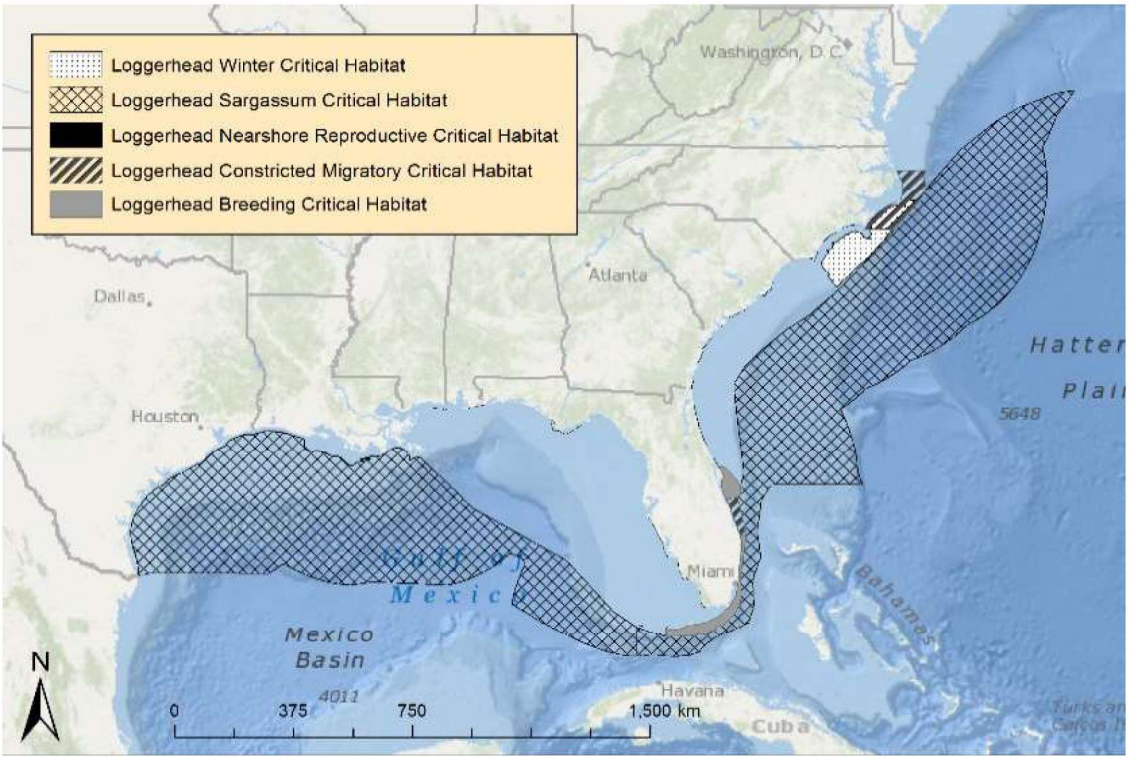


Figure 11. Map identifying designated critical habitat for the threatened Northwest Atlantic Ocean distinct population segment of loggerhead turtle

Programmatic Consultation

Details regarding the programmatic consultation including project specific reviews, annual review, and reporting stranded, injured, or dead animals were discussed in the 2021 letter of concurrence and will not be discussed further in this consultation.

Effects of the Action on Endangered Species Act-listed Species and Designated Critical Habitat

Under the ESA, "effects of the action" means "all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action" (see 50 C.F.R. §402.2).

The applicable standard to find that a proposed action is not likely to adversely affect ESA-listed species or designated critical habitat is that all of the effects of the action are expected to be discountable, insignificant, or wholly beneficial. Beneficial effects have an immediate positive effect without any adverse effects to the species or habitat. Insignificant effects relate to the size or severity of the impact and include those effects that are undetectable, not measurable, or so minor that they cannot be meaningfully evaluated. Insignificant is the appropriate effect conclusion when plausible effects are going to happen, but will not rise to the level of constituting an adverse effect. For an effect to be discountable, there must be a plausible adverse effect (i.e., a credible effect that could result from the action that would be an adverse effect if it did affect an ESA-listed species), but it is very unlikely to occur.

Overall, the stressors associated with the proposed action have the potential to affect ESA-listed species and designated critical habitat for ESA-listed species in the action area, depending on where JFC activities occur each year. Stressors are any physical, chemical, or biological agent, environmental condition, external stimulus, or event that may induce an adverse response in either an ESA-listed species or its designated critical habitat. The stressors associated with the proposed action include elevated sound pressure levels from the vehicle launch, sonic booms, and component splashdown, dispersion of vehicle components that may result in direct contact, ingestion, hazardous materials, and vessel transit and strikes. The stressors of vessel noise as well as in-air noise and presence from UAS associated with the proposed action were not discussed in the 2021 letter of concurrence.

Vessel Noise

The ESA-listed marine mammals, sea turtles, and fish (Table 1) may be affected by exposure to a range of vessel noises within their hearing abilities. The vessels used for support of JFC activities (e.g., store, deploy, and recover sensors, recover marine debris, etc.) will produce low-frequency,

broadband underwater sound, although the exact frequency and sound level produced varies by vessel type.

Depending on the context of exposure, responses of marine mammals and sea turtles in the action area to vessel noise will include startle response, avoidance, or other behavioral reactions, physiological stress responses, or no measurable response. Marine mammals are either not likely to respond to vessel noise or are not likely to measurably respond in ways that will significantly disrupt normal behavioral patterns that include, but are not limited to, breeding, feeding, or sheltering. Additionally, the effects of any temporary masking specifically from vessels are expected to be of a short duration and not result in meaningful changes to an animal's ability to communicate or detect biologically relevant cues given the background noise levels in the action area independent of vessels and the small percentage of vessel traffic these vessels represent in the action area. Therefore, the effects of vessel noise on marine mammals are considered insignificant.

Limited information is available on how or if sea turtles respond to noise from vessels. Sea turtles are most likely to habituate and are shown to be less affected by vessel noise at distances greater than 10 m (32.8 ft) (Hazel et al. 2007). Hazel et al. (2007) suggested that sea turtles may rely more on visual than auditory cues when reacting to approaching vessels. Additionally, there is evidence that reptiles may rely primarily on senses other than hearing, such as vision (Narazaki et al. 2013) and magnetic orientation (Avens and Lohmann 2003; Putman et al. 2015), for interacting with their environment. This suggests that if sea turtles were to respond to a vessel, the animal might not respond to the vessel based on noise alone. Popper et al. (2014a) noted that available information on the effects of vessel noise or other continuous sounds on sea turtles is lacking. The only potential effect Popper et al. (2014a) suggested could occur from vessel noise was a behavioral response or masking, with a higher likelihood of a behavioral response occurring the closer the sea turtle is to the vessel.

Compared to marine mammals that are highly adapted to use sound in the marine environment, sea turtles are less dependent on sound and their hearing is more limited in range to very low frequencies. Any masking of biologically important sounds for sea turtles will be temporary, occurring only when a vessel and sea turtle are in close proximity to one another. The short, temporary exposure, will not have any measurable effect on an animal's fitness.

If a sea turtle responded behaviorally to noise from a vessel, most responses will consist of slow movements away from vessels the animals perceive are on an approaching course, perhaps accompanied by slightly longer dives. Changes in behavior will likely consist of a temporary shift from behavioral states that have low energy requirements (resting or milling) to behavioral states with higher energy requirements (foraging, active swimming or traveling) and then returning to the resting or milling behavior shortly thereafter. Any behavioral responses to vessel noise are expected to be temporary (e.g., startle response, brief avoidance behavior). We expect

individual sea turtles that exhibit a temporary behavioral response will return to baseline behavior immediately following exposure to the vessel noise.

For these reasons, vessel noise is expected to cause minimal disturbance to sea turtles. If a sea turtle detects a vessel and avoids it, or has a temporary stress response, from the noise disturbance, these responses are expected to be temporary and only endured while the vessel transits through the action are where the sea turtle encountered it. Sea turtle responses to vessel noise disturbance are extremely minor, and a sea turtle will be expected to return to normal behaviors and baseline stress levels shortly after the vessel passes. Therefore, the effects of vessel noise on sea turtles are considered insignificant.

Fish can detect vessel noise due to their hearing capabilities at low frequency levels. In general, information regarding the effects of vessel noise on fish hearing and behaviors is limited. Although some temporary threshold shift (TTS) has been observed in fishes exposed to elevated background noise and other white noise, a continuous sound source similar to noise produced from vessels. For example, caged studies on sound pressure sensitive fishes show some TTS after several days or weeks of exposure to increased background sounds, although the hearing loss appeared to recover (e.g., Scholik and Yan 2002; Smith et al. 2006; Smith et al. 2004). Smith et al (2004) and Smith et al. (2006) exposed goldfish (a fish with hearing specializations) to noise with a sound pressure level of 170 decibels referenced to one microPascal root mean square (dB re: 1 µPa [rms]) and found a clear relationship between the amount of TTS and duration of exposure, until maximum hearing loss occurred at about 24 hours of exposure. A short duration (e.g., 10 minute) exposure resulted in 5 dB of TTS, whereas a 3 week exposure resulted in a 28 dB TTS that took over 2 weeks to return to pre-exposure baseline levels (Smith et al. 2004). Recovery times were not measures by researchers for shorter exposure durations, so recovery time for lower levels of TTS were not documented.

Vessel noise may also affect fish behavior by causing them to startle, swim away from an occupied area, change swimming direction and speed, or alter schooling behavior (Engas et al. 1998; Engas et al. 1995; Mitson and Knudsen 2003). Physiological responses have also been documented for fish exposed to increased vessel noise. Nichols et al (2015) demonstrated physiological effects to increased noise (playback of vessel noise) on coastal giant kelpfish (*Heterostichus rostratus*). The fish exhibited stress responses when exposed to intermittent noise, but not to continuous noise. These results indicate variability in the acoustic environment may be more important than the period of noise exposure for inducing stress in fishes. However, other studies have also shown exposure to continuous or chronic vessel noise may elicit stress responses indicated by increased cortisol levels (Scholik and Yan 2001; Wysocki et al. 2006). These experiments demonstrate physiological and behavioral responses to various vessel noises and can affect species' fitness and survival, but may also be influenced by the context and duration of exposure. It is important to noise that most of these exposures were continuous, not intermittent, and the fish were unable to avoid the sound source for the duration of the experiment because this was a controlled study. In contrast, wild fish are not hindered from

movement away from an irritating sound source, if detected, they are less likely to be subjected to accumulation periods that lead to the onset of hearing damage as indicated in these studies. In other cases, fish may eventually become habituated to the changes in their soundscape and adjust to the ambient and background noises.

Because of the characteristics of vessel noise, sound produced from vessels is unlikely to result in direct injury, hearing impairment, or other trauma to fishes. Plus, in the near field, fish are able to detect water motion as well as visually locate an oncoming vessel. In these cases, most fishes located in close proximity that detect the vessel either visually, via sound and motion in the water will be capable of avoiding the vessel or move away from the area affected by vessel noise. Thus, fish are more likely to react to vessel noise at close range than to vessel noise emanating from a greater distance away. These reactions may include physiological stress responses, or avoidance behaviors. Auditory masking due to vessel noise can potentially mask vocalizations and other biologically important sounds that fish may rely on. Vessel noise will be intermittent, temporary and localized, and such responses are not expected to compromise the general health or condition of individual fish from continuous exposures. The only impacts expected from exposure to vessel noise for fish may include temporary auditory masking, physiological stress, or minor changes in behavior. Therefore, the effects of vessel noise on fish are considered insignificant.

Thus, we find that the effects of vessel noise on ESA-listed marine mammals, sea turtles, and fish (Table 1) within the action area are insignificant.

In-Air Noise and Presence of Uncrewed Aerial or Aircraft Systems

The ESA-listed marine mammals, sea turtles, and fish (Table 1) may be exposed to in-air noise and presence of UAS. In most instances, exposure of a marine mammal, sea turtle, and fish to in-air noise and presence (e.g., shadow) of UAS would last for only seconds as the UAS quickly passes overhead. Animals would have to be at or near the water surface at the time of an overflight to be exposed to appreciable sound levels.

Laute et al. (2023) recorded underwater sound levels of three UAS models at varying altitudes and horizontal distances. The median broadband received levels ranged from 85.9 to 96.5 dB re: 1 μPa^2 (rms). Received sound levels of the UAS decreased with increasing horizontal distance (rather than altitude) and ambient sound levels of the UAS occurred at higher altitudes than expected (82.7 dB re: 1 μPa^2 [rms]).

Given the transitory and dispersed nature of UAS overflights as well as extremely short duration (seconds to minutes) of this stressor, it is extremely unlikely that ESA-listed marine mammals, sea turtles, and fish will co-occur in space and time with UAS in-air noise and that in-water effects will occur. Any exposures to in-air noise from UAS that may occur close to the water surface will be short-term and infrequent, resulting in either no measurable response or a brief, inconsequential behavioral response such as lifting of the head or orienting upward toward the

UAS. Repeated exposure to individuals over a short period of time is also extremely unlikely. Furthermore, the sound exposure level will be extremely low for ESA-listed marine mammals, sea turtles, and fish that spend the majority of their time underwater and may not even detect the UAS depending on where they are at in the water column at the time of the overflight.

For these reasons, marine mammals are either not likely to respond to in-air noise or are not likely to measurably respond in ways that will significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering. Due to the short-term and infrequent nature of any exposures, and the brief and inconsequential behavioral responses of animals that can follow such exposure, the effects of in-air noise and presence of UAS on marine mammals is considered insignificant.

Based on sea turtle sensory biology (Ketten and Bartol 2006; Lenhardt et al. 1994; Ridgway et al. 1969), sound from low flying aircraft can be heard by a sea turtle at or near the water surface. Sea turtles might also detect low flying UAS via visual cues such as the shadow. This suggests that sea turtles might not respond to UAS overflights based on noise alone.

Little information is available on how sea turtles respond to aircraft. The working group that developed the 2014 American National Standards Institute Guidelines for fish and sea turtles (Popper et al. 2014a) did not consider this acoustic stressor for sea turtles, in part because it is not considered to pose a great risk. We assume sea turtles in the action area may exhibit similar short-term behavioral responses (e.g., diving, changes in swimming direction, etc.) consistent with those behavioral observed during aerial surveys for research of sea turtles. We are unaware of any data on the physiological responses sea turtles exhibit to aircraft, but we conservatively assume a low-level, short-term stress response is possible. There could also be temporary masking of biologically relevant cues that generate longer duration of sound exposure with a hovering UAS. However, in general UAS overflight is brief, and does not persist in the action area for significant periods of time, not is the sound expected to be transmitted well into the water column. Thus, the risk of masking any biologically relevant sound to sea turtles is considered very low. A sea turtle can leave the area where noise disturbance persists, and thereby avoid continued disturbance. Any startle reactions that occur are expected to be brief, with sea turtles resuming normal behaviors once the UAS is no longer detectable or leaves the area. Due to the short-term nature of any exposures to UAS and the brief responses expected to the noise or visual disturbance produced, the effects of UAS overflight noise on sea turtle are considered temporary and minor. Therefore, the effects from in-air noise and presence of UAS on sea turtles are considered insignificant.

Little information is available on how fish respond to aircraft. If in-air sound transmits from UAS travel into the water column, it will likely only penetrate shallow depths and will be below the range of any injury criteria for fishes. Sound transmission into deep depths of the water column is not likely, and sound that is transferred into the water from air is only within a narrow cone under the UAS. Therefore, only fish located at or near the water surface and within the

limited area where transmission of UAS in-air noise is expected to occur have the potential to detect in-air noise produced from low-flying UAS. Due to the brief and dispersed nature of UAS overflights, masking of biologically relevant sounds for fish is extremely unlikely. In the rare circumstance a fish detects sounds produced from UAS overhead, only very brief startle or avoidance responses are expected. Additionally, due to the short-term, transient nature of in-air noise from UAS, fish are unlikely to be exposed multiple times within a short period of time that can lead to ongoing behavioral disruptions or stress. Any physiological stress and behavioral reactions will be short-term (seconds or minutes) and are expected to return to normal shortly after the disturbance from UAS ceases. Therefore, the effects from in-air noise and presence of UAS on fish are considered insignificant.

Thus, we find that the effects of in-air noise and presence of UAS on ESA-listed marine mammals, sea turtles, and fish (Table 1) within the action area are insignificant.

Effects to Endangered Species Act-listed Species

Details regarding the effects of the stressors of elevated sound pressure levels from the vehicle launch, sonic booms, and component splashdown, dispersion of vehicle components that may result in direct contact, ingestion, hazardous materials, and vessel transit and strikes on ESA-listed marine mammals, sea turtles, and fish in the action area were discussed in the 2021 letter of concurrence and will not be discussed further in this consultation. The effects of these stressors (i.e., elevated sound pressure levels from the vehicle launch, sonic booms, and component splashdown, dispersion of vehicle components that may result in direct contact, ingestion, hazardous materials, and vessel transit and strikes) on the Western DPS of Steller sea lion, Lower Columbia River ESU of Chinook salmon, Puget Sound ESU of Chinook salmon, Snake River Fall-Run ESU of Chinook salmon, Snake River Spring/Summer-Run ESU of Chinook salmon, Upper Columbia River Spring-Run ESU of Chinook salmon, Upper Willamette River ESU of Chinook salmon, Hood Canal Summer-Run ESU of chum salmon, Lower Columbia River ESU of Coho salmon, and Snake River ESU of sockeye salmon are expected be the same or similar as for other ESA-listed marine mammals, sea turtles, and fish considered in the 2021 letter of concurrence. We base this conclusion on the same or similar hearing capabilities, life history characteristics, and habitat uses.

Western DPS of Steller sea lions may be present within the Pacific Spaceport Complex Alaska stage 1 booster drop zone and are likely to have very low densities, patchy distributions, and seasonal occurrence in the action area. The ESUs of Chinook, chum, Coho, and sockeye salmon may be present within the Pacific Spaceport Complex Alaska stage 1 booster drop zone during the marine phase of their life cycle, but are considered rare and likely in very low densities in this portion of the action area. It is difficult to accurately estimate the number of individuals that can be exposed to potential stressors at a specified location and time in the offshore environment because fish distribution is influenced by a number of environmental factors and vertical distribution. As described in the 2021 letter of concurrence, we concluded the effects of elevated

sound pressure levels from vehicle launch, sonic booms, dispersion of vehicle components that may result in direct contact, ingestion, hazardous materials, and vessel transit and strikes on ESA-listed marine mammals, sea turtles, and fish within the action area are insignificant and/or discountable. The effects analysis of these stressors included ESA-listed pinniped and fish species that have similar hearing capabilities, life history characteristics, and habitat uses. We also conclude the effects of vessel noise as well as in-air noise and presence of UAS on ESA-listed marine mammals, sea turtles, and fish within the action area are insignificant and/or discountable and is discussed above in this consultation.

Effects to Designated Critical Habitat

Details regarding the effects of the stressors (elevated sound pressure levels from vehicle launch, sonic booms, dispersion of vehicle components that may result in direct contact, ingestion, hazardous materials, vessel transit and strikes) on designated critical habitat for Central America DPS of humpback whales, Mexico DPS of humpback whales, leatherback turtles, and Northwest Atlantic Ocean DPS of loggerhead turtles in the action area were discussed in the 2021 letter of concurrence and will not be discussed further in this consultation. The effects of these stressors are expected be the same or similar for the designated critical habitat for Main Hawaiian Islands insular DPS of false killer whales, Western North Pacific DPS of humpback whales, Hawaiian monk seals, and Western DPS of Steller sea lions that are in the expanded action area considered in this reinitiation. We base this conclusion on the same or similar PBFs of designated critical habitat for ESA-listed marine mammals and sea turtles.

The effects of the stressors of vessel noise, as well as in-air noise and presence of UAS on designated critical habitat for Main Hawaiian Islands insular DPS of false killer whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, Hawaiian monk seals, Western DPS of Steller sea lions, leatherback turtles, and Northwest Atlantic Ocean DPS of loggerhead turtles will likely have very minor effects (i.e., nearly undetectable or so minor that it cannot be meaningfully evaluated) on the PBFs (e.g., space for movement, prey species, sound levels for use or occupancy, foraging habitat, etc.). The stressors of vessel noise and in-air noise of UAS are temporary and transitory, and are considered insignificant (no lasting or appreciable impact) for space for movement and sound levels for use or occupancy. The stressors of vessel noise and in-air noise and presence of UAS are not likely to adversely affect prey items such as jellyfish, crustaceans (e.g., euphausiids), and fish as well as foraging habitat. In general, very little is known about sound detection and the use of sound by marine invertebrates (Budelmann 2010). Marine invertebrates, including jellyfish, probably do not detect pressure since they are the same density as water and they lack air cavities that will function like the fish swim bladder in responding to pressure (Budelmann 2010). Because any acoustic sensory capabilities, if present at all, are limited to detecting water motion, and water article motion near a sound source falls off rapidly with distance, marine invertebrates are probably limited to detecting nearby sound sources rather than sound caused by pressure waves from distant sound sources (Navy 2019a). Impacts of vessel

noise on prey species such as copepods is less known, but some studies have shown a reduction in egg production and size with exposure to vessel noise (Aspirault 2019). Additionally, important zooplankton predator (*Chaoborus flavicans*) increased anti-predatory defense behavior when exposed to short-term vessel noise (Rojas et al. 2021). These works highlight that noise can affect both fitness and behavior or zooplankton species; however, the results from these studies are contrasted by other research showing a lack of response in zooplankton from chronic noise (Prosnier et al. 2022; Sabet et al. 2019). If prey items are killed within designated critical habitat, it is likely that only a low number of individuals and therefore a small portion of prey species populations may be killed. This will result in a minimal change in the overall quantity or availability of prey items within the critical habitat as a while. Long-term consequences for prey populations and the effect on overall quantity, quality, and availability of prey items will be insignificant. We conclude the effects of vessel noise as well as in-air noise and presence from UAS on designated critical habitat within the action area are insignificant and/or discountable.

The flight path of the launch vehicle will be monitored and, if the launch vehicle deviates from its course or if other problems occur during flight, the onboard flight termination system will be activated to prevent debris from falling into any designated critical habitat. Critical habitat for the North Pacific right whale is present offshore Kodiak Island near the Pacific Spaceport Complex Alaska stage 1 booster drop zone. The Department of the Army has removed the designated critical habitat for North Pacific right whale from the Pacific Spaceport Complex Alaska stage 1 booster drop zone and no component will enter the water in this area. No aircraft or vessels associated with the JFC activities will operate in the designated critical habitat for the North Pacific right whale. Typical boundary vessels that enforce Notice to Mariners to clear the designated safety area of public vessels will operate offshore of Kodiak Island, but will not enter designated critical habitat for the North Pacific right whale. The Department of the Army does not intend to operate aircraft in the vicinity of Kodiak Island.

Critical habitat for Main Hawaiian Islands insular DPS of false killer whale is present within the Pacific Missile Range Facility stage 1 booster drop zone. Critical habitat for the Mexico DPS and Western North Pacific DPS of humpback whale is present within the Pacific Spaceport Complex Alaska stage 1 booster drop zone. Critical habitat for the Hawaiian monk seal is Hawaiian monk seal is present within the terrestrial areas and waters offshore of Kauai near the Pacific Missile Range Facility stage 1 booster drop zone. Critical habitat for the Western DPS of Steller lion is present within the Pacific Spaceport Complex Alaska stage 1 booster drop zone. Several known haul-out and rookery sites occur near the stage 1 booster drop zone near Kodiak Island. Critical habitat for the leatherback turtle is present within the JFC stage 1 booster drop zones. Critical habitat for the Northwest Atlantic Ocean DPS of loggerhead turtle is present within the Cape Canaveral Space Force Station stage 1 booster drop zone and Wallops Flight Facility stage 1 booster drop zone.

As described in the 2021 letter of concurrence, we concluded the effects of the stressors of elevated sound pressure levels from vehicle launch, sonic booms, dispersion of vehicle

components that may result in direct contact, ingestion, hazardous materials, and vessel transit and strikes on designated critical habitat within the action area are insignificant and/or discountable. These stressors are expected in the expanded action area in the Pacific Ocean. We also conclude the effects of vessel noise as well as in-air noise and presence of UAS on designated critical habitat within the action area are insignificant.

In conclusion, we find that the effects of the JFC activities (expanded action area and effects of vessel noise as well as in-air noise and presence of UAS) on the ESA-listed marine mammals, sea turtles, and fish as well as designated critical habitat in Table 1 are either insignificant and/or discountable. The addition and expansion of BOAs in the Pacific Ocean in the action area does not meaningfully change the calculated chances or expected likelihood of effects to ESA-listed marine mammals, sea turtles, and fish as well as designated critical habitat from the JFC activities considered in the original programmatic consultation and those added in this reinitiation. Therefore, these JFC activities may affect, but are not likely adversely affect any ESA-listed marine mammals, sea turtles, and fish or designated critical habitat in the new, expanded action area of the programmatic consultation.

Reporting

Since conclusion of consultation on October 14, 2021, 1 launch was conducted in 2022 and no launches were conducted in 2023. The first JFC activity launch was conducted in June 2022 from the Pacific Missile Range Facility (Kauai Test Facility) and experienced an anomaly during boosted flight. Spent booster and vehicle payload impacts occurred in the defined BOA. Two additional launches as part of JFC activities were planned from the Cape Canaveral Space Force Station, but were not conducted based on pre-flight vehicle checks and will be rescheduled. No recovery operations have been performed to date. During JFC activities, the Department of the Army has not observed any ESA-listed species under NMFS jurisdiction.

An annual review continues to be required, as described in the 2021 programmatic letter of concurrence. Information for the annual report should be submitted electronically to nmfs.hq.esa.consultations@noaa.gov with the subject line "Annual Review, OPR-2021-02470, Programmatic Concurrence for the Department of Defense Joint Flight Campaign Activities in the Atlantic and Pacific Oceans." We may share the annual reports with the appropriate NMFS regional offices for review and comment dependent on where JFC activities occur in a given year.

Additive Effects

We have concluded the JFC activities are not likely to adversely affect ESA-listed marine mammals, sea turtles, and fish (Table 1) or designated critical habitat for Main Hawaiian Islands insular DPS of false killer whales, Central America DPS, Mexico DPS, and Western North Pacific DPS of humpback whales, North Pacific right whales, Hawaiian monk seals, Western DPS of Steller sea lions, leatherback turtles, and Northwest Atlantic Ocean DPS of loggerhead

turtles. Programmatic consultations often involve actions that are expected to occur with some frequency over many years and possibly continue for an indefinite time span. As a result, we evaluate the potential for the effects of the stressors to ESA-listed species and designated critical habitat over the lifetime of the proposed action to result in additive effects due to chronic stress or cumulative effects. Therefore, we determine that, when considered additively, the JFC activities are not likely to adversely affect the ESA-listed species and designated critical habitat in the action area.

The Department of the Army proposes to conduct up to 6 flight test launches from up to 5 different launch locations per year, over a 10 year period that began in 2022. Test flights can occur at any time of the year. This is a relatively small number of annual activities, spread out over large expanses of open water in the Atlantic and Pacific Oceans, for a finite number of years. Each of the stressor categories (see Effects of the Action here and in the 2021 programmatic letter of concurrence) were determined to be extremely unlikely to occur and therefore be discountable, or to result in effects that are so small as to be insignificant. The possibility of extremely unlikely effects overlapping in time and space and having a cumulative effect does not seem plausible. Chronic stress from relatively infrequent activities occurring across vast areas also does not seem plausible. Therefore, additive effects occurring over the 10 years of JFC activities considered in the programmatic consultation are extremely unlikely to occur and thus discountable.

Conclusion

Based on this analysis, NMFS ESA Interagency Cooperation Division concurs with the Department of the Army that the changes to the proposed action may affect, but are not likely to adversely affect, the ESA-listed species and designated critical habitats in the revised action area.

Reinitiation of Consultation

Reinitiation of consultation is required and shall be requested by the Federal agency, where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and:

1. New information reveals effects of the action that may affect an ESA-listed species or designated critical habitat in a manner or to an extent not previously considered;
2. The identified action is subsequently modified in a manner that causes an effect to the ESA-listed species or designated critical habitat that was not considered in this concurrence letter; or
3. A new species is listed or critical habitat designated that may be affected by the identified action (50 C.F.R. §402.16).

Reinitiation is also required if take of an ESA-listed species occurs as a result of JFC activities.

Since the 2021 programmatic letter of concurrence was issued, ESA-listing has been proposed for sunflower sea star (*Pycnopodia helianthoides*) and critical habitat has been proposed for North Atlantic and Central North Pacific DPSs of green turtle in the action area of the programmatic consultation. Upon issuance of the final rules listing the species or designating critical habitat, the Department of the Army will need to reinitiate consultation if JFC activities may affect this species or these critical habitat units.

Please direct questions regarding this letter to Howard Goldstein, Consulting Biologist, at (301) 427-8417, or by email at howard.goldstein@noaa.gov, or me at (240) 723-6321, or by email at tanya.dobrzynski@noaa.gov.

Sincerely,

DOBRZYNSKI.TANYA.JANINE.1365846517 Digitally signed by DOBRZYNSKI.TANYA.JANINE.1365846517 Date: 2023.11.14 11:37:28 -05'00'

Tanya Dobrzynski
Chief, ESA Interagency Cooperation Division
Office of Protected Resources

Literature Cited

Alaska Aerospace Corporation. 2016. Application for a Five-Year Programmatic Permit for Small Takes of Marine Mammals Incidental to Launching of Space Launch Vehicles, Long Range Ballistic Target Missiles, and Smaller Missile Systems at Pacific Spaceport Complex Alaska, Kodiak Island, Alaska: 35.

Aspirault, A. 2019. Impact of boat soundon the feeding and growth behavior of planktonic species. Dissertation. University of Quebec at Rimouski.

Brown, Larry R, Peter B Moyle, and Ronald M Yoshiyama. 1994. Historical decline and current status of coho salmon in California. North American Journal of Fisheries Management 14(2):237-261.

Budelmann, B.U. 2010. Cephalopoda. R. Hubrecht, and J. Kirkwood, editors. The UFAW Handbook on the Care and Management of Laboratory and Other Research Animals, Eighth Edition. Wiley Blackwell, Oxford, UK.

Burgner, R.L. 1991. The life history of sockeye salmon (Oncorhynchus nerka). C. a. L. Margolis, editor. Life history of Pacific salmon. University of British Columbia Press, Vancouver, British Columbia, Canada.

Connor, William P, John G Sneva, Kenneth F Tiffan, R Kirk Steinhorst, and Doug Ross. 2005. Two alternative juvenile life history types for fall Chinook salmon in the Snake River basin. Transactions of the American Fisheries Society 134(2):291-304.

Engas, A., O. Misund, A. Soldal, B. Horvei, and A. Solstad. 1995. Reactions of Penned Herring and Cod to Playback of Original, Frequency-Filtered and Time-Smoothed Vessel Sound. Fisheries Research, 22: 243-254.

Engas, A., E. Haugland, and J. Ovredal. 1998. Reactions of Cod (*Gadus morhau*) in the Pre-Vessel Zone to an Approaching Trawler under Different Light Conditions. Hydrobiologia, 371/372: 199-206.

Healey, MC, C Groot, and L Margolis. 1991. Life history of chinook salmon (Oncorhynchus tshawytscha). Pacific salmon life histories:313-393.

Johnson, OW, and coauthors. 1997. Status review of chum salmon from Washington, Oregon, and California, Seattle, WA.

Laute, A., M. Glarou, F. Dodds, S.C. Gomez Rosand, T.J. Grove, A. Stoller, M.H. Rasmussen, and M.E.H. Fournet. 2023. Underwater sound of three unoccupied aerial vehicles at varying altitudes and horizontal distances. Journal of the Acoustical Society of America. 153(6): 3,419-3,427.

LCFRB. 2010. Washington Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan. Lower Columbia Fish Recovery Board, Washington. May 28, 2010.

MacFarlane, R Bruce, and Elizabeth C Norton. 2002. Physiological ecology of juvenile chinook salmon (Oncorhynchus tshawytscha) at the southern end of their distribution, the San Francisco Estuary and Gulf of the Farallones, California. Fishery Bulletin 100(2):244-257.

National Aeronautics and Space Administration. 2019. Final Wallops Flight Facility Site-wide Programmatic Environmental Impact Statement. May 2019: 980.

Navy. 2019a. Draft Supplemental Environmental Impact Statement/Overseas Environmental Impact Statement for Northwest Training and Testing. Naval Facilities Engineering Command, editor. Oak Harbor, WA.

Nichols, T., T. Anderson, and A. Sirovic. 2015. Intermittent noise induces physiological stress in a coastal marine fish. PLoS ONE, 10(9), e0139157.

Prosnier, L., E. Rojas, and V. Medoc. 2022. A freshwater zooplankton in the face to boat noise pollution. bioFxiv:2022.11.20.517267.

Rojas, E., S. Thevenin, G. MOntes, N. Boyer, and V. Medoc. 2021. From distraction to habituation: Ecological and behavioral responses of invasive fish to anthropogenic noise. Freshwater Biology 66(8): 1606-1618.

Sabet, S., S.A. Karnagh, and F.Z. Azbari. 2019. Experimental test of sound and light exposure on water flea swimming behavior. Proceedings of Meetings on Acoustics 37(1): 010015.

Salo, Ernest O. 1991. Life history of chum salmon (Oncorhynchus keta). Pages 231–309 in C. G. a. L. Margolis, editor. Pacific salmon life histories. University of British Columbia Press, Vancouver, B.C.

Scholik, A.R., and H.Y.Yan. 2001. Effects of underwater noise on auditory sensitivity of a cyprinid fish. Hearing Research 152(2-Jan): 17-24.

Scholik, A.R. and H.Y. Yan. 2002. The effects of noise on the auditory sensitivity of the bluegill sunfish, *Lepomis macrochirus*. Comparative Biochemistry and Physiology A Molecular and Integrative Physiology 133(1): 43-52.

Smith, M.E., A.S. Kane, and A.N. Popper. 2004. Noise-induced stress response and hearing loss in goldfish (*Carassius auratus*). Journal of Experimental Biology 207(3): 427-435.

Smith, M.E., A.B. Coffin, D.L. Miller, and A.N. Popper. 2006. Anatomical and functional recovery of the goldfish (*Carassius auratus*) ear following noise exposure. Journal of Experimental Biology 209(21): 4194-4202.

Wysocki, L.E., J.P. Dittami, and F. Ladich. 2006. Ship noise and cortisol secretion in European freshwater fishes. Biological Conservation 128(4): 501-508.

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF

August 29, 2023

Douglass Cooper
U.S. Fish and Wildlife Service
Southern Alaska Fish and Wildlife Field Office
4700 BLM Road
Anchorage, AK 995070

Re: Request for Initiation of Informal Consultation under Section 7 of the Endangered Species Act for Joint Flight Campaign activities offshore of Kodiak Island, Alaska

Dear Mr. Cooper:

The United States Army Space and Missile Defense Command (USASMDC) is assisting the Department of the Navy Strategic Systems Programs and the U.S. Army Rapid Capabilities and Critical Technologies Office, the Action Proponents, in evaluating the effects of proposed Joint Flight Campaign (JFC) supplemental activities. The Action Proponents have determined that JFC supplemental activities, specifically flight test activities offshore of Kodiak Island, may affect but are not likely to adversely affect Endangered Species Act (ESA) listed species under the jurisdiction of your office and request consultation under Section 7 of the ESA.

The JFC action involves up to six flight test launches per year, over the next 10 years, from multiple launch locations. After launch, tests would include vehicle flight over the Pacific and/or Atlantic Oceans and would involve splashdown of spent boosters as well as payload impact in Pacific and Atlantic broad ocean areas (BOAs). In 2022, the Action Proponents completed an Environmental Assessment (EA)/Overseas Environmental Assessment (OEA) for the JFC action to meet requirements of the National Environmental Policy Act. This document evaluated the potential effects of flight tests launching from four installations: (1) Sandia National Laboratory's Kaua'i Test Facility at Pacific Missile Range Facility (PMRF), Kaua'i, Hawai'i; (2) Vandenberg Space Force Base, California; (3) Wallops Flight Facility, Virginia; and (4) Cape Canaveral Space Force Station, Florida. These documents also evaluated the effects of flight test activities in Pacific and Atlantic BOAs. Based on these evaluations, the Action Proponents determined that for all ESA listed species and designated critical habitat under the jurisdiction of the U.S. Fish and Wildlife Service, JFC activities would either have no effect on species and habitats or were covered under existing biological opinions for host launch installations/facilities (details in the enclosed Biological Evaluation).

Since completion of the JFC EA/OEA, the Action Proponents have determined that additional launch capabilities from PMRF's Terminal High Altitude Area Defense (THAAD) launch pad and from the Pacific Spaceport Complex Alaska on Kodiak Island, as well as an expansion of the Pacific BOA, are required to meet the purpose and need of the JFC action. Based on analyses of the potential effects, the Action Proponents have determined that these proposed JFC

supplemental activities may affect ESA-listed species and designated critical habitats in a way not considered previously. Therefore, the Action Proponents have prepared a Biological Evaluation to evaluate the effects of proposed JFC supplemental activities on terrestrial species, seabirds, and northern sea otters (*Enhydra lutris kenyoni*) listed under the ESA and on designated critical habitat to support consultation with the Pacific Islands Fish and Wildlife Office and the Alaska Fish and Wildlife Office.

As described in the enclosed JFC supplemental activities Biological Evaluation, for all species and designated critical habitats under the jurisdiction of your office, the Action Proponents have determined that the Proposed Action may affect but is not likely to adversely affect the species and habitats considered in the Biological Evaluation. The effects of the Proposed Action would be insignificant or discountable for short-tailed albatross (*Phoebastria albatrus*), the Alaska Breeding distinct population segment (DPS) of Steller's eiders (*Polysticta stelleri*), and the Southwest DPS of northern sea otters (*Enhydra lutris kenyoni*). The Action Proponents have concluded that the Proposed Action would have no effect on designated critical habitat for the Southwest DPS of northern sea otters.

Our supporting analysis is provided in the enclosed Biological Evaluation. We request initiation of informal consultation under Section 7 of the ESA and request your written concurrence if you agree with our determinations.

We also plan to consult with the Pacific Islands Fish and Wildlife Office on the potential effects of JFC supplemental launch activities from the PMRF THAAD launch site in Hawai'i on Hawaiian ducks (*Anas wyvilliana*), nēnē (*Branta sandvicensis*), Hawaiian coots (*Fulica alai*), Hawaiian gallinule (*Gallinula galeata sandvicensis*), Hawaiian stilts (*Himantopus mexicanus knudseni*), the Central North Pacific DPS of green sea turtles (*Chelonia mydas*), Hawaiian hoary bats (*Lasiurus cinereus semotus*), and designated critical habitat for *Panicum niihauense*.

Please contact David Fuller in my office, USASMDC Environmental Division, regarding this consultation request at 256-955-5585 or david.g.fuller6.civ@army.mil.

Sincerely,

HILL.WELDON.H.JR.1216862682 Digitally signed by HILL.WELDON.H.JR.1216862682
Date: 2023.08.28 09:25:27 -05'00'

Weldon H. Hill, Jr.
Deputy Chief of Staff, Engineer
U.S. Army Space and Missile Defense Command

Enclosure: Terrestrial Biological Evaluation for Joint Flight Campaign Supplemental Activities

United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE
Southern Alaska Fish and Wildlife Field Office
4700 BLM Road
Anchorage, Alaska 99507

In Reply Refer to:
FWS/R7/SAFWFO

Weldon H. Hill, Jr.
U.S. Army Space and Missile Defense Command
5300 Martin Road SW
Redstone Arsenal, Alabama 35898

Subject: Informal Section 7 Consultation on Proposed Joint Flight Campaign Supplemental Activities (Consultation Number 2024-0004518)

Dear Weldon H. Hill, Jr.:

Thank you for requesting consultation with the U.S. Fish and Wildlife Service (Service) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq., as amended; ESA). The United States Army Space and Missile Defense Command is requesting informal consultation regarding the effects of proposed Joint Flight Campaign (JFC) supplemental activities on behalf of the U.S. Army Rapid Capabilities and Critical Technologies Office (Action Proponents). The JFC action includes test flight activities at six launch facilities, including the Pacific Spaceport Complex Alaska (PSCA), in Kodiak Alaska. You have determined the proposed actions may affect but are not likely to adversely affect short-tailed albatross (*Phoebastria albatrus*), the Southwest Alaska Distinct Population Segment (DPS) of northern sea otter (*Enhydra lutris kenyoni*), and Steller's eider (*Polysticta stelleri*). You have determined activities will have no effect on designated critical habitat, therefore critical habitat will not be discussed further in this letter.

Your request and our response pertain only to the potential effects of test flight activities at PSCA on species within the purview of the Service's Alaska Region. You have additionally requested consultation with the Pacific Islands Fish and Wildlife Office for activities occurring within the purview of the Service's Pacific Region.

Project Description and Consultation History

Action Description

The proposed action would include a subset of up to six test flights per year over the following 10 years to test various components of the JFC system's capacities. The considered flight vehicle is an all-up-round missile, which consists of a two-stage booster system and a payload. Each test flight action would consist of pre-launch operations, vehicle launch, vehicle flight, payload flight, and payload impact into the BOA. In each test flight, the first-stage motor would burn out and liftoff from a previously existing launch facility. The first-stage motor and inter-stage assembly would then be jettisoned and splash down into the stage 1 booster drop zone. Splashdown of the second-stage motor, payload adaptor, and payload would occur in an open ocean area referred to as the stage 2 booster drop and payload impact zones. In each of the proposed splashdown zones, the relative

component is expected to impact into deep open ocean areas. Test components are expected to sink after impact and visible debris following impact will be recovered and removed via recovery vessels.

Action Area
The proposed action would include ground preparation, launch activities, and test flights over the Pacific Broad Ocean Area (BOA). The Action Proponents completed an Environmental Assessment and Overseas Environmental Assessment in 2022 for the initial JFC Action which included test flights originating from the Pacific Missile Range Facility, Vandenberg Space Force Base, Cape Canaveral Space Force Station, and Wallops Flight Facility. The Action Proponents have expanded the scope of the action to meet the purpose and need of the JFC program, including the inclusion of test flights from PSCA. The proposed JFC supplemental activities may result in up to six test flights per year for 10 years from any included facilities. As proposed activities could take place from each of the included facilities, the effects are considered here as if all 6 annual test flights (60 flights in total) take place from PSCA.

In 2012 the Federal Aviation Administration (FAA) consulted with the Service regarding potential effects of programmatic launch activities from PSCA on threatened and endangered species and critical habitats within Service purview. Under this consultation, FAA made a no effects determination regarding impacts to Steller's eider, short-tailed albatross, the Southwest Alaska DPS of northern sea otters, and designated critical habitat for northern sea otter. In 2016, FAA upheld this determination as it pertained to the addition of small-lift and medium-lift rockets at PSCA. Joint Flight Campaign Action Proponents have determined that the potential effects of JFC launch activities at PSCA are encompassed by the 2012 findings, and no further consultation was requested regarding launch activities.

The Action Proponents have additionally made a no effects determination for all activities potentially impacting threatened and endangered species or designated critical habitat in the broader Pacific BOA and in the stage 2 booster drop zone. Therefore, this consultation pertains solely to determinations made regarding impacts potentially incurred through actions taking place within the stage 1 booster drop-zone of PSCA.

Status of the Species
Steller's Eider
The range of Steller's eider overlaps with the proposed stage 1 booster drop zone and the species can be expected to occur within the project vicinity seasonally. The Alaska-breeding population of Steller's eider was listed as threatened in 1997 due to concerns over declines inferred by reduced nesting range (USFWS 2019). Individuals migrate annually from tundra nesting grounds to wintering habitat in the Pacific, including the Kodiak Archipelago (Peterson 1980, Larned 1995, Rosenberg et al. 2014).

The proposed action has the potential to adversely impact Steller's eider through risk of direct collision with vehicle components, injury and harassment caused by noise, and the introduction of hazardous materials into the marine environment. Protected Alaska-Breeding Steller's eider are likely to occur within the project vicinity during winter months as they mix with Russian-Breeding populations to forage and undergo a full flightless molt, which may last up to 1 month (Peterson 1980, Martin *et al.* 2015). Pacific-wintering Steller's eiders primarily occur over shallow eelgrass

(*Zostera marina*) beds that are less than 10 meters (33 feet) deep and within 400 meters (1,312 feet) of shore and are therefore not likely to occur frequently in most of the stage-one booster drop zone (Peterson 1980, Larned 1995). Accordingly, direct contact with vehicle components and harm caused by hazardous materials is not expected. Based on noise modeling efforts by the action proponents, injury due to sound pressures are unlikely as individuals of the species are not expected to occur frequently within the area where elevated noise levels would exceed injury thresholds.

Short-tailed Albatross

The range of short-tailed albatross overlaps with the proposed stage 1 booster drop zone, and individuals of the species can be expected to occur within the project vicinity year-round. Short-tailed albatross were listed as endangered in 2000 (USFWS 2020). During breeding season, the species nests on remote islands, primarily in the western Pacific Ocean (USFWS 2020). During non-breeding season short-tailed albatross forage over deep water canyons in the Bering Sea, Aleutian Islands, and other waters, including offshore of the Kodiak Archipelago (Suryan et al. 2006, Suryan and Fischer 2010, O'Connor 2013, USFWS 2020). Adult short-tailed albatross are most likely to occur in the action area during the non-breeding season, as the majority migrate to offshore islands during the breeding season (USFWS 2020), however, up to 25 percent of adults during breeding season may remain in their non-breeding distribution each year (USFWS 1999). Juvenile short-tailed albatross are more likely to disperse broadly through the pacific BOA and have been observed in the offshore waters of the Kodiak Archipelago (O'Connor 2013, Orben et al. 2018).

The proposed action has the potential to adversely impact short-tailed albatross through direct contact with vehicle components, injury and harassment caused by elevated noise levels, and through the introduction of hazardous materials into the marine environment. Within the stage 1 booster zone, individuals of the species are most likely to occur along the continental shelf break. However, short-tailed albatross are not expected to occur in high densities in any portion of the proposed stage 1 drop zone at any point throughout the duration of the proposed action. With consideration for the relatively small spatial extent which would be subject to impact during component splashdown, direct contact with vehicle components is unlikely. Similarly, effects of introduced hazardous materials are expected to be discountable and injury due to increased sound pressure is unlikely. Behavioral responses due to elevated noise levels may occur, however these responses are likely to be short term and are not expected to substantially reduce fitness.

Northern Sea Otter

The range of the protected Southwest Alaska DPS of northern sea otter overlaps with the stage 1 booster drop zone, and the species is likely to occur within the project vicinity. The Southwest Alaska DPS of northern sea otter was listed threatened under the ESA in 2005 (USFWS 2021). Northern sea otters occur in bays and protected areas throughout the Kodiak Archipelago (Cobb 2018, USFWS 2021, Wilson et al. 2021).

Northern sea otters have the potential to be adversely affected by direct contact with vehicle components, through harassment due to elevated noise levels, and through the introduction of hazardous materials into the marine environment. While recent surveys estimated high densities of northern sea otter along the Kodiak Archipelago (13,274 individuals estimated in 2018), the majority of northern sea otter communities occur in the northern nearshore areas of Kodiak Island (Cobb 2018). While it is not yet clear why northern sea otters occur infrequently on the northern side of the

island, and increased dispersal to these habitat areas may occur in the future, the relatively sparse distribution of northern sea otters in the western portion of Kodiak renders the likelihood of occurrence within the project vicinity minimal (Cobb 2018). When considered alongside the species' preference for nearshore environments, northern sea otters are not expected to be present in most of the stage 1 booster drop zone. Injury due to direct contact with vehicle components or exposure to hazardous materials are therefore not likely. Behavioral modification in response to elevated noise levels may occur, however these changes are likely to occur temporarily and not result in reduced fitness. Sound pressure injury thresholds for sea otters are not expected to be surpassed in the action area.

Potential Effects of the Proposed Action

Elevated Sound Levels

Launch activities and vehicle flight would cause increased sound pressure within the launch area and flight path. Model estimates of splash down noise levels for vehicle components to be used in JFC activities are not available. The peak noise level of component splashdown has been estimated based on the splashdown noise levels recorded for past vehicle components of comparable size. During splashdown of the stage 1 booster, the action proponents expect sound pressures to peak at 218 decibels (dB) in water and 192 dB in air, and last no more than a few seconds.

Risk of injury due to increased sound pressure varies by species. Changes in auditory capabilities following exposure to elevated sound pressure are considered permanent or temporary threshold shifts (PTS or TTS respectively). In birds, single impulse standards for PTS are placed at 140 dBA (CalTrans 2016). In otariid pinnipeds and other non-phocid marine carnivores, PTS standards are set by the National Oceanic and Atmospheric Administration at 232 dB in water and 176 dB in air; TTS standards are placed at 226 dB in water and 170 dB in air (NMFS 2018). Action proponents have conducted modeling efforts and determined that sound pressures are expected to surpass injury thresholds for birds within 398 meters (1,306 feet) of the spent stage 1 booster splashdown and are not expected to surpass injury thresholds for otariid pinnipeds and other non-phocid marine carnivores.

Any elevation of noise levels above ambient noise may result in behavioral responses in birds, including startle responses, avoidance behaviors, changes in vocalization, and others (CalTrans 2016). Similar behavioral responses also occur in northern sea otters (Erbe et al. 2018).

Direct Contact with Vehicle Components

During test vehicle flight, spent stage 1 boosters will be jettisoned from the vehicle and splash down into the BOA. The stage 1 booster is expected to be 5.3 meters (17.4 feet) long by 0.86 meter (2.8 feet) in diameter. Vehicle components have the potential to directly contact listed species in the stage 1 splash down zone, resulting in injury or mortality.

Introduction of Hazardous Materials

Any substances that are contained or used in the construction of vehicle components may be introduced to the marine environment upon component splash down. These materials would include rocket motor, unused propellant, battery electrolytes, and heavy metals. Introduced hazardous materials are expected to occur in minimal amounts, such that their effects would be rendered discountable through dispersion and dilution.

Conclusion

After reviewing the proposed action and its anticipated effects, the Service concurs with the U.S. Army Rapid Capabilities and Critical Technologies Office's determination that the proposed supplemental activities of the Joint Flight Campaign may affect but are not likely to adversely affect the Steller's eider, short-tailed albatross, or Southwest DPS of northern sea otter. Your request and our concurrence satisfy the requirements of section 7 of the ESA. However, if new information reveals impacts of the proposed project that may affect listed species or critical habitat in a manner or to an extent not previously considered, or if this action is subsequently modified in a manner which was not considered in this assessment, or if a new species is listed or critical habitat designated that may be affected by the proposed action, section 7 consultation must be reinitiated.

This letter relates only to federally listed or proposed species and/or designated or proposed critical habitat under the jurisdiction of the Service. It does not address species under the jurisdiction of the National Marine Fisheries Service, or other legislation or responsibilities under the Fish and Wildlife Coordination Act, Migratory Bird Treaty Act, Marine Mammal Protection Act, Clean Water Act, National Environmental Policy Act, or Bald and Golden Eagle Protection Act.

If you have any questions or require additional information, please contact Nicolas Katz at nicolas_katz@fws.gov and reference consultation number 2024-0001548.

Sincerely,

DOUGLASS COOPER

Digitally signed by DOUGLASS COOPER
Date: 2023.10.30 16:38:52 -08'00'

Douglass M. Cooper
Ecological Services Branch Chief

Literature Cited

[CalTrans] California Department of Transportation. 2016. Technical guidance for assessment and mitigation of the effects of traffic noise and road construction noise on birds. Sacramento, California. Prepared by ICF International, Sacramento, California, Robert Dooling, Gaithersburg, Maryland, and Arthur Popper, Silver Spring, Maryland.

Cobb, M. 2018. Northern sea otter (*Enhydra lutris*) abundance and distribution on the Kodiak Archipelago, Alaska. Refuge Report, Kodiak National Wildlife Refuge, U.S. Fish and Wildlife Service, Kodiak, Alaska.

Erbe, C., R. Dunlop, and S. Dolman. 2018. Effects of noise on marine mammals. Pages 277-309 in H. Slabbekoorn, R.J. Dooling, A.N. Popper, and R.R. Fay, editors. Effects of anthropogenic noise on animals. Springer IIandbook of Auditory Research, Springer, New York, New York. https://doi.org/10.1007/978-1-4939-8574-6_10. Accessed 26 October 2023.

Larned, W.W. 1995. Distribution and abundance of Steller's eider (*Polysticta stelleri*) in the Kodiak Archipelago, Alaska. 1995. Anchorage, Alaska: U.S. Fish and Wildlife Service.

Martin, P.D., D.C. Douglas, T. Obritschkewitsch, and S. Torrence. 2015. Distribution and movements of Alaska-breeding Steller's Eiders in the nonbreeding period. The Condor 117:341–353.

[NMFS] National Marine Fisheries Service. 2018. 2018 Revisions to: Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing (Version 2.0): underwater thresholds for onset of permanent and temporary threshold shifts. U.S. Dept. of Commerce. NOAA. NOAA Technical Memorandum NMFS-OPR-59, 167 p.

Orben, R., A. O'Connor, R. Suryan, K. Ozaki, F. Sato, and T. Deguchi. 2018. Ontogenetic changes in at-sea distributions of immature short-tailed albatrosses *Phoebastria albatrus*. Endangered Species Research 35:23–37.

Petersen, M.R. 1980. Observations of wing-feather moult and summer feeding ecology of Steller's eiders at Nelson Lagoon, Alaska. Wildfowl 31:99–106.

Suryan, R. M., F. Sato, G.R. Balogh, K. David Hyrenbach, P.R. Sievert, and K. Ozaki. 2006. Foraging destinations and marine habitat use of short-tailed albatrosses: a multi-scale approach using first-passage time analysis. Deep Sea Research Part II: Topical Studies in Oceanography 53:370–386.

Suryan, R.M., and K.N. Fischer. 2010. Stable isotope analysis and satellite tracking reveal interspecific resource partitioning of nonbreeding albatrosses off Alaska. Canadian Journal of Zoology 88:299–305.

[USFWS] U.S. Fish and Wildlife Service. 2019. Status assessment of the Alaska breeding population of Steller's eiders. Fairbanks Fish and Wildlife Field Office, Fairbanks, Alaska.

USFWS. 2020. Five-year review: short-tailed albatross (*Phoebastria albatrus*). Anchorage Fish and Wildlife Conservation Office, Anchorage, Alaska.

USFWS. 1999. Short-tailed albatross (*Phoebastria albatrus*). FWS.gov. Accessed 23 Oct 2023.

Wilson, R.R., M. St. Martin, and W.S. Beatty. 2021. A hierarchical distance sampling model to estimate spatially explicit sea otter density. Ecosphere 12:e03666.

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF

August 29, 2023

James Kwon
DoD Coordinator
U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, HI 96850

Re: Request for Initiation of Informal Consultation under Section 7 of the Endangered Species Act for Joint Flight Campaign launch activities at the Pacific Missile Range Facility, Kaua‘i, Hawai‘i

Dear Mr. Kwon:

The United States Army Space and Missile Defense Command (USASMDC) is assisting the Department of the Navy Strategic Systems Programs and the U.S. Army Rapid Capabilities and Critical Technologies Office, the Action Proponents, in evaluating the effects of proposed Joint Flight Campaign (JFC) supplemental activities. The Action Proponents have determined that JFC supplemental activities, specifically launches from the Terminal High Altitude Area Defense (THAAD) launch site at the Pacific Missile Range Facility (PMRF), may affect but are not likely to adversely affect Endangered Species Act (ESA) listed species under the jurisdiction of your office and request consultation under Section 7 of the ESA.

The JFC action involves up to six flight test launches per year, over the next 10 years, from multiple launch locations. After launch, tests would include vehicle flight over the Pacific and/or Atlantic Oceans and would involve splashdown of spent boosters as well as payload impact in Pacific and Atlantic broad ocean areas (BOAs). In 2022, the Action Proponents completed an Environmental Assessment (EA)/Overseas Environmental Assessment (OEA) for the JFC action to meet requirements of the National Environmental Policy Act. This document evaluated the potential effects of flight tests launching from four installations: (1) Sandia National Laboratory’s Kaua‘i Test Facility at PMRF, Kaua‘i, Hawai‘i; (2) Vandenberg Space Force Base, California; (3) Wallops Flight Facility, Virginia; and (4) Cape Canaveral Space Force Station, Florida. These documents also evaluated the effects of flight test activities in Pacific and Atlantic BOAs. Based on these evaluations, the Action Proponents determined that for all ESA listed species and designated critical habitat under the jurisdiction of the U.S. Fish and Wildlife Service, JFC activities would either have no effect on species and habitats or were covered under existing biological opinions for host launch installations/facilities (details in the enclosed Biological Evaluation).

Since completion of the JFC EA/OEA, the Action Proponents have determined that additional launch capabilities from PMRF’s THAAD launch pad and from the Pacific Spaceport Complex

Alaska, as well as an expansion of the Pacific BOA, are required to meet the purpose and need of the JFC action. Based on analyses of the potential effects, the Action Proponents have determined that these proposed JFC supplemental activities may affect ESA-listed species and designated critical habitats in a way not considered in previous consultations. Therefore, the Action Proponents have prepared a Biological Evaluation to evaluate the effects of proposed JFC supplemental activities on terrestrial species, seabirds, and northern sea otters (*Enhydra lutris kenyoni*) listed under the ESA and on designated critical habitat to support consultation with the Pacific Islands Fish and Wildlife Office and the Alaska Fish and Wildlife Office.

As described in the enclosed JFC supplemental activities Biological Evaluation, for all species and designated critical habitats under the jurisdiction of your office, the Action Proponents have determined that the Proposed Action may affect but is not likely to adversely affect the species and habitats considered in the Biological Evaluation. The effects of the Proposed Action would be insignificant or discountable for Hawaiian ducks (*Anas wyvilliana*), nēnē (*Branta sandvicensis*), Hawaiian coots (*Fulica alai*), Hawaiian gallinule (*Gallinula galeata sandvicensis*), Hawaiian stilts (*Himantopus mexicanus knudseni*), the Central North Pacific distinct population segment (DPS) of green sea turtles (*Chelonia mydas*), and Hawaiian hoary bats (*Lasiurus cinereus semotus*). The Action Proponents have concluded that the Proposed Action may affect but is not likely to adversely affect designated critical habitat for *Panicum niihauense*.

Our supporting analysis is provided in the enclosed Biological Evaluation. We request initiation of informal consultation under Section 7 of the ESA and request your written concurrence if you agree with our determinations.

We also plan to consult with the Southern Alaska Fish and Wildlife Office on the potential effects of JFC supplemental activities in the nearshore waters of the Gulf of Alaska on short-tailed albatross (*Phoebastria albatrus*), the Alaska breeding DPS of Steller's eiders (*Polysticta stelleri*), and the Southwest DPS of northern sea otters.

Please contact David Fuller in my office, USASMDC Environmental Division, regarding this consultation request at 256-955-5585 or david.g.fuller6.civ@army.mil.

Sincerely,

HILL.WELDON.H.JR.1216862682 Digitally signed by HILL.WELDON.H.JR.1216862682
Date: 2023.08.28 09:26:21 -05'00'

Weldon H. Hill, Jr.
Deputy Chief of Staff, Engineer
U.S. Army Space and Missile Defense Command

Enclosure: Terrestrial Biological Evaluation for Joint Flight Campaign Supplemental Activities

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawai‘i 96850

In Reply Refer To:
2023-0127565-S7

December 14, 2023

Wheldon H. Hill, Jr.
Deputy Chief of Staff, Engineer
U.S. Army Space and Missile Defense Command
Post Office Box 1500
Huntsville, Alabama 35807-3801

Subject: Informal Consultation for the proposed Joint Flight Campaign Supplemental Activities at PMRF on Kaua‘i

Dear Mr. Hill:

The U.S. Fish and Wildlife Service (Service) received your August 29, 2023 email request for consultation. With assistance from the United States Army Space and Missile Defense Command (USASMDC), the Department of the Navy Strategic Systems Programs and the U.S. Army Rapid Capabilities and Critical Technologies Office (hereafter collectively referred to as the Action Proponents) are proposing supplemental activities for the Joint Flight Campaign (JFC) occurring at the Pacific Missile Range Facility (PMRF) on Kaua‘i. The Action Proponents are requesting our concurrence with the determination that the proposed activities may affect, but are not likely to adversely affect the federally endangered Hawaiian duck or koloa maoli (*Anas wyvilliana*), Hawaiian coot or ‘alae ke‘oke‘o (*Fulica alai*), Hawaiian common gallinule or ‘alae ‘ula (*Gallinula galeata sandvicensis*), Hawaiian stilt or ae‘o (*Himantopus mexicanus knudseni*) (hereafter collectively referred to as Hawaiian waterbirds); threatened Hawaiian goose or nēnē (*Branta sandvicensis*); threatened Central North Pacific distinct population segment (DPS) of the green sea turtle or honu (*Chelonia mydas*); endangered Hawaiian hoary bat or ‘ōpe‘ape‘a (*Lasiurus cinereus semotus*); and designated critical habitat for *Panicum niihauense*.

The findings in this consultation are based on the following: 1) your consultation request and accompanying biological evaluation; 2) email correspondence between the Service and Action Proponents occurring between September 12 and November 20, 2023; and 3) other information

available to us. This response is in accordance with section 7 of the Endangered Species Act of 1973 (Act), as amended (16 U.S.C. 1531 *et seq*.).

PMRF has previously consulted on this projects' effects on the endangered Hawaiian petrel or ʻuaʻu (*Pterodroma sandwichensis*), Hawaiʻi DPS of the band-rumped storm-petrel or ʻakēʻakē (*Hydrobates castro*), and threatened Newell's shearwater or aʻo (*Puffinus newelli*), therefore these species will not be reevaluated within this consultation. All activities described in this consultation that would be performed by the Department of the Navy (DON) or PMRF are addressed in a separate base-wide programmatic consultation between the Service and DON (01EPIF00-2014-F-0066-R001).

Project Desciption

In 2021, the Department of Energy (DOE) consulted with the Service on the effects of launch activities at the Kauaʻi Test Facility (KTF) at PMRF, including JFC activities. The Service issued a letter of concurrence that KTF launch activities may affect, but were not likely to adversely affect federally listed species or critical habitat (01EPIF00-2021-I-0329). The proposed action for JFC supplemental activities includes launches from the Terminal High Altitude Area Defense (THAAD) launch site at PMRF, which was not evaluated in the aforementioned letter of concurrence.

The proposed action would consist of up to six flight tests per year over 10 years across all launch sites in the JFC (sites include Hawaiʻi, California, Virginia, Florida, and Alaska). The addition of the THAAD launch site does not increase the total number of JFC flight tests, rather, launches from this location would be a subset of total JFC flight tests per year. The JFC launch vehicle, also known as an all-up-round missile, would consist of a two-stage booster system and a payload. The JFC vehicle would be launched from a Transporter Erector Launcher. Empirical data on sound pressure of JFC vehicle launch have not yet been collected, but modeling indicates that initial liftoff of the launch vehicle would result in peak sound pressures of approximately 145 decibels (dB) in air. After launch, the vehicle would ascend quickly, and sound pressures are expected to remain elevated above ambient sound levels for less than 60 seconds. Additionally, JFC launch activities would comply with the Navy's standard operating procedures for PMRF launches, including compliance with the PMRF Dark Skies program which limits the use of outdoor lighting during the seabird fledging season.

The THAAD launch site is located approximately within the northern third of PMRF at Barking Sands. The area around the THAAD launch site is covered primarily with landscaped vegetation that is managed by mowing. Patches of vegetation with taller trees are located at least 165 meters (m) (540 feet [ft]) southeast and east of the launch site. These patches of vegetation are dominated by introduced and invasive species with stands of kiawe (*Prosopis pallida*) trees that have patches of koa haole (*Leucaena leucocephala*), guinea grass (*Panicum maximum*), and lantana (*Lantana camara*) within them. Coastal dune habitats occur to the north and west of the THAAD launch site. The closest wetland habitat is 480 m (1,570 ft) from the launch site, and all beach habitat occurs at least 100 m (328 ft) from the launch site.

Conservation Measures

To avoid and minimize impacts to listed species and their habitats, the following conservation measures will be implemented as a part of this project:

General Measures

- Prior to conducting project activities, all personnel will receive an on-site training, in coordination with the PMRF Environmental Office, to ensure personnel understand PMRF's natural resource policies and wildlife protection regulations and protocols.
    - Training will include established PMRF Environmental Management Policies and guidelines relevant to the season of proposed activities, including "Nēnē Guidelines for PMRF Operations", "Good Samaritan Hazing" training for nēnē, "PMRF Dark Skies Program Briefing & Natural Resources Training", and "Shearwater Fallout Instructions".
    - All project personnel will be trained on the presence of ESA-listed species on PMRF and the importance of adhering to posted speed limits to avoid collision with protected wildlife.
- Project personnel will not approach, disturb, or feed any protected animal species or their nests.
- Project-related vehicle and equipment operation will occur within paved or maintained areas.

Wildfire Mitigation

- Areas up to the THAAD launch site fence line will be maintained free of flammable vegetation and therefore have minimal fire potential.
- Non-native areas surrounding the THAAD site will be regularly mowed.
- The areas adjacent to the launch pad will be pre-soaked with water prior to launch if deemed necessary due to extremely dry or windy conditions. Site conditions and the need for vegetation wetting will be evaluated and coordinated with PMRF Range and Environmental Offices prior to launch.
- Fire and emergency service crews will be present at every launch.

Nēnē

- Non-native areas surrounding the THAAD site will be regularly mowed. Bushes, trees, shrubs, and short statured grass will be regularly cleared to avoid creating nesting habitat (e.g., nēnē).
- Standard PMRF biweekly wildlife surveys and nest searched will be conducted.
- Launch area inspections (sweeps) will be conducted during launch set-up and prior to every launch to check for wildlife that may have entered the launch area.
- If nēnē are observed loafing or foraging within 61 m (200 ft) of the launch pad within 24 hours preceding the launch, project or PMRF test personnel will coordinate a response with the PMRF Environmental Office. Response solutions might include hazing (compliant with the nēnē 4(d) rule) by trained and authorized personnel to encourage nēnē to leave the area, or a nēnē nest search (within 61 m [200 ft] of the launch pad) if birds are unwilling to leave the area. If a nēnē nest is found within 53 m (175 ft) of the launch pad, the PMRF Environmental Office will be notified and USFWS will be

contacted (by PMRF Environmental personnel) for further coordination on a course of action before the launch proceeds.

Green sea turtle

- Project personnel will avoid entering beaches.
- Whenever possible, night lighting will be avoided or minimized. Where security or safety concerns require night lighting, either full cut-off lighting fixtures will be used or, if full cut-off fixtures cannot be installed, motion sensors will be used or lights will be turned off when not necessary. Between September 15th and December 15th, all project activities will be Dark Skies compliant.
- Standard PMRF patrols will be conducted to confirm any exposed lights during the night are required and meet shielding requirements.

Hawaiian hoary bat

- No trimming or removal of trees greater than 4.6 m (15 ft) tall will occur during the Hawaiian hoary bat pupping season (June 1 to September 15).
- No additional fencing or barbed wire will be installed as a part of this project.

Panicum niihauense

- Standard PMRF security procedures will be followed during JFC launch activities. No project-related vehicles, equipment, or personnel would enter beach habitats.

Analysis of Effects

Hawaiian waterbirds

Hawaiian waterbirds utilize a variety of wetland habitats, which are present in the southern and central portion of PMRF Barking Sands. Hawaiian waterbirds could be affected by elevated noise levels caused by launch activities. The closest wetland habitat to the THAAD launch site is 480 m (1,570 ft) away. At this distance, sound pressures would be no more than 125 dB immediately after launch and sounds above ambient levels would last less than a minute. Additionally, wildfire mitigation conservation measures will lower the risk of wildfire ignition or wildfire reaching waterbird habitat. By implementing the wildfire mitigation conservation measures and because launch-related noise is anticipated to be short term and low intensity due to the distance of Hawaiian waterbirds relative to the launch site, adverse effects to Hawaiian waterbirds are extremely unlikely to occur. Because effects to Hawaiian waterbirds are extremely unlikely to occur, they are therefore considered discountable.

Nēnē

While nēnē have not frequented the northern portion of PMRF Barking Sands historically, nēnē have been recorded in the vicinity of the THAAD launch site. The nearest documented nest to the THAAD launch site was a nest with no eggs approximately 90 m (295 ft) northwest of the launch site in fiscal year 2021 and two active nests were documented approximately 360 m (1,180 ft) and 500 m (1,640 ft) south of the launch site that year. Elevated noise levels could affect nēnē if they are in close vicinity during launch activities. By implementing the conservation measures above, including vegetation management, nest searches, and hazing, it would prevent the creation of desirable habitat for nēnē and discourage loafing and breeding in

the area. For these reasons, nēnē are not expected to be in the area during launches and any launch-related noise at further distances is anticipated to be short term and low intensity, therefore adverse effects to nēnē are extremely unlikely to occur. Because effects to nēnē are extremely unlikely to occur, they are therefore considered discountable.

Green sea turtle
Green sea turtles may nest or bask on any sandy beach area in Hawai‘i. Hauled out or nesting green sea turtles have the potential to be affected by elevated noise levels from launch activities. Additionally, optimal green sea turtle nesting habitat is a dark beach as they may become disoriented by artificial lighting, leading to exhaustion and placement of a nest in an inappropriate location. Hatchlings that emerge from nests may also be disoriented by artificial lighting. The closest sea turtle haul out or nesting habitat to the THAAD launch site is more than 100 m (328 ft) away. Sound pressure levels would be less than 135 dB in air at this distance immediately after launch. By implementing the conservation measures above, including best management practices for nighttime lighting, and because launch-related noise is anticipated to be short term and low intensity due to the distance of green sea turtles relative to the launch site, adverse effects to green sea turtles are extremely unlikely to occur. Because effects to green sea turtles are extremely unlikely to occur, they are therefore considered discountable.

Hawaiian Hoary Bat
The Hawaiian hoary bat roosts in woody vegetation across all islands and will leave their young unattended in trees and shrubs when they forage. If trees or shrubs 4.6 m (15 ft) or taller are cleared during the pupping season, June 1 through September 15, there is a risk that young bats could inadvertently be harmed or killed, since they are too young to fly or move away from disturbance. Hawaiian hoary bats also forage for insects from as low as 1 m (3 ft) to higher than 152.4 m (500 ft) above the ground and can become entangled in barbed wire used for fencing. By implementing the conservation measures above, which include no trimming of trees greater than 4.6 m (15 ft) during pupping season and no installing of barbed wire, adverse effects to the Hawaiian hoary bat are extremely unlikely to occur. Because effects to the Hawaiian hoary bat are extremely unlikely to occur, they are therefore considered discountable.

Critical habitat for Panicum niihauense
While the THAAD launch site is not located within designated critical habitat for *Panicum niihauense*, this critical habitat is nearby, and the proposed launch activities have the potential to impact it through wildfire risk. After decades of launches at the nearby KTF launch pads, there have not been any off-site vegetation fires. By implementing the wildfire conservation measures above, including maintaining vegetation surrounding the launch area, pre-soaking adjacent areas prior to launch, and the presence of fire crews at every launch, adverse affects to the designated critical habitat for *Panicum niihauense* due to wildfire is extremely unlikely to occur. Because effects to the designated critical habitat for *Panicum niihauense* are extremely unlikely to occur, they are therefore considered discountable.

Summary
We have reviewed our data and conducted an effects analysis of your project. By incorporating the conservation measures listed above, effects to Hawaiian waterbirds, nēnē, green sea turtles, Hawaiian hoary bats, and designated critical habitat for *Panicum niihauense* are extremely

unlikely to occur. Therefore, effects to these species and designated critical habitat are considered discountable. Because impacts from the proposed project are discountable, we concur with your determination that the proposed action may affect, but is not likely to adverse affect Hawaiian waterbirds, nēnē, green sea turtles, Hawaiian hoary bats, and designated critical habitat for *Panicum niihauense*.

We appreciate your efforts to conserve endangered species. If you have any questions, please contact Fish and Wildlife Biologist, Ryan Peʻa at ryan_pea@fws.gov or 808-792-9400, and refer to project code 2023-0127565-S7.

Sincerely,

RYAN PE'A Digitally signed by RYAN PE'A
Date: 2023.12.14 15:18:06 -10'00'

Ryan Peʻa
Acting Planning and Consultation Team Manager

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawai‘i 96850

In Reply Refer To:
2023-0127565-S7

December 14, 2023

Wheldon H. Hill, Jr.
Deputy Chief of Staff, Engineer
U.S. Army Space and Missile Defense Command
Post Office Box 1500
Huntsville, Alabama 35807-3801

Subject: Informal Consultation for the proposed Joint Flight Campaign Supplemental Activities at PMRF on Kaua‘i

Dear Mr. Hill:

The U.S. Fish and Wildlife Service (Service) received your August 29, 2023 email request for consultation. With assistance from the United States Army Space and Missile Defense Command (USASMDC), the Department of the Navy Strategic Systems Programs and the U.S. Army Rapid Capabilities and Critical Technologies Office (hereafter collectively referred to as the Action Proponents) are proposing supplemental activities for the Joint Flight Campaign (JFC) occurring at the Pacific Missile Range Facility (PMRF) on Kaua‘i. The Action Proponents are requesting our concurrence with the determination that the proposed activities may affect, but are not likely to adversely affect the federally endangered Hawaiian duck or koloa maoli (*Anas wyvilliana*), Hawaiian coot or ‘alae ke‘oke‘o (*Fulica alai*), Hawaiian common gallinule or ‘alae ‘ula (*Gallinula galeata sandvicensis*), Hawaiian stilt or ae‘o (*Himantopus mexicanus knudseni*) (hereafter collectively referred to as Hawaiian waterbirds); threatened Hawaiian goose or nēnē (*Branta sandvicensis*); threatened Central North Pacific distinct population segment (DPS) of the green sea turtle or honu (*Chelonia mydas*); endangered Hawaiian hoary bat or ‘ōpe‘ape‘a (*Lasiurus cinereus semotus*); and designated critical habitat for *Panicum niihauense*.

The findings in this consultation are based on the following: 1) your consultation request and accompanying biological evaluation; 2) email correspondence between the Service and Action Proponents occurring between September 12 and November 20, 2023; and 3) other information

available to us. This response is in accordance with section 7 of the Endangered Species Act of 1973 (Act), as amended (16 U.S.C. 1531 *et seq*.).

PMRF has previously consulted on this projects' effects on the endangered Hawaiian petrel or ʻuaʻu (*Pterodroma sandwichensis*), Hawaiʻi DPS of the band-rumped storm-petrel or ʻakēʻakē (*Hydrobates castro*), and threatened Newell's shearwater or aʻo (*Puffinus newelli*), therefore these species will not be reevaluated within this consultation. All activities described in this consultation that would be performed by the Department of the Navy (DON) or PMRF are addressed in a separate base-wide programmatic consultation between the Service and DON (01EPIF00-2014-F-0066-R001).

Project Desciption

In 2021, the Department of Energy (DOE) consulted with the Service on the effects of launch activities at the Kauaʻi Test Facility (KTF) at PMRF, including JFC activities. The Service issued a letter of concurrence that KTF launch activities may affect, but were not likely to adversely affect federally listed species or critical habitat (01EPIF00-2021-I-0329). The proposed action for JFC supplemental activities includes launches from the Terminal High Altitude Area Defense (THAAD) launch site at PMRF, which was not evaluated in the aforementioned letter of concurrence.

The proposed action would consist of up to six flight tests per year over 10 years across all launch sites in the JFC (sites include Hawaiʻi, California, Virginia, Florida, and Alaska). The addition of the THAAD launch site does not increase the total number of JFC flight tests, rather, launches from this location would be a subset of total JFC flight tests per year. The JFC launch vehicle, also known as an all-up-round missile, would consist of a two-stage booster system and a payload. The JFC vehicle would be launched from a Transporter Erector Launcher. Empirical data on sound pressure of JFC vehicle launch have not yet been collected, but modeling indicates that initial liftoff of the launch vehicle would result in peak sound pressures of approximately 145 decibels (dB) in air. After launch, the vehicle would ascend quickly, and sound pressures are expected to remain elevated above ambient sound levels for less than 60 seconds. Additionally, JFC launch activities would comply with the Navy's standard operating procedures for PMRF launches, including compliance with the PMRF Dark Skies program which limits the use of outdoor lighting during the seabird fledging season.

The THAAD launch site is located approximately within the northern third of PMRF at Barking Sands. The area around the THAAD launch site is covered primarily with landscaped vegetation that is managed by mowing. Patches of vegetation with taller trees are located at least 165 meters (m) (540 feet [ft]) southeast and east of the launch site. These patches of vegetation are dominated by introduced and invasive species with stands of kiawe (*Prosopis pallida*) trees that have patches of koa haole (*Leucaena leucocephala*), guinea grass (*Panicum maximum*), and lantana (*Lantana camara*) within them. Coastal dune habitats occur to the north and west of the THAAD launch site. The closest wetland habitat is 480 m (1,570 ft) from the launch site, and all beach habitat occurs at least 100 m (328 ft) from the launch site.

Conservation Measures

To avoid and minimize impacts to listed species and their habitats, the following conservation measures will be implemented as a part of this project:

General Measures

- Prior to conducting project activities, all personnel will receive an on-site training, in coordination with the PMRF Environmental Office, to ensure personnel understand PMRF's natural resource policies and wildlife protection regulations and protocols.
    - Training will include established PMRF Environmental Management Policies and guidelines relevant to the season of proposed activities, including "Nēnē Guidelines for PMRF Operations", "Good Samaritan Hazing" training for nēnē, "PMRF Dark Skies Program Briefing & Natural Resources Training", and "Shearwater Fallout Instructions".
    - All project personnel will be trained on the presence of ESA-listed species on PMRF and the importance of adhering to posted speed limits to avoid collision with protected wildlife.
- Project personnel will not approach, disturb, or feed any protected animal species or their nests.
- Project-related vehicle and equipment operation will occur within paved or maintained areas.

Wildfire Mitigation

- Areas up to the THAAD launch site fence line will be maintained free of flammable vegetation and therefore have minimal fire potential.
- Non-native areas surrounding the THAAD site will be regularly mowed.
- The areas adjacent to the launch pad will be pre-soaked with water prior to launch if deemed necessary due to extremely dry or windy conditions. Site conditions and the need for vegetation wetting will be evaluated and coordinated with PMRF Range and Environmental Offices prior to launch.
- Fire and emergency service crews will be present at every launch.

Nēnē

- Non-native areas surrounding the THAAD site will be regularly mowed. Bushes, trees, shrubs, and short statured grass will be regularly cleared to avoid creating nesting habitat (e.g., nēnē).
- Standard PMRF biweekly wildlife surveys and nest searched will be conducted.
- Launch area inspections (sweeps) will be conducted during launch set-up and prior to every launch to check for wildlife that may have entered the launch area.
- If nēnē are observed loafing or foraging within 61 m (200 ft) of the launch pad within 24 hours preceding the launch, project or PMRF test personnel will coordinate a response with the PMRF Environmental Office. Response solutions might include hazing (compliant with the nēnē 4(d) rule) by trained and authorized personnel to encourage nēnē to leave the area, or a nēnē nest search (within 61 m [200 ft] of the launch pad) if birds are unwilling to leave the area. If a nēnē nest is found within 53 m (175 ft) of the launch pad, the PMRF Environmental Office will be notified and USFWS will be

contacted (by PMRF Environmental personnel) for further coordination on a course of action before the launch proceeds.

Green sea turtle

- Project personnel will avoid entering beaches.
- Whenever possible, night lighting will be avoided or minimized. Where security or safety concerns require night lighting, either full cut-off lighting fixtures will be used or, if full cut-off fixtures cannot be installed, motion sensors will be used or lights will be turned off when not necessary. Between September 15th and December 15th, all project activities will be Dark Skies compliant.
- Standard PMRF patrols will be conducted to confirm any exposed lights during the night are required and meet shielding requirements.

Hawaiian hoary bat

- No trimming or removal of trees greater than 4.6 m (15 ft) tall will occur during the Hawaiian hoary bat pupping season (June 1 to September 15).
- No additional fencing or barbed wire will be installed as a part of this project.

Panicum niihauense

- Standard PMRF security procedures will be followed during JFC launch activities. No project-related vehicles, equipment, or personnel would enter beach habitats.

Analysis of Effects

Hawaiian waterbirds

Hawaiian waterbirds utilize a variety of wetland habitats, which are present in the southern and central portion of PMRF Barking Sands. Hawaiian waterbirds could be affected by elevated noise levels caused by launch activities. The closest wetland habitat to the THAAD launch site is 480 m (1,570 ft) away. At this distance, sound pressures would be no more than 125 dB immediately after launch and sounds above ambient levels would last less than a minute. Additionally, wildfire mitigation conservation measures will lower the risk of wildfire ignition or wildfire reaching waterbird habitat. By implementing the wildfire mitigation conservation measures and because launch-related noise is anticipated to be short term and low intensity due to the distance of Hawaiian waterbirds relative to the launch site, adverse effects to Hawaiian waterbirds are extremely unlikely to occur. Because effects to Hawaiian waterbirds are extremely unlikely to occur, they are therefore considered discountable.

Nēnē

While nēnē have not frequented the northern portion of PMRF Barking Sands historically, nēnē have been recorded in the vicinity of the THAAD launch site. The nearest documented nest to the THAAD launch site was a nest with no eggs approximately 90 m (295 ft) northwest of the launch site in fiscal year 2021 and two active nests were documented approximately 360 m (1,180 ft) and 500 m (1,640 ft) south of the launch site that year. Elevated noise levels could affect nēnē if they are in close vicinity during launch activities. By implementing the conservation measures above, including vegetation management, nest searches, and hazing, it would prevent the creation of desirable habitat for nēnē and discourage loafing and breeding in

the area. For these reasons, nēnē are not expected to be in the area during launches and any launch-related noise at further distances is anticipated to be short term and low intensity, therefore adverse effects to nēnē are extremely unlikely to occur. Because effects to nēnē are extremely unlikely to occur, they are therefore considered discountable.

Green sea turtle
Green sea turtles may nest or bask on any sandy beach area in Hawai‘i. Hauled out or nesting green sea turtles have the potential to be affected by elevated noise levels from launch activities. Additionally, optimal green sea turtle nesting habitat is a dark beach as they may become disoriented by artificial lighting, leading to exhaustion and placement of a nest in an inappropriate location. Hatchlings that emerge from nests may also be disoriented by artificial lighting. The closest sea turtle haul out or nesting habitat to the THAAD launch site is more than 100 m (328 ft) away. Sound pressure levels would be less than 135 dB in air at this distance immediately after launch. By implementing the conservation measures above, including best management practices for nighttime lighting, and because launch-related noise is anticipated to be short term and low intensity due to the distance of green sea turtles relative to the launch site, adverse effects to green sea turtles are extremely unlikely to occur. Because effects to green sea turtles are extremely unlikely to occur, they are therefore considered discountable.

Hawaiian Hoary Bat
The Hawaiian hoary bat roosts in woody vegetation across all islands and will leave their young unattended in trees and shrubs when they forage. If trees or shrubs 4.6 m (15 ft) or taller are cleared during the pupping season, June 1 through September 15, there is a risk that young bats could inadvertently be harmed or killed, since they are too young to fly or move away from disturbance. Hawaiian hoary bats also forage for insects from as low as 1 m (3 ft) to higher than 152.4 m (500 ft) above the ground and can become entangled in barbed wire used for fencing. By implementing the conservation measures above, which include no trimming of trees greater than 4.6 m (15 ft) during pupping season and no installing of barbed wire, adverse effects to the Hawaiian hoary bat are extremely unlikely to occur. Because effects to the Hawaiian hoary bat are extremely unlikely to occur, they are therefore considered discountable.

Critical habitat for Panicum niihauense
While the THAAD launch site is not located within designated critical habitat for *Panicum niihauense*, this critical habitat is nearby, and the proposed launch activities have the potential to impact it through wildfire risk. After decades of launches at the nearby KTF launch pads, there have not been any off-site vegetation fires. By implementing the wildfire conservation measures above, including maintaining vegetation surrounding the launch area, pre-soaking adjacent areas prior to launch, and the presence of fire crews at every launch, adverse affects to the designated critical habitat for *Panicum niihauense* due to wildfire is extremely unlikely to occur. Because effects to the designated critical habitat for *Panicum niihauense* are extremely unlikely to occur, they are therefore considered discountable.

Summary
We have reviewed our data and conducted an effects analysis of your project. By incorporating the conservation measures listed above, effects to Hawaiian waterbirds, nēnē, green sea turtles, Hawaiian hoary bats, and designated critical habitat for *Panicum niihauense* are extremely

unlikely to occur. Therefore, effects to these species and designated critical habitat are considered discountable. Because impacts from the proposed project are discountable, we concur with your determination that the proposed action may affect, but is not likely to adverse affect Hawaiian waterbirds, nēnē, green sea turtles, Hawaiian hoary bats, and designated critical habitat for *Panicum niihauense*.

We appreciate your efforts to conserve endangered species. If you have any questions, please contact Fish and Wildlife Biologist, Ryan Pe‘a at ryan_pea@fws.gov or 808-792-9400, and refer to project code 2023-0127565-S7.

Sincerely,

RYAN PE'A Digitally signed by RYAN PE'A
Date: 2023.12.14 15:18:06 -10'00'

Ryan Pe‘a
Acting Planning and Consultation Team Manager

From:	Alexandria Barkman - NOAA Federal
To:	Fuller, David G CIV USARMY SMDC (USA)
Cc:	Kolinski, Steven P CIV (USA); McElreath, Henry W CIV USARMY SMDC (USA); jamiyo.mack@ssp.navy.mil; Karen Barnes - KFS; Karen Hoksbergen - KFS; Susan Thornton - KFS; Hangartner, Scott A CTR USARMY HQDA RCCTO (USA); Hasley, David C CIV USARMY SMDC (USA); David Delaney - NOAA Federal; Malia Chow - NOAA Federal; Gerry Davis - NOAA Federal
Subject:	Re: Essential Fish Habitat abbreviated consultation request for the Joint Flight Campaign project - [UNCLASSIFIED - 2023-12-12T15:43:25.156Z]
Date:	Wednesday, December 20, 2023 9:01:17 PM

Aloha Mr. David Fuller,

The National Marine Fisheries Service (NMFS), Pacific Islands Regional Office Habitat Conservation Division received a request from Joint Action Proponents, the Department of the Navy, Strategic Systems Programs and the U.S. Army Rapid Capabilities and Critical Technologies Office for an abbreviated consultation for the Joint Flight Campaign (JFC) Flight Tests. The JFC has proposed to include and adhere to best management practices (BMPs) that, when implemented, will ensure that most adverse effects to EFH will be no more than minimal. We are providing a conservation recommendation under the EFH provisions within Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). Adherence to this conservation recommendation will help you ensure that adverse effects are avoided and minimized.

Project Description

The purpose of the proposed action is to test various aspects of the JFC system's capabilities. The proposed action includes preparations for the test, vehicle launch and overflight, impact of the boosters and payloads in the broad ocean area, and post launch operations. The launch vehicle, an all-up-round missile, would consist of a two-stage booster system and a payload. Up to six test missiles will launch per year over ten years from the Pacific Missile Range Facility (PMRF) in Waimea, Kaua'i. A maximum of six spent stage one boosters will be scheduled each year for splashdown in the Pacific Ocean within Hawaii's exclusive economic zone (EEZ). Individual rocket booster stages would splash down hundreds of miles (mi) apart into the ocean along the flight path and slowly sink up to thousands of feet (ft) as they come to rest on the sea floor. If all six tests are conducted from PMRF, there will be a maximum direct contact/damage area of approximately 360 ft^2 per year. Stage two booster drop/payload impact zones are outside of the US EEZ. The solid propellant is expected to be completely expended prior to splashdown. All payload materials are expected to sink to the ocean floor. Visible debris on the surface of the ocean will be recovered and removed. Within the Hawaiian EEZ, JFC activities would include the vehicle overflight at a high altitude, stage one booster splashdown, and potential vessel and aircraft operations for sensor coverage. The flight path will be monitored by a series of sensors that are part of existing programs including telemetry and radar, ship based mobile instrumentation, and Safety Relay aircraft as additional support. The vessels used are typically open ocean resupply vessels that will not anchor. The flight termination system will be designed to prevent debris from falling into any inhabited land area or marine protected areas. The JFC believes that overall

impacts from hazardous materials and waste in the Pacific Ocean is anticipated to be negligible.

Essential Fish Habitat

Portions of the water column and benthos of the action area are defined as EFH and support various life stages for the management unit species (MUS) identified under the Western Pacific Regional Fishery Management Council's Pelagic and Hawai'i Archipelago Fishery Ecosystem Plans. The marine water column from the surface to a depth of 3,280 ft from the shoreline to the outer boundary of the EEZ (200 nautical miles), and the seafloor from the shoreline out to a depth of 2,296 ft around each of the Hawaiian Islands, have been designated as EFH. As such, the water column and bottom of the Pacific Ocean around the Hawaiian Islands are designated as EFH, and support various life stages for MUS. The MUS and life stages found in these waters include eggs, larvae, juveniles, and adults of Bottomfish, Crustacean, and Pelagic MUS. Specific types of habitat considered as EFH include coral reef, patch reefs, hard substrate, artificial substrate, seagrass beds, soft substrate, lagoon, estuarine, surge zone, deep-slope terraces and pelagic/open ocean.

Action Area Baseline Condition

The PMRF stage one booster drop zone is approximately 15,100 mi^2 entirely in the US EEZ. Less than 1% of the drop zone is in waters 2,297 ft or less in depth. The Action Area includes a diversity of pelagic and benthic habitats including coral reefs, which support diverse marine communities.

Adverse Effects

NMFS anticipates that proposed activities may adversely affect MUS, but will have no more than a minimal impact to EFH. Potential effects include physical damage, increased turbidity, and increased risk of pollutants, chemicals, and invasive species to the water column and benthos.

Physical Damage/Removal (physical stressor): Splashdowns of stage one booster components may result in breakage or dislocation (i.e., mortality), or sub-lethal tissue abrasion of corals and benthic habitat components. Corals, which are primarily responsible for the structural complexity of coral reefs, are particularly vulnerable to physical damage because their slow-growing carbonate skeleton is relatively brittle and their polyps are easily damaged. In general, lobate, encrusting, and other massive colony morphologies tend to withstand breakage better than foliose, table, plating, and branching morphologies; more fragile forms tend to have higher growth rates (Rützler 2001). Reduction of topographic complexity in the habitats of the coral reef ecosystem reduces biodiversity and productivity (Alvarez-Filip et al. 2009). Literature reviews (Newell et al. 1998; ICES 2016) suggest that the successional marine community requires at least six to eight months to recover back to initial levels after removal, although broken coral will take many years to regrow if significant biomass is removed (Minton 2013).

Sedimentation (pollution stressor): Splashdowns may cause a temporary increase in

suspended sediment when the boosters land on the benthos. Coral reef organisms are easily smothered by sediment and can experience both physiological and lethal responses to concentrations below 10 milligrams (mg)/cm^2 /day and 10 mg/Liter (L) (Tuttle and Donahue 2022). Increased turbidity can cause changes in fish behavior, including altered predator-prey relationships (Higham et al. 2015). The effect of the temporary increases in turbidity from the splashdown should be no more than minimal.

Chemical Contamination (pollution stressor): Chemical pollutants may enter the marine environment from unspent rocket propellant, motors, batteries, and other system components that are not recovered. Contaminants can have a variety of lethal and sublethal effects on habitat-forming marine organisms, including alteration of growth, interference with reproduction, disruption of metabolic processes, and changes in behavior. These adverse effects can cascade through ecosystems, altering species composition and ecosystem functions and services. Some pollutants are environmentally persistent and can take years or even decades to biodegrade, and others can bioaccumulate or biomagnify through the food chain, eventually posing a direct threat to human health. Contaminant concentrations in fishes are linked to locations with increased urbanization and military history (Nalley et al. 2021; 2023).

Invasive Species (biological stressor): Increased vessel traffic may lead to the spread or introduction of invasive species on vessel hulls. Introduced species are organisms that have been moved, intentionally or unintentionally, into areas where they do not naturally occur. Invasive species rapidly increase in abundance to the point that they come to dominate their new environment, creating adverse ecological effects to other species of the ecosystem and the functions and services it may provide (Goldberg and Wilkinson 2004). Invasive species can decrease species diversity, change trophic structure, and diminish physical structure, but adverse effects are highly variable and species-specific.

JFC-proposed BMPs

- Vessel and equipment operations would not involve any intentional discharges of fuel, toxic wastes, or plastics and other solid wastes that could harm marine life or habitats.
- Any accidental spills from support equipment operations would be contained and cleaned up. Spill response kits would be available on all support equipment.
- Vessel operations would only occur when weather and sea conditions are acceptable for safe travel.
- Visible debris still on the surface of the water would be recovered and removed as much as practicable.
- Proposed activities would not involve any vessel anchoring.

NMFS Concerns

The splashdowns of rocket booster stages may result in adverse effects to EFH from physical damage to benthic organisms, including corals or seagrass, less than 2,297

ft deep in the EEZ from sinking debris. Since only 0.7% of the action area is less than 2,297 ft deep, adverse effects of stage one splashdowns on benthic EFH is expected to be very rare. If a stage from a missile did land in an area with coral reef, the effect could be significant, but the chance of that happening has been minimized. Chemical contamination of the water column up to 3,280 ft may result from unburned solid propellant residue, batteries, and petroleum from recovery vessels. Increased vessel traffic may cause introduction of invasive species from vessel hulls.

Conservation Recommendation

NMFS provides the following EFH conservation recommendation pursuant to 50 CFR 600.920 that when implemented—along with the JFC provided BMPs and mitigation measures—will ensure that potential adverse effects to EFH are avoided and minimized:

Conservation Recommendation 1: Ensure all vessel hulls do not pose a risk of introducing new invasive species and will not increase abundance of invasive species present at the project location

Conclusion

NMFS appreciates the coordination on the JFC flight tests. We have provided an EFH conservation recommendation that when implemented—along with the JFC proposed mitigation measures—will ensure that potential adverse effects to EFH are avoided and minimized.

Please be advised that regulations (Section 305(b)(4)(B)) to implement the EFH provisions of the Magnuson-Stevens Act require that federal activities agencies provide a written response to this letter within 30 days of its receipt and, a preliminary response is acceptable if more time is needed. The final response must include a description of measures to be required to avoid, mitigate, or offset the adverse effects of the proposed activities. If the response is inconsistent with our EFH conservation recommendation, an explanation of the reason for not implementing the recommendation must be provided at least 10 days prior to final approval of the activities.

Please do not hesitate to contact me with any comments, questions or to request further technical assistance at alexandria.barkman@noaa.gov.

References

Alvarez-Filip, L, Dulvy, N, Gill, J, Côté, I, Watkinson, A. 2009. Flattening of Caribbean coral reefs: Region-wide declines in architectural complexity. *Proceedings of the Royal Society B: Biological Sciences*. 276(1669):3019-3025.

Goldberg, J. and Wilkinson, C., 2004. Global threats to coral reefs: coral bleaching, global climate change, disease, predator plagues and invasive species. *Status of Coral Reefs of the World*, *2004*, pp.67-92.

Higham, T.E., Stewart, W.J. and Wainwright, P.C., 2015. Turbulence, temperature, and turbidity: the ecomechanics of predator–prey interactions in fishes. *Integrative and Comparative Biology*, 55(1), pp.6-20.

ICES. 2016. Effects of extraction of marine sediments on the marine environment 2005–2011. *ICES Cooperative Research Report No. 330*. 206 pp.

Minton, D. 2013. Review of growth rates for indo-pacific corals final report. National Oceanic and Atmospheric Administration Pacific Islands Regional Office.

Nalley, E.M., Tuttle, L.J., Barkman, A.L., Conklin, E.E., Wulstein, D.M., Richmond, R.H. and Donahue, M.J., 2021. Water quality thresholds for coastal contaminant impacts on corals: A systematic review and meta-analysis. *Science of The Total Environment*, *794*, p.148632.

Nalley, E.M., Pirkle, C.M., Schmidbauer, M.C., Lewis, C.J., Dacks, R.S., Thompson, M.D., Sudnovsky, M.D., Whitney, J.L. and Donahue, M.J., 2023. Trophic and spatial patterns of contaminants in fishes from the Republic of the Marshall Islands in the equatorial Pacific. *Chemosphere*, *314*, p.137593.

Newell, R.C., Seiderer, L.J. and Hitchcock, D.R., 1998. The impact of dredging works in coastal waters: a review of the sensitivity to disturbance and subsequent recovery of biological resources on the sea bed. *Oceanography and Marine Biology: An Annual Review*, 36, pp.127-178.

Rützler, K. 2001. Exploring Neptune's gardens: From landlubber to reef biologist. Washington, D.C.: National Museum of Natural History, Smithsonian Institution.

Tuttle, L.J. and Donahue, M.J., 2022. Effects of sediment exposure on corals: a systematic review of experimental studies. *Environmental Evidence*, *11*(1), pp.1-33.

UNCLASSIFIED

--

Alexandria Barkman, PhD.
EFH Consulting Biologist, PIRO Habitat Conservation Division
National Marine Fisheries Service | U.S. Department of Commerce
Office: (808) 725-5150

www.fisheries.noaa.gov

From:	Fuller, David G CIV USARMY SMDC (USA)
To:	Barkman, Alexandria L CIV (USA)
Cc:	Karen Hoksbergen - KFS
Subject:	Essential Fish Habitat abbreviated consultation request for the Joint Flight Campaign project - [UNCLASSIFIED - 2023-12-12T15:43:25.156Z]
Date:	Friday, December 22, 2023 1:23:21 PM

Aloha Dr. Barkman,

USASMDC received your Essential Fish Habitat (EFH) abbreviated consultation conclusions and conservation recommendations on December 20, 2023. The Action Proponents (Department of the Navy Strategic Systems Programs and the U.S. Army Rapid Capabilities and Critical Technologies Office) have accepted your conservation recommendation to *ensure all vessel hulls do not pose a risk of introducing new invasive species and will not increase abundance of invasive species present at the project location*. The Action Proponents plan to implement this measure as part of the proposed Joint Flight Campaign Action to ensure that potential adverse effects to EFH are avoided and minimized. With this written acceptance of the National Marine Fisheries Service's conservation recommendations, we consider the subject EFH consultation complete.

Thank you for your prompt attention to our consultation request and for your technical assistance with the consultation.

Thank you,
David

David Fuller
NEPA Program Manager
Environmental Division/NEPA Branch
U.S. Army Space & Missile Defense Command
Redstone Arsenal, AL
(c) 256.425.2016
(o) 256.955.5585

From:	Alexandria Barkman - NOAA Federal
To:	Fuller, David G CIV USARMY SMDC (USA)
Cc:	Karen Hoksbergen - KFS
Subject:	Re: Essential Fish Habitat abbreviated consultation request for the Joint Flight Campaign project - [UNCLASSIFIED - 2023-12-12T15:43:25.156Z]
Date:	Friday, December 22, 2023 1:34:32 PM

Hi David,
The Habitat Conservation Division of the National Marine Fisheries Service, Pacific Islands Regional Office (NMFS) has received the USASMDC's response to the conservation recommendations provided by NMFS. Thank you for your response and acceptance of the conservation recommendations. The EFH consultation is complete.

Regards,
Alex

--

Alexandria Barkman, PhD.
EFH Consulting Biologist, PIRO Habitat Conservation Division
National Marine Fisheries Service | U.S. Department of Commerce
Office: (808) 725-5150
www.fisheries.noaa.gov

B

Comments and Responses on the Draft Supplemental EA/OEA

This page intentionally left blank.

COMMENT INCORPORATION SUMMARY

COMMENT INCORPORATOR KFS, LLC	DATE 8 January 2024
COMMENTOR – ORGANIZATION OF COMMENTOR • Karen Vitulano - Environmental Protection Agency Region 9 • Scott Campbell - Environmental Protection Agency Region 10 • Ryan Pe'a - United States Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office • Todd Anderson - Individual • Carolyn Heitman - Individual	
TITLE OF DOCUMENT Draft Supplemental Environmental Assessment / Overseas Environmental Assessment Joint Flight Campaign Flight Tests, Finding of No Significant Impact / Finding of No Significant Harm (Public Review)	DATE OF DOCUMENT 1 December 2023

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.	FIGURE NO.	TABLE NO.	COMMENT or RECOMMENDED CHANGES	RESPONSE TO COMMENT OR HOW COMMENT WAS INCORPORATED
Regulators							
1.	4-5	N/A	17	N/A	N/A	Please update, as necessary, based on the results of the consultation with USFWS (currently ongoing) (United States Fish and Wildlife Service: Ryan Pe'a, Biologist)	Document updated with results of the consultation with USFWS.
2.	4-16					**Environmental Justice:** We appreciate the additional information in the DSEA in response to our comment regarding impacts to the Native Alaskan subsistence fishing community by identifying the amount of fish harvested by subsistence fishers in 2018. The DSEA concludes that subsistence fishers would be able to harvest the same amount of fish under the proposed action, but the response did not address whether the community was consulted on this conclusion. As we commented, conclusions regarding environmental justice impacts must consider the input of the affected community. Local communities are often best equipped to understand their own unique needs, dynamics, and goals and to recommend appropriate solutions. Community members may have suggestions on the proposed mitigation measure surrounding fishing season avoidance. This meaningful engagement is highlighted in *Section 1.1* of the Administrations' recently released *Ocean Justice Strategy*. ***Recommendation:*** We recommend consulting with the Native Alaskan community and ensuring their perspectives are included in the impact assessment conclusions. They may already be experiencing changes in the harvest since 2018 due to climate change. In the final FONSI, provide any input received from the Native	The Draft SEA/OEA was available for 30-day public review from 1-31 December 2023. A Notice of Availability was published in the Kodiak Daily Mirror and the Anchorage Daily News, and hard copies were placed in the Kodiak Public Library and the Anchorage Public Library for public access. The Draft SEA/OEA was also made available over the Internet at https://jfceaoea.govsupport.us. As noted in Chapter 8 of the Draft SEA/OEA, the Action Proponents coordinated with the Sun'aq Tribe of Kodiak and the Alutiiq Tribe of Old Harbor. No comments were received from the Native Alaskan community.

COMMENT INCORPORATION SUMMARY

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.	FIGURE NO.	TABLE NO.	COMMENT or RECOMMENDED CHANGES	RESPONSE TO COMMENT OR HOW COMMENT WAS INCORPORATED
						Alaskan community to support the conclusion of negligible adverse impact. Ocean Justice Strategy, December 2023. See https://www.whitehouse.gov/wp-content/uploads/2023/12/Ocean-Justice-Strategy.pdf (Environmental Protection Agency: Karen Vitulano, Region 9; Scott Campbell, Region 10)	
3.	2-7					**Ocean Debris Recovery**: We appreciate that the efforts regarding debris recovery in the ocean were added to the mitigation measures and FONSI as we recommended. ***Recommendation:*** We recommend the findings of these recovery efforts, including details on any materials recovered, be documented for each flight test (up to 6 per year) to inform future flight test impact assessments. (Environmental Protection Agency: Karen Vitulano, Region 9; Scott Campbell, Region 10)	The findings of recovery efforts, including details on any materials recovered, would be documented for each flight test.
4.	E-1	E.2.1	18	N/A	N/A	Please update, as necessary, based on the results of the consultation with USFWS (currently ongoing) (United States Fish and Wildlife Service: Ryan Pe'a, Biologist)	Appendix E updated with results of the consultation with USFWS.
5.	E-4					**Mitigation commitments – cleanup of contamination:** We appreciate the additional information that specified that the referenced mitigation plan coordinated with the Alaska Department of Environmental Conservation to remediate "any hazardous materials and return the land to a natural or previous state" is a mitigation *approach*. ***Recommendation:*** We recommend including as much specificity as possible for this mitigation commitment that was "coordinated and confirmed" by ADEC, perhaps referencing the correspondence with the ADEC and defining cleanup levels that constitute the "natural or previous state" so it is a binding mitigation commitment sufficient to support the FONSI. (Environmental Protection Agency: Karen Vitulano, Region 9; Scott Campbell, Region 10)	Statement revised for further clarification to read, "…, in accordance with a mitigation approach developed by the Action Proponents, **which will be** coordinated with and confirmed by the Alaska Department of Environmental Conservation."
Individuals							
6.						I am in full support of as many launches as possible under the US Defense Department's long range hypersonic weapons testing program at the Kodiak Pacific Spaceport. It's pretty kewl tbh.	Thank you for your comment.

COMMENT INCORPORATION SUMMARY

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.	FIGURE NO.	TABLE NO.	COMMENT or RECOMMENDED CHANGES	RESPONSE TO COMMENT OR HOW COMMENT WAS INCORPORATED
						I would only ask for some better notice the day of launch. The sudden RUD events that have characterized an average Kodiak launch over the past 5 or so years are especially kewl to watch. Thanks and good luck! Todd (Todd Anderson – 4 December 2023- via document review website)	
7.						To Whom it May Concern. Since the first EA was released in 1996 for the Kodiak Launch Complex, I have continually read and commented on various EAs since and every one of them came to the same conclusion of “no significant impacts”, so I am not going to waste any more of my time reading through another EA—the Defense Department’s Joint Flight Campaign EA by the U.S Army and Navy which includes adding the Pacific Spaceport Complex Alaska(PSCA) to future hypersonic missile testing. For the record, I am adamantly against any further MDA/military missile tests from Narrow Cape in Kodiak, Alaska. Narrow Cape is state, public property and a highly used, recreational area on Kodiak’s road system and the military needs to find government property, not public property to do its research/testing or else launch from military ships, not from state owned public property. The Kodiak public including fishermen have put up with many inconveniences over the years from rocket/ missile testing at the PSCA and have reached their limit on patience and launch companies contaminating Kodiak’s environment from launch accidents(such as the January 2023 rocket explosion that contaminated Narrow Cape soil, which required 180 containers of contaminated soil to be removed and shipped off island to Seattle, WA.). The Navy used to do launch exercises off the California Coast years ago until the public and Envionmental sic groups had enough of the contamination to waters, etc. and brought a lawsuit against the Navy. It wasn’t long after that the Navy decided to come to Alaska and test in the Gulf of Alaska. The testing has now been expanded to include the whole Alaska coastline down the Aleutian Chain. Enough is enough.	Thank you for your comment. The Draft SEA/OEA was available for 30-day public review from 1-31 December 2023. A Notice of Availability was published in the Kodiak Daily Mirror and the Anchorage Daily News, and hard copies were placed in the Kodiak Public Library and the Anchorage Public Library for public access. The Draft SEA/OEA was also made available over the Internet at https://jfceaoea.govsupport.us. Any comments/input received from the community were considered in the Final SEA/OEA and are included in Appendix B of the Final SEA/OEA.

COMMENT INCORPORATION SUMMARY

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.	FIGURE NO.	TABLE NO.	COMMENT or RECOMMENDED CHANGES	RESPONSE TO COMMENT OR HOW COMMENT WAS INCORPORATED
						I am requesting any final decision making be held off until representatives from the Navy/Army come to Kodiak in person after the holidays and hold a public meeting, as it is what the people in Kodiak have been discussing and wanting since the Navy's public notice in the Kodiak Daily Mirror. Carolyn Heitman Kodiak, Alaska (Carolyn Heitman, 14 December 2023-via the document review website)	

C

Key Documents

This page intentionally left blank.

Appendix C. Key Documents

Key documents are sources of information incorporated into this Supplemental Environmental Assessment / Overseas Environmental Assessment (EA/OEA). These documents are considered to be key because they address similar actions, analyses, or impacts that may apply to this Proposed Action.

- *Joint Flight Campaign (JFC) Environmental Assessment / Overseas Environmental Assessment*, 2022 (DON and U.S. Army 2022). See https://jfceaoea.govsupport.us/documents/. The JFC EA/OEA provides analysis of proposed Navy Strategic Systems Programs (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 (PMRF) / Kaua`i Test Facility (KTF), Kaua`i, Hawai`i; Wallops Flight Facility, Wallops Island, Virginia; Vandenberg Space Force Base, California; and Cape Canaveral Space Force Station, Florida. Candidate impact areas include Broad Ocean Areas (BOA) in the Pacific and Atlantic Oceans.
- *Final Environmental Assessment / Overseas Environmental Assessment for Hypersonic Flight Test-3 (FT-3),* 2021 (U.S. Army 2021). See https://ft3eaoea.govsupport.us/. The U.S. Army RCCTO proposed to conduct a single developmental hypersonic flight test, FT-3, between March 2021 and September 2021 from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands.
- *Final Environmental Assessment / Overseas Environmental Assessment for Flight Experiment 2 (FE-2),* 2019 (DON 2019). See https://fe-2-eaoea.com/. This EA/OEA provides analysis of a proposed Navy SSP experimental flight test with an experimental payload from one of two candidate launch sites, which included KTF at PMRF, Kaua`i, Hawai`i and the Wallops Flight Facility, Wallops Island, Virginia. Candidate impact areas included Illeginni Islet, U.S. Army Kwajalein Atoll, Ronald Reagan Ballistic Missile Defense Test Site, Republic of the Marshall Islands, and BOAs in the Pacific and Atlantic Oceans. The purpose of the project was to collect data on a developmental payload by testing range performance and to demonstrate technologies for prospective strike capabilities specifically to flight test the developmental payload concept to demonstrate the maturity of key technologies including precision navigation, guidance and control, and enabling capabilities.
- *Final Environmental Assessment, Finding of No Significant Impact/Record of Decision for the Kodiak Launch Complex Launch Pad 3*, 2016 (FAA 2016). This EA provides analysis of potential environmental impacts of the Federal Aviation Administration action to modify the Alaska Aerospace Corporation's Launch Site Operator License for the Kodiak Launch Complex, now PSCA. The EA evaluated the potential environmental impacts of modifying the Launch Site Operator License to include medium-lift launch capability at PMRF with the addition of new infrastructure necessary to support

launches. Activities included the construction of a launch pad and associated facilities, launch of a variety of orbital and suborbital vehicles, and associated launch support activities at PSCA.

- *Site Wide Environmental Assessment for Sandia National Laboratories, Kaua`i Test Facility*, 2018 (DOE 2018). This EA provides analysis of the Department of Energy's continued operation of the Sandia National Laboratories, KTF located on PMRF, Kaua`i, Hawai`i. This EA evaluated the National Nuclear Safety Administration's action to continue conducting launch activities at the site and to expand vertical launch capabilities at the site. Evaluated activities included construction as well as operational support and launch activities for Department of Defense missions and flight tests.

D

Relevant Laws and Regulations

This page intentionally left blank.

Appendix D. Relevant Laws and Regulations

The Joint Flight Campaign (JFC) Action Proponents have prepared this Supplemental Environmental Assessment / Overseas Environmental Assessment (EA/OEA) based on federal and state laws, statutes, regulations, and policies that are pertinent to the implementation of the Proposed Action. The pertinent laws and regulations are listed below and the regulatory setting under these laws and regulations is described in the subsections of this appendix.

- National Environmental Policy Act (NEPA; 42 United States Code [U.S.C.] § 4321 et seq.), which requires an environmental analysis for major federal actions that have the potential to significantly impact the quality of the human environment
- Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] §§ 1500-1508)
- Navy regulations for implementing NEPA (32 CFR § 775), which provides Navy policy for implementing Council on Environmental Quality regulations and NEPA
- Navy Chief of Naval Operations Instruction (OPNAVINST) M-5090.1
- Department of the Army Procedures for Implementing NEPA (32 CFR § 651)
- Clean Air Act (42 U.S.C. § 7401 et seq.)
- Clean Water Act (33 U.S.C. § 1251 et seq.)
- Coastal Zone Management Act (16 U.S.C. § 1451 et seq.)
- National Historic Preservation Act (54 U.S.C. § 300101 et seq.)
- Endangered Species Act (ESA; 16 U.S.C. § 1531 et seq.)
- Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (MSA) (16 U.S.C. § 1801 et seq.)
- Marine Mammal Protection Act (MMPA; 16 U.S.C. § 1361 et seq.)
- Migratory Bird Treaty Act (MBTA; 16 U.S.C. §§ 703-712)
- Bald and Golden Eagle Protection Act (16 U.S.C. §§ 668-668d)
- National Marine Sanctuaries Act (16 U.S.C. § 1431 et seq.)
- American Antiquities Act, National Monuments (54 U.S.C. § 320301 et seq.)
- Executive Order (EO) 11988, Floodplain Management
- EO 11990, Protection of Wetlands
- EO 12088, Federal Compliance with Pollution Control Standards
- EO 12114, Environmental Effects Abroad of Major Federal Actions

- EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations
- EO 13045 (as amended), Protection of Children from Environmental Health Risks and Safety Risks
- EO 13089, Coral Reef Protection
- EO 13112, Invasive Species
- EO 13158, Marine Protected Areas
- EO 13175, Consultation and Coordination with Indian Tribal Governments
- EO 13834, Sections 6, 7, and 11, Efficient Federal Operations
- EO 14057, Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability
- EO 14082, Implementation of the Energy and Infrastructure Provisions of the Inflation Reduction Act of 2022

D.1 Pacific Missile Range Facility

D.1.1 Water Resources – PMRF

Groundwater quality is regulated under several statutes and regulations, including the Safe Drinking Water Act, the Clean Water Act, and the National Pollutant Discharge Elimination System. For information regarding how the U.S. Environmental Protection Agency (USEPA) enforces federal clean water and safe drinking laws, provides support for municipal wastewater treatment plants, and pollution prevention plans for protection of watersheds and drinking water, access https://www.epa.gov/regulatory-information-topic/regulatory-and-guidance-information-topic-water. For information regarding the Kaua`i Department of Water, including its annual water quality report for the Kekaha-Waimea water system, access http://www.kauaiwater.org/wqr_waimea.pdf.

The Clean Water Act establishes federal limits, through the National Pollutant Discharge Elimination System program, on the amounts of specific pollutants that can be discharged into surface waters to restore and maintain the chemical, physical, and biological integrity of the water (DON 2019). The National Pollutant Discharge Elimination System program regulates water pollution discharges of point (i.e., end of pipe) versus nonpoint sources (i.e., storm water).

Flood potential is determined by the 100-year floodplain, which is defined as the area that has a 1% chance of inundation by a flood event in a given year. All of Pacific Missile Range Facility (PMRF) is in the Tsunami Evacuation Zone, which is coincident with the Federal Flood Hazard Zone (DON 2019).

D.1.2 Cultural Resources – PMRF

The National Historic Preservation Act protects cultural resources in the United States. Section 106 of the National Historic Preservation Act requires a federal agency to consider the effects of the Proposed Action on historic properties with the Hawai`i State Historic Preservation Division. Only one extant Kaua`i Test Facility building/structure has undergone eligibility evaluation and consultation with the State Historic Preservation Division: the Missile Service Tower, which was found to be not eligible.

In addition to the National Historic Preservation Act, the Archaeological Resources Protection Act of 1979 (16 U.S.C. 470aa- 470mm) prohibits the excavation or removal of items of archaeological interest from federal lands without a permit; the Antiquities Act of 1906 (16 U.S.C. § 431); and the Native American Graves Protection and Repatriation Act (25 U.S.C. § 3001 et seq.), require that federal agencies return “Native American cultural items” to the federally recognized native groups with which they are associated, and specifies procedures to be followed if such items are discovered on federal land. In 2012, a Programmatic Agreement was executed for Navy undertakings in Hawai`i, and the area of responsibility encompasses Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility; outlying Oahu installations; and PMRF at Barking Sands, Kaua`i (DON 2018a). The Programmatic Agreement covers Navy installations undertakings on land up to 5.5 kilometers (km; 3 nautical miles [nm]) from shore, but not the at-sea training and testing activities (DON 2018a). The Programmatic Agreement includes stipulations for development of an integrated cultural resources management plan, determinations of areas of potential effects, identification of historic properties, access to historic sites and interpretative activities, review of project effects, monitoring of ground disturbing activities, annual reporting requirements, and consultation with Native Hawaiians and other consulting parties (DON 2018a).

D.1.3 Biological Resources – PMRF

The regulatory requirements that apply to biological resources within the PMRF Region of Influence (ROI) include requirements under the ESA, MMPA, MSA, MBTA, and several EOs.

Endangered Species 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 United States Fish and Wildlife Service (USFWS) or National Oceanic and Atmospheric Administration Fisheries 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 (16 U.S.C. §§ 1531-1544). For all ESA listed species, the ESA defines “harm” as an act which kills or injures wildlife including significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (16 U.S.C. §§ 1531-1544). The ESA defines harassment as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly

disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering.

Magnuson-Stevens Fishery Conservation and Management Act

The MSA (16 U.S.C. § 1801 et seq.) provides for the conservation and management of the fisheries. Under the MSA, essential fish habitat (EFH) consists of the waters and substrate needed by fish to spawn, breed, feed, or grow to maturity. An EFH may include U.S. waters within Exclusive Economic Zones (seaward boundary out to a distance of 370 km [200 nm]) and covers all fish species within a fishery management unit (50 CFR § 600.805). Under the MSA, an adverse effect means any impact that reduces quality and/or quantity of EFH (50 CFR § 600.810). Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH (50 CFR § 600.810). EFH and its geographic boundaries are defined by regional fisheries management councils. Federal agencies must evaluate the effects of an action on EFH and must consult with the National Marine Fisheries Service on actions that may adversely affect EFH (67 Federal Register [FR] 2343 [January 17, 2002]).

Marine Mammal Protection Act

All marine mammals are protected under the provisions of the MMPA (16 U.S.C. § 1361 et seq.). The MMPA prohibits any person or vessel from “taking” marine mammals in the United States or the high seas without authorization. As defined by the MMPA, Level A harassment of cetaceans is any act that has the potential to injure a marine mammal or marine mammal stock in the wild. Level B harassment is defined as any act that has the potential to disturb a marine mammal or marine mammal stock in the wild by causing behavioral pattern disruptions, including but not limited to migration, breathing, nursing, breeding, feeding, or sheltering. The National Defense Authorization Act of Fiscal Year 2004 (Public Law 108-136) amended the definition of harassment as it applies to military readiness activities or scientific research activities conducted by or on behalf of the Federal Government, consistent with Section 104(c)(3). In this Act, military readiness activities were defined as “all training and operations of the Armed Forces that relate to combat” and “the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use.” For military readiness activities Level B harassment is defined as any act that 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 [16 U.S.C. § 1362 (18)(B)(i) and (ii)]. Section 101(a)(5) of the MMPA directs the Secretary of the Department of Commerce to allow, upon request, the incidental (but not intentional) taking of marine mammals if certain findings are made and regulations are issued. Under the MMPA, marine mammal stocks can be listed as depleted. The term depleted is defined by the MMPA as any case in which a species or population stock is determined to be below its optimum sustainable population.

Migratory Bird Treaty Act

Both migratory and most native-resident bird species are protected under the MBTA (16 U.S.C. §§ 703-712), and their conservation by federal agencies is mandated 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. Under EO 13186, federal agencies must evaluate the effects of actions on migratory birds with emphasis on species of concern, which were later defined as birds of conservation concern by USFWS. Birds listed as birds of conservation concern are species with the highest conservation priority which without additional conservation actions are likely to become candidates for listing under the ESA. 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. Congress has defined military readiness activities as all training and operations of the U.S. Armed Forces that relate to combat and the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use (16 U.S.C. § 703 note). As directed by Section 315 of the Authorization Act, the USFWS issued a final rule authorizing incidental take, with limitations, that results from military readiness activities of the Armed Forces (72 FR 8931 [February 28, 2007]). The final rule authorizing the Department of Defense (DOD) to take migratory birds in such cases includes a requirement that the Armed Forces must confer and cooperate with USFWS to develop and implement appropriate conservation measures to minimize or mitigate adverse effects of the proposed action if the action is likely to result in a significant adverse effect on the sustainability of a population of a migratory bird species (50 CFR § 21.42).

Other Biological Resource-Related Executive Orders

This EA/OEA also evaluates the effects of the action on biological resources as required by EO 13112, *Invasive Species*; EO 11990, *Protection of Wetlands*; EO 13089, *Coral Reef Protection*; and EO 13158, *Marine Protected Areas*.

D.1.4 Public Health and Safety – PMRF

Refer to JFC EA/OEA Section 3.1.3.1, Pages 3-19 through 3-20 for information on PMRF's regulatory setting. All hazardous operations at PMRF would be performed under strict adherence to existing standard operating procedures to ensure worker and public health and safety requirements are met. Standard operating procedures provide general requirements and guidance for all range operations, including ordnance safety, pre-launch and hazardous operations control, ordnance handling and storage facilities, liquid fuels storage and handling, and launch pad operations.

D.1.5 Hazardous Materials and Waste – PMRF

Hazardous materials handling, storage, and disposal are federally regulated by the USEPA in accordance with the Federal Water Pollution Control Act, Clean Water Act, Toxic Substances

Control Act, Solid Waste Disposal Act, Resource Conservation and Recovery Act, Comprehensive Environmental Response Compensation and Liability Act, and the Clean Air Act.

D.2 Pacific Spaceport Complex Alaska

D.2.1 Air Quality and Climate Change – PSCA

Clean Air Act (National Ambient Air Quality Standards)

The Clean Air Act, as amended, requires the USEPA to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. USEPA Region 10 and Alaska Department of Environmental Conservation regulate air quality in Alaska. The Clean Air Act (42 U.S.C. §§ 7401-7671q), as amended, assigns the USEPA responsibility to establish the primary and secondary NAAQS (40 CFR § 50) that specify acceptable concentration levels of six criteria pollutants: particulate matter (measured as both particulate matter less than 10 microns in diameter [PM_{10}] and particulate matter less than 2.5 microns in diameter [$PM_{2.5}$]), sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, and lead. Short-term NAAQS (1-, 8-, and 24-hour periods) have been established for pollutants contributing to acute health effects, while long-term NAAQS (annual averages) have been established for pollutants contributing to chronic health effects. While each state has the authority to adopt standards stricter than those established under the federal program, the State of Alaska has accepted the federal standards.

General Conformity (Attainment Versus Nonattainment)

The USEPA classifies the air quality in a region according to whether the concentrations of criteria pollutants in ambient air exceed the NAAQS. Federal regulations designate Air Quality Control Regions in violation of the NAAQS as *nonattainment* areas, while Air Quality Control Regions with concentration levels below the NAAQS are designated as *attainment* areas. An Air Quality Control Region in *maintenance* indicates that it was previously designated nonattainment but is now attainment.

The General Conformity Rule applies only to significant federal actions in nonattainment or maintenance areas. This rule requires that any federal action meets the requirements of a State Implementation Plan or Federal Implementation Plan. More specifically, Clean Air Act conformity is ensured when a federal action does not cause a new violation of the NAAQS; contribute to an increase in the frequency or severity of violations of NAAQS; or delay the timely attainment of any NAAQS, interim progress milestones, or other milestones toward achieving compliance with the NAAQS.

Hazardous Air Pollutants / Mobile Sources

USEPA implements national standards for Hazardous Air Pollutants (42 U.S.C. § 7412). Hazardous air pollutants, also known as toxic air pollutants or air toxics, are those pollutants that

are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. The National Emission Standards for Hazardous Air Pollutants regulate emissions of 188 Hazardous Air Pollutants from stationary sources (40 CFR § 61). Examples of Hazardous Air Pollutants include benzene, asbestos, and other specific volatile organic compounds/hydrocarbons; heavy metal compounds; and other particulate matter. Hazardous Air Pollutants emitted from mobile sources are called Mobile Source Air Toxics, which are compounds emitted from fuel combustion in vehicles, non-road equipment, vessels, and aircraft. The primary Mobile Source Air Toxics are 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter, ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. The USEPA Final Rule for Control of Emissions of Hazardous Air Pollutants from Mobile Sources (40 CFR § 80) sets gasoline and vehicle emission standards. Unlike the criteria air pollutants, there are no NAAQS for benzene and other Hazardous Air Pollutants. The primary control methodologies for these pollutants for mobile sources involve reducing their content in fuel and altering the engine operating characteristics to reduce the volume of pollutant generated during combustion.

Stratospheric Ozone Depletion

The stratosphere extends from 9.7 km (6 miles [mi]) to approximately 48 km (30 mi) above the Earth's surface and contains the Earth's ozone layer. This layer is important in absorbing harmful ultraviolet radiation from the sun. Over the last few decades, anthropogenic (human-made) gases released into the atmosphere, mainly chlorine-containing substances, have threatened ozone concentrations in the stratosphere which filter harmful ultraviolet sunlight. Chlorofluorocarbons and halons have been widely used in electronics and refrigeration systems and fire extinguishing agents. Once released, these gases mix in the atmosphere worldwide until they reach the stratosphere, where ultraviolet radiation releases their chlorine, fluorine, and bromine components. Global compliance with the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer and amendments has resulted in significantly reduced worldwide production of chlorofluorocarbons and other ozone-depleting substances, including bans in many countries by specific dates. In 2022 National Oceanic and Atmospheric Administration scientists announced that an annual analysis of air samples collected at remote sites around the globe that is tracking a continued decline in the atmospheric concentration of ozone-depleting substances shows the threat to the ozone layer receding below a significant milestone. (NOAA 2022d).

High-temperature afterburning reactions in the exhaust plume of rockets can contribute to overall global chlorine loading, which contributes to ozone depletion. Stratospheric hydrogen chloride can have a half-life of 2.3 years, but hydrogen chloride from rocket emissions could have longer lifetimes because part of the emissions occurs at atmospheric levels above the stratosphere. Aluminum oxide, which is emitted from the rocket exhaust as solid particles, could contribute to ozone depletion via activation of chlorine in the atmosphere. Emissions of nitrogen oxides produced in the exhaust plume of rockets can also contribute to stratospheric ozone depletion (DON and U.S. Army 2022).

Greenhouse Gas Emissions

Greenhouse gases (GHGs) are not considered criteria air pollutants and are not specifically called out for regulation in the Clean Air Act, but the USEPA has the authority to regulate GHGs under the Clean Air Act (Massachusetts v. EPA, 549 U.S. 497 [2007]). Navy installations that emit GHGs above established thresholds are required to comply with applicable requirements of the GHG Reporting Program, state rules, and USEPA permitting requirements. The Navy reports its GHG emissions inventory annually to the Office of the Secretary of Defense. (DON 2021)

One indicator of potential significance for GHG emissions is the USEPA's GHG reporting threshold of 25,000 metric tons per year (27,558 short tons per year) within 40 CFR § 98. In practice, this rule only applies to stationary sources (USEPA 2023); however, the Proposed Action would almost exclusively generate mobile source emissions. The 2023 (9 January) Council on Environmental Quality Notice of Interim Guidance on GHG Emissions in NEPA acknowledges the increasing urgency of the climate crisis and advances in climate science and GHG analysis techniques. The guidance makes essentially three recommendations to federal agencies which include the following (Council on Environmental Quality 2023, McCormick and Wortzel 2023):

1. Encourages federal agencies to quantify the reasonably foreseeable GHG emissions of a proposed action and its alternatives when possible, but the guidance does not generate any particular quantity of GHG emissions as "significantly" disturbing the quality of the human environment. The guidance overall recommends that agencies apply appropriate tools and methodologies to quantify GHG emissions, compare GHG emission quantities across alternative scenarios, and place emissions in relevant context, including how they relate to climate action commitments and goals. If tools or data are not reasonably available to quantify GHG emissions, the reasons for why quantification is not possible should be provided along with seeking to present a reasonable estimated range of emissions. If even a reasonable range of potential GHG emissions cannot be provided, the agency should provide a qualitative analysis and its rationale for determining that a quantitative analysis is not possible.
2. Agencies should disclose and provide background information for GHG emissions and climate effects to help decision makers and the public comprehend the proposed action potential GHG emissions and climate change consequences.
3. The Interim Guidance discusses how agencies can best use the NEPA scoping process to determine the extent to which a more detailed analysis of climate change and GHG emissions is appropriate.

Because the Long Range Hypersonic Weapon All-Up-Round is still in development, GHG impacts will be analyzed qualitatively by comparison to previous flight test launches.

State, Local, U.S. Territory/Commonwealth Regulatory Setting

Outside of the U.S. outer continental shelf (beyond 200 nm from the east coast shore), the Pacific Broad Ocean Area does not have an air quality regulatory body that has jurisdiction over the region. State jurisdiction over the ocean varies from state to state and extends out to 3 to 12 nm from the shoreline, with federal jurisdiction beyond the state jurisdiction to the 200-nm point. Because the Pacific study area begins approximately 50 nm from the U.S. East Coast, federal jurisdiction applies to this analysis, but state jurisdiction does not.

D.2.2 Water Resources – PSCA

See the Flight Test 3 (FT-3) EA/OEA (U.S. Army 2021, Section 3.1.2.1, Page 3-9) for PSCA's regulatory requirements regarding surface water and groundwater.

The USEPA finalized its definition of Waters of the United States on December 30, 2022 (https://www.epa.gov/newsreleases/epa-and-army-finalize-rule-establishing-definition-wotus-and-restoring-fundamental), primarily restoring the pre-2015 definitions and updating to reflect to Supreme Court decisions and latest science. Alaska's wetlands are currently regulated by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act as a subset of all "Waters of the United States" (U.S. Army 2021). The U.S. Army Corps of Engineers and USEPA have published a Joint Coordination Memorandum, titled 2022 Coordination Memo, to establish the processes that the organizations are to follow regarding correct implementation of the new definition of Waters of the United States and jurisdictions in the states (https://www.epa.gov/wotus/current-implementation-waters-united-states).

PSCA's non-transient, non-community "Class A" public water system is permitted by the Alaska Department of Environmental Conservation (U.S. Army 2021). PSCA secured a Certificate of Appropriation for groundwater usage from the State of Alaska Department of Natural Resources (number LAS 24062) and is authorized to use 1.03 acre-feet (1,270,486 liters [335,627 gallons]) of groundwater per year (U.S. Army 2021).

D.2.3 Biological Resources – PSCA

The regulatory requirements that apply to biological resources within the PSCA ROI include provisions of the ESA, MMPA, MSA, MBTA, and several EOs as described in **Section D.1.3**. The regulatory setting in the PSCA ROI also includes the Bald and Golden Eagle Protection Act.

Bald and Golden Eagle Protection Act

This act protects both bald and golden eagles (*Haliaeetus leucocephalus* and *Aquila chrysaetos*) by prohibiting the take, possession, sale, purchase, export or import of eagles (16 U.S.C. § 668). This prohibition includes living or dead eagles as well as any eagle part, nest, or egg. Under the act, the definition of "take" includes pursuit, shooting at, poisoning, wounding, killing, capture, trapping, molesting, or disturbing of eagles, all of which are prohibited without a permit.

D.2.4 Public Health and Safety – PSCA

PSCA's safety policies and standard operating procedures for general operations and launch-specific safety plans have been developed to meet or exceed the requirements of the Range Commanders Council Common Risk Criteria for National Test Ranges and Standard 321-20 (RCC 321-20); Air Force Sustainment Center Manual (AFSCMAN) 2004; and Federal Aviation Administration (FAA) Notice of Proposed Rulemaking (USASMDC/ARSTRAT 2014).

Military aircraft fly in accordance with FAA Regulations 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. These rules include the use of tactical training and maintenance flight test areas, arrival and departure routes, and airspace restrictions as appropriate to help control air operations.

EO 13045, Protection of Children from Environmental Health Risks and Safety Risks (1997) (As Amended by EO 13229 (2001) and EO 13296 (2003)) requires federal agencies to "make it a high priority 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."

All health and safety procedures prescribed by the manual are in accordance with applicable DOD, federal, and state regulations and standards. According to the 2017 PSCA EA, these include Army Pamphlet 385-64, Ammunition and Explosive Safety Standards; DOD 6055.09-M, DOD Ammunition and Explosive Safety Standards; and Range Commanders Council Standard 321, Common Risk Criteria Standards for National Test Ranges.

D.2.5 Hazardous Materials and Wastes – PSCA

Hazardous materials use, storage, and disposal are managed in accordance with the PSCA Safety Policy, the PSCA Emergency Response Plan, the PSCA General Compliance Plan for Emergency Planning and Community Right to Know Act, the Kodiak Area Emergency Operation Plan, the Explosive Site Plan (as required by 14 CFR § 420), Resource Conservation and Recovery Act, and other applicable state and federal environmental laws (U.S. Army 2021). All mission-specific hazardous waste, such as propellants and explosives, must be removed at the end of the mission by the Action Proponents. PSCA maintains a Spill Prevention, Control, and Countermeasure Plan covering the fuel/oil storage facilities (See U.S. Army 2021, Table 3-5, Page 3-43).

D.2.6 Socioeconomics/Environmental Justice – PSCA

EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, was issued by President William J. Clinton in 1994. Its purpose is to focus federal attention on the environmental and human health effects of federal actions on minority and low-income populations with the goal of achieving environmental protection for all communities.

EO 12898 directs federal agencies to:

- Identify and address the disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law.
- Develop a strategy for implementing environmental justice.
- Promote nondiscrimination in federal programs that affect human health and the environment.

D.3 Pacific Ocean

D.3.1 Water Resources – Pacific Ocean

The 1982 United Nations Convention on the Law of the Sea (referred to as "The Convention") established Exclusive Economic Zones which extend 370 km (200 nm) from shore, where coastal governments have sovereign rights to the water column and sea floor as well as the natural resources found there (United Nations 2012). The Convention also established intergovernmental organizations under the United Nations such as the International Maritime Organization, which regulates ocean shipping; the International Seabed Authority, which regulates the exploration and exploitation of seabed minerals; and the International Tribunal for the Law of the Sea, which has legal authority to rule in disputes of interpretation and application of the Convention. These authorities are the agreed upon groups responsible for managing the human relationship to, use of, and conservation of international waters, excluding Exclusive Economic Zones.

D.3.2 Biological Resources – Pacific Ocean

The regulatory requirements that apply to biological resources within the Pacific Ocean ROI include provisions of the ESA, MMPA, MBTA, MSA, and EO 12114 as described in **Section D.1.3**. The regulatory setting in Exclusive Economic Zone waters of the Pacific Ocean ROI also includes the National Marine Sanctuaries Act and the Antiquities Act, as it applies to Marine National Monuments.

National Marine Sanctuaries Act

Each National Marine Sanctuary has its own set of regulations within subparts of 15 CFR § 922. Subparts A through E contain regulations that apply to all sanctuaries and subparts F through R each contain the sanctuary-specific regulations for all 14 sanctuaries. While each sanctuary has its own unique set of regulations, there are some regulatory prohibitions that are typical for many sanctuaries including prohibitions on discharging material or other matter into the sanctuary; disturbance of, construction on or alteration of the seabed; disturbance of cultural resources; and exploring for, developing or producing oil, gas or minerals. In addition, some sanctuaries prohibit other activities, such as the disturbance of marine mammals, seabirds and sea turtles, operation of aircraft in certain zones, use of personal watercraft, mineral mining, and anchoring of vessels. If a federal agency finds that a proposed action is likely to injure sanctuary resources, the agency

is required to submit a "written statement" to the Office of National Marine Sanctuaries describing the potential effects of the activity on sanctuary resources and must consult with the National Oceanic and Atmospheric Administration on activities that trigger the need to consult.

National Monuments

Marine national monuments are designated by Presidential Proclamation via the Antiquities Act of 1906 (54 U.S.C. § 320301 et seq.). U.S. Marine National Monuments are designated within U.S. Exclusive Economic Zones. These areas have prohibitions on injuring, disturbing, or damaging monument resources, including biological resources. There are also prohibitions on placing or abandoning any structure, material, or other matter on the submerged lands. However, activities and exercises of the U.S. Armed Forces are exempt from these national monument prohibitions.

D.3.3 Hazardous Materials and Waste – Pacific Ocean

Hazardous materials are defined by 49 CFR § 171.8 and include “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 CFR § 173.” Transportation of hazardous materials is regulated by the U.S. Department of Transportation.

Hazardous wastes are defined by the Resource Conservation and Recovery Act, 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 CFR § 273. Four types of waste are currently covered under the universal waste regulations: hazardous waste batteries, hazardous waste pesticides that are either recalled or collected in waste pesticide collection programs, hazardous waste thermostats, 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, and lead-based paint. The USEPA is given authority to regulate special hazard substances by the Toxic Substances Control Act. Asbestos is also regulated by the USEPA under the Clean Air Act and the Comprehensive Environmental Response, Compensation, and Liability Act. The DOD established the Defense Environmental Restoration Program 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 Defense Environmental Restoration Program. 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 Navy's initiative to address Defense Environmental Restoration Program requirements.

This page intentionally left blank.

E

Mitigation Measures

This page intentionally left blank.

Appendix E. Mitigation Measures

Mitigation measures are designed to avoid, minimize, rectify, reduce, or compensate for potential adverse effects to various environmental resources during implementation of the Proposed Action. The mitigations outlined in the following sections are applicable to all locations and environmental resource areas, unless otherwise specified.

E.1 Air Quality and Climate Change

The following mitigation measures will be implemented as part of the Proposed Action at Pacific Spaceport Complex Alaska (PSCA) to minimize the potential effects of carbon monoxide from Proposed Action:

- Use hybrid gasoline–electric vehicles (alternate fuel source).
- Use battery electric vehicles.
- Follow vehicle maintenance practices for vehicle efficiency and use of fuel.
- Increase the use of low-carbon fuels.
- Reduce the number of vehicles used by workers.
- Use public transit.
- Develop and use transportation strategies to reduce carbon monoxide production (i.e., car/van pool).

E.2 Biological Resources

E.2.1 PMRF Biological Conservation and Mitigation Measures

The following avoidance, minimization, and conservation measures would be implemented as part of the Proposed Action at Pacific Missile Range Facility (PMRF) to minimize the potential effects of the Proposed Action on Endangered Species Act (ESA)-listed species:

- Prior to conducting project activities, all personnel will receive on-site training in coordination with the PMRF Environmental Program to ensure personnel understand PMRF's natural resource policies and wildlife protection regulations and protocols.
- Training will include established PMRF Environmental Management Policies and guidelines relevant to the season of proposed activities, including "Nēnē Guidelines for PMRF Operations", "Good Samaritan Hazing" training for nēnē", "PMRF Dark Skies Program Briefing & Natural Resources Training", and "Shearwater Fallout Instructions".

- All project personnel will be trained on the presence of ESA-listed species on PMRF and the importance of adhering to posted speed limits to avoid collision with protected wildlife.
- Project personnel will not approach, disturb, or feed any protected animal species or their nests.
- Project personnel will avoid entering beaches.
- Project-related vehicle and equipment operation will occur within paved or maintained areas.
- Areas up to the Terminal High Altitude Area Defense (THAAD) launch site fence line will be maintained free of flammable vegetation to minimize fire potential.
- Non-native areas surrounding the THAAD site will be regularly mowed. Bushes, trees, shrubs, and short statured grass will be regularly cleared to reduce wildfire risk and avoid creating nesting habitat for nēnē.
- The areas adjacent to the launch pad will be pre-soaked with water prior to launch if deemed necessary due to extremely dry or windy conditions. Site conditions and the need for vegetation wetting will be evaluated and coordinated with PMRF Range and Environmental Offices prior to launch.
- Fire and emergency service crews will be present at every launch.
- If the flight test will occur during the Hawaiian seabird fledging season, the Action Proponents will comply with the requirements of the 2014 and 2018 biological opinions as implemented by the Navy at PMRF, as well as any relevant procedures resulting from potential future Navy PMRF consultations with the U.S. Fish and Wildlife Service (USFWS) regarding the effects of lighting on ESA-listed seabirds.
- Whenever possible, night lighting will be avoided or minimized. Where security or safety concerns require night lighting, either full cut-off lighting fixtures will be used or, if full cut-off fixtures cannot be installed, motion sensors will be used or lights will be turned off when not necessary. Between September 15th and December 15th, all project activities will be Dark Skies compliant.
- Standard PMRF patrols will be conducted to confirm any exposed lights during the night are required and meet shielding requirements.
- Standard PMRF biweekly wildlife surveys and nest searches will be conducted.
- Launch area inspections (sweeps) will be conducted during launch set-up and prior to every launch to check for wildlife that may have entered the launch area.
- If nēnē are observed loafing or foraging within 61 meters (m; 200 feet [ft]) of the launch pad within 24 hours preceding the launch, project or PMRF test personnel would coordinate a response with the PMRF Environmental Office. Response solutions might

include hazing (compliant with the nēnē 4(d) rule) by trained and authorized personnel to encourage nēnē to leave the area, or a nēnē nest search (within 61 m [200 ft] of the launch pad) if birds are unwilling to leave the area. If a nēnē nest were found within 53 m (175 ft) of the launch pad, PMRF Environmental Office will be notified and the USFWS will be contacted (by PMRF Environmental Office personnel) for further coordination on a course of action before the launch proceeds.

- No trimming or removal of trees is expected for the Proposed Action. Any trimming or removal of trees over 4.6 m (15 ft) tall would be conducted outside of the Hawaiian hoary bat pupping season (June 1 to September 15).
- No additional fencing or barbed wire would be installed for the Proposed Action at PMRF.
- Standard PMRF security procedures will be followed during Joint Flight Campaign (JFC) launch activities. No project-related vehicles, equipment, or personnel would enter beach habitats.

E.2.2 Pacific Ocean Biological Conservation and Mitigation Measures

The following avoidance, minimization, and conservation measures would be implemented as part of the Proposed Action in the Pacific Broad Ocean Area to minimize the potential effects of the Proposed Action on ESA-listed and Marine Mammal Protection Act protected species:

- During travel to and from impact zones, and during raft deployment, ship personnel would monitor for marine mammals and sea turtles to avoid potential vessel strikes, consistent with Navy standard operating procedures for vessel operation. Vessel operators would adjust speed or raft deployment based on the presence of special-status animals and/or lighting and turbidity conditions.
- Vessel operations would only occur when weather and sea conditions are acceptable for safe travel. Vessel operations would not involve any intentional ocean discharges of fuel, toxic wastes, or plastics and other solid wastes that could potentially harm marine life.
- Any accidental spills from support equipment operations would be contained and cleaned up. Spill response kits would be available on all support equipment.
- Proposed activities would not involve any vessel anchoring.
- Measures would be implemented to ensure all vessel hulls do not pose a risk of introducing new invasive species and therefore would not increase abundance of invasive species present at project locations.
- Payload impact sites would be inspected after each flight test and any visible flight test debris on the ocean surface would be recovered and removed to the extent practicable.
- The Action Proponents will submit an annual report to the National Marine Fisheries Service (NMFS) as required and specified in the NMFS ESA Section 7 letters of

concurrence (NMFS 2021 and **Appendix A**). The annual report would include information regarding JFC program activities and observations of ESA-listed species, submitted within 30 days of the end of each program year.

E.3 Public Health and Safety

E.3.1 PMRF Public Health and Safety Mitigation Measures

- PMRF publishes dedicated warning Notices to Air Missions (NOTAMs) and Notices to Mariners (NTMs) 1 week before flight tests. In addition, a 24-hour recorded message is updated on the hotline daily by Range Operations to inform the public when and where hazardous operations will take place. Pre-launch NOTAMs and NTMs will be issued 24 hours before launch in the ocean and flight areas defined, and the areas will be actively monitored prior to launch.

E.3.2 PSCA Public Health and Safety Mitigation Measures

- Pasagshak Point Road is closed at the site boundary and monitored during launch day to ensure that no unauthorized personnel enter the Ground Hazard Area.
- PSCA will publish NOTAMs and NTMs, coordinate security closures of lands and waters around PSCA and with the United States Coast Guard, Federal Aviation Administration, and the Alaska Department of Transportation and Public Facilities (USASMDC/ ARSTRAT 2014). Imminent launches will be announced on the local radio as well as in the newspaper.

E.4 Hazardous Materials and Wastes

E.4.1 PMRF Hazardous Materials and Waste Mitigation Measures

- Hazardous materials usage and waste would continue to be managed by PMRF under existing applicable federal, state, local, and Department of Defense (DOD) requirements. Authorized personnel will follow the existing range transportation safety plan and ordnance storage, handling, and safety plans. The Action Proponents must comply with range management plans for oil and hazardous materials outlined in the range Spill Prevention Control and Countermeasures Plan, the Installation Spill Contingency Plan, and existing standard operating procedures.
- Only trained and authorized mission critical personnel would utilize support equipment and material hazards needed to perform the Proposed Action.
- Follow ordnance management procedures found in Pacific Missile Range Facility Instruction (PMRFINST) 8020.5, Explosive Safety Criteria for Range Users Ordnance Operations.

- Any program using a new type of ordnance device for which proven safety procedures have not been established requires an Explosive Safety Approval before the ordnance is allowed on PMRF or used on a test range (DON and U.S. Army 2022). This approval involves a detailed analysis of the explosives and of the proposed test activities, procedures, and facilities for surveillance and control, an adequacy analysis of movement and control procedures, and a design review of the facilities where the ordnance items will be handled (DON and U.S. Army 2022). JFC Supplemental EA/OEA Action Proponents will continue updating the existing JFC Explosive Safety Approval process with any new information as it becomes available.

E.4.2 PSCA Hazardous Materials and Waste Mitigation Measures

- Hazardous materials usage and waste would continue to be managed by PSCA under existing applicable federal, state, local, and DOD requirements. Authorized personnel will follow the existing range transportation safety plan and ordnance storage, handling, and safety plans. The Action Proponents must comply with Launch Site management plans for oil and hazardous materials outlined in existing standard operating procedures.
- Only trained and authorized mission critical personnel would utilize support equipment and material hazards needed to perform the Proposed Action.
- Although unlikely, in the event of an accident at PSCA, the Action Proponents must remediate any hazardous materials and return the land to a natural or previous state, in accordance with a mitigation approach developed by the Action Proponents, which will be coordinated with and confirmed by the Alaska Department of Environmental Conservation.

E.4.3 Pacific Ocean Hazardous Material and Waste Mitigation Measures

- Although no residual debris is expected following impact, after each flight test a recovery team would be sent to inspect the impact location as soon as range safety clears the area. Visible debris on the surface of the ocean would be recovered and removed after each flight test (up to six joint test operations per year until 2032).

E.5 Socioeconomics/Environmental Justice Mitigation Measures

E.5.1 PSCA Socioeconomics/Environmental Justice

- To the extent possible the Navy would avoid testing during the fishing season (the prime fishing time is from July – September).

This page intentionally left blank.

F

Other Considerations Required by NEPA

This page intentionally left blank.

Appendix F. Other Considerations Required by NEPA

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

In accordance with 40 Code of Federal Regulations (CFR) §§ 1502.24 and 1506.2, to the fullest extent possible, this Supplemental Environmental Assessment / Overseas Environmental Assessment (EA/OEA) was prepared concurrent to and integrated with environmental impact analyses and related surveys and studies required by all other federal environmental review laws and Executive Orders (EOs) applicable to the Proposed Action (**Table F-1**), including state, tribal, or local laws or ordinances; the National Historic Preservation Act of 1966 (54 United States Code [U.S.C.] § 300101 et seq.); and the Endangered Species Act of 1973 (16 U.S.C. § 1531 et seq.).

F.1 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (EO 12898)

An Environmental Justice analysis is included in this document to comply with the intent of EO 12898, and Navy and Department of Defense guidance. The EO states that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." In addition, the EO requires that minority and low-income populations be given access to information and opportunities to provide input to decision making on federal actions.

This Supplemental EA/OEA has identified no human health or environmental effects by the Proposed Action that would result in disproportionately high or adverse effects on minority or low income populations in the locations evaluated. The Proposed Action activities also would be conducted in a manner that would not exclude persons from participating in, deny persons the benefits of, or subject persons to discrimination because of their race, color, national origin, or socioeconomic status.

F.2 Federal Actions to Address Protection of Children from Environmental Health Risks and Safety Risks (EO 13045, as Amended by EO 13229 and 13296)

This Joint Flight Campaign (JFC) Supplemental EA/OEA has not identified any environmental health and safety risks that may disproportionately affect children, in compliance with EO 13045, as amended by EO 13229 and 13296.

Table F-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) (42 U.S.C. § 4321 et seq.); Council on Environmental Quality NEPA implementing regulations (40 CFR §§ 1500-1508)	Compliant
Clean Air Act (42 U.S.C. § 7401 et seq.)	Compliant
Clean Water Act (33 U.S.C. § 1251 et seq.)	Compliant
Coastal Zone Management Act (16 U.S.C. § 1451 et seq.)	Compliant
National Historic Preservation Act (54 U.S.C. § 300101 et seq.)	Compliant
Endangered Species Act (16 U.S.C. § 1531 et seq.)	Compliant
Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (16 U.S.C. § 1801 et seq.)	Compliant
Marine Mammal Protection Act (16 U.S.C. § 1361 et seq.)	Compliant
Migratory Bird Treaty Act (16 U.S.C. §§ 703-712)	Compliant
Bald and Golden Eagle Protection Act (16 U.S.C. §§ 668-668d)	Compliant
National Marine Sanctuaries Act (16 U.S.C. § 1431 et seq.)	Compliant
American Antiquities Act, National Monuments (54 U.S.C. § 320301 et seq.)	Compliant
Executive Order 11990, Protection of Wetlands	Compliant
Executive Order 12088, Federal Compliance with Pollution Control Standards	Compliant
Executive Order 12114, Environmental Effects Abroad of Major Federal Actions	Compliant
Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations	Compliant
Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks	Compliant
Executive Order 13089, Coral Reef Protection	Compliant
Executive Order 13112, Invasive Species	Compliant
Executive Order 13158, Marine Protected Areas	Compliant
Executive Order 13175, Consultation and Coordination with Indian Tribal Governments	Compliant

Abbreviations: CFR = Code of Federal Regulations, U.S.C. = United States Code

F.3 Coastal Zone Management

The Coastal Zone Management Act (CZMA) of 1972 (16 U.S.C. § 1451 et seq., as amended) established policy for management of coastal resources to preserve, protect, develop, and where possible, restore or enhance the coastal zone. Under the CZMA, coastal states and territories develop and implement management programs which consider ecological, cultural, historic, aesthetic, and economic values of land and water resources of the coastal zone. Any federal agency proposing to conduct or support an activity within or outside the coastal zone that will affect any land or water use or natural resource of the coastal zone is required to do so in a manner consistent with the CZMA or applicable state coastal zone program to the maximum extent practicable (16 U.S.C. § 1454). A federal activity in, or affecting, a coastal zone generally requires preparation of a coastal zone consistency determination or a negative determination. Lands managed by the federal government are excluded from Coastal Zone Management (CZM) areas (16 U.S.C. § 1453); however, federal actions on federal property may be subject to consistency requirements when the activity affects coastal zone resources beyond the boundaries of the federal property.

F.3.1 Pacific Missile Range Facility

Under Hawai`i's CZM Program, the Hawai`i coastal zone includes the entire state and is managed by the State Office of Planning. While the Pacific Missile Range Facility (PMRF) is a federal facility which is excluded from the state's CZM and is outside the coastal zone, federal activities at PMRF must be evaluated to determine if they may have spillover effects on adjacent coastal zones. Military testing and training at PMRF have been included in a list of Navy de minimis activities under the CZMA (DON 2019). The Hawai`i CZM Program determined that the listed activities "are expected to have insignificant direct or indirect (cumulative and secondary) coastal effects and should not be subject to further review by the Hawai`i CZM Program" (DON 2019). Proposed JFC Supplemental activities at PMRF would be within the range of military testing that routinely occurs at the installation. Based on the above conclusion by the state's Program and based on the coastal zone consistency determinations for other federal launch activities at PMRF (DON 2008a, DOE 2018, DON 2019, DON and U.S. Army 2022), the Action Proponents have determined that JFC Supplemental launch activities would not affect any coastal use or resource, and that no review by the Hawai`i CZM Program is necessary.

F.3.2 Pacific Spaceport Complex Alaska

The State of Alaska withdrew from participation in the CZMA's National Coastal Management Program in 2011 (76 Federal Register 39857 [7 July 2011]). The CZMA federal consistency provision no longer applies in Alaska.

F.4 Relationship Between Short-Term Use of the Environment and Long-Term Productivity

The National Environmental Policy Act 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 concern. This refers to the possibility that choosing one 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.

- The short-term impacts of the JFC flight tests documented in this Supplemental EA/OEA are negligible in their potential impacts to the environment. Therefore, the potential for impacts on the maintenance of the affected environment and the long-term productivity of the affected environment is negligible as well. No Proposed Actions would degrade beneficial uses of the local environments analyzed in this Supplemental EA/OEA.

G

Biological Evaluations and Assessments

This page intentionally left blank.

Appendix G. Biological Evaluations and Assessments

Biological evaluations and assessments were prepared to support consultation with federal regulatory agencies under requirements of Section 7 of the Endangered Species Act (ESA) and Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA). This appendix includes the following evaluations and assessments prepared for Joint Flight Campaign Supplemental activities:

- *Marine Biological Evaluation for Joint Flight Campaign Supplemental Activities*. June 2023. Submitted to the National Marine Fisheries Service (NMFS) to support consultation under Section 7 of the ESA.
- *Terrestrial Biological Evaluation for Joint Flight Campaign Supplemental Activities*. July 2023. Submitted to the U.S. Fish and Wildlife Service to support consultation under Section 7 of the ESA.
- *Essential Fish Habitat Assessment for Joint Flight Campaign Activities*. In development. This assessment will be submitted to NMFS to support Essential Fish Habitat consultation under Section 305(b)(2) of the MSA. This document is currently being prepared and will be included in this appendix when finalized and submitted to NMFS.

This page intentionally left blank.

13 June
2023

Final
Marine Biological Evaluation for Joint Flight Campaign Supplemental Activities









Prepared for:
U.S. Army Space and Missile Defense Command

Department of the Navy Strategic Systems Programs

U.S. Department of the Army Rapid Capabilities and Critical Technologies Office

Prepared by:
KFS, LLC

DISTRIBUTION STATEMENT A: Approved for public release: distribution unlimited.

This page intentionally left blank

Table of Contents

Acronyms and Abbreviations iii
1.0 Introduction 1
1.1 Purpose and Objectives 1
1.2 Regulatory Setting 2
1.3 Background and Consultation History 2
1.3.1 Background and Consultation History for Operations at PMRF 2
1.3.2 Background and Consultation History for Operations at PSCA 3
1.3.3 Background and Consultation History for the Pacific BOA 4
2.0 Description of the Proposed Action and Action Area 5
2.1 Description of the Proposed Action 5
2.1.1 Launch Site Preparations and Operations 7
2.1.2 Terminal Location Preparations and Operations 7
2.1.3 Flight Test 8
2.1.4 Post-Test Operations 8
2.2 Avoidance, Minimization, and Conservation Measures 9
2.3 Description of the Action Area 9
3.0 Listed Species and Designated Critical Habitat in the Action Area 15
3.1 ESA-Listed Species in the Action Area 15
3.1.1 ESA-Listed Species Not Evaluated in this Assessment 15
3.1.2 Marine Mammals 15
3.1.3 Fish 20
3.2 Designated Critical Habitat in the Action Area 23
3.2.1 Critical Habitat Not Affected 23
3.2.2 Humpback Whale Critical Habitat 23
3.2.3 False Killer Whale Critical Habitat 24
3.2.4 Steller Sea Lion Critical Habitat 24
4.0 Effects of the Proposed Action 25
4.1 Effects on ESA-listed Species 25
4.1.1 Exposure to Elevated Sound Levels 25
4.1.2 Direct Contact 29
4.1.3 Exposure to Hazardous Materials 30
4.1.4 Collision with Vessels 31
4.2 Effects on Designated Critical Habitat 32
5.0 Conclusions 35
6.0 Literature Cited 37
7.0 List of Preparers 41

Figures

Figure 1. JFC Launch Vehicle 5
Figure 2. Transporter Erector Launcher 6
Figure 3. Proposed JFC Supplemental Activity Locations at PMRF 10
Figure 4. Proposed JFC Supplemental Activity Locations at PSCA.....11
Figure 5. Proposed JFC PMRF Stage 1 Booster Drop Zone 12
Figure 6. Proposed JFC Supplemental PSCA Stage 1 Booster Drop Zone 13
Figure 7. JFC Activity Locations in the Pacific Ocean.....14
Figure 8. Biologically Important Areas in the PSCA Stage 1 Booster Drop Zone.....19

Tables

Table 1. Launch Vehicle Characteristics 6
Table 2. Payload System Characteristics.....6
Table 3. ESA-Listed Species and Designated Critical Habitat in the Action Area. 16
Table 4. Potential Stressors Resulting from Proposed JFC Activities in the BOA.....26
Table 5. Distance to Effect Thresholds in Wildlife for Elevated In-Water Sound Levels Resulting from JFC Component Splashdown or Impact.....28

Acronyms and Abbreviations

AAC	Alaska Aerospace Corporation
BIA	Biologically Important Area
BO	Biological Opinion
BOA	Broad Ocean Area
dB	Decibel(s)
DON	Department of the Navy
DPS	Distinct Population Segment
EA	Environmental Assessment
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit
FE-2	Flight Experiment 2
FR	Federal Register
ft	Feet
JFC	Joint Flight Campaign
km	Kilometer(s)
m	Meter(s)
mi	Mile(s)
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OEA	Overseas Environmental Assessment
PMRF	Pacific Missile Range Facility
PSCA	Pacific Spaceport Complex Alaska
PTS	Permanent Threshold Shift
RCCTO	U.S. Army Rapid Capabilities and Critical Technologies Office
re	Referenced to
SSP	Strategic Systems Programs
THAAD	Terminal High Altitude Area Defense
TTS	Temporary Threshold Shift
U.S.	United States
USASMDC	United States Army Space and Missile Defense Command
µPa	Micropascal(s)

This page intentionally left blank

1.0 Introduction

1.1 Purpose and Objectives

The purpose of this Biological Evaluation is to evaluate the potential effects of proposed Joint Flight Campaign (JFC) supplemental activities (Proposed Action) on species listed as endangered or threatened under the Endangered Species Act (ESA) and on designated critical habitat under the jurisdiction of the National Marine Fisheries Service (NMFS). The JFC program is a joint campaign of the United States Department of the Navy (DON) Strategic Systems Programs (SSP) and the U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO), the Action Proponents. This Biological Evaluation has been prepared by the Navy SSP and U.S. Army RCCTO with the assistance of the U.S. Army Space and Missile Defense Command (USASMDC) in accordance with the requirements of Section 7 of the ESA.

The JFC action involves up to six flight test launches per year, over the next 10 years, from multiple launch locations. After launch, tests would include vehicle flight over the Pacific and/or Atlantic Oceans and would involve splashdown of spent boosters as well as payload impact in Pacific and Atlantic broad ocean areas (BOA). In 2022, the Action Proponents completed an Environmental Assessment (EA)/Overseas Environmental Assessment (OEA) for the JFC action (DON and U.S. Army 2022) to meet requirements of the National Environmental Policy Act. The Action Proponents also completed a Marine Biological Evaluation for the JFC action in 2021 to evaluate program effects on protected resources in compliance with requirements of the ESA. These documents evaluated the potential effects of flight tests launching from four installations: (1) Pacific Missile Range Facility (PMRF), Kauaʻi, Hawaiʻi; (2) Vandenberg Space Force Base, California; (3) Wallops Flight Facility, Virginia; and (4) Cape Canaveral Space Force Station, Florida. These documents also evaluated the effects of flight test activities in Pacific and Atlantic BOAs. The Action Proponents consulted with NMFS on the potential effects of the Proposed Action under Section 7 of the ESA and NMFS issued a letter of concurrence that proposed JFC activities may affect but are not likely to adversely affect ESA-listed species or designated critical habitats (NMFS Reference Number: OPR-2021-02470; NMFS 2021).

Since completion of the JFC EA/OEA and the 2021 consultation on JFC activities, the Action Proponents have decided that additional launch capabilities from PMRF's Terminal High Altitude Area Defense (THAAD) launch pad and from the Pacific Spaceport Complex Alaska (PSCA), as well as an expansion of the Pacific BOA, are required to meet the purpose and need of the JFC action.

Based on preliminary analyses, the Action Proponents determined that these proposed JFC supplemental activities may affect ESA-listed species and designated critical habitats not considered in the 2021 consultation with NMFS. Therefore, the Action Proponents have prepared this Biological Evaluation to support reinitiation of consultation (NMFS Reference Number: OPR-2021-02470) under Section 7 of the ESA.

This Biological Evaluation describes proposed JFC supplemental activities for the purposes of evaluating the potential effects of the Proposed Action on ESA-listed species and designated critical habitats under the jurisdiction of NMFS. A summary of relevant background information and consultation history for the JFC action is included in **Section 1.3**, *Background and Consultation History*.

1.2 Regulatory Setting

This Biological Evaluation addresses the potential effects of Proposed Action activities on marine ESA-listed species and critical habitats in compliance with Section 7 of the ESA for the portions of the Proposed Action that would take place in and over U.S. territory and international waters. This evaluation addresses only species under the jurisdiction of NMFS.

1.3 Background and Consultation History

In 2021, USASMDC, on behalf of all Action Proponents, requested concurrence that JFC activities in the Atlantic and Pacific Oceans and launch activities at PMRF may affect but were not likely to adversely affect marine ESA-listed species and designated critical habitats. On 14 October 2021, NMFS issued a programmatic concurrence letter for JFC activities in the Atlantic and Pacific Oceans (NMFS Reference Number: OPR-2021-02470). This consultation evaluated the effects of JFC launches from PMRF, as well as vehicle flight, booster splashdown, and payload impact in BOAs of the Atlantic and Pacific. Detailed information can be found in the JFC Biological Evaluation (USASMDC et al. 2021) and the NMFS concurrence letter (NMFS 2021).

The JFC Biological Evaluation and NMFS concurrence letter also detailed other previous consultations which covered certain JFC pre-launch, launch, and post-launch activities on land or in nearshore waters at existing launch facilities. Some JFC activities are covered under existing consultations at Wallops Flight Facility, Cape Canaveral Space Force Station, and Vandenberg Space Force Base and would occur under the terms of these existing consultations or standard operating procedures as implemented by lead agencies at those launch facilities (i.e., the National Aeronautics and Space Administration, Federal Aviation Administration, and Department of the Air Force) (details in USASMDC et al. 2021 and NMFS 2021).

JFC supplemental activities include only JFC launch activities at PMRF's THAAD launch site, launch activities at PSCA, and JFC activities in the expanded portion of the BOA in the Pacific Ocean. These activities constitute the Proposed Action. A brief background and consultation history for each of these proposed supplemental activity locations is included in the subsections below.

1.3.1 Background and Consultation History for Operations at PMRF

In the 2021 consultation on JFC activities, the Action Proponents concluded that launch activities at the Kaua'i Test Facility Launch Pad 42 at PMRF may affect but were not likely to adversely affect hauled out Hawaiian monk seals (*Neomonachus schauinslandi*) and NMFS

concurred with this determination (NMFS 2021). Launch noise was the only JFC stressor with the potential to affect Hawaiian monk seals hauled out on PMRF beaches or rocky shorelines. NMFS concluded that there would be no physical injury to monk seals from noise and that any behavioral disturbance to sound would be limited to temporary startle reactions or an animal temporarily leaving the beach or haul-out and entering the ocean (NMFS 2021). NMFS further concluded that they did not anticipate trampling of any age class, including pups, in part because these pinnipeds are relatively solitary animals and do not congregate in large numbers (NMFS 2021).

The Action Proponents have evaluated the potential effects of JFC supplemental launches from the THAAD launch site and have concluded that all potential effects were evaluated in the 2021 JFC consultation. The same as for launches from Kaua‘i Test Facility, sound pressure levels from Proposed Action launches from the THAAD launch site would be no more than 130 decibels (dB) in air in any beach habitat. Launches from the THAAD launch site would not be in addition to those already considered but would be a subset of the up to six launches per year considered in the 2021 consultation. The Proposed Action would not result in any additional effects on Hawaiian monk seals that were not already considered in the 2021 consultation. Therefore, proposed launch activities from PMRF’s THAAD launch site are not addressed further in this Biological Evaluation.

1.3.2 Background and Consultation History for Operations at PSCA

Based on analyses of the effects of the Proposed Action and review of the evaluated effects of programmatic PSCA launch activities, proposed launch activities at PSCA would have no effect on ESA-listed marine species. At most, launch noise might cause behavioral disturbance in Steller sea lions at the ocean surface. However, based on NMFS conclusions for programmatic launch activities from PSCA (which included larger launch vehicles than those proposed for JFC), launch activities would not affect any ESA-listed species under the jurisdiction of NMFS.

Consultation history with NMFS for PSCA launch activities included the following:

- In 2011, NMFS issued a programmatic Biological Opinion (BO) for space vehicle and missile launch operations at PSCA for the 5-year period from 2011-2016 (NMFS 2011). In this BO, NMFS concluded that launch operations at PSCA were not likely to adversely affect ESA-listed whales (i.e., fin whale, humpback whale, and North Pacific right whale) (NMFS 2011). NMFS also concluded that launch operations would not destroy or adversely modify Steller sea lion critical habitat (NMFS 2011). NMFS concluded that launch noise from the loudest launch vehicles may affect and would likely adversely affect Steller sea lions through non-lethal incidental take. The BO concluded that this take was not likely to jeopardize the continued existence of the species and required monitoring of pinnipeds quarterly and during launches.
- In 2017, Alaska Aerospace Corporation (AAC) applied for a new 5-year programmatic permit for small takes of marine mammals incidental to launching of space launch vehicles and missiles at the PSCA (AAC 2016). In their application, AAC concluded that ongoing space and missile launch activities at the PSCA would not affect ESA-listed marine species in the action area (i.e., Steller sea lions, gray whales, and humpback

whales) (AAC 2016). When NMFS issued regulations (valid May 2017 through April 2022) allowing for the issuance of Letters of Authorization for the incidental take of harbor seals during launch operations at the PSCA (82 Federal Register [FR] 14996 [24 March 2017]), NMFS determined that proposed activities would not affect Steller sea lions (or any other ESA-listed species) and that no consultation was required under the ESA.

The JFC launch vehicle is smaller than many vehicles launched from PSCA as part of programmatic launch activities. The effects of JFC supplemental launch operations would be the same or very similar to those of ongoing launch operations at PSCA as evaluated by AAC, the Federal Aviation Administration, and NMFS. No effects to ESA-listed marine species or designated critical habitats under the jurisdiction of NMFS are expected due to proposed Navy CPS launch operations at PSCA. Therefore, proposed launch activities from PSCA are not addressed further in this Biological Evaluation.

1.3.3 Background and Consultation History for the Pacific BOA

In the 2021 consultation on the effects of JFC activities, the Action Proponents and NMFS concluded that JFC activities in Pacific and Atlantic BOAs (see **Figure 7** in **Section 2.3**) may affect but were not likely to adversely affect marine ESA-listed species and designated critical habitats (NMFS 2021). This consultation evaluated the effects of vehicle flight, vessel activity, booster splashdown, and payload impact in large areas of the Atlantic and Pacific Oceans.

For all species and designated critical habitats considered in the 2021 consultation, the Action Proponents have determined that all of the potential effects of JFC supplemental activities were fully evaluated in the 2021 consultation. There were no changes to the Atlantic BOA or activities therein. Expansion of the Pacific BOA did not meaningfully change the calculated chances or expected likelihood of effects on these species or habitats and would not result in any effects not already considered. Therefore, for all species and designated critical habitats evaluated in the 2021 JFC consultation (see **Table 3** in **Section 3.1**), the Action Proponents have determined that no additional consultation with NMFS is required under Section 7 of the ESA.

Because of the expanded BOA for JFC supplemental activities associated with THAAD launch site and PSCA launches, the Action Area contains ESA-listed species and designated critical habitats not considered in the 2021 consultation with NMFS. This Biological Evaluation includes an analysis of the potential effects of the Proposed Action on those species and designated critical habitats that occur in the Action Area and were not considered in the 2021 consultation.

2.0 Description of the Proposed Action and Action Area

2.1 Description of the Proposed Action

The Proposed Action (JFC supplemental activities) would consist of up to six flight tests per year over 10 years, designed to prove various aspects of the JFC system's capabilities. The Proposed Action would entail ground preparations for the test, launch and flight test, impact of the payload, and post launch operations. The JFC launch vehicle, also known as an all-up-round missile, would consist of a two-stage booster system and a payload (**Figure 1**). The JFC vehicle would be approximately 87.6 centimeters (34.5 inches) in diameter and 10.2 meters (m) (33.6 feet [ft]) in length. The first and second stages would include a total of approximately 6,804 kilograms (15,000 pounds) of solid propellant. Characteristics of the launch vehicle are presented in **Table 1**. The payload system characteristics are presented in **Table 2**.

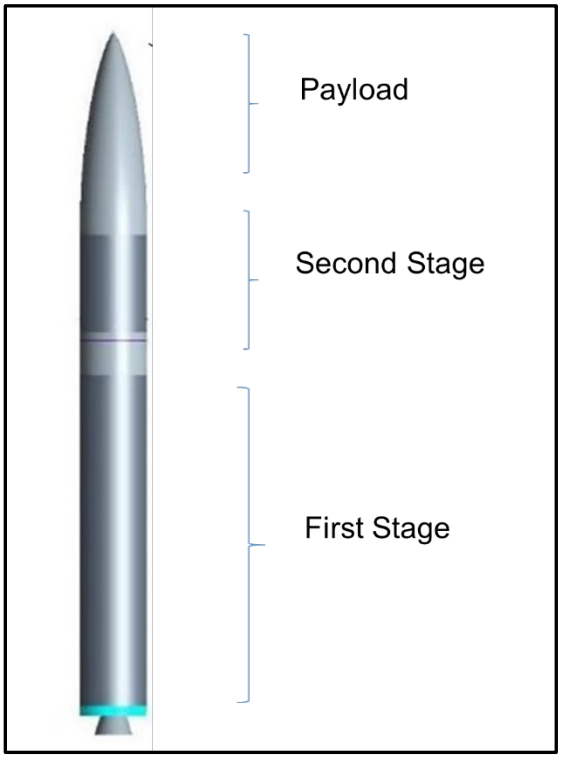


Figure 1. JFC Launch Vehicle

The Proposed Action includes launches from the THAAD launch site at PMRF and from two launch sites at PSCA. The addition of the THAAD and PSCA launch sites does not increase the total number of JFC flight tests as evaluated in the 2022 JFC EA/OEA, rather, launches from the supplemental locations would be a subset of total JFC flight tests per year. JFC launches utilizing supplemental locations would occur as soon as the second half of fiscal year 2023.

A typical JFC test campaign would include pre-launch operations; the flight test including launch, vehicle flight, payload flight, and payload impact into the BOA; and post-test operations. Proposed Action launches would occur from existing launch facilities at the THAAD launch site at PMRF or at PSCA. The JFC vehicle would be launched from a Transporter Erector Launcher (**Figure 2**). Support vehicles involved in launch activities would include the Battery Operations Center (the mobile command, control, and communications center for the Transporter Erector Launcher) as well as the Battery Operations Center support vehicle. Launch activities would occur in compliance with the procedures for ongoing launch operations at the host installations/ facilities.

Table 1. Launch Vehicle Characteristics

Major Components	Rocket motors, propellant, magnesium thorium, nitrogen gas, halon, asbestos, battery electrolytes (lithium-ion, silver zinc)
Communications	Various 5- to 20-watt radio frequency transmitters; one maximum 400-watt radio frequency pulse
Power	Up to nine lithium ion polymer and silver zinc batteries, each weighing between 1.3 and 18 kilograms (3 and 40 pounds)
Propulsion/Propellant	Rocket propellant and approximately 1.3 kilograms (3 pounds) of pressurized nitrogen gas
Other	Small Class C (1.4) electro-explosive devices for flight termination

Table 2. Payload System Characteristics

Structure	Aluminum, steel, titanium, magnesium and other alloys, copper, fiberglass, chromate coated hardware, tungsten, plastic, Teflon, quartz, room temperature vulcanizing silicone
Communications	Two up-to 20-watt radio frequency transmitters
Power	Up to three lithium ion polymer batteries, each weighing between 1 and 23 kilograms (2 and 50 pounds)
Propulsion	None
Other	Class C (1.4) electro-explosive devices for safety and payload system subsystems operations

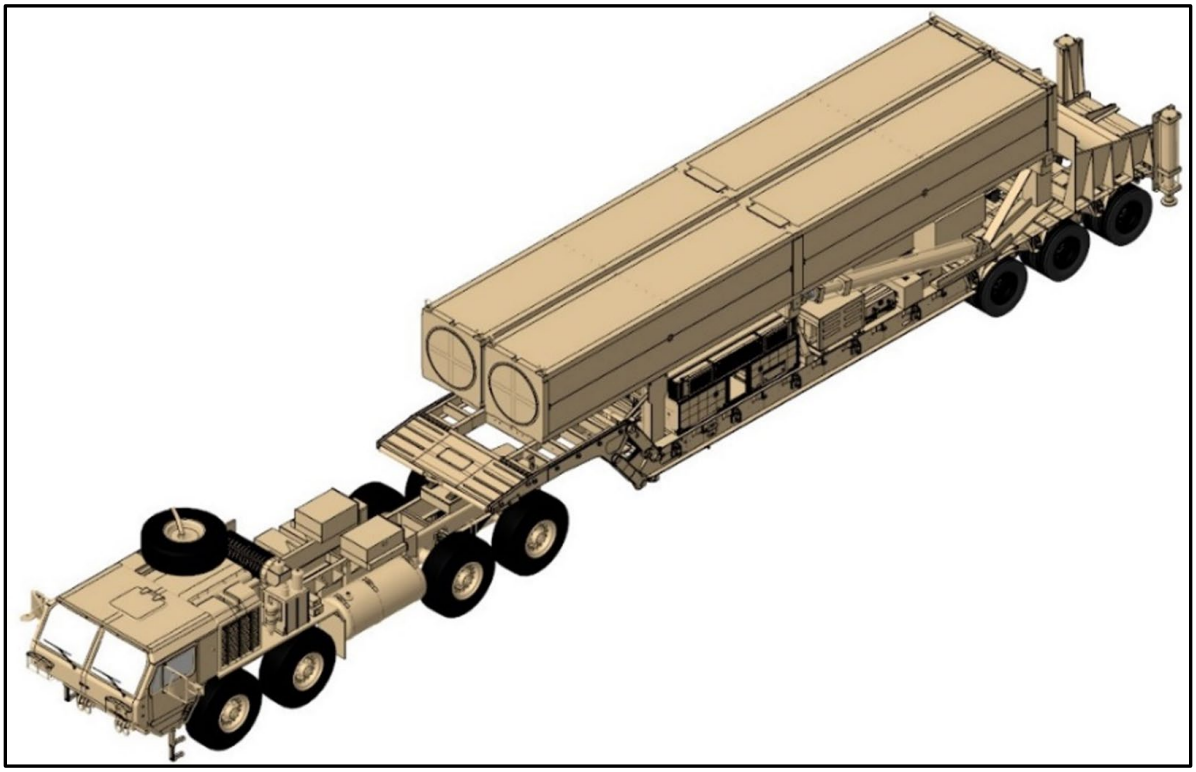


Figure 2. Transporter Erector Launcher

2.1.1 Launch Site Preparations and Operations

Prior to launch, routine activities would take place at existing launch installations/facilities to prepare for flight testing. Launch site preparations and operations would occur in compliance with the standard operating procedures and best management practices as implemented by the host installations/facilities for ongoing operations. As part of pre-launch preparations and operations, project personnel would execute ground equipment checkout, flight vehicle-to-booster assembly and checkout, and other preparations for flight testing. These activities would be directed by the JFC proponent representatives who would coordinate activities with host installation/facility representatives and range organizations. All proposed launch activities would use existing facilities and infrastructure systems.

At PMRF, the potential launch site for the Proposed Action is the THAAD launch site (see **Figure 3** in **Section 2.3**). JFC launch activities would comply with the Navy's standard operating procedures for PMRF launches. Empirical data on sound pressure of JFC vehicle launch have not yet been collected, but modeling indicates that initial liftoff of the launch vehicle would result in peak sound pressures of approximately 145 dB in air (referenced to [re] 20 micropascals [µPa]) at approximately 30 m (100 ft) from the launch pad (Kahle et al. 2021) (see **Figure 3**). After launch, the vehicle would ascend quickly, and sound pressures are expected to remain elevated above ambient sound levels for less than 60 seconds (Kahle et al. 2021).

2.1.2 Terminal Location Preparations and Operations

For a nominal mission, it is anticipated that up to 4 weeks of increased activities would be required in the BOA. Included among these activities would be:

- Operation of a support ship
- Setting up mobile terminal area scoring
- Deploying sea-based sensor rafts at the impact area
- Deploying telemetry assets

The support ship would be used to gather information on the JFC flight test during terminal flight and impact using shipboard radars and other sensors. It is expected that the support ship would remain on station for up to 2 weeks while waiting for the test to occur. The support ship would also be used to tow a main instrumentation raft to the test support location and to deploy up to a dozen self-stationing sensor rafts prior to the test flight.

The self-stationing sea-based sensor rafts, which may include radar, acoustic, and/or optical sensors, would be placed around the payload target site in the BOA to collect data on payload impact. Self-stationing sensor rafts generally use twin battery-powered trolling motors for thrust navigation and station-keeping. None of the rafts would require an anchoring system. Rafts would be outfitted and inspected at port prior to being deployed for a test.

2.1.3 Flight Test

Flight test activities after launch would include vehicle flight and impact of the payload in the BOA. Following first-stage motor ignition and liftoff from the launch location, the first-stage motor would burn out downrange and separate from the second stage with the inter-stage assembly also being jettisoned. These components would splash down in the stage 1 booster drop zones (see **Figures 5** through **7** in **Section 2.3**). Farther into flight, the second stage would burn out and separate, with the payload adapter also being jettisoned from the payload. The payload would fly toward a predesignated site in the BOA. Splashdown of the second-stage motor, payload adaptor, and payload would occur at different points in the open ocean within the areas referred to as the stage 2 booster drop/payload impact zones (see **Figure 7** in **Section 2.3**).

If the launch vehicle were to deviate from its course or should other problems occur during flight that might jeopardize public safety, the onboard flight termination system would be activated. This action would initiate a predetermined safe mode for the vehicle, causing it to fall towards the ocean and terminate flight. The flight termination system would be designed to prevent debris from falling into any inhabited land area or marine protected area.

The flight path would be monitored by a series of sensors with overlapping coverage of the flight from launch until payload impact in the BOA. All sensors are part of existing programs, would be utilized under the operating procedures for those programs, and would be scheduled for use based on availability. The sensors would include the following:

- Existing ground-based optics, telemetry, and radars
- Sea based sensors include ship-based mobile instrumentation. In addition, ship-based unmanned aerial vehicles and drones may be used for telemetry, video, and surveillance.
- Existing sensors on board military or commercial aircraft.
- Safety Relay aircraft may be used as additional range safety support “off-axis” to ensure public safety. Takeoff and landing operations would occur as a part of ongoing operations for existing programs.

2.1.4 Post-Test Operations

For the BOA drop zones, the proposed component impact would occur in deep ocean waters. Test components are expected to sink after splashdown or impact and no residual debris is expected. However, a recovery team would be sent to inspect the payload impact location as soon as range safety clears the area. The BOA areas are too deep to allow safe recovery of any hardware that might survive the impact with the water and still have sufficient mass to sink. Visible debris still on the surface of the water would be recovered and removed. The self-stationing rafts and the large instrumentation raft would be recovered by the support ship.

2.2 Avoidance, Minimization, and Conservation Measures

The following avoidance and minimization measures would be implemented as part of project activities to minimize the potential effects of the Proposed Action on ESA-listed marine species:

- During travel to and from impact zones, and during raft deployment, ship personnel would monitor for marine mammals and sea turtles to avoid potential vessel strikes. Vessel operators would adjust speed or raft deployment based on expected animal locations, densities, and/or lighting and turbidity conditions.
- Vessel operations would only occur when weather and sea conditions are acceptable for safe travel. Vessel operations would not involve any intentional ocean discharges of fuel, toxic wastes, or plastics and other solid wastes that could potentially harm marine life.

2.3 Description of the Action Area

For JFC supplemental activities, vehicle launches could occur at the THAAD launch site at PMRF (**Figure 3**) and at PSCA's Area 1 and Launch Pad 2 (**Figure 4**). Proposed vehicle launches would occur at existing launch facilities at all installations/facilities. As described in **Sections 1.1** and **1.3**, this evaluation does not include additional analyses of proposed launch activities as these activities would either have no effect on marine ESA-listed species or are covered under existing Section 7 NMFS consultations. Therefore, launch activities at PMRF and PSCA are not evaluated in further detail in this Biological Evaluation.

After launch, the JFC vehicle would fly over the ocean towards a terminal payload impact site in the BOA. Stage 1 booster splashdown would occur within the stage 1 booster drop zones (**Figures 5** and **6**) and stage 2 booster splashdown and payload impact would occur within the stage 2 booster drop/payload impact zones shown in **Figure 7**.

The Action Area for this evaluation includes the proposed THAAD launch site at PMRF (**Figure 3**); PSCA launch sites (**Figure 4**); the stage 1 and stage 2 booster drop zones in the BOA where components would splash down or impact and where the vehicle would fly over the Pacific Ocean (**Figures 5** through **7**); and any areas subject to potential stressors of the Proposed Action including elevated sound levels and vessel operation.

The BOA portion of the Action Area is composed mostly of deep ocean waters and the airspace above those waters. The stage 1 booster drop zones occur mostly outside U.S. territorial seas (greater than 22 kilometers [km] [12 nautical miles] from the territorial baseline) but mostly within the U.S. exclusive economic zone (out to 370 km [200 nautical miles] from the territorial sea baseline) (**Figures 5** and **6**). The stage 2 booster drop zones (which would include payload impact) occur almost exclusively outside exclusive economic zones, in the high seas (**Figure 7**).

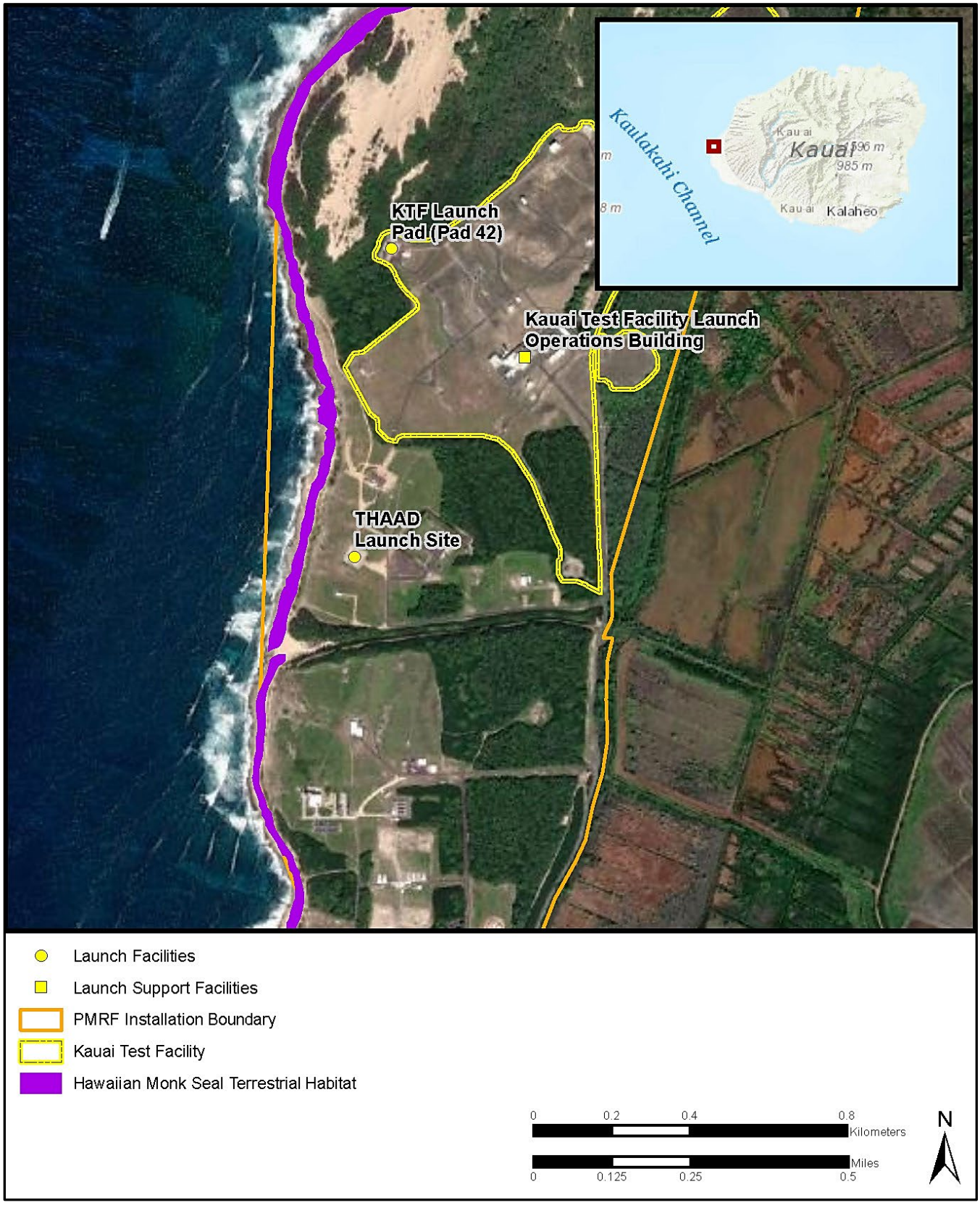


Figure 3. Proposed JFC Supplemental Activity Locations at PMRF

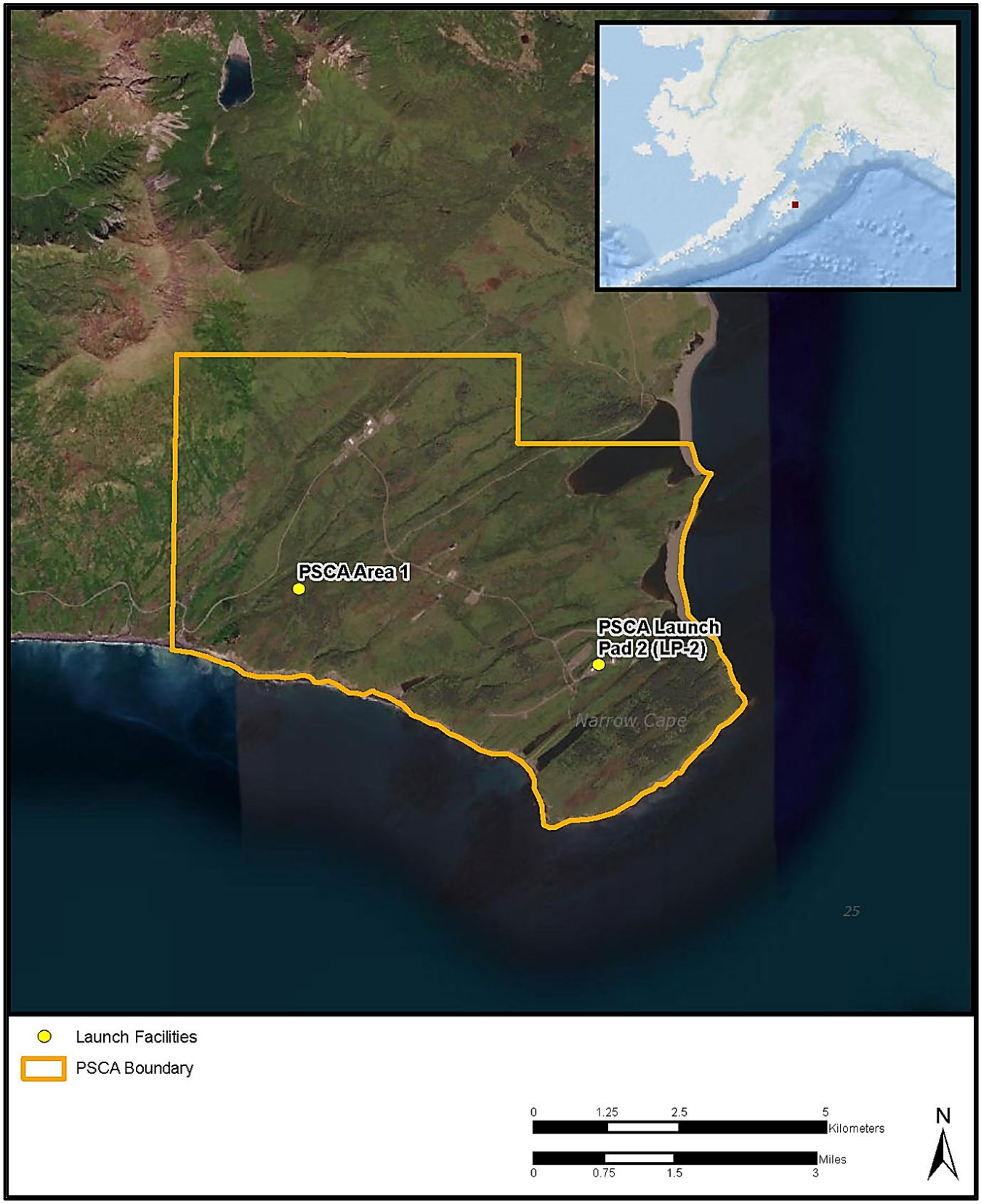


Figure 4. Proposed JFC Supplemental Activity Locations at PSCA

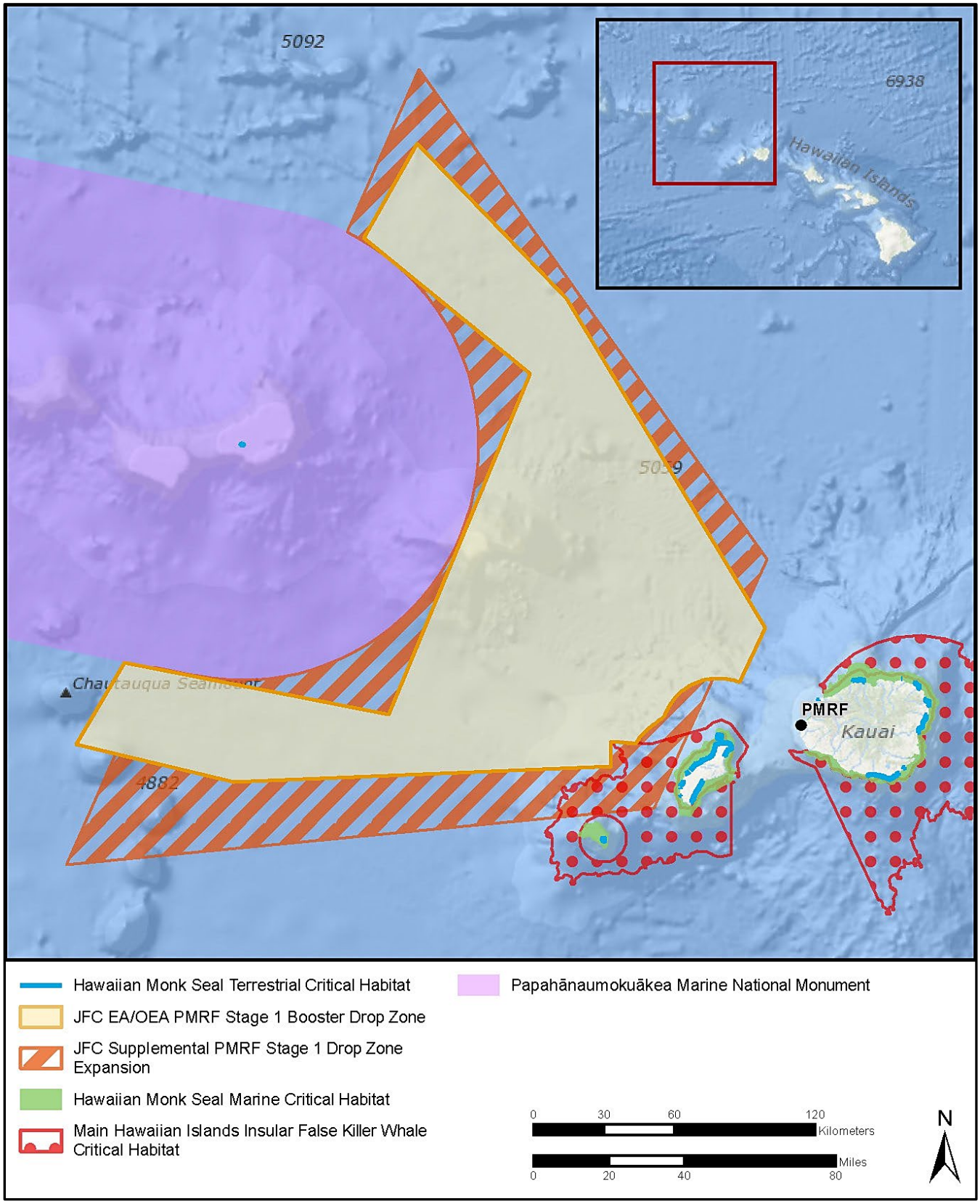


Figure 5. Proposed JFC PMRF Stage 1 Booster Drop Zone

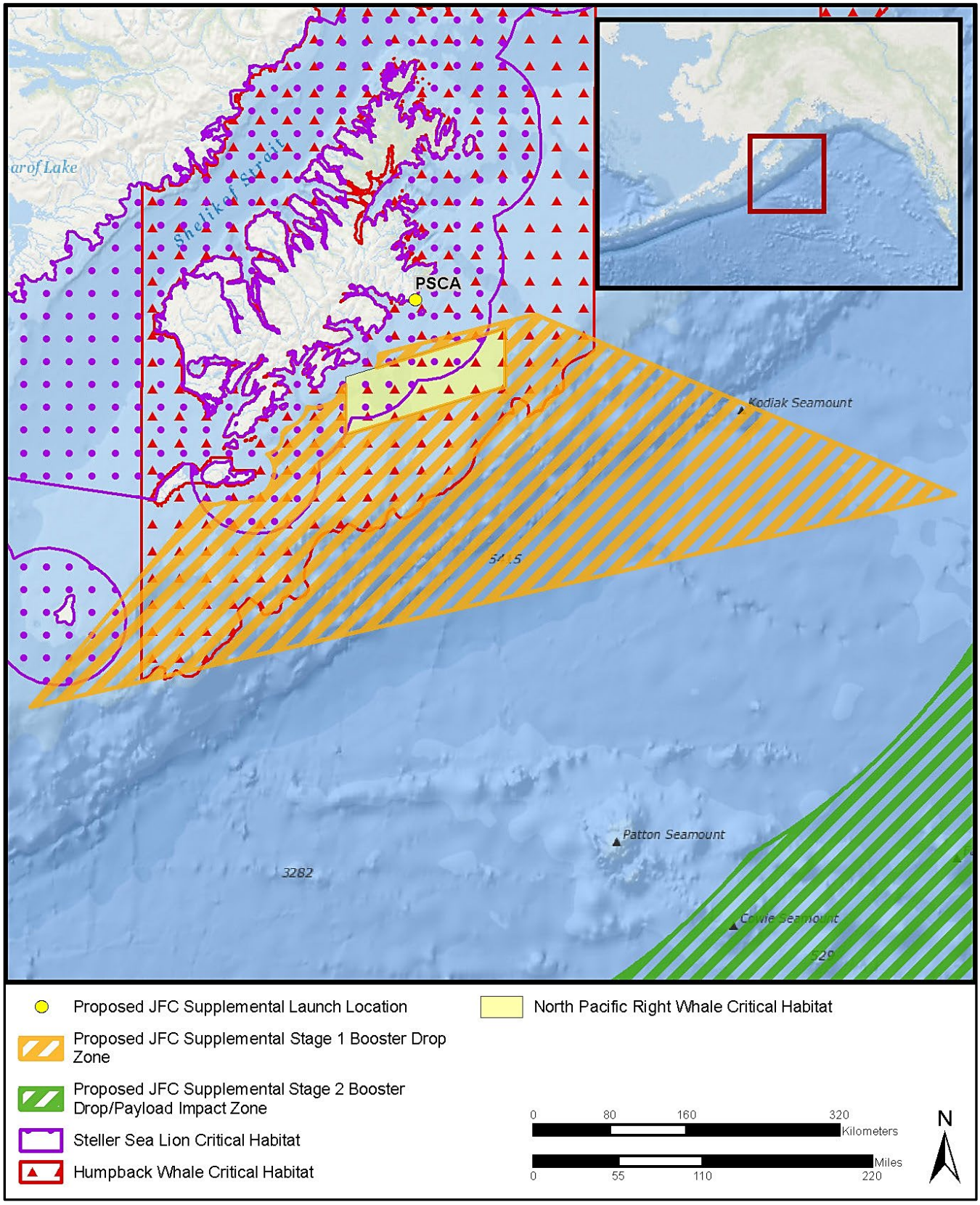


Figure 6. Proposed JFC Supplemental PSCA Stage 1 Booster Drop Zone

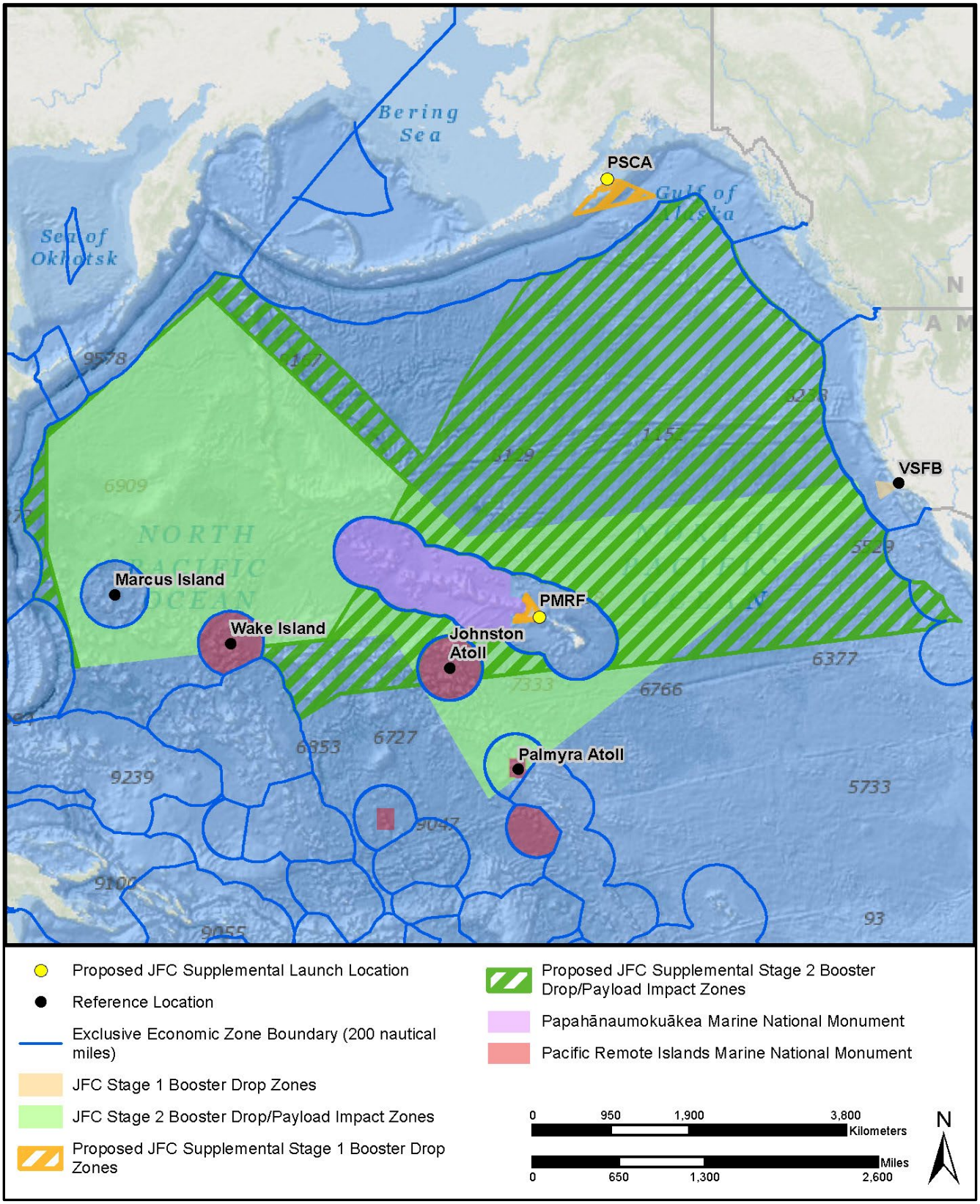


Figure 7. JFC Activity Locations in the Pacific Ocean

3.0 Listed Species and Designated Critical Habitat in the Action Area

3.1 ESA-Listed Species in the Action Area

ESA-listed species in the Action Area include eight cetacean, three pinniped, five sea turtle, and eight fish species (**Table 3**). Only one ESA-listed species under the jurisdiction of NMFS has the potential to occur on land at PMRF, the Hawaiian monk seal. Because of the large number of species and distinct population segments (DPSs) in the Action Area, detailed descriptions of each species are not included in this evaluation. This section includes a summary of each species group (e.g., marine mammals) and major threats to species in the group. Descriptions of each species are available in the National Oceanic and Atmospheric Administration (NOAA) Fisheries species directory (NOAA 2023a) as well as in several Navy assessments and reports (DON 2019a, DON 2017, DON 2018b, DON 2014), and are incorporated here by reference. Additional species information can be provided upon request.

3.1.1 ESA-Listed Species Not Evaluated in this Assessment

The effects of JFC activities on the majority of the ESA-listed species in the Action Area were considered in the 2021 consultation as indicated in **Table 3**. While the densities of some species are slightly different with expansion of the BOA for the Proposed Action, the stressors and magnitude of effect have not changed, and effects of the JFC action remain discountable or insignificant for all of these species. The Action Proponents and NMFS concluded that JFC activities may affect but were not likely to adversely affect the nine marine mammal, five sea turtle, and four fish species in the Action Area that were considered in the 2021 consultation (**Table 3**). The Action Proponents have determined that there would be no effects of JFC supplemental activities on these species that were not already considered in the 2021 consultation, that the conclusions remain valid, and that no additional consultation on these species is required. The species evaluated in the 2021 consultations are not evaluated in further detail in this Biological Evaluation.

3.1.2 Marine Mammals

ESA-listed marine mammals in the Action Area that were not considered in the 2021 consultation include one cetacean species and one pinniped species (**Table 3**). The best available information on population size for marine mammal stocks in the Action Area can be found in the 2022 Draft Marine Mammal Stock Assessment Reports (NOAA 2022) and are incorporated here by reference. The best available density data for ESA-listed marine mammals in the BOA of the Action Area comes from the Navy's Marine Species Density Databases for training and testing areas in the Pacific (DON 2017, DON 2018b, DON 2014, Rone et al. 2017) as described in **Section 4.0**, *Effects of the Proposed Action*.

Table 3. ESA-Listed Species and Designated Critical Habitat in the Action Area.

Common Name	Scientific Name	Federal Listing Status	Likelihood of Occurrence			2021 JFC Consultation Determination	Designated Critical Habitat in the Action Area
			PMRF Stage 1 Booster Drop Zone	PSCA Stage 1 Booster Drop Zone	Pacific Stage 2 Booster Drop/Payload Impact Zones		
Cetaceans							
Sei whale	*Balaenoptera borealis*	E	P	P	L	NLAA	-
Blue whale	*Balaenoptera musculus*	E	P	P	L	NLAA	-
Fin whale	*Balaenoptera physalus*	E	P	L	L	NLAA	-
Gray whale – Western North Pacific DPS[1]	*Eschrichtius robustus*	E	-	P	P	Not Evaluated	-
North Pacific right whale	*Eubalaena japonica*	E	-	L	L	NLAA	Yes
Humpback whale	*Megaptera novaeangliae*						
Mexico DPS		T	U[1]	P	L	NLAA	Yes
Western North Pacific DPS		E	U[1]	P	L	NLAA	Yes
Sperm whale	*Physeter macrocephalus*	E	L	L	L	NLAA	-
False killer whale – Main Hawaiian Islands Insular DPS	*Pseudorca crassidens*	E	P	-	-	NLAA	Yes
Pinnipeds							
Guadalupe fur seal	*Arctocephalus townsendi*	T	-	-	P	NLAA	-
Steller sea lion – Western DPS	*Eumetopias jubatus*	E	-	L	-	Not Evaluated	Yes
Hawaiian monk seal	*Neomonachus schauinslandi*	E	P	-	-	NLAA	Yes
Sea Turtles							
Loggerhead turtle – North Pacific Ocean DPS	*Caretta caretta*	E	P	L	L	NLAA	-
Green turtle	*Chelonia mydas*						
Central North Pacific DPS		T	L	-	L	NLAA	-
Central West Pacific DPS		E	-	-	L	NLAA	-
East Pacific DPS		T	-	L	L	NLAA	-
Leatherback turtle	*Dermochelys coriacea*	E	P	P	L	NLAA	-
Hawksbill turtle	*Eretmochelys imbricata*	E	L	P	L	NLAA	-
Olive ridley turtle	*Lepidochelys olivacea*	T	P	P	L	NLAA	-

Common Name	Scientific Name	Federal Listing Status	Likelihood of Occurrence			2021 JFC Consultation Determination	Designated Critical Habitat in the Action Area
			PMRF Stage 1 Booster Drop Zone	PSCA Stage 1 Booster Drop Zone	Pacific Stage 2 Booster Drop/Payload Impact Zones		
Fish							
Oceanic whitetip shark	*Carcharhinus longimanus*	T	L	-	L	NLAA	-
Giant manta ray	*Manta birostris*	T	P	-	L	NLAA	-
Chum salmon – Hood Canal Summer-run ESU	*Oncorhynchus keta*	T	-	P[2]	-	Not Evaluated	-
Coho salmon – Lower Columbia River ESU/DPS	*Oncorhynchus kisutch*	T	-	P[2]	-	Not Evaluated	-
Steelhead	*Oncorhynchus mykiss*						
Lower Columbia River ESU/DPS		T	-	P[2]	-	NLAA	-
Middle Columbia River ESU/DPS		T	-	P[2]	-	NLAA	-
Snake River Basin ESU/DPS		T	-	P[2]	-	NLAA	-
Upper Columbia River ESU/DPS		T	-	P[2]	-	NLAA	-
Upper Willamette River ESU/DPS		T	-	P[2]	-	NLAA	-
Sockeye Salmon – Snake River ESU/DPS	*Oncorhynchus nerka*	E	-	P[2]	-	Not Evaluated	-
Chinook salmon	*Oncorhynchus tshawytscha*						
Lower Columbia River ESU/DPS		T	-	L[2]	-	Not Evaluated	-
Puget Sound ESU/DPS		T	-	P[2]	-	Not Evaluated	-
Snake River Fall ESU/DPS		T	-	P[2]	-	Not Evaluated	-
Snake River Spring/Summer ESU/DPS		T	-	L[2]	-	Not Evaluated	-
Upper Columbia River Spring ESU/DPS		E	-	L[2]	-	Not Evaluated	-
Upper Willamette River ESU/DPS		T	-	L[2]	-	Not Evaluated	-
Scalloped hammerhead shark	*Sphyrna lewini*						
Eastern Pacific DPS		E	-[3]	-	L	NLAA	-
Indo-West Pacific DPS		T	-[3]	-	L	NLAA	-

[1] Humpback whales are likely to occur in the PMRF stage 1 booster drop zone but are likely part of the Hawai'i DPS which is not listed under the ESA.

[2] Fourteen ESA-listed ESUs of salmon and steelhead have the potential to occur in the PSCA stage 1 booster drop zone during the marine phase of their life cycles. Occurrence for these species is based on general patterns of migration for these species; no specific occurrence data for ESA-listed ESUs in the Action Area are known.

[3] Scalloped hammerhead sharks may occur in the PMRF stage 1 booster drop zone but would be part of the Central Pacific DPS which is not ESA-listed.

Abbreviations: DPS = Distinct Population Segment; E = Endangered; ESU = Evolutionary Significant Unit; T = Threatened; L = Likely, regularly occurs in all or part of the area; NLAA = May Affect but Not Likely to Adversely Affect; P = Potential, has the potential to occur in the area occasionally or at low densities during parts of the year; U = Unlikely, occurrence in area rare or extralimital; "-" = does not occur in this portion of the Action Area.

General threats to marine mammal species in the Action Area include ingestion of marine debris, entanglement in fishing nets or other marine debris, collision with vessels, loss of prey species due to new seasonal shifts in prey species or overfishing, excessive noise above baseline levels in a given area, disturbance from whale watching activities, chemical and physical pollution of the marine environment, parasites and diseases, and changing sea surface temperatures due to global climate change (NOAA 2023a). There is increasing evidence that loud underwater noise can be lethal, physically damaging, or disruptive to cetaceans (NOAA 2023a, Miller 2007). Increased anthropogenic noise in the ocean can alter the normal vocalizations or communication patterns in marine mammals and can even increase stress levels, alter feeding or migratory behaviors, or cause animals to leave vacating feeding or mating grounds (NOAA 2023a, Miller 2007). Certain cetaceans are affected by elevated noise levels more than others. Some deep diving species seem to be particularly susceptible to acoustic damage and anthropogenic noise has been linked to strandings in some species (Miller 2007).

Gray Whale (*Eschrichtius robustus*)

Originally listed as endangered under the ESA throughout its range (35 FR 8491 [2 June 1970]), the Eastern Pacific Population was delisted in 1994 (59 FR 31094 [16 June 1994]) while the Western North Pacific DPS remains listed as endangered. The Western North Pacific DPS feeds primarily in nearshore waters off Sakhalin Island in the Okhotsk Sea and off the southeastern Kamchatka Peninsula in the southwest Bering Sea (Weller et al. 2012, NMFS 1991). These whales are believed to use coastal waters of eastern Russia, the Korean Peninsula, and Japan for migration to wintering grounds in the South China Sea (Weller et al. 2012). Western DPS gray whales also migrate to wintering grounds in the Eastern North Pacific (Mate et al. 2015, Weller et al. 2012). Gray whales have been observed year-round near Ugak Bay since 2009 (Moore et al. 2007, Rone et al. 2017) and likely feed on abundant benthic organisms such as amphipods and cumaceans (Moore et al. 2007, NMFS 1991).

The NOAA Cetacean Density and Distribution Mapping Working Group has identified a biologically important summer feeding area for gray whales in the Albatross Bank region off Kodiak Island as well as a gray whale migration corridor through the Gulf of Alaska (used November through January and March through May) which includes the waters east of Kodiak Island (Ferguson et al. 2015) (**Figure 8**).

Gray whales are known to occur in the Action Area near Kodiak Island (Moore et al. 2007, Rone et al. 2017) within the stage 1 booster drop zone and may occur seasonally in the northernmost portions of the stage 2 booster drop zone. The best available density estimates for gray whales in the Action Area are those found in the Navy's Gulf of Alaska Marine Species Density Database (DON 2014). The Gulf of Alaska is considered to be within the range of the unlisted Eastern population of gray whales, and it is assumed that the majority of gray whales in the Action Area belong to this population. However, due to evidence of movement of Western DPS whales into the Eastern Pacific, it is considered a possibility that a small (but unknown) number of gray whales in the Action Area may be from the endangered Western DPS of gray whales.

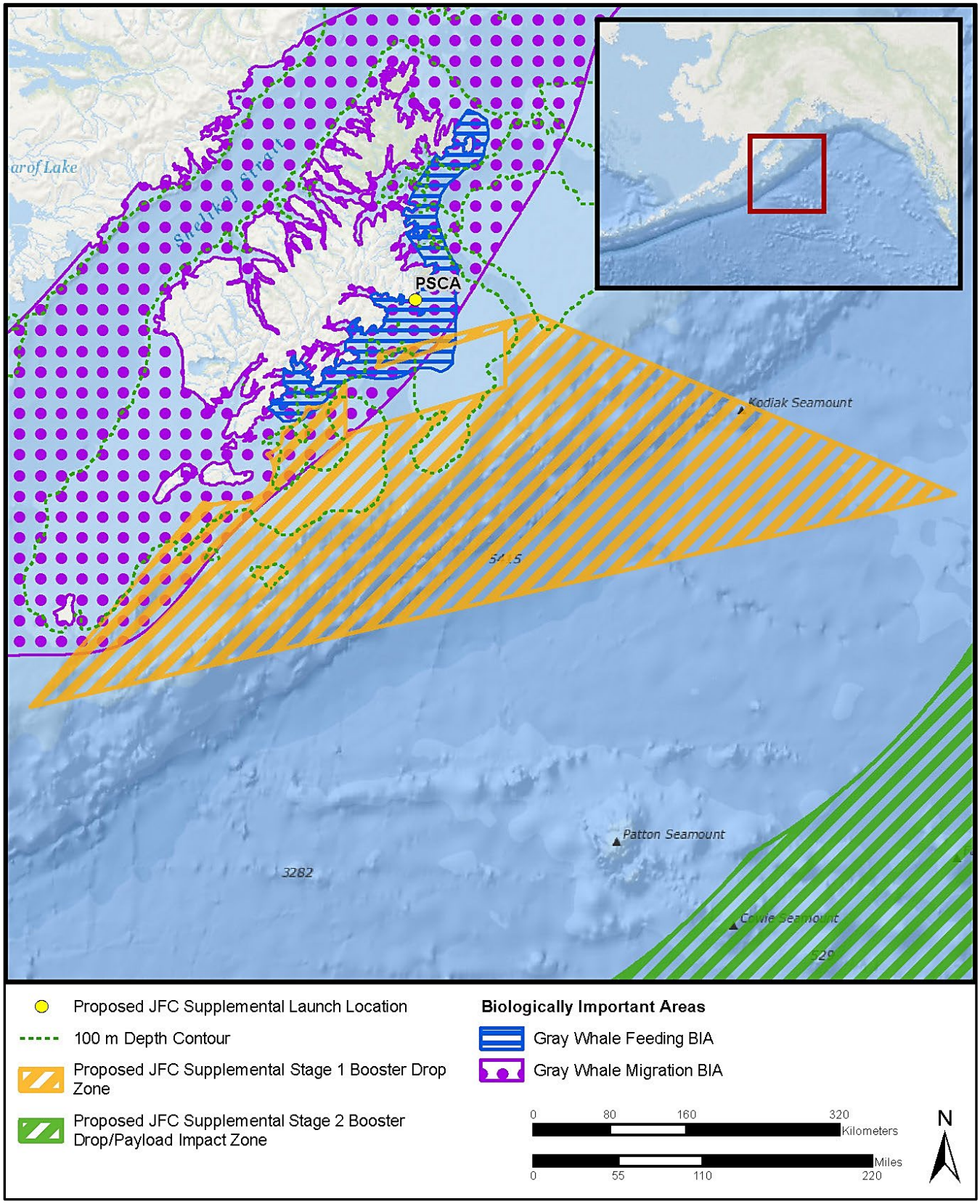


Figure 8. Biologically Important Areas in the PSCA Stage 1 Booster Drop Zone

Steller sea lion (*Eumetopias jubatus*)

Steller sea lions were listed as a threatened species under the ESA throughout their range in 1990. In 1997, NMFS reclassified Steller sea lions as two DPSs under the ESA (62 FR 24345 [5 May 1997]). The Eastern DPS maintained its threatened status until it was delisted in 2013. The Western DPS is defined as Steller sea lions born at rookeries from Prince William Sound westward, including those located on and near Kodiak Island. The listing status of the Western DPS was revised to endangered in 1997 (62 FR 24345).

Sea lions use terrestrial habitats throughout the year for haul-out sites where they rest and molt, and as rookery sites for mating and pupping (NMFS 2008). Steller sea lions are predators that forage and feed at sea on a variety of fish and cephalopods (NMFS 2008). These large pinnipeds forage near shore and in pelagic waters and may dive several hundred feet to catch prey (NMFS 2008). While adult females with pups generally forage within 20 km (12 miles [mi]) of rookery sites, adult sea lions without pups forage at larger distances from haul-out sites and dive to greater depths (NMFS 2008, 58 FR 165). Satellite telemetry studies of sea lions in the central Gulf of Alaska and Aleutian Islands indicate that adult females and juveniles make short trips to sea from rookeries in the summer averaging 17 km (11 mi) (maximum 49 km or 30 mi) from rookeries and generally stay over the continental shelf (NMFS 2008). In winter, adult females went farther out to sea but most pups made relatively short trips to sea (NMFS 2008).

Steller sea lions are likely to occur in the stage 1 booster drop zone and have critical habitat in this portion of the Action Area (see **Section 3.2.4**). The at-sea distribution of Steller sea lions varies seasonally and with prey availability and the density of sea lions in the Action Area is largely unknown. Several known haul-out and rookery sites occur near the stage 1 booster drop zone near Kodiak Island and sea lions must regularly transit nearshore waters surrounding haul-out sites to reach their offshore feeding areas (NMFS 2008). The best available density estimates for Steller sea lions at-sea are found in the Navy's Gulf of Alaska Marine Species Density Database (DON 2014) where year-round at-sea density was estimated at 0.0098 individuals per square kilometer.

Based on 2021 surveys of the Western DPS of Steller sea lion haul-out and rookery sites in Alaska, there were an estimated 40,528 non-pups and 12,631 pups in the Alaska portion of the Western DPS (Sweeney et al. 2022). The modeled non-pup counts for the Western DPS in Alaska increased at a rate of 1.7% per year between 2006 and 2021 and pup counts increased 1.2% per year (Sweeney et al. 2022). The modeled pup count increased at a rate of 1.52% per year (95% CI = 0.94-2.08) between 2000 and 2018 and exhibited similar trends east and west of Samalga Pass.

3.1.3 Fish

ESA-listed species not considered in the 2021 consultation include several Evolutionary Significant Units (ESUs) of four salmonid species (**Table 3**). These salmonid species have the potential to occur in the stage 1 booster drop zone for PSCA launched flight tests during the marine phase of their life cycles. However, the ESA-listed ESUs of salmon only occur in this

drop zone seasonally, are considered rare in the Action Area, and are only described briefly in this section.

Chum Salmon (*Oncorhynchus keta*)

Chum salmon spawn in freshwater habitats from Monterey Bay, California, all the way around the Pacific Rim to Korea and Japan (NMFS 2004). All chum salmon are anadromous, and juveniles migrate out to sea almost immediately after emergence (NMFS 2004). Chum salmon usually spend a few days or weeks in estuaries before moving farther out to coastal areas where they feed in epipelagic waters for 2 to 4 years (Quinn and Myers 2005). North American populations then migrate north along the continental shelf and begin to move further offshore as they grow (Quinn and Myers 2005). Chum salmon are not likely to be found in coastal waters again until they migrate to spawning habitats at maturity (Quinn and Myers 2005). Chum salmon prefer zooplankton and micronekton as prey, and their spatial and temporal distribution and abundance are likely linked to the distribution and abundance of prey as well as to physical ocean characteristics such as temperature and currents (Quinn and Myers 2005).

One ESA-listed chum salmon ESU has the potential to occur in the Action Area, the Hood Canal Summer-run ESU (NOAA 2023b). While the distribution and abundance of the Hood Canal Summer-run ESU chum salmon in the Gulf of Alaska are unknown, juvenile chum salmon are generally found in more coastal habitats with immature salmon moving further offshore as they grow and mature (Echave et al. 2012). The proportion of the total aggregation of chum salmon in the Gulf of Alaska that belong to the Hood Canal Summer-run ESU is unknown, but it is likely a small fraction of the total chum salmon numbers there. Juvenile and immature chum salmon from this ESU would be rare in the stage 1 booster drop zone.

Coho Salmon (*Oncorhynchus kisutch*)

Coho salmon occur throughout the North Pacific where they spawn in rivers and streams from California to Alaska, the Aleutians, and portions of Russia, Korea, and Japan (Stout et al. 2012). After hatching, young coho salmon generally remain in freshwater rivers and streams for 18 months before transitioning to marine habitats of the Pacific (Stout et al. 2012). During their approximately 18-month marine phase (Stout et al. 2012), coho salmon migrate slowly along the coast and are more commonly found in coastal and inland waters than further offshore (Quinn and Myers 2005). Some male coho salmon are known to mature and spawn after only 5 to 7 months at sea (Stout et al. 2012). The marine range of North American coho salmon extends from the Oregon-California border northward along the coast to the central Aleutians and further offshore throughout the eastern and central North Pacific (Quinn and Myers 2005).

Coho salmon from the threatened Lower Columbia River ESU have the potential to occur in the Action Area (NOAA 2023b) but are more likely to be found in coastal waters than in offshore waters. These fish are also more likely to be found in marine waters near their spawning locations (off British Columbia, Washington, and Oregon) than in Alaskan waters (Quinn and Myers 2005, Johnson et al. 1991). Coho salmon from the Lower Columbia River ESU would be very rare in the booster drop zones with unknown but likely very low densities.

Sockeye Salmon (*Oncorhynchus nerka*)

In the North Pacific, sockeye salmon spawn in rivers on the west coast of North America from the Columbia River north to the Noatak River in Alaska, as well as in Japan north to the Anadyr River in Asia (NMFS 2004). Sockeye salmon generally spawn in streams near lakes or in lakes, and juvenile fish use lake habitats for 1 to 3 years before migrating to the ocean (NMFS 2004). Juvenile fish then use marine habitats of the North Pacific for 1 to 4 years before returning to their natal streams to spawn (NMFS 2004). Other populations of sockeye salmon are nonanadromous or resident and remain in lake environments through most of their lives (NMFS 2004). The marine distribution of sockeye salmon is primarily epipelagic waters of the open ocean where they feed on zooplankton and micronekton and these fish are not commonly found in coastal waters until they return to spawn (Quinn and Myers 2005). During their marine phase, North American sockeye populations tend to migrate along the continental shelf northward towards Alaska or westward along the Aleutians and the eastern Bering Sea (Quinn and Myers 2005). As these fish grow larger, they tend to move further offshore; however, timing and movement depends on the physical characteristics of the ocean (water temperature and currents) and on distribution and abundance of their zooplankton prey (Quinn and Myers 2005).

Sockeye salmon from the Snake River ESU have the potential to occur in the Action Area both in coastal habitats and BOA waters. Juvenile sockeye salmon in the Gulf of Alaska are generally found in continental shelf waters with lower abundance levels than those seen in the Bering Sea (Echave et al. 2012). Immature sockeye salmon are found farther from shore along the shelf break and over deeper oceanic waters (Echave et al. 2012). It is possible that a very small but unknown number of Snake River ESU sockeye salmon could occur in the booster drop zones.

Chinook Salmon (*Oncorhynchus tshawytscha*)

On the west coast of North America, chinook salmon historically spawned in fresh water from southern California north to Point Hope, Alaska in the Chukchi Sea (NMFS 2004). These anadromous fish have two life history types, one “stream-type” that remains in freshwater for a year or more before migrating to the ocean and a second “ocean-type” that migrates to the ocean within their first year (NMFS 2004). The ocean-type is known to have coastal-oriented, ocean migrations where they are found predominantly in coastal ocean waters before returning to freshwater habitats to spawn (NMFS 2004). The stream-type populations undertake more extensive offshore ocean migrations at sea between their freshwater life history stages (NMFS 2004). Chinook salmon off much of the Oregon coast and northward tend to migrate north and are found throughout eastern North Pacific waters (Quinn and Myers 2005) including the Gulf of Alaska. The duration of the marine phase for chinook salmon varies depending on their life-history type and other factors, but typically lasts 2–4 years (Quinn and Myers 2005). In general, the at-sea abundance of chinook salmon (regardless of type), is higher in coastal waters than in offshore waters (Echave et al. 2012, Quinn and Myers 2005, Myers et al. 2005).

Six ESA-listed chinook salmon ESU/DPSs have the potential to occur in the Action Area (NOAA 2023b). Snake River Spring/Summer ESU and Snake River Fall ESU populations occur in the Snake River Basin which covers portions of Idaho, Oregon, and Washington. The Upper Willamette River ESU occurs in Oregon. The Puget Sound ESU, Upper Columbia River Spring

ESU, and Lower Columbia River ESU populations occur primarily in Washington State. In a study of at-sea recoveries of coded-wire tagged salmon, Chinook salmon that originated from Idaho were primarily recovered off the west coast of Canada with a few recoveries in coastal waters of Alaska (Myers et al. 2005). Therefore, Snake River ESUs are considered rare in the Action Area. Chinook salmon that originated from Oregon, Washington, and British Columbia were recovered in coastal waters throughout the Northeast Pacific from Oregon north through Alaska along the Aleutians and into the Bering Sea (Figure 5-7 in Myers et al. 2005). Quinn and Myers (2005) cited data that chinook salmon from Oregon were caught primarily in waters off British Columbia (56%) and Alaska (25%). Fish from these ESUs are likely to occur in coastal waters of the Gulf of Alaska but are considered infrequent in the BOA of the Gulf of Alaska. If individuals from these ESUs are present in the Action Area, they would be at very low but unknown densities.

3.2 Designated Critical Habitat in the Action Area

3.2.1 Critical Habitat Not Affected

Hawaiian Monk Seal Critical Habitat

As evaluated in the 2021 consultation, designated critical habitat for Hawaiian monk seals occurs in terrestrial areas and waters offshore of Kaua‘i near the PMRF stage 1 booster drop zone (**Figure 5**). However, no components would fall within these critical habitat areas and no other proposed activities have been identified that would affect designated critical habitat or the primary constituent elements of this habitat. There would be no effects on designated critical habitat for Hawaiian monk seals.

North Pacific Right Whale Critical Habitat

Designated critical habitat for North Pacific right whales includes an offshore area near Kodiak Island (**Figure 6**) (73 FR 19000 [8 April 2008]). This area was designated as critical habitat primarily because the majority of North Pacific right whale sightings in the Gulf of Alaska had been documented within it and also because it supports high prey densities (71 FR 38277 [6 July 2006]). The primary constituent elements essential for conservation of North Pacific right whales are “species of large copepods and other zooplankton in areas where they concentrate in densities sufficient to support and encourage feeding” (71 FR 38277).

The Action Proponents have removed this designated critical habitat area from the PSCA stage 1 booster drop zone; therefore, no components would enter the water in this critical habitat area. The Proposed Action would not alter the presence or density of prey species such as large copepods and other zooplankton; therefore, the Proposed Action would have no effect on designated critical habitat for North Pacific right whales and it is not discussed in further detail in this Biological Evaluation.

3.2.2 Humpback Whale Critical Habitat

Designated critical habitat for both the Western North Pacific DPS and Mexico DPS of humpback whales occurs within a portion of the PSCA Stage 1 booster drop zone (**Figure 6**).

These designated critical habitat areas include waters which serve as seasonal feeding habitat for these DPSs and contain the essential biological feature of humpback whale prey (86 FR 21082 [21 April 2021]). The physical and biological features essential to the conservation of both humpback whale DPSs are prey species, primarily euphausiids and small pelagic schooling fishes, of sufficient quality, abundance, and accessibility within humpback whale feeding areas to support feeding and population growth (86 FR 21082 [21 April 2021]).

3.2.3 False Killer Whale Critical Habitat

Designated critical habitat for the Main Hawaiian Islands Insular DPS of the false killer whale occurs within the proposed PMRF stage 1 booster drop zone (**Figure 5**). This designated habitat includes waters from the 45-m (148-ft) depth contour to the 3,200-m (10,500-ft) depth contour around the Main Hawaiian Islands (83 FR 35062 [24 July 2018]). The physical or biological features of this habitat that are essential to the conservation of insular false killer whales are: (1) island-associated marine false killer whale habitat; (2) sufficient quantity, quality, and availability of prey species; (3) waters free of harmful pollutants; and (4) habitat free of anthropogenic noise that would significantly impair the value of the habitat for false killer whale use or occupancy.

3.2.4 Steller Sea Lion Critical Habitat

Steller sea lion critical habitat is centered on major rookery and haul-out sites as defined in 58 FR 45281 (NMFS 1993). Designated critical habitat for this species includes the physical and biological habitat features that support reproduction, foraging, rest, and refuge essential to the conservation of the Steller sea lion (NMFS 1993). Steller sea lion Western DPS critical habitat includes a terrestrial zone (0.9 km [0.6 mi] landward from the baseline of major rookeries and haul-outs), an air zone (0.9 km [0.6 mi] above the terrestrial critical habitat), an aquatic zone (37 km [23 mi] seaward from the baseline of major rookeries and haul-outs), and special foraging areas (NMFS 1993). Special foraging areas do not occur in the Action Area and the potential effects of the Proposed Action would not extend into terrestrial or air zones of sea lion critical habitat; therefore, the following description focuses on the aquatic zone.

The essential component of Steller sea lion aquatic critical habitat is adequate food resources (NMFS 1993), especially for lactating adult females, young-of-the-year, and juveniles. Lactating females must remain close to their pups and generally forage within 37 km (23 mi) of their rookery (NMFS 1993). Juvenile sea lions also tend to forage in the shallower waters within 37 km (23 mi) of haul-outs (NMFS 1993). As juveniles are less efficient foragers than adults and do not dive as deep in search of prey (NMFS 1993), it is essential that adequate prey resources are available in their foraging waters.

There are several Steller sea lion haul-outs near the Action Area: at Cape Barnabas, north of Dangerous Cape at Gull Point, Ugak Island, Cape Chiniak, and Two-headed (NMFS 1993). Steller sea lion critical habitat includes 37-km (23-mi) buffers around these haul-out sites. A portion of the PSCA stage 1 booster drop zone occurs within this designated critical habitat (**Figure 6**).

4.0 Effects of the Proposed Action

The Proposed Action has the potential to directly or indirectly affect ESA-listed marine species and their habitats due to exposure to elevated sound levels, direct contact, exposure to hazardous materials, and collision with vessels. The stressors presented in this section are the same as those presented in the 2021 Biological Evaluation for JFC activities (USASMDC et al. 2021). The magnitude and potential effects of the stressors have not changed, only the location of Proposed Activities has changed. The assumptions relevant to the potential stressors in the BOA portion of the Action Area are summarized in **Table 4** and described in this section.

4.1 Effects on ESA-listed Species

4.1.1 Exposure to Elevated Sound Levels

Sources of Elevated Sound Levels

The Proposed Action may result in elevated noise levels in the BOA both in-air and underwater due to sonic booms from vehicle overflight and as a result of splashdown of JFC components.

No model estimates are available for sonic boom footprints resulting from JFC flight, but similar to other recent flight tests (DON 2019a), sonic booms are expected to average 130 dB in-water (re 1 µPa) at the surface for most of the vehicle flight and last no more than 270 milliseconds. Maximum sound levels from sonic booms for vehicle flight are expected to be 135 dB re 1 µPa (DON 2019a). Sonic booms generated by the payload near impact may be up to 175 dB re 1 µPa near the impact point and last approximately 75 milliseconds (DON 2019a).

No model estimates of noise levels are available for splashdown of JFC components; therefore, the peak noise levels have been estimated based on the size characteristics of the vehicle components compared to the component sizes for other test vehicles for which splashdown noise estimates are available (DON 2019a). Using peak sound pressure estimates for the largest Navy Flight Experiment-2 (FE-2) stage (approximately 1.4 times bigger than JFC stage 1) for the stage 1 booster and the smallest FE-2 stage (approximately the same size as JFC stage 2) for the stage 2 booster, the peak sound pressures are expected to be less than 218 dB re 1 µPa for splashdown of the stage 1 booster and 201 dB re 1 µPa for the stage 2 booster. Similarly, estimated sound levels for impact of the FE-2 payload (DON 2019a) are used as a bounding case for the JFC payload. Sound pressures from payload impact are expected to be less than 191 dB in-water (re 1 µPa) at the ocean surface and would last no more than a few seconds.

Table 4. Potential Stressors Resulting from Proposed JFC Activities in the BOA

Stressor	Stage 1 Booster Drop Zones	Stage 2 Booster Drop and Payload Impact Zones
Elevated Sound Pressure Levels		
Sonic Booms	Maximum sound pressure less than 135 dB in water (re 1 µPa) at the surface for vehicle flight. Duration 0.27 seconds.	Maximum sound pressure less than 135 dB in water (re 1 µPa) at the surface for vehicle flight. Duration 0.27 seconds. Maximum sound pressure less than 175 dB in water (re 1 µPa) near payload impact. Duration approximately 0.08 seconds.
Vehicle Component Splashdown/ Payload Impact	Estimated maximum of 218 dB in-water at stage 1 booster splashdown.	Estimated maximum of 201 dB in-water at stage 2 booster splashdown. Estimated maximum of 191 dB in-water at payload impact.
Direct Contact		
Test Components	One booster stage would splash down into the ocean. Approximate dimensions: Stage 1= 5.3 m long x 0.86 m diameter	One booster stage and the payload would splash down into the ocean. Approximate dimensions: Stage 2 = 2.0 m long x 0.86 m diameter Payload = 2.9 m long x 0.86 m diameter
Hazardous Materials		
Chemicals or Debris from Test Components	Introduction of launch vehicle materials into deep ocean waters, including rocket motors, unused propellant, battery electrolytes, and heavy metals. Components and materials expected to sink to the bottom or rapidly dilute.	Introduction of launch vehicle and payload materials into deep ocean waters, including rocket motor, unused propellant, battery electrolytes, residual explosives, and heavy metals. Components and materials expected to sink to the bottom or rapidly dilute.
Human Activity and Equipment Operation		
Vessel Traffic	Support ship may transit area on route to payload impact site.	Self-stationing sensor rafts (3 m by 3.7 m), deployed from a support ship, would be placed around the payload target site. Rafts would use twin battery-powered trolling motors for station-keeping. The largest support vessel would be approximately 92 m long with a 6 m draft and would remain on station for up to two weeks. There is no intension to anchor during this time. During travel to and from impact zones, and during raft deployment, ship personnel would monitor for marine mammals and sea turtles to avoid potential vessel strikes. Vessel operators would adjust speed or raft deployment based on animal presence and ocean conditions.

Abbreviations: dB = decibels, m = meter(s), re = referenced to, µPa = micropascal

Potential Effects of Elevated Sound Levels

Noise has the potential to affect the behavior and hearing sensitivity of marine mammals and fish. Loud sounds might cause these organisms to quickly react, altering their normal behavior either briefly or more long term or may even cause physical injury. The extent of the effect depends on the frequency and intensity of the sound as well as on the hearing ability of the animal and its distance from the noise source. Marine organisms have different hearing abilities and thresholds for effects.

The evaluation of potential effects of elevated sound levels was based primarily on the standard sound effect thresholds for effects to marine wildlife as detailed by NOAA Fisheries (NOAA 2018), summarized in environmental analyses for other recent test programs (DON 2019a, U.S. Army 2021), and incorporated here by reference. In general, a sound level that is sufficient to cause physical injury to auditory receptors is a sound that exceeds an organism's permanent threshold shift (PTS) level. The extent of physical injury depends on the received sound pressure level as well as the anatomy of each species. A temporary threshold shift (TTS) is when an organism is exposed to sound pressures below the threshold of permanent physical injury but loud enough to result in temporary hearing alteration. Sound levels above the TTS threshold have the potential to temporarily impair an animal's ability to communicate, navigate, forage, and detect predators. Another common effect of elevated sound levels is behavioral modification. Most documented occurrences of behavioral responses to anthropogenic sounds have been observations of short-term behavioral responses, which include temporary changes in feeding, resting, or social interactions (NRC 2005). For marine mammals, behavioral responses may include changes in surfacing, breathing patterns, dive duration, vocalization, and group composition but tend to be highly variable (NRC 2005).

The effect thresholds for functional hearing groups relevant to ESA-listed species in marine habitats are summarized in **Table 5** along with the distance to potential effect from project-related noise sources. The methodology for estimating the range to potential effect thresholds for wildlife are detailed in the FE-2 Biological Assessment (DON 2019a) and are incorporated here by reference.

Table 5. Distance to Effect Thresholds in Wildlife for Elevated In-Water Sound Levels Resulting from JFC Component Splashdown or Impact.

Functional Hearing Group	Permanent Threshold Shift (PTS)		Temporary Threshold Shift (TTS)			
	Threshold (dB SPL_{peak})	Radial Distance to Threshold from Stage 1 Splashdown meters (feet)	Threshold (dB SPL_{peak})	Radial Distance to Threshold from Splashdown meters (feet)		
				Stage 1	Stage 2	Payload
Low-frequency Cetaceans (gray whales)	219 dB	-	213 dB	2 (6)	-	-
Otariid Pinnipeds (sea lions)	232 dB	-	226 dB	-	-	-
Fish	229 dB(1)	-	186 dB SEL_{cum}(1)	40 (131)	6 (18)	2 (6)

Sources: DON 2019a, NOAA 2018, Finneran and Jenkins 2012, Popper et al. 2014
Notes: All sound pressures in this table are in dB SPLpeak re 1 µPa unless indicated.
(1) The PTS threshold for fish with swim bladders is based on the mortality/mortal injury threshold in NMFS 2015 and Popper et al. 2014. Thresholds in fish are not specific to auditory injury.
Abbreviations: dB = decibels, SEL = Sound Exposure Level, SPL = Sound Pressure Level

Effects of Elevated Sound Levels

Elevated sound levels would have insignificant effects on ESA-listed marine species in the Action Area.

Maximum sound levels for sonic booms in the Action Area (175 dB re 1 µPa) do not exceed the injury thresholds (PTS or TTS) for marine mammals or fish (**Table 5**). Sonic boom sound pressures may be high enough to cause behavioral disturbance in ESA-listed species near the payload impact site; however, effects would be insignificant. Behavioral disturbance is unlikely due to the low density of ESA-listed species in the Action Area, the low intensity of the sound, the short duration of the sound, and the rapid attenuation of sound pressures in the water. Any change in animal activity due to sonic boom noise would be limited to temporary startle reactions with no long-term effects and no effects on animal fitness.

Splashdown of the boosters and payload would not exceed the permanent injury threshold for any ESA-listed marine species. Splashdown may create sound pressures above the temporary injury threshold (TTS) for wildlife but only over very small areas (**Table 5**). Based on their low densities in the Action Area, it is very unlikely that any ESA-listed species would be in the area where sound pressures would be above the temporary injury threshold. Sounds from test component splashdown would be loud enough to cause behavioral disturbance in marine wildlife over larger areas. However, behavioral disturbance is unlikely based on the low density of ESA-listed species in the Action Area and the small number of tests (no more than six per year). Any realized behavioral disturbance due to sound would likely be limited to short-duration behavioral responses. Animals would be expected to return to normal behaviors within minutes of the short duration (no more than a few seconds) sounds and no effects to animal fitness

would be expected. Overall, effects of elevated sound levels due to test component splashdown in the BOA would be insignificant for all ESA-listed species considered in this evaluation.

4.1.2 Direct Contact

Sources of Direct Contact and Analysis Methodology

The Proposed Action would result in the spent stage 1 and 2 boosters as well as the payload splashing down in the booster drop zones. These falling components would enter marine habitats and have the potential to directly contact marine organisms. Based on the dimensions of the vehicle components and payload (see **Table 4** for estimated sizes), and the best available information on species density in the booster drop zones, the number of expected marine mammal exposures to direct contact from falling test components was calculated. The estimated number of exposures to direct contact was based on methodology used for other test programs (DON 2019a, DON 2019b, DON 2018a) where the probability of contact is calculated for four splashdown scenarios and averaged across scenarios. Detailed methodology for estimation of direct contact is available in the FE-2 Biological Assessment (DON 2019a) and the Mariana Islands Training and Testing Activities Biological Assessment (DON 2019b), is incorporated here by reference, and is available upon request.

The JFC program would include up to six tests per year over 10 years. These tests could take place from any of the installations described in **Section 1.0**, but it is not known at this time how many tests would occur annually from each installation. Therefore, for analysis purposes it is assumed that all tests could be from each of the proposed supplemental launch locations (i.e., six tests from PMRF's THAAD launch site and six from PSCA launch sites) as a conservative approach for estimating the potential effects to ESA-listed species in the BOA.

The best available density data for ESA-listed marine mammals in the Action Area comes from the Navy's Marine Species Density Databases for training and testing areas in the Pacific (DON 2017, DON 2018b, DON 2014, Rone et al. 2017). While the density data from these Navy training and testing study areas are the best available for the Action Area, they do not cover the entire Action Area. Species densities were averaged across study areas within a proposed drop zone and the highest estimated densities across seasons were used to represent animal densities in the entire drop zone.

Effects of Direct Contact

Overall, the effects of direct contact on ESA-listed marine species would be discountable. For species with available density estimates (gray whales and Steller sea lions), the estimated number of animal exposures is substantially less than one animal for a launch from PSCA and no direct contact is expected to occur. Even when summed for the maximum six tests per year over 10 years, the number of animals expected to be exposed to direct contact is substantially less than one.

For a flight test from PSCA, the number of estimated animal exposures is 0.00002 individuals per test for gray whales and 0.000006 for Steller sea lions. This corresponds to a 1 in 48,000

chance of contacting a gray whale and a 1 in 330,000 chance of contacting a Seller sea lion during a single test from PSCA. Exposure estimates are likely overestimates because they do not account for differences in seasonal distribution or differences in density across the large stage 2 booster drop zones but rather assume the maximum seasonal density for the entire year for the entire drop zone. Even if the maximum number of six flight tests per year over 10 years is assumed, the number of animal exposures is less than 0.001 animals for both species for the life of the program.

While density data are not available for ESA-listed fish in the Action Area, these species are likely to have very low densities, patchy distributions, and in many cases seasonal occurrence in the Action Area. Given the small direct contact area and the low density and patchy distribution of ESA-listed fish in the Action Area, it is very unlikely that these fish would be subject to direct contact from JFC vehicle components. Overall, no direct contact of ESA-listed wildlife is expected, and the effects would be discountable.

4.1.3 Exposure to Hazardous Materials

Sources of Hazardous Materials

Marine wildlife have the potential to be exposed to hazardous materials as the vehicle components splash down into the booster drop zones. Any substances of which the spent boosters or payload are constructed or that are contained in the stages and not consumed during flight or jettison (**Tables 1** and **2**) would fall into marine habitats. The propellants would be consumed before splashdown and the area affected by the dissolution of chemicals would be relatively small because of the size of the launch vehicle components and the minimal amount of residual materials they would contain. Any chemicals introduced to the water column would be quickly diluted and dispersed by wave action, ocean currents, and the large volume of water.

Test components have the potential to pose an ingestion risk to marine wildlife. However, all debris is expected to sink to the ocean bottom where depths reach thousands of feet and where most ESA-listed species and their prey do not occur. While no residual debris is expected, a recovery team would inspect the payload impact site after the test flight to recover and remove any visible debris present on the ocean surface.

Effects of Hazardous Materials

Hazardous materials would have insignificant or discountable effects on marine ESA-listed species. As discussed above, densities of listed species in the BOA are very low and the potentially affected areas would be very small. No animals are expected to come into contact with hazardous chemicals in concentrations high enough to have any effect on the animals and effects would be insignificant.

Similarly, test debris would sink to the ocean bottom where most ESA-listed animals and their prey species would not occur. Possible exceptions include benthic feeding species such as gray whales in relatively shallow shelf waters. Gray whales are known to feed by filtering benthos such as amphipods by scooping up substrate from the sea floor (Moore et al. 2007, Ferguson et

al. 2015). Gray whales primarily feed by filtering substrate in waters 20 to 40 m (66 to 131 ft) deep where prey are most abundant but may feed in waters up to 100 m (328 ft) deep (Johnson et al. 1983). Water depths in the stage 1 booster drop zone range from approximately 30 to 5,400 m (100 to 17,700 ft) but are mostly more than 100 m (328 ft) deep (**Figure 8**). Most gray whales observed feeding in 1999–2005 surveys east of Kodiak Island (Moore et al. 2007) were in waters near the entrance to Ugak Bay and the gray whale feeding biologically important area only overlaps a very small portion of the PSCA stage 1 booster drop zone (**Figure 8**). It is possible that a small number of gray whales may feed in the booster drop zone. If gray whales fed in areas where debris were deposited, it is possible that they could ingest intercept debris and be harmed. As discussed in **Section 3.1.2**, the Gulf of Alaska is within the range of the Eastern population of gray whales (not listed under the ESA), and it is assumed that the majority of gray whales in the Action Area belong to this population. It is possible that a very small (but unknown) number of gray whales in the Gulf of Alaska may be from the endangered Western DPS of gray whales. Because ESA-listed population densities are likely extremely low in the Action Area, it is considered discountable that a Western DPS gray whale would ingest and be adversely affected by debris resulting from the Proposed Action. While ingestion of debris is also a possibility for other listed species, it is extremely unlikely that marine organisms would be co-located with debris, and it is considered discountable that any ESA-listed would come into contact with or ingest test debris.

4.1.4 Collision with Vessels

Sources of Vessel Traffic

The Proposed Action may involve use of sea-based sensors on vessels along the flight path and on self-stationing rafts near the payload impact point. The largest support vessel would be approximately 92 m (300 ft) long with a 6 m (20 ft) draft and may remain on station for up to 2 weeks. Self-stationing sensor rafts would be deployed from a test support ship and the ship may be active in the BOA for up to 4 weeks. While these sensors involve vessel traffic in the BOA, operation of the majority of these vessels would be part of existing programs and would operate under the standard operating procedures of those programs. Ship personnel would monitor for marine mammals and sea turtles to avoid potential vessel strikes during travel to and from impact zones and during raft deployment. Vessel operators would adjust vessel speed or raft deployment based on expected animal locations, densities, and or lighting and turbidity conditions. Vessel operations would only occur when weather and sea conditions are acceptable for safe travel. Vessel operations would not involve any intentional ocean discharges of fuel, toxic wastes, or plastics and other solid wastes that could potentially harm marine life. No vessel anchoring would occur in the BOA.

There would be relatively little vessel traffic for the Proposed Action and the use of vessels for the Proposed Action would not meaningfully increase total vessel traffic in the Pacific BOA. Self-stationing rafts would be powered by two small battery-powered trolling motors and would pose very little strike risk for wildlife. No self-stationing raft or other vessel equipment is expected to pose an entanglement risk for wildlife.

Effects of Collision with Vessels

It is discountable that any ESA-listed species considered in this evaluation would collide with a project-related vessel. Marine mammals must surface to breathe air and therefore are at risk of being struck by vessels. As part of the Proposed Action, vessel operators would watch for and avoid (to the extent feasible given safety and ocean conditions) marine mammals and sea turtles. ESA-listed fish are less likely to be near the surface and are also able to move to avoid oncoming vessels. All of these ESA-listed species have low densities in the BOA. For all species, the risk of collision with project-related vessels is discountable.

4.2 Effects on Designated Critical Habitat

The Proposed Action has the potential to affect the primary constituent elements of designated critical habitat through introduction of hazardous materials and test debris, and through vessel traffic. The sources or hazardous materials and vessel traffic are discussed in **Sections 4.1.3** and **4.1.4**. Any chemicals introduced to the water column would be quickly diluted and dispersed by wave action, ocean currents, and the large volume of water, and are therefore not likely to be present in concentrations which would harm marine life or alter habitats. There would be relatively little vessel traffic for the Proposed Action and the use of vessels for the Proposed Action would not meaningfully increase total vessel traffic in the Pacific BOA. Hazardous materials, test debris, and vessel traffic may affect but are not likely to adversely affect designated critical habitats within the booster drop zones.

Critical habitat for the Western North Pacific and Mexico DPSs of humpback whales occurs in the PSCA stage 1 booster drop zone (**Figure 6**). Hazardous materials, debris, and vessel traffic would not change euphausiid or small pelagic schooling fish distributions or densities in these critical habitat areas in any measurable way. Therefore, the Proposed Action is not likely to affect the essential features necessary for humpback whale conservation in these critical habitat areas.

Critical habitat for the Main Hawaiian Islands Insular DPS of false killer whales occurs in a portion of the PMRF stage 1 booster drop zone (**Figure 5**). Hazardous materials, debris, and vessel traffic would not change prey quantity, quality, or availability in this critical habitat area in any measurable way. While proposed activities may introduce hazardous materials into critical habitat areas, chemicals and debris would not be present in quantities or concentrations which would be harmful to false killer whales or their prey. Any program-related noise (i.e., sonic booms or stage 1 booster splashdown noise) would not significantly impair the value of the habitat for false killer whale use or occupancy because the noise would be at relatively low levels and would be single, short-duration sounds. Therefore, the Proposed Action is not likely to affect the primary constituent elements necessary for false killer whale conservation in this critical habitat area.

Designated aquatic critical habitat for the Western DPS of Steller sea lions occurs in a portion of the PSCA stage 1 booster drop zone (**Figure 6**). Hazardous materials, debris, and vessel traffic would not change the distribution or abundance of sea lion prey resources in this critical habitat area in any measurable way. The Proposed Action is not likely to alter the primary constituent elements necessary for Steller sea lion conservation in this designated critical habitat.

This page intentionally left blank

5.0 Conclusions

Based on the conclusion that all effects of the Proposed Action would be insignificant and/or discountable for marine ESA-listed species, the U.S. Army RCCTO and Navy SSP have determined that JFC supplemental activities may affect but are not likely to adversely affect the ESA-listed species considered in this evaluation and listed in **Table 3**. Six marine species may be, but are not likely to be adversely affected by the Proposed Action: gray whales (*Eschrichtius robustus),* the Western DPS of Steller sea lions (*Eumetopias jubatus*), the Hood Canal Summer run ESU of chum salmon (*Oncorhynchus keta*), the Lower Columbia River ESU of coho salmon (*Oncorhynchus kisutch*), the Snake River ESU of sockeye salmon (*Oncorhynchus nerka*), and six ESUs of chinook salmon (*Oncorhynchus tshawytscha*) (Lower Columbia River, Puget Sound, Snake River Fall, Snake River Spring/Summer, Upper Columbia River Spring, and Upper Willamette River ESUs).

As described in **Section 1.3** and **Section 3.1.1**, for all other ESA-listed species in the Action Area, the Action Proponents have determined that JFC supplemental activities would have no effects on these species that were not already considered in the 2021 consultation on JFC activities. The Action Proponents and NMFS concluded that JFC activities may affect but were not likely to adversely affect ESA-listed species in the Action Area that were considered in the 2021 consultation (**Table 3**). The Action Proponents have determined that these conclusions remain valid and that no additional consultation on these species is required under Section 7 of the ESA.

The Action Proponents have concluded that the Proposed Action may affect but is not likely to adversely affect designated critical habitat for the Western North Pacific DPS of humpback whales, the Mexico DPS of humpback whales, the Main Hawaiian Islands Insular DPS of false killer whales, and the Western DPS of Steller sea lions. Furthermore, the Action Proponents have determined that the Proposed Action would have no effect on designated critical habitats for Hawaiian monk seals or North Pacific right whales.

This page intentionally left blank

6.0 Literature Cited

AAC (Alaska Aerospace Corporation). 2016. Application for a Five-Year Programmatic Permit for Small Takes of Marine Mammals Incidental to Launching of Space Launch Vehicles, Long Range Ballistic Target Missiles, and Smaller Missile Systems at Pacific Spaceport Complex Alaska, Kodiak Island, Alaska. Submitted to the National Marine Fisheries Service, Office of Protected Resources.

DON (Department of the Navy). 2014. Commander Task Force 3rd and 7th Fleet Navy Marine Species Density Database for the Gulf of Alaska. NAVFAC Pacific Technical Report. Naval Facilities Engineering Command Pacific, Pearl Harbor, HI.

_____. 2017. U.S. Navy Marine Species Density Database Phase III for the Hawaii-Southern California Training and Testing Study Area. NAVFAC Pacific Technical Report. Naval Facilities Engineering Command Pacific, Pearl Harbor, HI.

_____. 2018a. Hawaii-Southern California Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement. October 2018.

_____. 2018b. U.S. Navy Marine Species Density Database Phase III for the Mariana Islands Training and Testing Study Area. Authors: S. Hanser, E. Becker, and M. Zickel. U.S. Pacific Fleet Technical Report. Pearl Harbor, HI. 130 pp.

_____. 2019a. Biological Assessment for Flight Experiment-2 (FE-2). June 2019.

_____. 2019b. Mariana Islands Training and Testing Biological Assessment to Support Endangered Species Act Section 7 Consultation with the National Marine Fisheries Service. July 2019.

DON and U.S. Army (United States Navy and United States Army). 2022. Joint Flight Campaign Environmental Assessment / Overseas Environmental Assessment. February 2022.

Echave, K., M. Eagleton, E. Farley, and J. Orsi. 2012. A refined description of essential fish habitat for Pacific salmon within the U.S. Exclusive Economic Zone in Alaska. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-AFSC-236.

Ferguson, M. C., C. Curtice, and J. Harrison. 2015. Biologically Important Areas for Cetaceans Within U.S. Waters – Gulf of Alaska Region. Aquatic Mammals 41(1):65-78.

Finneran, J. J. and A. K. Jenkins. 2012. Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis. April 2012.

Johnson, K. R. C. H. Nelson, and J. H. Barber, Jr. 1983. Assessment of Gray Whale Feeding Grounds and Sea Floor Interaction in the Northeastern Bering Sea. United States Department of the Interior Geological Survey Report 83-727.

Johnson, O. W., T. A. Flagg, D. J. Maynard, G. B. Milner, and F. W. Waknitz. 1991. Status Review for Lower Columbia River Coho Salmon. NOAA Technical Memorandum NMFS F/NWC-202. June 1991.

Kahle, W., P. Phillips, D. Rodney, and G. Krik. 2021. Launch at KTF Acoustic Study. Rev 4. Johns Hopkins Applied Physics Lab.

Mate, B. R., V. Y. Ilyashenko, A. L. Bradford, V. V. Vertyankin, G. A. Tsidulko, V. V. Rozhnov, and L. M. Irvine. 2015. Critically endangered western gray whales migrate to the eastern North Pacific. Biology Letters 11:20150071.

Myers, K. W., N. D. Davis, A. G. Celewycz, E. V. Farley, Jr., J. Morris, M. Trudel, M. Fukuwaka, S. Kovalenko, and A. Shubin. 2005. High seas salmonid coded-wire tag recovery data, 2005. (NPAFC Doc. 905.) SAFS-UW-0505, School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA.

Miller, C. E. 2007. Current State of Knowledge of Cetacean Threats, Diversity and Habitats in the Pacific Islands Region. Whale and Dolphin Conservation Society Australasia, Inc.

Moore, S. E., K. M. Wynne, J. C. Kinney, and J. M. Grebmeier. 2007. Gray Whale Occurrence and Forage Southeast of Kodiak Island, Alaska. Marine Mammal Science 23(2):419-428.

NMFS (National Marine Fisheries Service). 1991. Endangered Fish and Wildlife; Gray Whale. Proposed Rule to delist the eastern North Pacific stock. 56 FR 58869. 22 November 1991.

_____. 1993. Designated Critical Habitat; Steller Sea Lion. Final Rule. 58 FR 45269. 27 August 1993.

_____. 2004. Endangered and Threatened Species: Proposed Listing Determinations for 27 ESUs of West Coast Salmonids; Proposed Rule. 69 FR 33102. 14 June 2004.

_____. 2008. Recovery Plan for the Steller Sea Lion Eastern and Western Distinct Population Segments (*Eumetopias jubatus*). March 2008.

_____. 2011. Endangered Species Act -Section 7 Consultation Biological Opinion for Issuance of Regulations and Letters of Authorization Under the Marine Mammal Protection Act to Authorize Incidental Take of Marine Mammals by U.S. Citizens Engaged in Space Vehicle and Missile Launch Operations at the Kodiak Launch Complex on Kodiak Island, Alaska. Issued 18 March 2011.

_____. 2015. Biological Opinion and Conference Report on Navy Northwest Training and Testing Activities and National Marine Fisheries Service Marine Mammal Protection Act Incidental Take Authorization. 9 November 2015.

_____. 2021. Programmatic Concurrence Letter for the Department of Defense Joint Flight Campaign Activities in the Atlantic and Pacific Oceans. NMFS Reference Number: OPR-2021-02470. 14 October 2021.

NOAA (National Oceanic and Atmospheric Administration). 2018. 2018 Revision to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) – Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts. April 2018.

_____. 2022. 2022 Draft Marine Mammal Stock Assessment Reports. NOAA Fisheries Marine Mammal Stock Assessment Reports. Available online: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports>. Accessed March 2023.

_____.2023a. Species Directory. ESA Threatened and Endangered. Available online: <https://www.fisheries.noaa.gov/species-directory/threatened-endangered>. Accessed March 2023.

_____.2023b. Endangered, Threatened, and Candidate Species in Alaska. Species under NOAA Fisheries Authority. Available online: <https://www.fisheries.noaa.gov/alaska/endangered-species-conservation/endangered-threatened-and-candidate-species-alaska>. Accessed March 2023.

NRC (National Research Council). 2005. Marine Mammal Populations and Ocean Noise: Determining When Noise Causes Biologically Significant Effects. National Academies Press, Washington, DC.

Popper, A. N., A. D. Hawkins, R. R. Fay, D. A. Mann, S. Bartol, T. J. Carlson, S. Coombs, W. T. Ellison, R. L. Gentry, M. B. Halvorsen, S. Lokkeborg, P. H. Rogers, B. L. Southall, D. G. Zeddies, and W. N. Tavolga. 2014. Sound exposure guidelines for fish and sea turtles: a technical report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI. 20 April 2014.

Quinn, T. P., and K. W. Myers. 2005. Anadromy and the marine migrations of Pacific salmon and trout: Rounsefell revisited. Reviews in Fish Biology and Fisheries 14:421-442.

Rone, B. K., A. N. Zerbini, A. B. Douglas, D. W. Weller, and P. J. Clapham. 2017. Abundance and distribution of cetaceans in the Gulf of Alaska. *Marine Biology* 164:23.

Stout, H. A., P. W. Lawson, D. L. Bottom, T. D. Cooney, M. J. Ford, C. E. Jordan, R. G. Kope, L. M. Kruzic, G. R. Pess, G. H. Reeves, M. D. Scheuerell, T. C. Wainwright, R. S. Waples, E. Ward, L. A. Weitkamp, J. G. Williams, and T. H. Williams. 2012. Scientific conclusions of the status review for Oregon coast coho salmon (*Oncorhynchus kisutch*). U.S. Dept. Commerce, NOAA Technical Memo. NMFS-NWFSC-118.

Sweeney, K., B. Birkemeier, K. Luxa, and T. Gelatt. 2022. Results of Steller Sea Lion Surveys in Alaska, June-July 2021. Memorandum of the National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 7 February 2022.

U.S. Army (United States Army). 2021. Final Environmental Assessment/Overseas Environmental Assessment for Hypersonic Flight Test 3 (FT-3). April 2021.

USASMDC et al. (United States Army Space and Missile Defense Command, United States Navy Strategic Systems Programs, and United States Army Rapid Capabilities and Critical Technologies Office). 2021. Marine Biological Evaluation for the Joint Flight Campaign. May 2021.

Weller, D. W., A. Klimek, A. L. Bradford, J. Calambokidis, A. R. Lang, B. Gisborne, A. M. Burdin, W. Szaniszlo, J. Urban, A. G. Unzueta, S. Swartz, and R. L. Brownell Jr. 2012. Movements of gray whales between the western and eastern North Pacific. Endangered Species Research 18:193-199.

7.0 List of Preparers

Government Preparers

David Fuller, National Environmental Policy Act Program Manager

Contractor Preparers

Karen Hoksbergen, Biologist, KFS, LLC
M.S., 2004, Biology, Northern Michigan University
B.S., 2001, Biology and Wildlife, University of Wisconsin Stevens Point
Years of Experience: 22

Amy McEniry, Technical Editor, KFS, LLC
B.S., 1988, Biology, University of Alabama in Huntsville
Years of Experience: 35

This page intentionally left blank

6 July

2023

Terrestrial Biological Evaluation for Joint Flight Campaign Supplemental Activities



Prepared for:
U.S. Army Space and Missile Defense Command

Department of the Navy Strategic Systems Programs

U.S. Department of the Army Rapid Capabilities and Critical Technologies Office

Prepared by:
KFS, LLC

DISTRIBUTION STATEMENT A: Approved for public release: distribution unlimited.

Cover image: Nēnē on Kauaʻi, Karen Hoksbergen

Table of Contents

Acronyms and Abbreviations iii
1.0 Introduction 1
1.1 Purpose and Objectives 1
1.2 Regulatory Setting 2
1.3 Background and Consultation History 2
1.3.1 Background and Consultation History for Activities Evaluated in the JFC EA/OEA 2
1.3.2 Background and Consultation History for JFC Supplemental Activities 4
2.0 Description of the Proposed Action and Action Area 7
2.1 Description of the Proposed Action 7
2.1.1 Launch Site Preparations and Operations 9
2.1.2 Terminal Location Preparations and Operations 9
2.1.3 Flight Test 11
2.1.4 Post-Test Operations 11
2.2 Avoidance, Minimization, and Conservation Measures 12
2.3 Description of the Action Area 13
3.0 Listed Species and Designated Critical Habitat in the Action Area 19
3.1 ESA-listed Species in the Action Area 19
3.1.1 Species Not Included in Evaluation 19
3.1.2 Hawaiian Waterbirds 20
3.1.3 Hawaiian Goose or Nēnē 24
3.1.4 Short-tailed Albatross 25
3.1.5 Steller's Eider 25
3.1.6 Green Sea Turtle 26
3.1.7 Northern Sea Otter 26
3.1.8 Hawaiian Hoary Bat 27
3.2 Designated Critical Habitat in and Near the Action Area 27
3.2.1 Critical Habitat Not Affected 27
3.2.2 *Panicum niihauense* Critical Habitat 28
4.0 Effects of the Proposed Action 29
4.1 Stressors Associated with the Proposed Action 29
4.1.1 Exposure to Elevated Sound Levels 29
4.1.2 Physical Injury 35
4.1.3 Exposure to Heat and Increased Wildfire Risk 35
4.1.4 Exposure to Hazardous Materials 36
4.2 Effects of the Proposed Action on Listed Species 36
4.2.1 Hawaiian Waterbirds 36
4.2.2 Hawaiian Goose or Nēnē 37
4.2.3 Short-tailed Albatross 38

4.2.4 Steller's Eider....39
4.2.5 Green Sea Turtle....39
4.2.6 Northern Sea Otter....40
4.2.7 Hawaiian Hoary Bat....40
4.3 Effects of the Proposed Action on Designated Critical Habitat....42
4.3.1 *Panicum niihauense* Critical Habitat....42
5.0 Conclusions....43
6.0 Literature Cited....45
7.0 List of Preparers....49

Figures

Figure 1. JFC Launch Vehicle....7
Figure 2. Transporter Erector Launcher....8
Figure 3. Proposed JFC Supplemental Activity Locations at PMRF....10
Figure 4. JFC Activity Locations in the Pacific Ocean....15
Figure 5. Proposed JFC PMRF Stage 1 Booster Drop Zone....16
Figure 6. Proposed JFC Supplemental PSCA Stage 1 Booster Drop Zone....17
Figure 7. Proposed JFC Supplemental Activity Locations at PSCA....18
Figure 8. Number of Vehicle Collisions for ESA-listed Birds at PMRF Main Base, 2014 to 2020....23
Figure 9. Modeled Maximum Sound Pressure Levels and Duration for JFC Launches....32

Tables

Table 1. Launch Vehicle Characteristics....8
Table 2. Payload System Characteristics....8
Table 3. ESA-listed Species in the Action Area....21
Table 4. Potential Stressors Resulting from Proposed JFC Supplemental Activities....30

Acronyms and Abbreviations

BO	Biological Opinion
BOA	Broad Ocean Area
CCSFS	Cape Canaveral Space Force Station
cm	Centimeter(s)
dB	Decibel(s)
dBA	A-weighted Decibel(s)
DOE	Department of Energy
DON	Department of the Navy
DPS	Distinct Population Segment
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FE-2	Flight Experiment 2
FR	Federal Register
ft	Feet
JFC	Joint Flight Campaign
KTF	Kauaʻi Test Facility
m	Meter(s)
NOAA	National Oceanic and Atmospheric Administration
OEA	Overseas Environmental Assessment
PMRF	Pacific Missile Range Facility
PSCA	Pacific Spaceport Complex Alaska
PTS	Permanent Threshold Shift
RCCTO	U.S. Army Rapid Capabilities and Critical Technologies Office
re	Referenced to
SPL	Sound Pressure Level
SSP	Navy Strategic Systems Programs
THAAD	Terminal High Altitude Area Defense
TTS	Temporary Threshold Shift
U.S.	United States
USAF	United States Air Force
USASMDC	United States Army Space and Missile Defense Command
USFWS	United States Fish and Wildlife Service
VSFB	Vandenberg Space Force Base
WFF	Wallops Flight Facility
µPa	Micropascal(s)

This page intentionally left blank

1.0 Introduction

1.1 Purpose and Objectives

The purpose of this Biological Evaluation is to evaluate the potential effects of proposed Joint Flight Campaign (JFC) supplemental activities at the Pacific Missile Range Facility (PMRF) and Pacific Spaceport Complex Alaska (PSCA) (i.e., the Proposed Action) on species listed as endangered or threatened under the Endangered Species Act (ESA) and on designated critical habitat under the jurisdiction of the United States Fish and Wildlife Service (USFWS). The JFC program is a joint campaign of the Department of the Navy (Navy) Strategic Systems Programs (SSP) and the U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO), the Action Proponents. This Biological Evaluation has been prepared by the Navy SSP and U.S. Army RCCTO with the assistance of the U.S. Army Space and Missile Defense Command (USASMDC) in accordance with the requirements of Section 7 of the ESA.

The Action Proponents and USASMDC have also prepared this evaluation in coordination with Cooperating Agencies including the Navy's PMRF Environmental Office.

The JFC action involves up to six flight test launches per year, over the next 10 years, from multiple launch locations. After launch, tests would include vehicle flight over the Pacific and/or Atlantic Oceans and would involve splashdown of spent boosters as well as payload impact in the broad ocean area (BOA). In 2022, the Action Proponents completed an Environmental Assessment (EA)/Overseas Environmental Assessment (OEA) for the JFC action (DON and U.S. Army 2022) to meet requirements of the National Environmental Policy Act and to evaluate the effects of the JFC action on protected resources in compliance with other regulatory requirements, including the ESA. The JFC EA/OEA evaluated the potential effects of launch activities at four installations: (1) PMRF, Kauaʻi, Hawaiʻi; (2) Vandenberg Space Force Base (VSFB), California; (3) Wallops Flight Facility (WFF), Virginia; and (4) Cape Canaveral Space Force Station (CCSFS), Florida. In the JFC EA/OEA, the only launch location at PMRF considered for JFC launches was a launch pad at the Kauaʻi Test Facility (KTF).

Since completion of the JFC EA/OEA, the Action Proponents have decided that additional launch capabilities from PMRF's Terminal High Altitude Area Defense (THAAD) launch pad and from PSCA are required to meet the purpose and need of the JFC action.

This Biological Evaluation describes proposed JFC supplemental activities for the purposes of evaluating the potential effects of the Proposed Action on ESA-listed species and designated critical habitats. A summary of relevant effect determinations and background information for the JFC action as originally scoped is included in **Section 1.3**, *Background and Consultation History*.

1.2 Regulatory Setting

This Biological Evaluation addresses the potential effects of Proposed Action activities on ESA-listed species and critical habitats under the jurisdiction of USFWS in compliance with Section 7 of the ESA.

1.3 Background and Consultation History

This Biological Evaluation evaluates only JFC supplemental activities at PMRF's THAAD launch site and in territorial waters offshore of PSCA, that have the potential to affect ESA-listed species under the jurisdiction of USFWS. A brief summary of existing Section 7 consultation coverage and/or conclusions pursuant to the ESA for JFC activities not addressed in this evaluation (i.e., activities evaluated in the JFC EA/OEA and in the BOA beyond the U.S. exclusive economic zone [EEZ]) as well as for locations included in this evaluation are included in the following subsections.

1.3.1 Background and Consultation History for Activities Evaluated in the JFC EA/OEA

Launches from Kauaʻi Test Facility at Pacific Missile Range Facility

The effects of JFC launch operations from KTF as well as operational support activities at PMRF on ESA-listed species and critical habitats have previously been evaluated through consultation with the USFWS.

The Department of Energy (DOE) consulted with USFWS on the effects of launch activities at KTF, including JFC launch activities, in 2021. The DOE and USFWS evaluated the effects of launches from KTF including elevated noise levels, wildfire risk, and heat and emissions from launch. The USFWS issued a Letter of Concurrence that KTF launch activities were not likely to adversely affect ESA-listed species or designated critical habitats (USFWS Reference Number 01EPIF00-2021-I-0329) (USFWS 2021a).

The effects of launch or launch support activities performed by the Navy at PMRF were addressed in base-wide programmatic consultations with USFWS. In 2014, the USFWS issued a biological opinion (BO) on PMRF base-wide infrastructure, operations, and maintenance (USFWS Reference Number 01EPIF00-2014-F-0066) (USFWS 2014a). This consultation was reinitiated to address effects on ESA-listed seabirds and USFWS issued a BO in 2018 (USFWS 2018a). These BOs addressed the effects of operations and maintenance activities, including artificial lighting at launch facilities and ESA-listed species management, at all PMRF base-wide locations. ESA-listed species management, including hazing of nēnē (*Branta sandvicensis*) near launch facilities to prevent injury and nest abandonment, is performed by the PMRF Environmental Office under the terms of existing consultations.

Where relevant, JFC activities would be conducted within the terms of these BOs as implemented by the Navy and DOE at PMRF. The Action Proponents concluded that JFC launches from KTF and launch support activities at PMRF would not result in any potential

effects to ESA-listed species that were not considered in these previous consultations and that no additional consultation with the USFWS was required for JFC activities evaluated in the 2022 EA/OEA.

Launches from Wallops Flight Facility

The National Aeronautics and Space Administration has consulted with the USFWS on the potential effects of launch activities at WFF, including launches from Launch Pad 0-B (USFWS Reference Number 2015-F-3317) (USFWS 2019a). This consultation included all proposed and ongoing programmatic launch activities at WFF which could take place year-round and at any time of the day (USFWS 2019a). The USFWS concluded that take of piping plovers (*Charadrius melodus*), red knots (*Calidris canutus ruba*), and loggerhead turtles (*Caretta caretta*) due to ongoing activities (including launch activities) at WFF is not likely to result in population declines or to jeopardize the continued existence of these species (USFWS 2019a). JFC activities would comply with the terms and conditions of the 2019 BO (USFWS 2019a) as implemented by WFF. The Action Proponents concluded that the effects of JFC launch activities at WFF were encompassed within those evaluated in WFF programmatic consultations and BOs and that no additional consultation with the USFWS under Section 7 of the ESA was required for JFC activities at WFF.

Launches from Cape Canaveral Space Force Station

CCSFS's Launch Complex-46 has been and will continue to be used for a range of launch vehicles including space vehicle launches. Numerous BOs have been issued by USFWS for operations at CCSFS (available in Appendix C of USAF 2020). Through consultation with the USFWS the 45th Space Wing and Launch Operators have developed light management plans for launch complex related lighting installation and use to minimize effects to nesting sea turtles. A light management plan, approved by USFWS, would be in place for any JFC operations at Launch Complex-46 and no additional consultation with USFWS would be required if the light management plan meets the requirements of existing BOs. JFC activities at CCSFS would be conducted within the terms of existing BOs as implemented by the Department of the Air Force at CCSFS. The Action Proponents determined that the effects of JFC launch and launch support activities on ESA-listed species at CCSFS were encompassed within those evaluated in existing consultations and BOs for CCSFS and that no additional consultation with the USFWS under Section 7 of the ESA was required for JFC activities at CCSFS.

Launches from Vandenberg Space Force Base

VSFB was considered as an alternative launch location for JFC flight tests; however, VSFB was not carried forward as part of the preferred alternative for the JFC action. Even if a decision were made to include VSFB launches for JFC, the Action Proponents concluded that the potential effects of JFC activities on ESA-listed species were encompassed within existing programmatic consultations and the resulting BOs for base-wide operations and maintenance at VSFB (USFWS 2018b). JFC activities would be conducted within the terms of the BO as implemented by the Department of the Air Force at VSFB. The effects of JFC launch activities on threatened and endangered species at VSFB were not expected to be different than or in

addition to those concluded for ongoing operations (including launch activities) at VSFB. Therefore, the Action Proponents determined that no additional consultation with the USFWS under Section 7 of the ESA was required for JFC activities at VSFB.

Activities in the Pacific and Atlantic Broad Ocean Areas

The Action Proponents determined that JFC activities as evaluated in the JFC EA/OEA (DON and U.S. Army 2022) would have no effect on ESA-listed seabirds in the Atlantic or Pacific BOAs and that no consultation with USFWS was required for JFC activities in the BOA.

1.3.2 Background and Consultation History for JFC Supplemental Activities

Launches from THAAD Launch Site at Pacific Missile Range Facility

As described in the PMRF subsection of **Section 1.3.1**, the effects of some JFC supplemental launch support activities and of launch lighting have been evaluated in previous consultations and resulting BOs for base-wide operations at PMRF. Where relevant, JFC supplemental activities would be conducted within the terms of these BOs as implemented by the Navy and DOE at PMRF. The Action Proponents have determined that the effects of JFC supplemental launch support operations and nighttime lighting at launch facilities do not result in any potential effects not considered in these previous consultations and that no additional consultation is required for Newell's shearwaters (*Puffinus auricularis newelli*), band-rumped storm-petrels (*Oceanodroma castro*), Hawaiian petrels (*Pterodroma sandwichensis*), and short-tailed albatross (*Phoebastria albatrus*) at PMRF.

Except for launch pad lighting, the aforementioned consultations did not evaluate the potential effects of JFC supplemental launches from the THAAD launch site (i.e., elevated noise levels, wildfire risk, and heat and emissions from launch). Since proposed launch activities may affect Hawaiian ducks (*Anas wyvilliana*), Hawaiian coots (*Fulica alai*), Hawaiian gallinules (*Gallinula galeata sandvicensis*), Hawaiian stilts (*Himantopus mexicanus knudseni*), nēnē, Hawaiian hoary bats (*Lasiurus cinereus semotus*), hauled out green sea turtles (*Chelonia mydas*) and designated critical habitat for lau'ehu (*Panicum niihauense*), the potential effects of launches at the THAAD launch site are evaluated in this Biological Evaluation.

Launches from Pacific Spaceport Complex Alaska

In 2012, the Federal Aviation Administration (FAA) consulted with USFWS on the effects of PSCA programmatic launch activities on ESA-listed species and critical habitats under USFWS jurisdiction. On 14 December 2012, USFWS determined that programmatic launch activities were not likely to adversely affect northern sea otters (*Enhydra lutris kenyoni*) or Steller's eiders, (*Polysticta stelleri*), would have no effect on short-tailed albatross, and would have no effect on designated critical habitat for northern sea otters (FAA 2016). In 2016, the FAA evaluated the effects of launch activities for small-lift and medium-lift rockets at PSCA and determined that these conclusions remained valid for these modifications to launch activities.

The Action Proponents have determined that the potential effects of JFC launch activities at PSCA are encompassed within those evaluated by the FAA in 2012. Proposed launch activities

would not have any effects on ESA-listed species that were not evaluated in the 2012 consultation. The Action Proponents have determined that no additional consultation is necessary for JFC launch activities at PSCA.

Activities in the Supplemental Pacific Broad Ocean Areas

The Action Proponents have determined that JFC supplemental activities in the PMRF stage 1 booster drop zone and in all stage 2 booster drop and payload impact zones (for both PMRF- and PSCA-launched flight tests) would have no effect on ESA-listed seabirds (i.e., band-rumped storm-petrel, short-tailed albatross, Hawaiian petrel, and Newell's shearwater) and that no consultation with USFWS is required for JFC activities in those portions of the BOA.

The Action Proponents have determined that splashdown of JFC spent stage 1 boosters in waters offshore of Kodiak Island (i.e., the PSCA stage 1 booster drop zone) would have no effect on northern sea otter designated critical habitat because no components would splash down in this habitat. However, proposed JFC supplemental activities may affect short-tailed albatross, Steller's eiders, and northern sea otters and the potential effects of stage 1 splashdown on these species are addressed in this Biological Evaluation.

This page intentionally left blank

2.0 Description of the Proposed Action and Action Area

2.1 Description of the Proposed Action

The Proposed Action (JFC supplemental activities) would consist of up to six flight tests per year over 10 years designed to prove various aspects of the JFC system's capabilities. The Proposed Action would entail ground preparations for the test, launch and flight test, impact of the payload, and post launch operations. The JFC launch vehicle, also known as an all-up-round missile, would consist of a two-stage booster system and a payload (**Figure 1**). The JFC vehicle would be approximately 87.6 centimeters (cm; 34.5 inches) in diameter and 10.2 meters (m) (33.6 feet [ft]) in length. The first and second stages would include a total of approximately 6,804 kilograms (15,000 pounds) of solid propellant. Characteristics of the launch vehicle are presented in **Table 1**. The payload system characteristics are presented in **Table 2**.

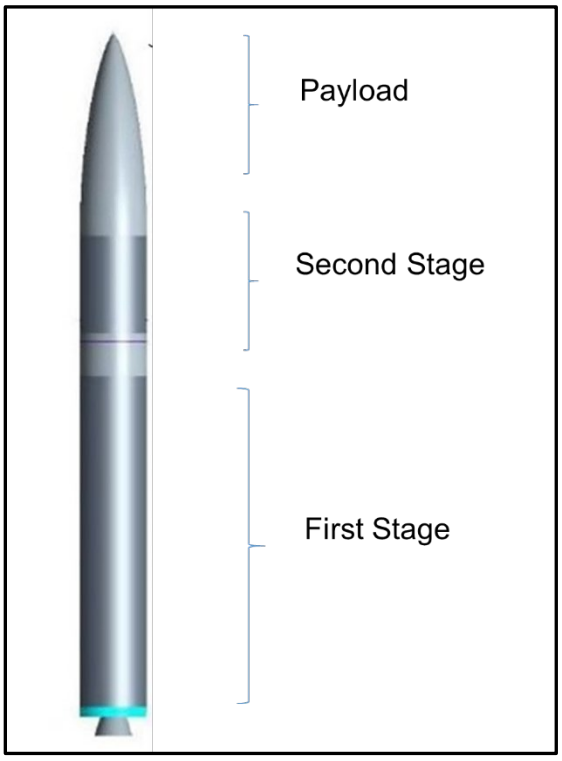


Figure 1. JFC Launch Vehicle

The Proposed Action includes launches from the THAAD launch site at PMRF and from two launch sites at PSCA. The addition of the THAAD and PSCA launch sites does not increase the total number of JFC flight tests as evaluated in the 2022 JFC EA/OEA, rather, launches from the supplemental locations would be a subset of total JFC flight tests per year. JFC launches utilizing supplemental locations would occur as soon as the second half of fiscal year 2023.

A typical JFC test campaign would include pre-launch operations; the flight test including launch, vehicle flight, payload flight, and payload impact into the BOA; and post-test operations. As described above, Proposed Action launches would occur from existing launch facilities at the THAAD launch site at PMRF or at PSCA. The JFC vehicle would be launched from a Transporter Erector Launcher (**Figure 2**). Support vehicles involved in launch activities would include the Battery Operations Center (the mobile command, control, and communications center for the Transporter Erector Launcher) as well as the Battery Operations Center support vehicle. Launch activities would occur in compliance with the procedures for ongoing launch operations at the host installations/facilities.

Table 1. Launch Vehicle Characteristics

Major Components	Rocket motors, propellant, magnesium thorium, nitrogen gas, halon, asbestos, battery electrolytes (lithium-ion, silver zinc)
Communications	Various 5- to 20-watt radio frequency transmitters; one maximum 400-watt radio frequency pulse
Power	Up to nine lithium ion polymer and silver zinc batteries, each weighing between 1.3 and 18 kilograms (3 and 40 pounds)
Propulsion/Propellant	Rocket propellant and approximately 1.3 kilograms (3 pounds) of pressurized nitrogen gas
Other	Small Class C (1.4) electro-explosive devices for flight termination

Table 2. Payload System Characteristics

Structure	Aluminum, steel, titanium, magnesium and other alloys, copper, fiberglass, chromate coated hardware, tungsten, plastic, Teflon, quartz, room temperature vulcanizing silicone
Communications	Two up-to 20-watt radio frequency transmitters
Power	Up to three lithium ion polymer batteries, each weighing between 1 and 23 kilograms (2 and 50 pounds)
Propulsion	None
Other	Class C (1.4) electro-explosive devices for safety and payload system subsystems operations

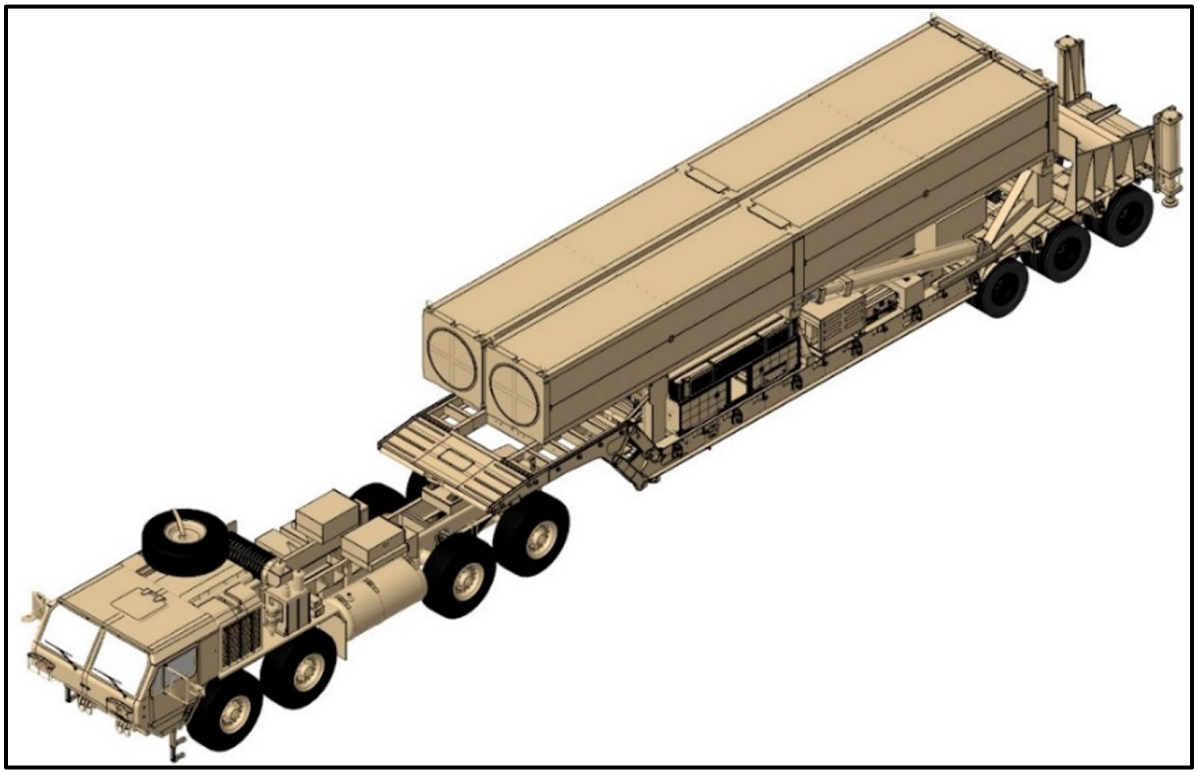


Figure 2. Transporter Erector Launcher

2.1.1 Launch Site Preparations and Operations

Prior to launch, routine activities would take place at existing launch installations/facilities to prepare for flight testing. Launch site preparations and operations would occur in compliance with the standard operating procedures and best management practices as implemented by the host installations/facilities for ongoing operations. As part of pre-launch preparations and operations, project personnel would execute ground equipment checkout, flight vehicle-to-booster assembly and checkout, and other preparations for flight testing. These activities would be directed by the JFC proponent representatives who would coordinate activities with host installation/facility representatives and range organizations. All proposed launch activities would use existing facilities and infrastructure systems.

At PMRF, the potential launch site for the Proposed Action is the THAAD launch site (**Figure 3**). JFC launch activities would comply with the Navy's standard operating procedures for PMRF launches, including compliance with the PMRF Dark Skies program which limits the use of outdoor lighting during the seabird fledging season. Empirical data on sound pressure of JFC vehicle launch have not yet been collected, but modeling indicates that initial liftoff of the launch vehicle would result in peak sound pressures of approximately 145 decibels (dB) in air (referenced to [re] 20 micropascals [µPa]) at approximately 30 m (100 ft) from the launch pad (Kahle et al. 2021) (**Figure 3**). After launch, the vehicle would ascend quickly, and sound pressures are expected to remain elevated above ambient sound levels for less than 60 seconds (Kahle et al. 2021).

2.1.2 Terminal Location Preparations and Operations

For a nominal mission, it is anticipated that up to 4 weeks of increased activities would be required in the BOA. Included among these activities would be:

- Operation of a support ship
- Setting up mobile terminal area scoring
- Deploying sea-based sensor rafts at the impact area
- Deploying telemetry assets

The support ship would be used to gather information on the JFC flight test during terminal flight and impact using shipboard radars and other sensors. It is expected that the support ship would remain on station for up to 2 weeks while waiting for the test to occur. The support ship would also be used to tow a main instrumentation raft to the test support location and to deploy up to a dozen self-stationing sensor rafts prior to the test flight.

The self-stationing sea-based sensor rafts, which may include radar, acoustic, and/or optical sensors, would be placed around the payload target site in the BOA to collect data on payload impact. Self-stationing sensor rafts generally use twin battery-powered trolling motors for thrust navigation and station-keeping. None of the rafts would require an anchoring system. Rafts would be outfitted and inspected at port prior to being deployed for a test.

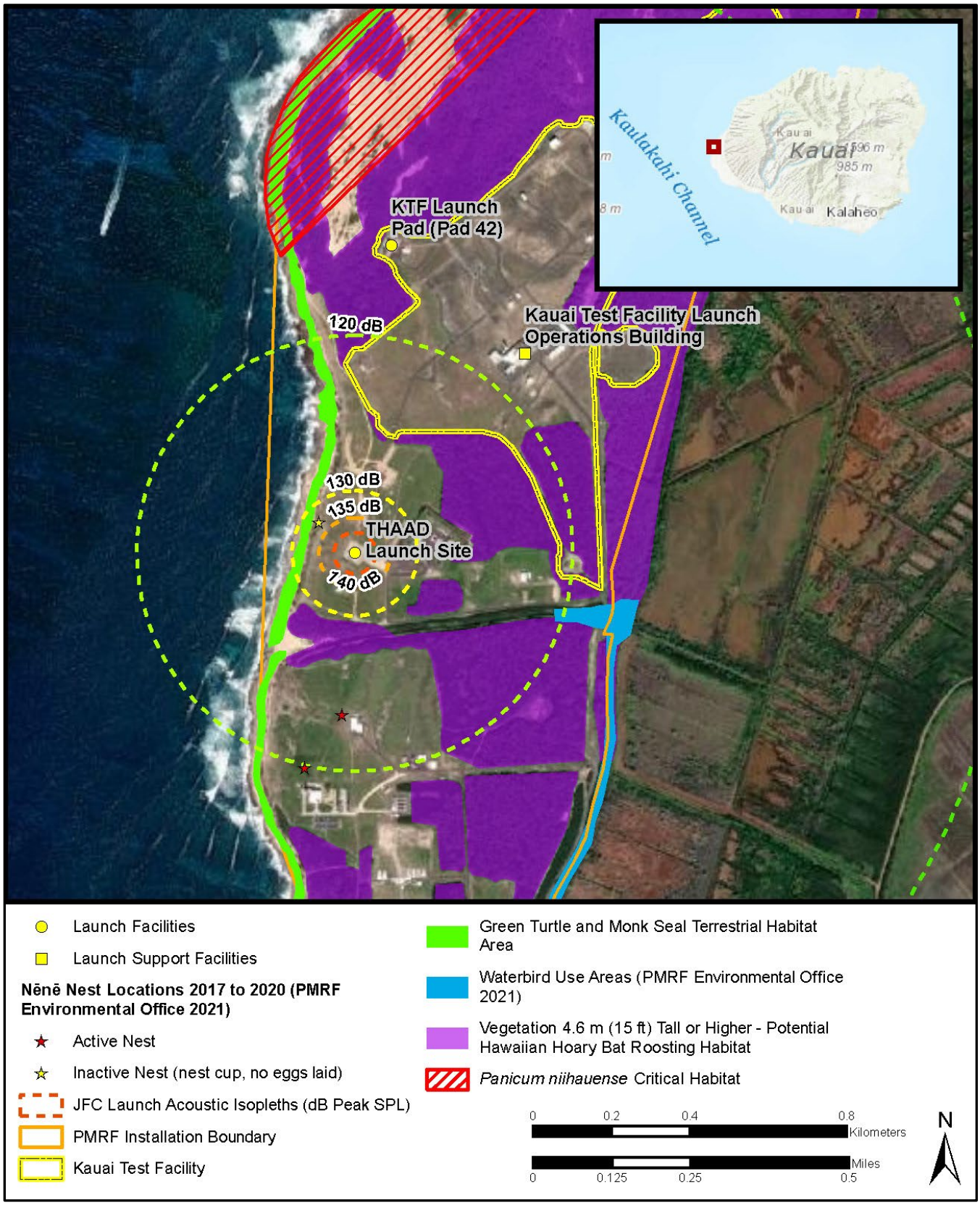


Figure 3. Proposed JFC Supplemental Activity Locations at PMRF

2.1.3 Flight Test

Flight test activities after launch would include vehicle flight and impact of the payload in the BOA. Following first-stage motor ignition and liftoff from the launch location, the first-stage motor would burn out downrange and separate from the second stage with the inter-stage assembly also being jettisoned. These components would splash down in the stage 1 booster drop zones (see **Figures 4** through **6** in **Section 2.3**). Farther into flight, the second stage would burn out and separate, with the payload adapter also being jettisoned from the payload. The payload would fly toward a predesignated site in the BOA. Splashdown of the second-stage motor, payload adaptor, and payload would occur at different points in the open ocean within the areas referred to as the stage 2 booster drop/payload impact zones (see **Figure 4** in **Section 2.3**).

If the launch vehicle were to deviate from its course or should other problems occur during flight that might jeopardize public safety, the onboard flight termination system would be activated. This action would initiate a predetermined safe mode for the vehicle, causing it to fall towards the ocean and terminate flight. The flight termination system would be designed to prevent debris from falling into any inhabited land area or marine protected area.

The flight path would be monitored by a series of sensors with overlapping coverage of the flight from launch until payload impact in the BOA. All sensors are part of existing programs, would be utilized under the operating procedures for those programs, and would be scheduled for use based on availability. The sensors would include the following:

- Existing ground based optics, telemetry, and radars
- Sea based sensors include ship-based mobile instrumentation. In addition, ship-based unmanned aerial vehicles and drones may be used for telemetry, video, and surveillance.
- Existing sensors on board military or commercial aircraft.
- Safety Relay aircraft may be used as additional range safety support “off-axis” to ensure public safety. Takeoff and landing operations would occur as a part of ongoing operations for existing programs.

2.1.4 Post-Test Operations

For the BOA drop zones, the proposed component impact would occur in deep ocean waters. Test components are expected to sink after splashdown or impact and no residual debris is expected. However, a recovery team would be sent to inspect the payload impact location as soon as range safety clears the area. The BOA areas are too deep to allow safe recovery of any hardware that might survive the impact with the water and still have sufficient mass to sink. Visible debris still on the surface of the water would be recovered and removed. The self-stationing rafts and the large instrumentation raft would be recovered by the support ship.

2.2 Avoidance, Minimization, and Conservation Measures

PMRF Biological Conservation and Mitigation Measures

The following avoidance, minimization, and conservation measures would be implemented as part of the Proposed Action at PMRF to minimize the potential effects of the Proposed Action on ESA-listed species:

- Prior to conducting project activities, all personnel will receive an on-site training, in coordination with the PMRF Environmental Office, to ensure personnel understand PMRF's natural resource policies and wildlife protection regulations and protocols.
- Training would include established PMRF Environmental Management Policies and guidelines relevant to the season of proposed activities, including "Nēnē Guidelines for PMRF Operations", "Good Samaritan Hazing" training for nēnē, "PMRF Dark Skies Program Briefing & Natural Resources Training", and "Shearwater Fallout Instructions" (materials available upon request).
- All project personnel will be trained on the presence of ESA-listed species on PMRF and the importance of adhering to posted speed limits to avoid collision with protected wildlife.
- Project personnel will not approach, disturb, or feed any protected animal species or their nests.
- Project-related vehicle and equipment operation will occur within paved or maintained areas.
- If the test flight will occur during the Hawaiian seabird fledging season, the Action Proponents will comply with the requirements of the 2014 and 2018 BOs as implemented by the Navy at PMRF, as well as any relevant procedures resulting from potential future Navy PMRF consultations with USFWS regarding the effects of lighting on ESA-listed seabirds.
- Whenever possible, night lighting should be avoided or minimized, and any exterior lighting should be shielded and positioned to minimize emission of light beyond the intended target.
- If nēnē are observed loafing or foraging within 61 m (200 ft) of the launch pad within 24 hours preceding the launch, project or PMRF test personnel would coordinate a response with the PMRF Environmental Office. Response solutions might include hazing by trained and authorized personnel to encourage nēnē to leave the area, or a nēnē nest search (within 61 m [200 ft] of the launch pad) if birds are unwilling to leave the area. If a nēnē nest were found within 53 m (175 ft) of the launch pad, the PMRF Environmental Office would be notified and USFWS would be contacted (by PMRF Environmental personnel) for further coordination on a course of action before the launch proceeds.

- No trimming or removal of trees is expected for the Proposed Action. Any trimming or removal of trees over 4.6 m (15 ft) tall would need to be conducted outside of the Hawaiian hoary bat pupping season (June 1 to September 15).
- No additional fencing or barbed wire would be installed for the Proposed Action at PMRF.

2.3 Description of the Action Area

For JFC supplemental activities, vehicle launches could occur at the THAAD launch site at PMRF (**Figure 3**) and at PSCA's Area 1 and Launch Pad 2 (**Figure 7**). Proposed vehicle launches would occur at existing launch facilities at all installations/facilities. As described in **Section 1.3**, proposed launch activities at PSCA would have no effect on ESA-listed species or designated critical habitats because no ESA-listed species or designated critical habitat under the jurisdiction of USFWS occurs in the Action Area where launch activity stressors would occur at PSCA. Therefore, launch activities at PSCA are not evaluated further in this Biological Evaluation.

After launch, the JFC vehicle would fly over the ocean towards a terminal payload impact site in the BOA. Stage 1 booster splashdown would occur within the stage 1 booster drop zones (**Figures 5** and **6**) and stage 2 booster splashdown and payload impact would occur within the stage 2 booster drop/payload impact zones shown in **Figure 4**.

The Action Area for this evaluation includes the potential launch site at PMRF (**Figure 3**), the stage 1 and stage 2 booster drop zones in the BOA where components would splash down or impact and where the vehicle would fly over the Pacific Ocean (**Figures 4** through **6**); and any PMRF or BOA areas subject to potential stressors of the Proposed Action including elevated sound levels and human activity.

PMRF is located in Hawai'i on the western shores of the island of Kaua'i. PMRF's mission includes providing training for Navy and other Department of Defense agencies using existing equipment and technologies as well as providing support to research, development, test, and evaluation programs being developed by the Department of Defense. As part of this mission, vehicle and rocket launches regularly occur on PMRF.

The PMRF portion of the Action Area consists of terrestrial habitats. The Action Area at PMRF includes habitats for ESA-listed species under USFWS jurisdiction. The area around the THAAD launch site is covered primarily with landscaped vegetation that is managed by mowing. Patches of vegetation with taller trees are located at least 165 m (540 ft) southeast and east of the launch site (**Figure 3**). These patches of vegetation are dominated by introduced and invasive species with stands of kiawe (*Prosopis pallida*) trees that have patches of koa haole (*Leucaena leucocephala*), guinea grass (*Panicum maximum*), and lantana (*Lantana camara*) within them (DOE 2019). Coastal dune habitats occur to the north and west of the THAAD launch site. The closest wetland habitat is 480 m (1,570 ft) from the launch site, and all beach habitat occurs at least 100 m (328 ft) from the launch site (**Figure 3**).

The BOA portion of the Action Area is composed mostly of deep ocean waters and the airspace above those waters. The stage 1 booster drop zones occur mostly outside U.S. territorial seas (greater than 22 kilometers [12 nautical miles] from the territorial baseline) but mostly within the U.S. EEZ (out to 370 kilometers [200 nautical miles] from the territorial sea baseline) (**Figures 5** and **6**). The stage 2 booster drop zones (which would include payload impact) occur almost exclusively outside EEZs, in the high seas (**Figure 4**).

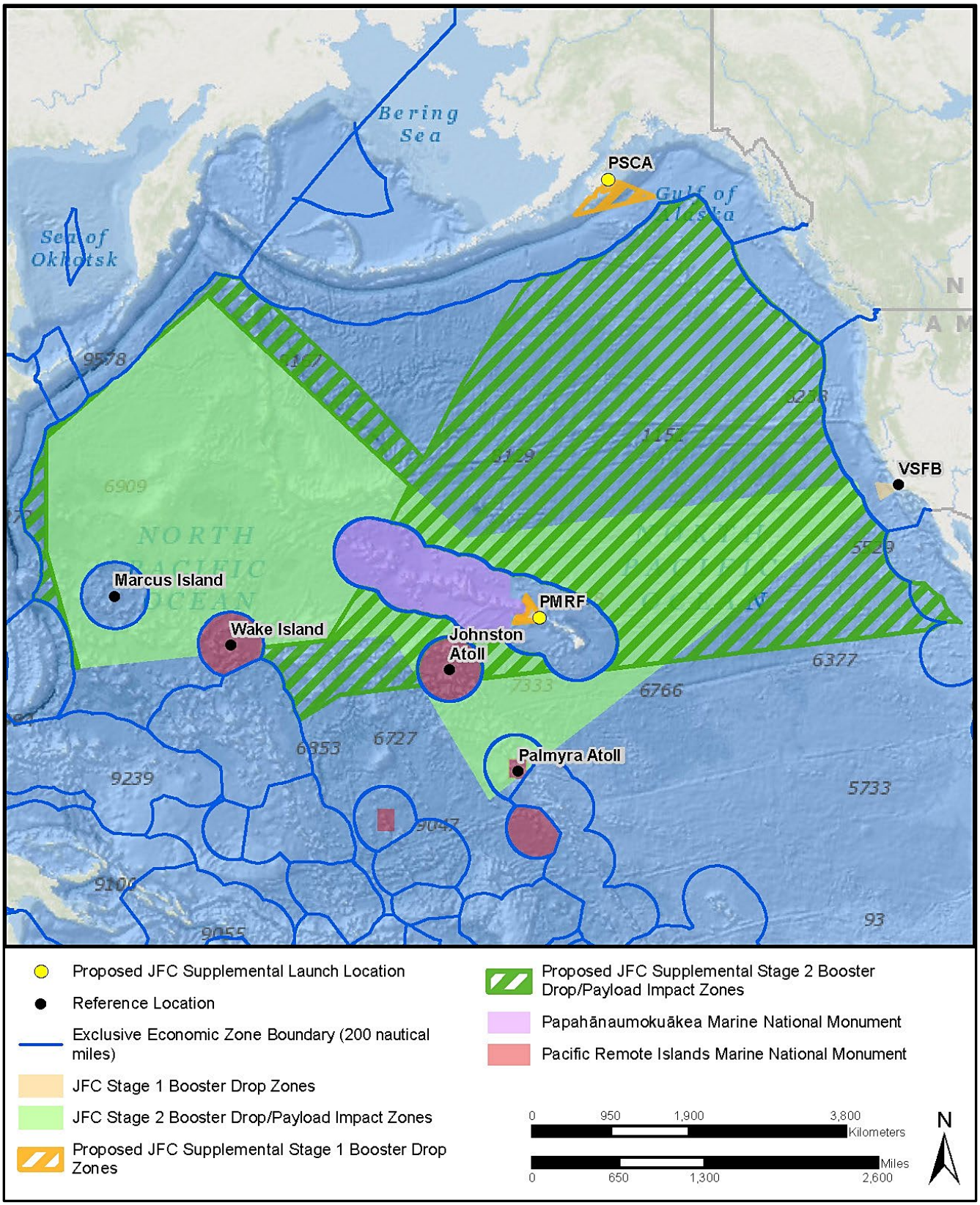


Figure 4. JFC Activity Locations in the Pacific Ocean

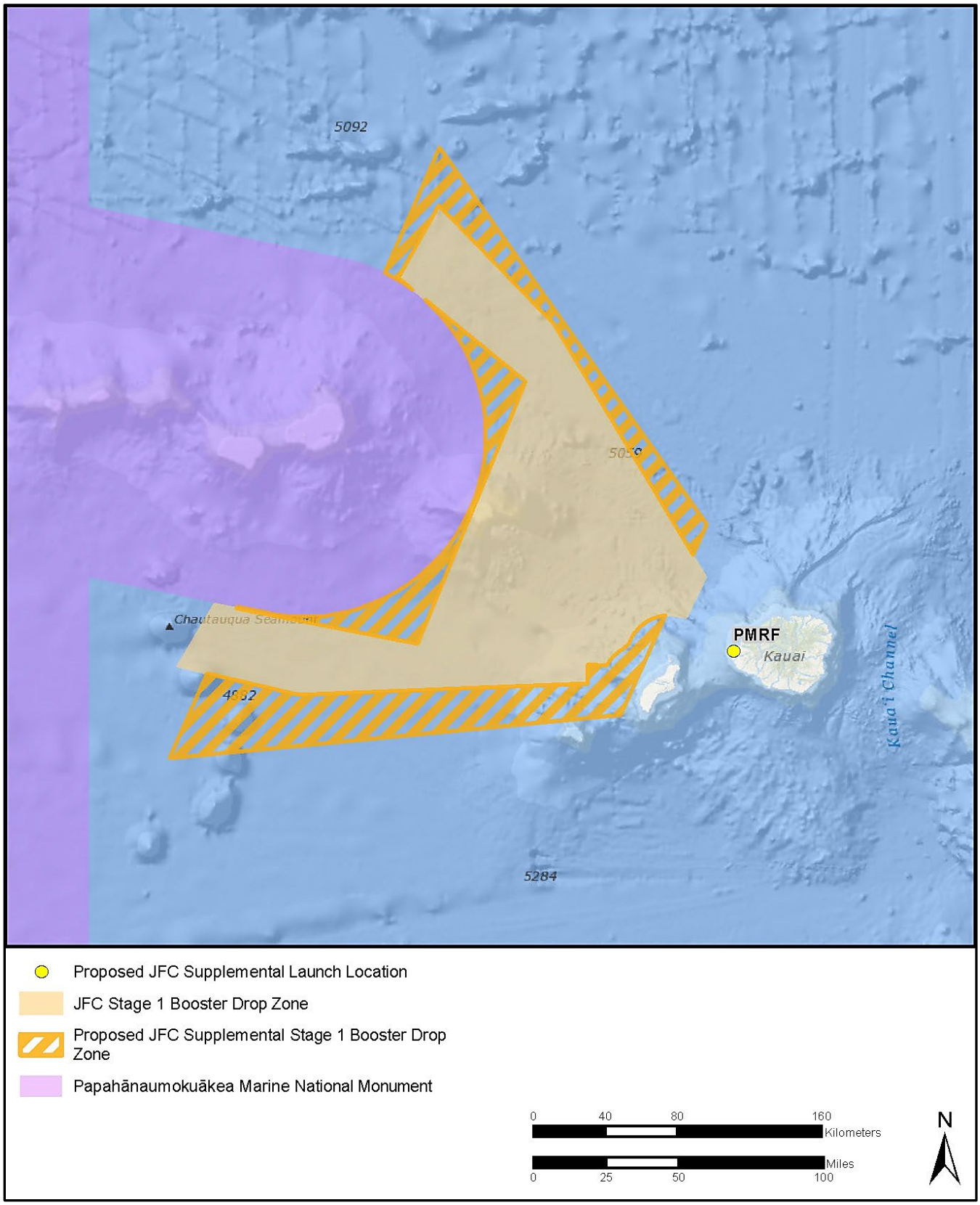


Figure 5. Proposed JFC PMRF Stage 1 Booster Drop Zone

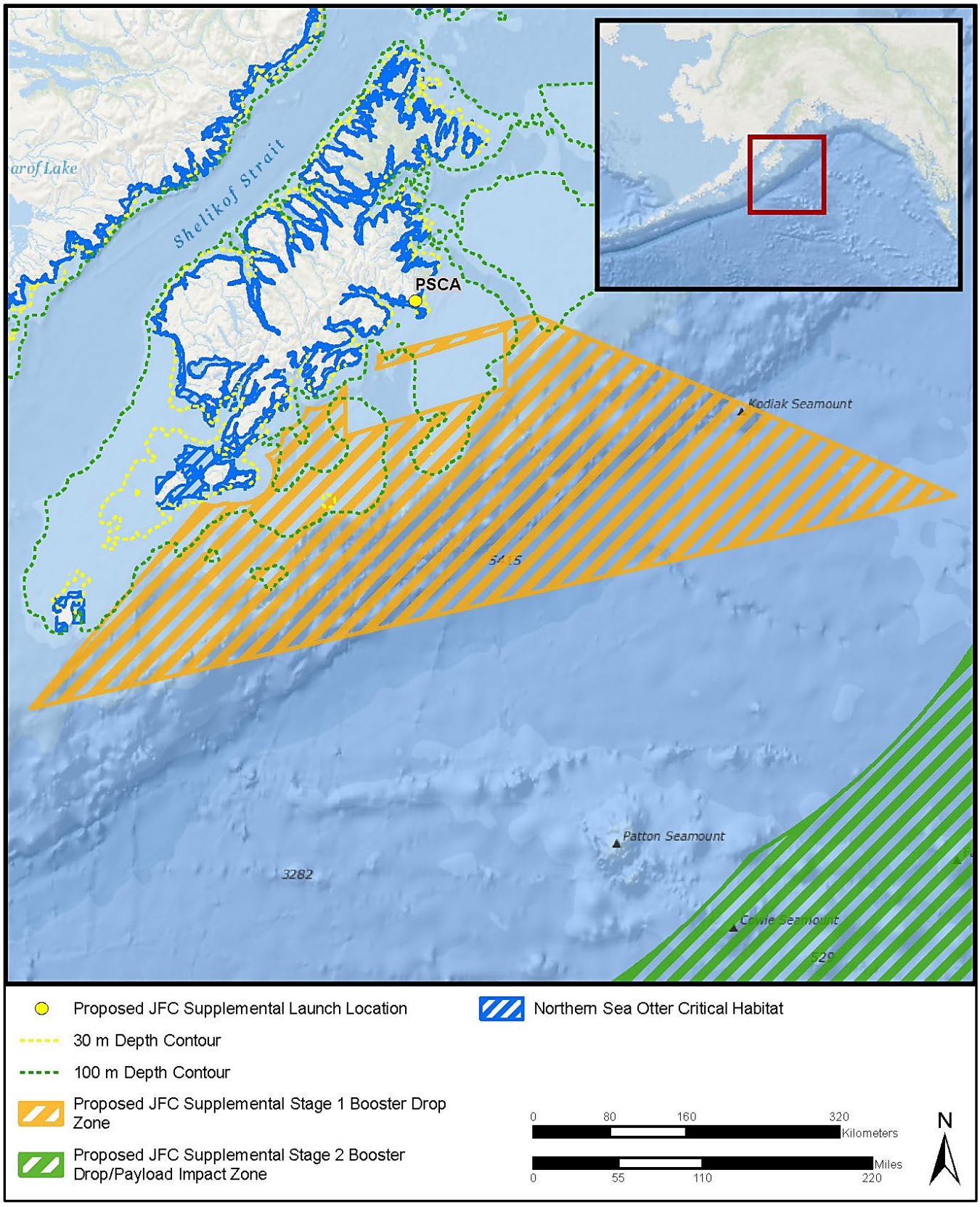


Figure 6. Proposed JFC Supplemental PSCA Stage 1 Booster Drop Zone

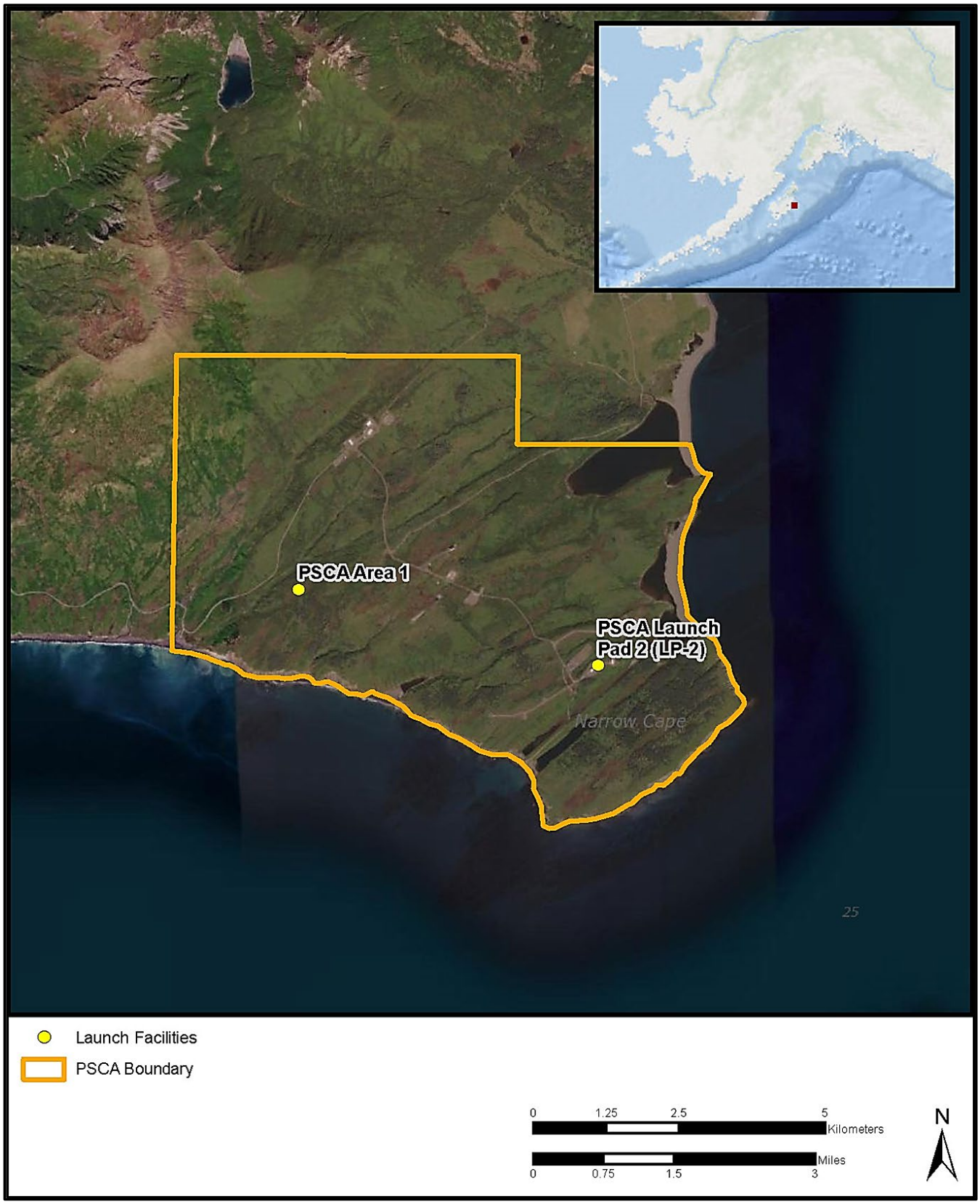


Figure 7. Proposed JFC Supplemental Activity Locations at PSCA

3.0 Listed Species and Designated Critical Habitat in the Action Area

3.1 ESA-listed Species in the Action Area

ESA-listed species in the Action Area include 10 bird species, Hawaiian hoary bats, northern sea otters, and hauled out and nesting green sea turtles (**Table 3**). No ESA-listed plants are known to occur in the Action Area. However, unoccupied designated critical habitat for the ESA-endangered *Panicum niihauense* occurs on PMRF and is discussed in **Section 3.2**, *Designated Critical Habitat in and Near the Action Area*.

This section includes a brief description of ESA-listed species or species groups as well as information about their distribution in the Action Area. Given the limited potential for the Proposed Action to affect species, detailed life history and range-wide population descriptions are not included in this Biological Evaluation.

3.1.1 Species Not Included in Evaluation

Three Hawaiian seabird species have the potential to fly through the PMRF portion of the Action Area at night: band-rumped storm-petrels, Hawaiian petrels, and Newell's shearwater. These birds are highly pelagic, spending large amounts of time foraging at-sea both during and outside of their breeding season. All three species are likely to occur in the BOA portion of the Action Area where they rest and feed in the open ocean. These Hawaiian seabirds do not nest, rest, or forage at PMRF, but only have the potential to fly through the launch area at night during flights to and from breeding colonies in the mountain of Kaua'i. The potential for ESA-listed seabirds to be present in the Action Area is greatest during the breeding and fledging seasons and is higher when nighttime lighting is in use at PMRF, as birds may be attracted to artificial lighting.

The most significant continuing threats for these species are terrestrial threats such as predation by non-native animals on nests and adults during the breeding season, artificial lighting, and collision with structures and powerlines (USFWS 2015). Threats to these seabirds in their marine habitats include ocean pollution and entanglement in marine debris and fishing gear (USFWS 2015). Artificial lighting is a threat to fledgling seabirds which may become disoriented by artificial lighting causing them to become exhausted and fall-out or to collide with structures such as communication towers and utility lines (USFWS 2015). Although new lights on PMRF are shielded and the Navy has implemented a Dark Skies program during the seabird fledging season, artificial lighting and fallout remain concerns for Hawaiian seabirds on PMRF.

The Navy at PMRF has consulted with the USFWS on the effects of PMRF base-wide artificial lighting, including launch pad lighting, on Hawaiian seabirds as described in **Section 1.3**. The USFWS issued a BO, including an incidental take statement and terms and conditions, for base-wide operations in 2018 (USFWS 2018a). The Navy implements a number of base-wide mitigation measures at PMRF to reduce the effects of artificial lighting on Hawaiian seabirds including the following:

- Scheduling non-time-sensitive night operations outside the peak of the seabird fledging season (September 15 through December 15) to the extent practicable;
- Turning off unnecessary external lighting during seabird fledgling season;
- Using full cut-off fixtures where security or safety concerns require night lighting;
- Conducting patrols to confirm any exposed lights during the night are truly required and meet the shielding requirements;
- Controlling base-wide predators to enhance survival and minimize the risk of predation to any downed seabirds on the installation;
- Monitoring for downed seabirds on the installation during the seabird fledging season; and
- Recovering seabirds that fall out, taking them to a fallout station located inside the PMRF gate, and reporting when birds fall out.

Operations of tenants and tenant programs at PMRF must comply with these mitigations measures as implemented by the Navy at PMRF.

The Action Proponents have concluded that the effects of all JFC launch support activities and launch pad lighting on ESA-listed Hawaiian seabirds have been fully accounted for in the PMRF base-wide consultations and resulting BOs issued by the USFWS. The Action Proponents have also concluded that there would be no effect on these species in the BOA portion of the Action Area. Because all of the potential effects of the Proposed Action on these species have already been consulted on, no additional consultation is necessary for the band-rumped storm-petrel, Hawaiian petrel, or Newell's shearwater and they are not considered further in this Biological Evaluation.

3.1.2 Hawaiian Waterbirds

Four species of ESA-listed Hawaiian waterbirds occur on PMRF: Hawaiian ducks, Hawaiian coots, Hawaiian gallinules, and Hawaiian stilts. Due to the similarity in habitat and potential response to proposed activities, the four Hawaiian waterbirds are discussed as a group. These Hawaiian waterbirds use a variety of wetland habitats including the man-made ditches and ponds at PMRF. These birds do not nest, rest, or forage at the THAAD launch site but occur in wetland habitats near the THAAD launch site.

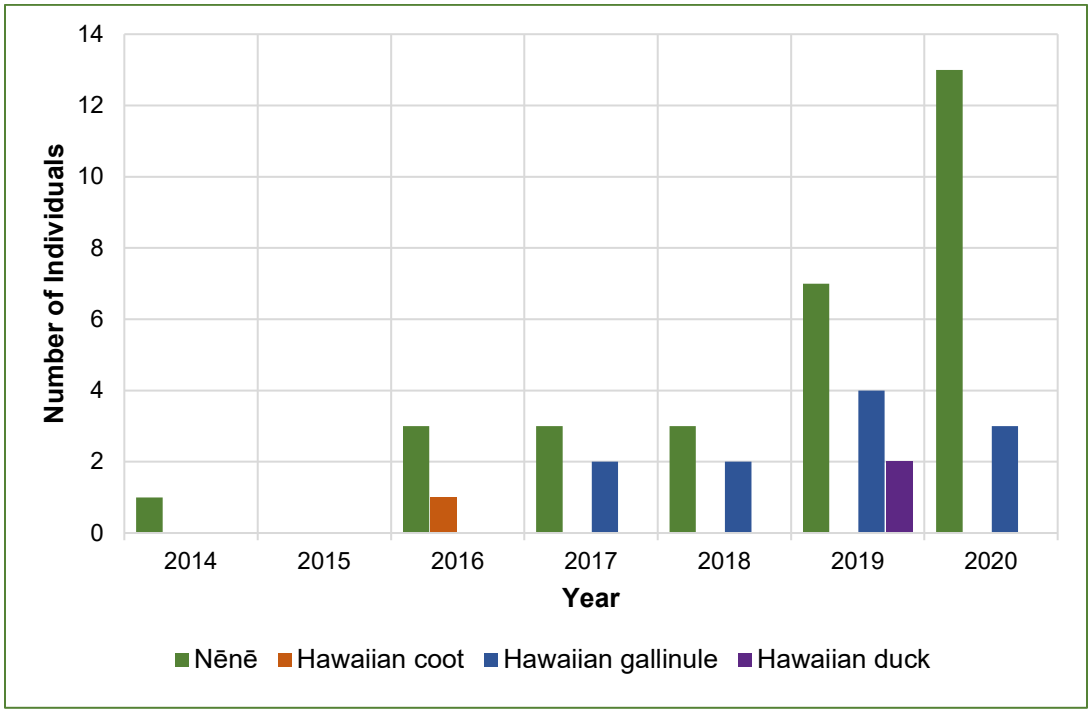
Table 3. ESA-listed Species in the Action Area

Common Name	Scientific Name	ESA Status	Occurrence Notes		
			PMRF	PSCA Stage 1 Drop Zone	Other Portions of the BOA
Plants					
Lau'ehu	*Panicum niihauense*	E	No plants occur at PMRF. Designated critical habitat occurs at least 720 m (2,360 ft) to the north of the THAAD launch site.	–	–
Birds					
Hawaiian duck	*Anas wyvilliana*	E	Wetland habitats. Closest use area at least 480 m (1,570 ft) from THAAD launch site.	–	–
Hawaiian goose or nēnē	*Branta sandvicensis*	T	Use a variety of habitats. Nests in the Action Area.	–	–
Hawaiian coot	*Fulica alai*	E	Wetland habitats, ponds, and ditches. Closest use area at least 480 m (1,570 ft) from THAAD launch site.	–	–
Hawaiian gallinule	*Gallinula galeata sandvicensis*	E	Wetland habitats, ponds, and ditches. Closest use area at least 480 m (1,570 ft) from THAAD launch site.	–	–
Hawaiian stilt	*Himantopus mexicanus knudseni*	E (PT)	Wetland habitats, ponds, and ditches. Closest use area at least 480 m (1,570 ft) from THAAD launch site.	–	–
Band-rumped storm-petrel (Hawai'i DPS)	*Oceanodroma castro*	E	Unlikely but may fly through the Action Area at night	–	Feed and rest in open ocean
Short-tailed albatross	*Phoebastria albatrus*	E	–	Rare in nearshore and shelf waters	Feed and rest in open ocean
Steller's eider (Alaska Breeding DPS)	*Polysticta stelleri*	T	–	Steller's eiders likely to occur in nearshore waters. Birds from the Alaska Breeding DPS have the potential to occur in the Action Area.	–
Hawaiian petrel	*Pterodroma sandwichensis*	E	May fly through the Action Area at night	–	Feed and rest in open ocean
Newell's shearwater	*Puffinus auricularis newelli*	T	May fly through the Action Area at night	–	Feed and rest in open ocean

Common Name	Scientific Name	ESA Status	Occurrence Notes		
			PMRF	PSCA Stage 1 Drop Zone	Other Portions of the BOA
Reptiles					
Green sea turtle (Central North Pacific DPS)	*Chelonia mydas*	T	Haul out and nest on PMRF beaches	–	– (only in marine habitats)
Mammals					
Northern sea otter (Southwest DPS)	*Enhydra lutris kenyoni*	E	–	Unlikely in drop zone but likely in nearshore waters	–
Hawaiian hoary bat	*Lasiurus cinereus semotus*	E	Present year round, foraging at night and potentially roosting in trees at least 4.6 m (15 ft) tall during the day. Closest potential roosting habitat 165 m (540 ft) from THAAD launch site.	–	–

Abbreviations: BOA = Broad Ocean Area, DPS = distinct population segment, E = endangered, ESA = Endangered Species Act, ft = feet, m = meters, PMRF = Pacific Missile Range Facility, PSCA = Pacific Spaceport Complex Alaska, PT = proposed threatened, T = threatened, THAAD = Terminal High Altitude Area Defense, "–" = does not occur in this portion of the Action Area

Hawaiian ducks, or koloa maoli, breed year-round with a peak in breeding from March through June (USFWS 2011). These birds use a variety of wetlands from marshes and coastal ponds to montane streams and pools (USFWS 2011). Hawaiian ducks are opportunistic feeders, feeding on a variety of aquatic invertebrates such as snails, insect larvae, earthworms, crayfish, tadpoles, mosquito fish (*Gambusia affinis*), grass seeds, seeds and leaves of wetland plants, and green algae (USFWS 2011). Primary threats to Hawaiian ducks include hybridization with mallards (*Anas platyrhynchos*), predation of eggs and chicks by rats, domestic dogs, cats, introduced fish, and birds, and habitat degradation (USFWS 2011). One of the risks to Hawaiian waterbirds on PMRF is mortality from vehicle collisions. From 2014 to March 2020, two Hawaiian ducks were reported struck by vehicles at PMRF, both in 2019 (**Figure 8**) (PMRF Environmental Program 2021). The population of Hawaiian ducks on Kaua'i is estimated to be around 2,000 birds and is larger than the population on all other islands combined (USFWS 2011).



Data Source: PMRF Environmental Program 2021

Figure 8. Number of Vehicle Collisions for ESA-listed Birds at PMRF Main Base, 2014 to 2020

Hawaiian coots, or 'alae ke'oke'o, are non-migratory and breed year-round, likely depending on local seasonal weather conditions (USFWS 2011). Hawaiian coots build floating nests made of aquatic vegetation and require bodies of water with emergent vegetation and open water for both nesting and feeding (USFWS 2011). Hawaiian coots feed on a variety of invertebrates such as snails, crustaceans, aquatic and terrestrial insects, tadpoles, and small fish, as well as on seeds and leaves of aquatic plants (USFWS 2011). Primary threats to this species include predation by introduced animals, habitat alteration, and disease (USFWS 2011). One of the risks to Hawaiian waterbirds on PMRF is mortality from vehicle collisions. From 2014 to March 2020, only one Hawaiian coot was reported struck by a vehicle at PMRF (**Figure 8**) (PMRF

Environmental Program 2021). The Hawaiian coot population on Kauaʻi averages approximately 500 birds (USFWS 2011).

Hawaiian gallinules, or ʻalae ʻula, nest in dense emergent vegetation in areas with shallow standing water (less than 61 cm [24 inches] deep) (USFWS 2011). This territorial bird nests year-round with a peak in nesting activity between March and August (USFWS 2011). These birds use coastal wetland habitats including freshwater marches, taro patches, lotus fields, margins of streams and ditches with emergent vegetation, reservoirs, wet pastures, and occasionally brackish waters (USFWS 2011). Primary threats to this species include flooding, predation by introduced animals, habitat alteration, and disease (USFWS 2011). From 2014 to March 2020, 11 Hawaiian gallinules were reported struck by vehicles at PMRF, all near Kinikini Ditch (**Figure 8**) (PMRF Environmental Program 2021). Hawaiian gallinules occur only on Oʻahu and Kauaʻi with a total population averaging approximately 300 individuals (USFWS 2011).

Hawaiian stilts, or aeʻo, typically nest from mid-February through August, but the nesting season varies among years and may depend on water levels (USFWS 2011). These birds lay eggs in a scrape on the ground which is typically located on a freshly exposed mudflat interspersed with low-growing vegetation (USFWS 2011). On Oʻahu, approximately 80 percent of Hawaiian stilt nests were located on small islands (USFWS 2011). Hawaiian stilts primarily use low elevation aquatic habitats with shallow water (less than 23 cm [9 inches] deep) (USFWS 2011). Primary threats to this species include predation, habitat alteration, flooding, and disease (USFWS 2011). No vehicle collisions have been recorded for Hawaiian stilts on PMRF. The Hawaiian stilt population on Kauaʻi is between 125 and 350 birds (USFWS 2011).

The closest Hawaiian waterbirds use area to the THAAD launch site is at least 480 m (1,570 ft) away (**Figure 3**) (PMRF Environmental Office 2021). Waterbirds use ditches in this area for foraging and resting and may use habitat adjacent to ditches for nesting.

3.1.3 Hawaiian Goose or Nēnē

The Hawaiian goose or nēnē is a largely terrestrial bird that breeds from August to April with a peak in egg laying in December (USFWS 2018c). Nests are built on the ground in the dense shade of a shrub or other vegetation (USFWS 2018c). These birds use a variety of habitats ranging from coastal dune vegetation and non-native grasslands, shrublands, cinder deserts, native alpine grasslands and shrublands, and sparsely vegetated lava flows (USFWS 2018c). Hawaiian geese are grazers, feeding opportunistically on a variety of vegetation (USFWS 2018c). While mostly non-migratory, Hawaiian geese may move to grassland habitats during certain times of the year to take advantage of fresh grasses with high water and protein content (USFWS 2018c). Primary threats to Hawaiian geese range-wide include predation of eggs and goslings by rats, pigs, and cats; predation on adults by dogs, cats, and pigs; being struck by vehicles; and continued habitat modification (USFWS 2018c). The nēnē population on Kauaʻi has been stable to increasing for several decades and the USFWS expects the population to continue to increase, provided mongoose are not introduced to the island (USFWS 2019b). The most recent estimate of the nēnē population on Kauaʻi is 1,482 (USFWS 2019b); approximately 45 percent of the total nēnē population.

Nēnē are commonly observed on PMRF, especially on the southern half of the base (NAVFAC PAC 2010). PMRF Natural Resource staff conduct twice-weekly surveys of nēnē at PMRF Main Base and the average number of nēnē per survey has been relatively stable (between 22 and 34 birds per survey) over the past 5 years (PMRF Environmental Office 2021). The number of recorded nēnē nests on PMRF Main Base has been increasing since 2015, with a total of 33 nests recorded during the 2019 nēnē breeding season (NAVFAC PAC 2022). Nēnē are known to occur in habitats surrounding the THAAD launch site (PMRF Environmental Office 2021). In fiscal year 2021, several nēnē nests were recorded in the Action Area including a nest with no eggs approximately 90 m (295 ft) northwest of the launch site and active nests approximately 360 m (1,180 ft) and 500 m (1,640 ft) south of the launch site (**Figure 3**) (PMRF Environmental Office 2021).

One of the primary risks to nēnē on PMRF and Kauaʻi is injury or mortality from vehicle collisions. Over a 2-year period (2015 and 2016) over 50 nēnē were struck and killed by cars on roadways of Kauaʻi (USFWS 2019b). Most of these vehicle strikes occurred where nēnē populations are the largest (in Hanalei and Kīlauea on the north shore; USFWS 2019b), but many recent vehicle collisions have occurred on PMRF. From 2014 through 2020, a total of 30 nēnē were struck by vehicles at PMRF Main Base, including 7 collisions in 2019 and 13 in 2020 (**Figure 8**) (PMRF Environmental 2021).

3.1.4 Short-tailed Albatross

Short-tailed albatross spend the majority of their lives at-sea, only coming to land to breed on remote islands in the western Pacific (USFWS 2009a). Outside of the breeding season, this species migrates to productive feeding grounds in waters of the Bering Sea, Aleutian Islands, and Gulf of Alaska (USFWS 2009a). Short-tailed albatross feed on prey seized from the water surface including squid, shrimp, fish, fish eggs, and crustaceans (USFWS 2009a). The waters offshore of Kodiak are part of the core habitat for immature short-tailed albatross (USFWS 2014b). Short-tailed albatross are considered rare in nearshore areas offshore of Kodiak Island (FAA 2016) but likely occur in outer shelf waters.

3.1.5 Steller's Eider

The Alaska breeding Distinct Population Segment (DPS) of Steller's eider is listed as a threatened species under the ESA. Birds from the northern and western Alaska breeding populations winter in coastal waters of southwest Alaska where they mix with the larger Russian-Pacific breeding population of eiders (USFWS 2019c). Steller's eiders spend most of the year in shallow, near-shore marine waters (generally within 402 m [1,320 ft] of shore) where they feed on invertebrates such as bivalves, amphipods, gastropods, crustaceans, and polychaete worms (USFWS 2019c).

Steller's eiders have the potential to occur in the PSCA stage 1 booster drop zone during the winter months (mid-October through March) (FAA 2016). Baseline studies of the Narrow Cape area in 1995 indicated that Steller's eiders were commonly observed in numbers ranging up to 600 off Narrow Cape in the winter months (FAA 1996). However, systematic surveys conducted for seven launches from PSCA (then KLC) recorded only small rafts of 30 to 60 birds on two

occasions (FAA 2016). Steller's eiders generally occur in nearshore waters (less than 30 m or 98 ft deep) (Martin et al. 2015, USFWS 2019c) and would be unlikely in much of the stage 1 booster drop zone (**Figure 6**).

In a study of Steller's eiders wintering off Kodiak Island in Chiniak Bay (north of PSCA), most of the tagged birds migrated to eastern Arctic Russia and likely belonged to the Pacific-Russian breeding population, which is not ESA-listed (Rosenberg et al. 2014, USFWS 2019c). Only a portion of the Steller's eiders in the Action Area would be from the ESA-endangered Alaska breeding DPS as this population mixes with the non-listed Russian breeding population at winter feeding grounds (Martin et al. 2015, USFWS 2019c). At this time, there is not enough information to determine the proportion of eiders in the Action Area which would be members of the ESA-listed Alaska breeding population (USFWS 2019c).

3.1.6 Green Sea Turtle

The only portion of the Action Area in which sea turtles haul out or nest on land, and would therefore be under USFWS jurisdiction, is at PMRF. Green sea turtles hauling out or nesting at PMRF are from the threatened Central North Pacific DPS. Green sea turtles are regularly found in inshore waters around the main Hawaiian Islands and the Northwest Hawaiian Islands, where reefs, their preferred habitats for feeding and resting, are most abundant (Seminoff et al. 2015). The majority of the Hawaiian green sea turtle population nests at French Frigate Shoals and mainly migrate to coastal areas of the main Hawaiian Islands to feed (NOAA 2023). While uncommon and scattered, some turtles do nest on the main Hawaiian Islands (Seminoff et al. 2015), including Kaua'i, from late April through September. Habitat degradation and loss as well as the harvest of eggs and nesting females for food remain a primary threat to the species across the Pacific Ocean (NOAA 2023). Other primary threats to sea turtles include bycatch in commercial fisheries, ship strikes, and marine debris (NOAA 2023).

Green sea turtles rest and feed in nearshore habitats off PMRF and haul out on PMRF beaches; primarily near Nohili Ditch (**Figure 3**) (NAVFAC PAC 2010). PMRF Environmental staff regularly monitor Barking Sands beaches for green sea turtles and nesting activity, with twice weekly monitoring from November 2016 to June 2019 and daily checks after June 2019. From November 2016 through March 2021, 179 sea turtle haul-out observations were recorded at PMRF with an average of 3.5 turtle haul-out records per month (PMRF Environmental Office 2021). The highest numbers of recorded sea turtle haul-outs on PMRF were between February and April each year. Green sea turtles have also nested on PMRF beaches during the summer months (NAVFAC PAC 2010). Since 2015, there have been 10 documented successfully hatched sea turtle nests on PMRF as well as 15 documented digs or nest pits that were either not used for nesting or were failed nests (PMRF Environmental Office 2023).

3.1.7 Northern Sea Otter

The range of the listed Southwest DPS of northern sea otters extends from Attu Island in the Aleutians to Western Cook Inlet. Sea otters use all types of coastal habitats within their range but are often found off rocky coasts or in large bays with kelp beds (USFWS 2009b). While northern sea otters can be found at the surface in deeper waters, sea otters are found in waters

less than 100 m (328 ft) deep (**Figure 6**), which is the approximate extent of their diving ability (USFWS 2009b). Northern sea otters primarily forage in waters less than 30 m (100 ft) deep (USFWS 2009b) and the USFWS has estimated that in high density habitat (waters 40 m [130 ft] deep or less), the carrying capacity is 3 to 15 otters per square kilometer (USFWS 2021b). A small number of northern sea otters (0 to eight individuals) are likely to occur in nearshore marine water of the offshore of PSCA (FAA 2016). However, given the distance from shore and water depth in the stage 1 booster drop zone (**Figure 6**), it is not likely that sea otters would occur in the booster drop zone.

3.1.8 Hawaiian Hoary Bat

These insectivorous bats forage at night and may range several kilometers in a night (Bonaccorso et al. 2015). The Hawaiian hoary bat roosts in both introduced and native woody vegetation, generally greater than 4.6 m (15 ft) in height, and will leave young unattended in trees and shrubs when they forage (Amlin and Siddiqi 2015, USFWS 1998). These bats breed in the fall (September to December), with pregnant bats giving birth (pupping) in May or June (USFWS 1998, Gorressen et al. 2013). The lactation period for Hawaiian hoary bats is June to August, after which young bats fledge to forage on their own (Gorressen et al. 2013). There are no known density or population estimates for Hawaiian hoary bats on Kauaʻi.

The Hawaiian hoary bat has been recorded foraging at PMRF throughout the year (NAVFAC PAC 2010, Bonaccorso and Pinzari 2011, Welch et al. 2021). Based on acoustic surveys at PMRF, bat activity on PMRF was highest in the fall (from August through November) (Bonaccorso and Pinzari 2011, Welch et al. 2021). Between 18 October and 10 November 2020, there were an average of 982 detections per night at a Nohili Ditch sampling site, approximately 285 m (935 ft) east of the THAAD launch site (Welch et al. 2021). Bats were present (occupancy based on at more than two calls per night) during at least 60 percent of survey nights at the Nohili Ditch site throughout the year and foraging activity was detected during approximately 20 to 90 percent of active nights (Welch et al. 2021).

3.2 Designated Critical Habitat in and Near the Action Area

3.2.1 Critical Habitat Not Affected

Designated critical habitat for the Southwest DPS of the northern sea otter occurs offshore of PSCA (**Figure 6**). This designated critical habitat extends from the end of the Aleutian Islands to lower western Cook Inlet and includes waters around Kodiak Island. This Kodiak-Kamishak-Alaska Peninsula Unit of critical habitat includes nearshore marine waters ranging from the mean high tide line seaward for a distance of 100 m (328 ft), or to a water depth of 20 m (66 ft; USFWS 2009b). The primary constituent elements of sea otter critical habitat include shallow rocky areas, nearshore waters, and kelp forests that provide protection and escape from predators; and sufficient quantities of prey resources (USFWS 2009b) The Proposed Action would have no effect on these primary constituent elements, as the stage 1 booster drop zone is outside of designated critical habitat. Therefore, the Proposed Action would have no effect on this critical habitat, and it is not discussed further in this Biological Evaluation.

3.2.2 *Panicum niihauense* Critical Habitat

Designated critical habitat for the ESA-endangered *Panicum niihauense*, or lau ʻehu, occurs in coastal dune habitats on PMRF. These critical habitat areas are unoccupied by the species and there are no historical records of *Panicum niihauense* growing in these areas. The designated critical habitat units on and near PMRF have been deemed essential to the conservation of *Panicum niihauense* because they support habitat that is important to the establishment of additional populations on Kauaʻi (68 Federal Register [FR] 9116 [27 February 2003]). Within these units, the primary constituent elements of critical habitat are sand dunes in coastal shrubland at elevations between 0 and 29 m (0 and 95 ft).

The designated critical habitat for *Panicum niihauense* is at least 540 m (1,770 ft) north of the THAAD launch site (**Figure 3**). No ESA-listed plants are known to occur in the Action Area.

4.0 Effects of the Proposed Action

The Proposed Action has the potential to directly or indirectly affect ESA-listed species and their habitats due to exposure to elevated sound levels, physical injury, exposure to hazardous materials, and increased wildfire risk. The assumptions relevant to the potential stressors in the Action Area are summarized in **Table 4** and described in **Section 4.1**. An analysis of the effects of proposed activities on each ESA-listed species or designated critical habitat is included in **Section 4.2** along with an effect determination.

4.1 Stressors Associated with the Proposed Action

4.1.1 Exposure to Elevated Sound Levels

Sources of Elevated Sound Levels

The Proposed Action may result in elevated noise levels both in air and underwater due to vehicle launch, due to sonic booms from vehicle overflight, and as a result of splashdown of JFC components.

Launch Noise. Empirical data on sound pressure of JFC vehicle launch have not yet been collected, but modeling indicates that initial liftoff of the launch vehicle would result in peak sound pressures of approximately 145 dB in air (re 20 µPa) at approximately 30 m (100 ft) from the launch site (**Figure 9**) (Kahle et al. 2021). After launch, the vehicle would ascend quickly, and sound pressures are expected to remain elevated above ambient sound levels for less than 60 seconds (**Figure 9**) (Kahle et al. 2021). The JFC launch acoustics model used several conservative assumptions and did not account for atmospheric absorption, ground interference, or atmospheric conditions (Kahle et al. 2021). Sound pressures could be as much as 10 dB less than modeled; therefore, model estimates should be considered maximum possible sound pressures which would result from JFC launches (Kahle et al 2021). **Figure 3** shows the maximum sound pressures expected for a launch from PMRF's THAAD launch site.

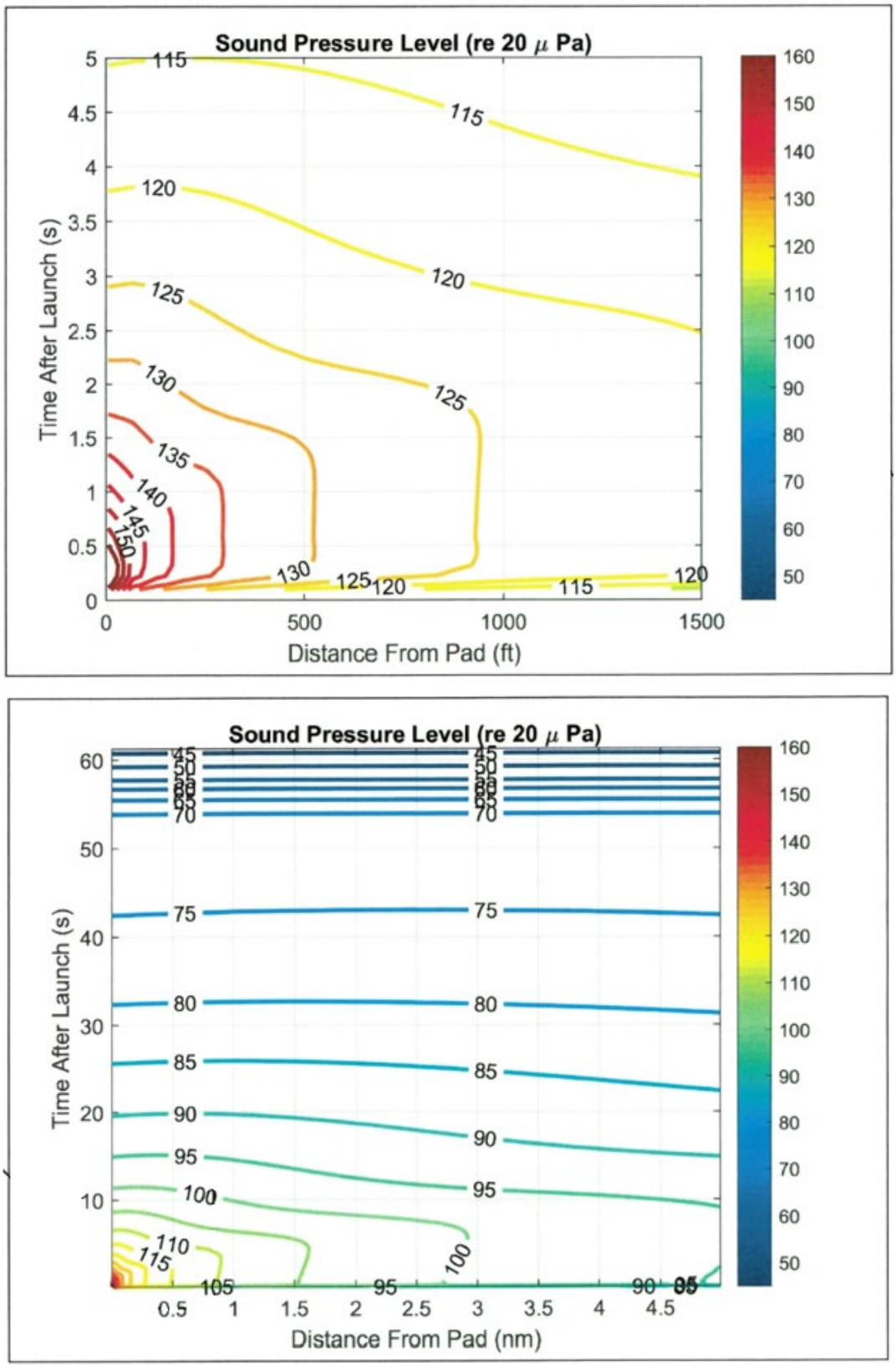
Human Activity and Equipment Operation. Project-related noise would be generated by human activity and equipment operation resulting from launch-related activities at PMRF. Human activity and equipment operation at PMRF would be similar to ongoing launch support activities conducted at PMRF on a regular basis. Up to 100 test personnel would be on-site for up to 2 weeks for launch activities. Equipment operation would involve use of the Transporter Erector Launcher, the Battery Operations Center, and the Battery Operations Center support vehicles. Expected noise levels for operation of these vehicles would be similar to typical large trucks or tractors and are estimated to have maximum sound pressure levels of 82 dB in air (re 20 µPa) at a distance of 15 m (50 ft), even if mobile generators needed to be used for power (WSDOT 2020). All activities and noise would be centered on the THAAD launch site and support facilities.

Table 4. Potential Stressors Resulting from Proposed JFC Supplemental Activities

Stressor	PMRF	Stage 1 Booster Drop Zones	Stage 2 Booster Drop and Payload Impact Zones
Elevated Sound Pressure Levels			
Launch Noise	Maximum sound pressures in air (re 20 µPa): • 145 dB at 30 m from launch, duration less than 1 second • 140 dB at 53 m from launch, duration less than 1.5 seconds • 135 at 91 m from launch, duration less than 2 seconds	None	None
Human Activity and Equipment Operation	Up to 100 test personnel would be on-site for up to 2 weeks for launch activities. Equipment operation noise typical of large trucks at a maximum of 82 dB in air (re 20 µPa) at 15 m.	None	None
Sonic Booms	None	Maximum sound pressure less than 135 dB in water (re 1 µPa) at the surface and 109 dB in air (re 20 µPa) for vehicle flight. Duration 0.27 seconds.	Maximum sound pressure less than 135 dB in water (re 1 µPa) and 109 dB in air (re 20 µPa) at the surface for vehicle flight. Duration 0.27 seconds. Maximum sound pressure less than 175 dB in water and 149 dB in air near payload impact. Duration approximately 0.08 seconds.
Vehicle Component Splashdown/ Payload Impact	None	Estimated maximum of 218 dB in water and 192 in air at stage 1 booster splashdown.	Estimated maximum of 201 dB in water and 175 in air at stage 2 booster splashdown. Estimated maximum of 191 dB in water and 165 in air at payload impact.
Physical Injury			
Direct Contact from Test Components	None	One booster stage would splash down into the ocean. Approximate dimensions: • Stage 1= 5.3 m long x 0.86 m diameter	One booster stage and the payload would splash down into the ocean. Approximate dimensions: • Stage 2 = 2.0 m long x 0.86 m diameter • Payload = 2.9 m long x 0.86 m diameter
Vehicle Strike Risk	Use of launch, launch support, and personnel vehicles. Estimate 100 vehicle trips per day for up to a two-week period for each test at PMRF.	None	None

Stressor	PMRF	Stage 1 Booster Drop Zones	Stage 2 Booster Drop and Payload Impact Zones
Heat/Wildfire Risk			
Launch	Burning of propellant during launch generates heat and increases the risk of wildfires. Wildfires may destroy or modify habitat for ESA-listed species, including designated critical habitat. Only wildlife on or directly adjacent to the launch pad might be affected by heat from launch.	None	None
Hazardous Materials			
Launch Emissions	Launch vehicles release exhaust components into the air. Launch emissions, including hydrogen chloride and aluminum oxide, have the potential to be harmful to plants, wildlife, and habitats near the launch pad or flight path.	None	None
Chemicals or Debris from Test Components	None	Introduction of launch vehicle materials into deep ocean waters, including rocket motor, unused propellant, battery electrolytes, and heavy metals. Components and materials expected to sink to the bottom or rapidly dilute.	Introduction of launch vehicle and payload materials into deep ocean waters, including rocket motor, unused propellant, battery electrolytes, residual explosives, and heavy metals. Components and materials expected to sink to the bottom or rapidly dilute.

Abbreviations: µPa = micropascal, dB = decibels, ESA = Endangered Species Act, m = meters, PMRF = Pacific Missile Range Facility, re = referenced to



Source: Figures from Kahle et al. 2021

Figure 9. Modeled Maximum Sound Pressure Levels and Duration for JFC Launches

Sonic Booms. No model estimates are available for sonic boom footprints resulting from JFC flight, but similar to other recent flight tests (DON 2019) sonic booms are expected to average 104 dB in air (re 20 µPa) at the ocean surface for most of the vehicle flight and last no more than 270 milliseconds. Maximum sound levels from sonic booms for vehicle flight are expected to be 109 dB in air (DON 2019). Sonic booms generated by the payload near impact may be up to 149 dB in air near the impact point and last approximately 75 milliseconds (DON 2019).

Component Splashdown or Impact. No model estimates of noise levels are available for splashdown of JFC components; therefore, the peak noise levels have been estimated based on the size characteristics of the vehicle components compared to the component sizes for other test vehicles for which splashdown noise estimates are available (DON 2019). Using peak sound pressure estimates for the largest Navy Flight Experiment-2 (FE-2) stage (approximately 1.4 times bigger than JFC stage 1) for the stage 1 booster and the smallest FE-2 stage (approximately the same size as JFC stage 2) for the stage 2 booster, the peak sound pressures are expected to be less than 218 dB in water (re 1 µPa) at the surface (192 dB in air) for splashdown of the stage 1 booster and 201 dB in water (207 dB in air) for the stage 2 booster. Similarly, estimated sound levels for impact of the FE-2 payload (DON 2019) are used as a bounding case for the JFC payload. Sound pressures from payload impact are expected to be less than 191 dB in water (165 dB in air) at the ocean surface and would last no more than a few seconds.

Potential Effects of Elevated Sound Levels

Noise has the potential to affect the behavior and hearing sensitivity of birds, sea turtles, sea otters, and bats. Loud sounds might cause these organisms to quickly react, altering their normal behavior either briefly or more long term or may even cause physical injury. The extent of the effect depends on the frequency and intensity of the sound as well as on the hearing ability of the animal and its distance from the noise source.

The ESA-listed species considered in this Biological Evaluation have different hearing abilities and thresholds for effects. In general, a sound level that is sufficient to cause physical injury to auditory receptors is a sound that exceeds an organism's permanent threshold shift (PTS) level. The extent of physical injury depends on the received sound pressure level (SPL) as well as the anatomy of each species. A temporary threshold shift (TTS) is when an organism is exposed to sound pressures below the threshold of permanent physical injury but loud enough to result in temporary hearing alteration. Sound levels above the TTS threshold have the potential to temporarily impair an animal's ability to communicate, navigate, forage, and detect predators. Elevated sound levels at lower levels can also cause behavioral modification. Most documented occurrences of behavioral responses to anthropogenic sounds have been observations of short-term behavioral responses, which include temporary changes in feeding, resting, or social interactions (NRC 2005).

For birds, the current threshold standard for PTS is 140 A-weighted decibels (dBA) for impulsive sounds (CALTRANS 2016b). There are no data available on TTS thresholds in birds (CALTRANS 2016b); however, unlike most other taxa, birds have the ability to regenerate hair

cells in the inner ear, which allows them to recover from auditory injury better than other species, usually within several weeks (CALTRANS 2016b). Any elevated SPL, especially above ambient noise levels, has the potential to cause behavioral and/or physiological effects in birds (CALTRANS 2016b). Behavioral responses to elevated SPLs in birds include behaviors such as alert behavior, startle response, avoidance behavior, and changes in vocalization (CALTRANS 2016b). In some cases, where noises induce behavioral response repeatedly over time, effects to birds may include chronic stress, which may compromise their overall heath and reproductive success. However, there is some evidence that certain birds may acclimate or become habituated to noises after frequent exposure and cease to respond behaviorally (CALTRANS 2016b). A 93 dBA threshold for masking effects from continuous noise sources has been suggested as a conservative estimate of behavioral effects in birds (CALTRANS 2016b).

The majority of information regarding hearing sensitivity and effect thresholds in sea turtles applies only to sea turtles in water (DON 2022, DON 2017). For in-water sounds, the thresholds generally used for PTS and TTS onset are peak SPLs of 232 dB and 226 dB respectively (DON 2022, DON 2017) and 160 dB is sometimes used as an in water behavioral disturbance threshold. The closest sea turtle habitat to the THAAD launch site is at least 100 m (328 ft) from launch pad and in-air SPLs would be expected to be less than 135 dB in air.

The evaluation of potential effects of elevated sound levels on sea otters was based primarily on the standard sound effect thresholds for effects for the otariid pinniped and other non-phocid marine carnivores group as detailed by the National Oceanic and Atmospheric Administration (NOAA) Fisheries (NOAA 2018) and the Navy (DON 2017). The PTS onset thresholds for otters are estimated to be 232 dB in water (re 1 µPa) and 176 dB in air (re 20 µPa). TTS onset thresholds for sea otters are 226 dB in water and 170 dB in air. The best estimate for behavioral disturbance threshold in otariid pinnipeds and other non-phocid marine carnivores is 100 dB in-air.

There is little information available concerning PTS and TTS thresholds for bats. As described in CALTRANS 2016a, bats are very well adapted to prevent or avoid auditory damage (CALTRANS 2016a). Many bats regularly experience loud sounds (100 to 140 dB) in their natural environment (Simmons et al. 2018), and individual bats may emit sound up to 120 dB when navigating and locating prey (Simmons et al. 2016). Bats have several morphological, physiological, and behavioral adaptations to noise including behavioral avoidance of loud sounds, changing the shape and orientation of the outer ear, closing a flap in the ear canal, and a tympanic reflex which reduces the transmission of sound (CALTRANS 2016a). Even though bats have adaptations to prevent or avoid auditory damage, the consequences of hearing impairment in bats can be serious. Damage to lower frequency sensory cells in the ear might result in impaired passive listening ability while damage to high frequency sensory cells might result in impaired echolocation (CALTRANS 2016a). Studies exposing big brown bats (*Eptesicus fuscus*) to intense sounds up to 123 dB root mean squared (sound exposure level of 158 dB) for 1 hour showed no significant alteration in bats' ability to navigate and no evidence of significant TTS (Simmons et al. 2018, Simmons et al. 2016).

4.1.2 Physical Injury

Sources of Physical Injury

Direct Contact from Vehicle Components. The Proposed Action would result in the spent stage 1 and 2 boosters as well as the payload splashing down in the booster drop zones in the BOA. These falling components would enter marine habitats and have the potential to directly contact wildlife. The estimated dimensions of JFC vehicle components and payload are presented in **Table 4**. The JFC program would include up to six tests per year over 10 years. These tests could take place from any of the installations evaluated in the 2022 JFC EA/OEA and those proposed as supplemental launch locations (i.e., the THAAD launch site and PSCA). It is not known at this time how many tests would occur annually from each installation. Therefore, for analysis purposes it is assumed that all tests could be from each launch site as a conservative approach for estimating the potential effects to ESA-listed species in the BOA.

Vehicle Strike Risk. The Proposed Action would involve use of vehicles for launch (i.e., the Transporter Erector Launcher), launch support (i.e., the Battery Operations Center and Battery Operations Center support vehicles), and personnel transport. Vehicle use related to the Proposed Action is within the envelope of normal operations at PMRF and would not substantially increase vehicle traffic on PMRF or on State Highway 50 which leads to PMRF. If a conservative approach is taken to estimate strike risk for the Proposed Action separate from normal PMRF operations, and it is assumed that the Proposed Action might result in up to 100 vehicle trips per day for 2 weeks, proposed activities might constitute 0.5 percent of annual traffic on PMRF (based on 2021 average annual daily traffic estimates) (Hawai‘i State Office of Planning 2023).

Vehicle traffic poses a risk to nēnē and Hawaiian water birds due to vehicle collision risk. A number of avoidance and minimization measures would be implemented to avoid vehicle collisions with nēnē and Hawaiian waterbirds including posted speed limits and personnel training (see **Section 2.2**). All personnel would be trained on the importance of not approaching special-status wildlife and of adhering to posted speed-limits on the installation.

4.1.3 Exposure to Heat and Increased Wildfire Risk

Sources of Heat and Wildfire Risk

Launch Heat. Heat would be generated during JFC launch and has the potential to harm vegetation and wildlife near the launch pad. Based on evaluation of thermal impacts at nearby launch sites at KTF (approximately 730 m or 2,400 ft away), there is little risk to wildlife from launch heat. For the largest launch vehicles used at KTF, maximum heat level at 37 m (120 ft) from the launch point are around 0.40 British thermal units per second per square foot (DOE 2019). This is approximately the same heat flux an object would experience 10 cm (4 inches) away from a 100-watt incandescent bulb (DOE 2019). The JFC stage 1 booster is substantially smaller than the largest launch configurations used at KTF (DOE 2019); therefore, the thermal footprint would be smaller.

Wildfire Risk. Heat generated at launch also has the potential to ignite wildfires which may modify or destroy habitat for listed plant and animal species. Overall, the chances of a wildfire occurring due to launch are extremely low. Standard safety procedures are in place at PMRF to minimize the potential for wildfires as the result of vehicle launch. The THAAD launch pad is maintained free of flammable vegetation up to the site fence line (**Figure 3**) and therefore presents little wildfire risk. PMRF has a Fire Protection Program and PMRF Fire crews would be present for every launch. After decades of launches at the nearby KTF launch pads (730 m or 2,400 ft away from the THAAD launch pad), there have not been any off-site vegetation fires because of launches (DOE 2019, PMRF Environmental Office 2021).

4.1.4 Exposure to Hazardous Materials

Sources of Hazardous Materials

Launch Emissions. Vehicle launch emissions typically include aluminum oxide, carbon dioxide, carbon monoxide, hydrogen, hydrogen chloride, nitrogen, water, ferric chloride, ferric oxide, nitric oxide, chlorine, and sulfur dioxide (DOE 2019). The quantities of these launch emissions for the JFC vehicle are not known at this time, but the stage 1 motor used on the JFC vehicle is a small motor compared to many of the other vehicles launched from nearby KTF. Because the launch vehicle will ascend quickly away from the launch pad, only a small portion of the launch exhaust would be emitted near the launch area and the exhaust emissions would quickly dissipate through atmospheric dispersion (DOE 2019).

Test Components. Wildlife have the potential to be exposed to hazardous materials as the vehicle components splash down into the booster drop zones. Any substances of which the spent boosters or payload are constructed or that are contained in the stages and not consumed during flight or jettison (**Tables 1** and **2**) would fall into marine habitats. The propellants would be consumed before splashdown and the area affected by the dissolution of chemicals would be relatively small because of the size of the launch vehicle components and the minimal amount of residual materials they would contain. Any chemicals introduced to the water column would be quickly diluted and dispersed by wave action, ocean currents, and the large volume of water.

Test components have the potential to pose an ingestion risk to wildlife. However, all debris is expected to sink to the ocean bottom where depths reach thousands of feet and where most ESA-listed species and their prey do not occur. While no residual debris is expected, a recovery team would inspect the payload impact site after the test flight to recover and remove any visible debris present on the ocean surface.

4.2 Effects of the Proposed Action on Listed Species

4.2.1 Hawaiian Waterbirds

Due the similarity in habitat and potential response to proposed activities, the four Hawaiian waterbirds in **Table 3** are discussed as a group. Hawaiian waterbirds have the potential to be affected by elevated noise levels. The nearest waterbird habitat area is over 480 m (1,570 ft)

from the THAAD launch site (**Figure 3**). Sound pressures at this distance would be no more than 125 dB and sounds above ambient levels would last less than a minute (**Figure 9**). Expected launch noise levels would not exceed established physical injury thresholds (140 dB) (CALTRANS 2016b) for ESA-listed birds in any waterbird habitat areas. Elevated noise levels can also cause behavioral disturbance in wildlife and may mask normal animal communications. Due to the low intensity and short duration of launch noise, any effects on Hawaiian waterbirds would be limited to temporary startle reactions with no long-term or meaningful impacts on individual fitness. Birds would be expected to return to normal behaviors and distributions within minutes of the launch. Noise from equipment use is not expected to affect Hawaiian waterbirds. Based on the expected vehicle traffic in relation to normal levels of vehicle traffic and based on records of waterbird vehicle strikes on PMRF, the number of expected bird exposures to vehicle strike were calculated. No waterbirds are expected to be exposed to injury from vehicle strike (exposure estimated to 0.02 birds per year) and the effects would be discountable. Waterbirds are not expected to be exposed to any other stressors from the proposed vehicle launch. The effects of the Proposed Action on the Hawaiian waterbird species (i.e., Hawaiian ducks, Hawaiian coots, Hawaiian gallinules, and Hawaiian stilts) would be insignificant or discountable.

The Proposed Action may affect but is not likely to adversely affect Hawaiian ducks, Hawaiian coots, Hawaiian gallinules, and Hawaiian stilts.

4.2.2 Hawaiian Goose or Nēnē

Nēnē have the potential to be affected by elevated noise levels which might cause disturbance of nesting and grazing birds, and by launch emissions and heat. Launch SPLs may exceed the injury threshold for birds (140 dB) up to 53 m (175 ft) from the launch pad. If any nēnē or their nests were present within 53 m (175 ft) of launch, nēnē could be physically injured by elevated sound pressures as well as by heat and emissions from launch. While nēnē have not frequented the northern portion of PMRF Barking Sands historically, nēnē have been recorded in the vicinity of the THAAD launch site. The nearest documented nest to the THAAD launch site was a nest with no eggs approximately 90 m (295 ft) northwest of the launch site in fiscal year 2021 and two active nests were documented approximately 360 m (1,180 ft) and 500 m (1,640 ft) south of the launch site that year (**Figure 3**) (PMRF Environmental Office 2021).

Normal human activity and equipment operation at the launch pad site may deter nēnē from using the area within 53 m (175 ft) of the launch pad for grazing. If nēnē were to occur or persist in the immediate launch pad area within 24 hours preceding the launch, project personnel would coordinate a response with the PMRF Environmental Office. Response solutions might include hazing by trained and authorized personnel to encourage nēnē to leave the area, or a nēnē nest search if birds are unwilling to leave the area. If a nēnē nest were found within 53 m (175 ft) of the launch pad, the PMRF Environmental Office would be notified and the USFWS would be contacted (by PMRF Environmental Office personnel) for further coordination on a course of action before the launch would proceed. While these mitigation measures would be in place for the Proposed Action, it is considered unlikely that nēnē or their nests would occur within 53 m (175 ft) of the launch pad during launch and it is very unlikely that nēnē would be injured by the launch.

Beyond 53 m (175 ft) from the launch site, nēnē might be exposed to noise levels high enough to cause behavioral disturbance. As described above for waterbirds, due to the relatively low intensity and short duration (less than 1 minute) of launch noise, any realized disturbance effects would be limited to temporary startle reactions with no meaningful impacts on individual fitness or behavior patterns. Birds would be expected to return to normal behaviors and distributions within hours of launch. Noise from equipment use is not expected to affect nēnē because the expected sound pressures levels are so low that they are unlikely to cause even behavioral disturbance. No nest abandonment would be expected due to Proposed Action sound levels.

Based on the expected proposed vehicle traffic in relation to normal levels of vehicle traffic on PMRF and based on records of nēnē vehicle collisions on PMRF, no nēnē are expected to be exposed to injury from vehicle strike (exposure estimated to 0.07 birds per year). Even over a 10-year period, less than one nēnē would be expected to be injured by vehicle collision and the effects would be discountable. Overall, with implementation of measures to avoid any potential injury of nēnē if birds are located within 53 m (175 ft) of the launch pad and to avoid injury from vehicles, the effects of the Proposed Action on nēnē would be discountable or insignificant.

The Proposed Action may affect but is not likely to adversely affect nēnē.

4.2.3 Short-tailed Albatross

Short-tailed albatross have the potential to be affected by elevated noise levels, direct contact from vehicle components, and exposure to hazardous materials in the PSCA stage 1 booster drop zone. Because of the extremely low density and sparse distribution of short-tailed albatross in other portions of the BOA, the Action Proponents have determined that the Proposed Action would have no effect on albatross in these other portions of the Action Area.

Within the stage 1 booster drop zone, the effects of proposed activities on short-tailed albatross would be discountable or insignificant. No density estimates for albatross in the stage 1 booster drop zone are available; however, these birds are considered rare in the nearshore waters off Kodiak Island (FAA 2016) and likely only occur in this area seasonally. Given the small direct contact area for test components and the likely low density and patchy distribution of albatross in the Action Area, it is very unlikely that birds would be subject to direct contact from JFC vehicle components or be exposed to hazardous materials. Overall, no direct contact or exposure to hazardous materials is expected, and the effects would be discountable.

Sound pressures may exceed the injury thresholds for birds within approximately 398 m (1,306 ft) of spent stage 1 booster splashdown. As described in **Section 4.1.1**, this is a worst-case estimate of the area where sound pressures might exceed the PTS threshold. For the same reasons listed above, it is unlikely that short-tailed albatross would be in the area subject to sound pressures loud enough to cause physical injury. Individual short-tailed albatross might be startled by splashdown noise, but any effects of this single, short-duration noise are expected to be short-term with no long-term or physiologically meaningful effects. Birds would return to normal behaviors within minutes and the effects of noise on albatross would be insignificant.

The Proposed Action may affect but is not likely to adversely affect short-tailed albatross.

4.2.4 Steller's Eider

Steller's eiders have the potential to be affected by elevated noise levels, direct contact from vehicle components, and exposure to hazardous materials in the PSCA stage 1 booster drop zone. Because Steller's eiders are very unlikely to occur in other portions of the BOA, the Proposed Action would have no effect on eiders in these other portions of the Action Area.

Within the stage 1 booster drop zone, the effects of proposed activities on ESA-listed Steller's eiders would be discountable or insignificant. Historically, Steller's eiders were commonly observed in relatively high numbers off Narrow Cape in the winter months (FAA 1996). However, in more recent surveys, Steller's eiders were found in this area infrequently and at lower numbers (FAA 2016). Only a portion of the Steller's eiders in the Action Area would be from the ESA-endangered Alaska breeding DPS as this population mixes with the non-listed Russian breeding population at winter feeding grounds (Martin et al. 2015, USFWS 2019c). No density estimates for the ESA-listed DPS birds in the stage 1 booster drop zone are available; however, these birds generally occur in nearshore waters (less than 30 m or 98 ft deep) (Martin et al. 2015, USFWS 2019c) and would be unlikely in much of the stage 1 booster drop zone (**Figure 6**). Given the small direct contact area for test components and the likely low density and sparse distribution of Steller's eiders in the Action Area, it is very unlikely that birds would be subject to direct contact from JFC vehicle components or be exposed to hazardous materials. Overall, no direct contact or exposure to hazardous materials is expected, and the effects would be discountable.

Sound pressures may exceed the injury thresholds for birds within approximately 398 m (1,306 ft) of spent stage 1 booster splashdown. As described in **Section 4.1.1**, this is a worst-case estimate of the area where sound pressures might exceed the PTS threshold. For the same reasons listed above, it is unlikely that Steller's eiders would be in the area subject to sound pressures loud enough to cause physical injury. Individual birds might be startled by splashdown noise, but any effects of this single, short-duration noise are expected to be short-term with no long-term or physiologically meaningful effects. Birds would return to normal behaviors within minutes and the effects of noise on Steller's eiders would be insignificant.

The Proposed Action may affect but is not likely to adversely affect the Alaska breeding DPS of Steller's eiders.

4.2.5 Green Sea Turtle

Hauled out and nesting green sea turtles have the potential to be affected by elevated sound levels resulting from launch at PMRF. Green sea turtles on land also have the potential to be affected by artificial lighting; however, the Navy at PMRF has consulted with the USFWS on the effects of base-wide artificial lighting and there would be no additional effects of proposed activity lighting on turtles that were not considered in the 2014 BO (USFWS 2014a). Project personnel would be trained on the presence of ESA-listed species and their habitats on PMRF

and would not approach or disturb basking or nesting sea turtles. Project-related vehicle and equipment use would occur in paved or maintained areas and vehicles would not enter beach habitats.

The closest sea turtle haulout or nesting habitat to the THAAD launch site is more than 100 m (328 ft) away. In-air SPLs would be less than 135 dB in air at this distance. This SPL is below the injury threshold and is below the level that is likely to cause behavioral disturbance in sea turtles. Launch noise is very unlikely to affect hauled out or nesting green sea turtles and the effects would be discountable.

The Proposed Action may affect but is not likely to adversely affect Central North Pacific DPS green sea turtles.

4.2.6 Northern Sea Otter

Northern sea otters have the potential to be affected by elevated noise levels, direct contact from vehicle components, and exposure to hazardous materials in the PSCA stage 1 booster drop zone. Northern sea otters are likely to occur in nearshore habitats off Kodiak Island but are unlikely to occur in the stage 1 booster drop zone. Sea otters occur in waters less than 100 m (328 ft) deep but spend almost all of their time in waters less than 30 m (100 ft) deep (USFWS 2009b).

The effects of proposed activities on ESA-listed Southwest Alaska DPS northern sea otters would be discountable or insignificant. Given the small direct contact area for the spent stage 1 booster and the very low density of sea otters in the drop zone, it is very unlikely that individuals would be subject to direct contact from JFC vehicle components or be exposed to hazardous materials. Overall, no direct contact or exposure to hazardous materials is expected, and the effects would be discountable.

Sound pressures resulting from the proposed action would not exceed the injury thresholds for sea otters. Individual otters might be startled by elevated sound levels, but any effects of this single, short-duration noise are expected to be short-term with no long-term or physiologically meaningful effects. Otters would return to normal behaviors minutes of sound and the effects of noise on norther sea otters would be insignificant.

The Proposed Action may affect but is not likely to adversely affect the Southwest Alaska DPS of northern sea otters.

4.2.7 Hawaiian Hoary Bat

Hawaiian hoary bats have the potential to be affected by disturbance of roosting bats due to launch noise and by loss or modification of rooting habitat due to fire risk. Hawaiian hoary bats may roost in trees over 4.6 m (15 ft) tall in the Action Area. The kiawe-koa haole scrub habitat south and east of the THAAD launch site (**Figure 3**) contains trees that are over 4.6 m (15 ft) tall. The closest roost-size trees would be approximately 165 m (540 ft) from the launch site. If

the launch were conducted at night, elevated noise levels may also disturb foraging bats. Bats are known to forage in almost all habitats in the Action Area throughout the year.

Roosting bats have the potential to be disturbed or stressed by any noise levels above ambient sound levels (CALTRANS 2016a). Sound pressure levels would be less than 130 dB in all potential bat roosting habitat. If bats are roosting in the Action Area, sudden loud noise from launch might cause bats to leave their roost trees. Any bats that left their roost trees would likely find another roost tree in an adjacent area. Because launch noise is a single, very short duration sound, any realized adult roost abandonment is very unlikely to cause abandonment of young pups, as bats would be expected to return to normal behaviors soon after launch.

Any launch noise at night has the potential to disturb foraging bats. Launch noise may cause bats to leave the immediate launch area temporarily, but bats normally range several kilometers in a night (Bonaccorso et al. 2015) and other areas of PMRF and the Mana Plain are known to provide foraging habitat for Hawaiian hoary bats (Bonaccorso and Pinzari 2011). Foraging bats would be expected to return to normal behaviors within minutes of launch. Launch noise would be a one-time, relatively short duration (less than 60 seconds) event that would have no long-term effects on bat habitat use (roosting or foraging). Any disturbance from launch noise would be expected to be short-term behavioral response with no lasting or long-term physiological or behavioral effects.

The potential exists for launch noise to cause acoustic trauma, or physical injury, in bats flying very close to the launch site if launch occurs at night. However, bats are very well adapted to prevent or avoid auditory damage as described in **Section 4.1.1**. Given the adaptations of bats to avoid impacts of loud sounds, it is not expected that the physical injury threshold for bats would be any closer to the launch pads than the bird threshold is (53 m or 175 ft) and it is used as a conservative estimate. No roost-size trees occur within 53 m (175 ft) of the launch pad. Bats may be temporarily startled by launch noise (behavioral disturbance), but it is unlikely that launch noise would injure bats or that it would meaningfully impair essential behavioral patterns, including breeding, feeding, or sheltering. The effects of elevated noise levels from launch would be insignificant for Hawaiian hoary bats.

As discussed in **Section 4.1.3**, there is very little risk of wildfire from launch activities at PMRF. No long-term adverse effects to vegetation are expected due to launch heat, emissions, or wildfire. Given the distance to the closest bat roosting habitat, proposed launch activities are very unlikely to adversely affect bat habitat and the effects would be discountable.

The Proposed Action may affect but is not likely to adversely affect Hawaiian hoary bats.

4.3 Effects of the Proposed Action on Designated Critical Habitat

4.3.1 *Panicum niihauense* Critical Habitat

The Proposed Action has the potential to affect *Panicum niihauense* designated critical habitat through wildfire risk. As discussed in **Section 4.1.3**, there is very little risk of wildfire from launch activities at PMRF. Standard safety procedures would be in place to reduce wildfire risk including fire crews being present at every launch. After decades of launches at the nearby KTF launch pads (which are closer to the designated critical habitat than the THAAD launch site), there have not been any off-site vegetation fires (DOE 2019, PMRF Environmental Office 2021). Given the distance to the closest designated critical habitat, proposed launch activities are very unlikely to adversely affect the primary constituent elements of *Panicum niihauense* critical habitat and the effects would be discountable.

The Proposed Action may affect but is not likely to adversely affect *Panicum niihauense* designated critical habitat.

5.0 Conclusions

Based on the conclusion that all effects of the Proposed Action would be insignificant or discountable for ESA-listed species, the Action Proponents have determined that JFC supplemental activities may affect but are not likely to adversely affect the ESA-listed species considered in this evaluation. The Proposed Action may affect but is not likely to adversely affect Hawaiian ducks (*Anas wyvilliana*), nēnē (*Branta sandvicensis*), Hawaiian coots (*Fulica alai*), Hawaiian gallinule (*Gallinula galeata sandvicensis*), Hawaiian stilts (*Himantopus mexicanus knudseni*), short-tailed albatross (*Phoebastria albatrus*), the Alaska Breeding DPS of Steller's eiders (*Polysticta stelleri*), the Central North Pacific DPS of green sea turtles (*Chelonia mydas*), the Southwest DPS of northern sea otters (*Enhydra lutris kenyoni*), and Hawaiian hoary bats (*Lasiurus cinereus semotus*). Proposed activities would have no effects on the Hawai'i DPS of band-rumped storm-petrel (*Oceanodroma castro*), Hawaiian petrel (*Pterodroma sandwichensis*), or Newell's shearwater (*Puffinus auricularis newelli*) beyond those already evaluated in previous consultations with the USFWS.

The Action Proponents have concluded that the Proposed Action may affect but is not likely to adversely affect designated critical habitat for *Panicum niihauense*. The Action Proponents have determined that the Proposed Action would have no effect on designated critical habitat for the Southwest DPS of northern sea otters.

This page intentionally left blank

6.0 Literature Cited

Amlin, A. and A. Siddiqi. 2015. Endangered Species Recovery Committee Hawaiian Hoary Bat Guidance Document. State of Hawai‘i Department of Land and Natural Resources, Division of Forestry and Wildlife. December 2015.

Bonaccorso, F., and C. Pinzari. 2011. Hawaiian Hoary Bat Occupancy at the Pacific Missile Range Facility (PMRF) and Satellite Facilities. Final Report. September 2011.

Bonaccorso, F. J., C. M. Todd, A. C. Miles, and P. M. Gorresen. 2015. Foraging range movements of the endangered Hawaiian hoary bat *Lasiurus cinereus semotus* (Chiroptera: Vespertilionidae). Journal of Mammalogy 96:64-71.

CALTRANS (California Department of Transportation). 2016a. Technical Guidance for the Assessment and Mitigation of the Effects of Traffic Noise and Road Construction Noise on Bats. Sacramento, CA. Prepared by ICF International, Sacramento, CA, and West Ecosystems Analysis, Inc., Davis, CA.

_____. 2016b. Technical Guidance for Assessment and Mitigation of the Effects of Traffic Noise and Road Construction Noise on Birds. Sacramento, CA. Prepared by ICF International, Sacramento, CA, Robert Dooling, Gaithersburg, MD, and Arthur Popper, Silver Spring, MD.

DOE (Department of Energy). 2019. Continued Operation of the Kauai Test Facility Sandia National Laboratories, Hawaii Final Site-wide Environmental Assessment. Department of Energy National Nuclear Security Administration. November 2018.

DON (Department of the Navy). 2017. Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase III). Technical Report. June 2017.

_____. 2019. Biological Assessment for Flight Experiment-2 (FE-2). June 2019.

_____. 2022. Point Mugu Sea Range Final Environmental Impact Statement/Overseas Environmental Impact Statement. January 2022.

DON and U.S. Army (Department of the Navy and United States Army). 2022. Joint Flight Campaign Environmental Assessment / Overseas Environmental Assessment. February 2022.

FAA (Federal Aviation Administration). 1996. Environmental Assessment of the Kodiak Launch Complex, Kodiak Island, Alaska. May 1996.

_____. 2016. Final Environmental Assessment, Finding of No Significant Impact/Record of Decision for the Kodiak Launch Complex Launch Pad 3. April 2016.

Gorresen, P. M., F. J. Bonaccorso, C. A. Pinzari, C. M. Todd, K. Montoya-Aiona, and K. Brinck. 2013. A Five-Year Study of Hawaiian Hoary Bat (*Lasiurus cinereus semotus*) Occupancy on the Island of Hawai‘i. Hawai‘i Cooperative Studies Unit Technical Report HCSU-041. University of Hawai‘i at Hilo. July 2013.

Hawai‘i State Office of Planning. 2023. Hawai‘i Statewide GIS Program. Traffic Volume 2021. Available at https://histategis.maps.arcgis.com/apps/mapviewer/index.html?webmap =f4f33df28c77441d942fb19fe82ee051. Accessed online May 2023.

Kahle, W., P. Phillips, D. Rodney, and G. Krik. 2021. Launch at KTF Acoustic Study. Rev 4. Johns Hopkins Applied Physics Lab.

Martin, P. D., D. C. Douglas, T. Obritschkewitsch, and S. Torrence. 2015. Distribution and movements of Alaska-breeding Steller's Eiders in the nonbreeding period. Condor 117:341-353.

NAVFAC PAC (Navy Facilities Engineering Command, Pacific). 2010. Integrated Natural Resources Management Plan for Pacific Missile Range Facility Islands of Kaua‘i, O‘ahu, and Ka‘ula, State of Hawai‘i. November 2010.

_____. 2022. Biological Assessment for the Re-initiation of Effects of Base Infrastructure Operations and Maintenance on Federally Threatened and Endangered Species at Pacific Missile Range Facility (PMRF) Sites Kaua‘i, Hawai‘i. February 2022.

NOAA (National Oceanic and Atmospheric Administration). 2018. 2018 Revision to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) – Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts. April 2018.

_____. 2023. NOAA Fisheries Species Directory. Available online at: https://www.fisheries.noaa.gov/species-directory

NRC (National Research Council). 2005. Marine Mammal Populations and Ocean Noise: Determining When Noise Causes Biologically Significant Effects. National Academies Press, Washington, DC.

PMRF (Pacific Missile Range Facility) Environmental Office. 2021. Personal communication providing data regarding ESA-listed species presence and reproduction on PMRF. Provided by the PMRF Environmental Office. January through April 2021.

PMRF (Pacific Missile Range Facility) Environmental Office. 2023. Personal communication providing data regarding ESA-listed species presence on PMRF. Provided by the PMRF Environmental Office. May 2023.

Rosenberg, D. H., M. J. Petrula, J. L. Schamber, D. Zwiefelhofer, T. E. Hollmen, and D. D. Hill. 2014. Seasonal Movements and Distribution of Steller's Eiders (*Polysticta stelleri*) Wintering at Kodiak Island, Alaska. Arctic 67 (3):347-359.

Seminoff, J. A., C. D. Allen, G. H. Balazs, P. H. Dutton, T. Eguchi, H. L. Haas, S. A. Hargrove, M. Jensen, D. L. Klemm, A. M. Lauritsen, S. L. MacPherson, P. Opay, E. E. Possardt, S. Pultz, E. Seney, K. S. Van Houtan, and R. S. Waples. 2015. Status review of the green turtle (*Chelonia mydas*) under the endangered species act. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center.

Simmons, A. M., K. N. Hom, M. Warnecke, and J. A. Simmons. 2016. Broadband Noise Exposure Does Not Affect Hearing Sensitivity in Big Brown Bats (*Eptesicus fuscus*). Journal of Experimental Biology 219: 1031-1040. doi:10.1242/jeb.135319.

Simmons, A. M., A. Ertman, K. N. Hom, and J. A. Simmons. 2018. Big brown bats (*Eptesicus fuscus*) Successfully Navigate Through Clutter After Exposure to Intense Band-Limited Sound. Nature, Scientific Reports 8:13555. DOI:10.1038/s41598-018-31872-x.

USAF (United States Air Force). 2020. Integrated Natural Resources Management Plan. Cape Canaveral Air Force Station, Patrick Air Force Base, Malabar Transmitter Annex, Jonathan Dickinson Missile Tracking Annex. September 2020.

USFWS (United States Fish and Wildlife Service). 1998. Recovery Plan for the Hawaiian Hoary Bat. U.S. Fish and Wildlife Service, Portland, OR.

_____. 2009a. Short-tailed Albatross (*Phoebastria albatrus*) 5-Year Review: Summary and Evaluation. Anchorage Fish and Wildlife Field Office.

_____. 2009b. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Southwest Alaska Distinct Population Segment of the Northern Sea Otter; Final Rule. 74 FR 51988-52012. October 8, 2009.

_____. 2011. Recovery Plan for Hawaiian Waterbirds, Second Revision. U.S. Fish and Wildlife Service, Portland, Oregon.

_____. 2014a. Formal Consultation for Pacific Missile Range Facility Base-wide Infrastructure, Operations, and Maintenance, Kauaʻi. September 9, 2014.

_____. 2014b. Short-tailed Albatross (*Phoebastria albatrus*) 5-year Review: Summary and Evaluation. September 23, 2014.

_____. 2015. Endangered and Threatened Wildlife and Plants; Endangered Status for 49 Species from the Hawaiian Islands; Proposed Rule. 80 FR 58820. September 30, 2015.

_____. 2018a. Biological Opinion of the U.S. Fish and Wildlife Service for the Proposed Base-wide Infrastructure, Operations, and Maintenance Activities at the Pacific Missile Range Facility, Island of Kauaʻi, Hawaiʻi. August 20, 2018.

_____. 2018b. Reinitiating of Programmatic Biological Opinion on Routine Mission Operations and Maintenance Activities, Vandenberg Air Force Base, Santa Barbara County, California. November 20, 2018.

_____. 2018c. Endangered and Threatened Wildlife and Plants; Reclassifying the Hawaiian Goose from Endangered to Threatened With a 4(d) Rule. Proposed Rule. 76 FR 13942-13942. April 2, 2018.

_____. 2019a. Wallops Flight Facility Update and Consolidation of Existing Biological Opinions, Accomack County, VA, Project # 2015-F-3317. June 7, 2019.

_____. 2019b. Endangered and Threatened Wildlife and Plants; Reclassifying the Hawaiian Goose from Endangered to Threatened With a 4(d) Rule. Final Rule. 84 FR 69918-69947. December 19, 2019.

_____. 2019c. Status Assessment of the Alaska-breeding Population of Steller's Eiders. USFWS, Fairbanks Fish and Wildlife Field Office. March 2019.

_____. 2021a. Letter from the USFWS, Pacific Islands Fish and Wildlife Office Dated July 16, 2021. Subject: Request for Section 7 consultation on proposed and ongoing terrestrial launch activities at Kauaʻi Test Facility.

_____. 2021b. Southwest Distinct Population Segment of the Northern Sea Otter (*Enhydra lutris kenyoni*). 5-Year Review: Summary and Evaluation.

Welch, J. H., A. E. Gall, and A. K. Prichard. 2021. Hawaiian Hoary Bat Occupancy and Activity Levels at the Pacific Missile Range Facility Barking Sands, Kauaʻi, Hawaiʻi, 2020-2021.

WSDOT (Washington State Department of Transportation). 2020. Construction Noise Impact Assessment. Chapter 7 in Biological Assessment Preparation manual. Updated August 2020.

7.0 List of Preparers

Government Preparers

David Fuller, National Environmental Policy Act Program Manager

Contractor Preparers

Karen Hoksbergen, Biologist, KFS, LLC
M.S., 2004, Biology, Northern Michigan University
B.S., 2001, Biology and Wildlife, University of Wisconsin Stevens Point
Years of Experience: 22

Amy McEniry, Technical Editor, KFS, LLC
B.S., 1988, Biology, University of Alabama in Huntsville
Years of Experience: 35

This page intentionally left blank

December

2023

Essential Fish Habitat Assessment for Joint Flight Campaign Activities

Final

Prepared for:
U.S. Army Space and Missile Defense Command

Department of the Navy Strategic Systems Programs

U.S. Department of the Army Rapid Capabilities and Critical Technologies Office

Prepared by:
KFS, LLC



DISTRIBUTION STATEMENT A: Approved for public release: distribution unlimited

This page intentionally left blank

Table of Contents

Acronyms and Abbreviations ii
1.0 Introduction 1
1.1 Purpose and Objectives 1
1.2 Regulatory Setting 1
1.3 Background and Consultation History 2
2.0 Description of the Proposed Action and Action Area 3
2.1 Description of the Proposed Action 3
2.2 Avoidance, Minimization, and Conservation Measures 7
2.3 Description of the Action Area 8
3.0 Designated Essential Fish Habitat in the Action Area 9
3.1 Bottomfish EFH 11
3.2 Pelagics EFH 11
3.3 Crustacean EFH 11
4.0 Effects of the Proposed Action 13
4.1 Direct Physical Contact/Damage 14
4.2 Introduction of Chemicals or Debris 15
4.3 Increase in Turbidity 17
5.0 Conclusions 21
6.0 Literature Cited 23
7.0 List of Preparers 25

Figures

Figure 1. JFC Launch Vehicle 3
Figure 2. Proposed JFC PMRF Stage 1 Booster Drop Zone 5
Figure 3. Proposed JFC Activity Locations for PMRF-Launched Flight Tests 6

Tables

Table 1. Launch Vehicle Characteristics 4
Table 2. Payload System Characteristics 4
Table 3. Ocean Depths within the Action Area 8
Table 4. Essential Fish Habitat in the Action Area 10
Table 5. Potential Stressors Resulting from Proposed JFC Activities in the Action Area 13

Acronyms and Abbreviations

BOA	Broad Ocean Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DON	Department of the Navy
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
ft	Feet
ft^2	Square Feet
JFC	Joint Flight Campaign
km	Kilometer(s)
km^2	Square Kilometer(s)
m	Meter(s)
m^2	Square Meter(s)
mi^2	Square Mile(s)
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MUS	Management Unit Species
nm	Nautical Mile(s)
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OEA	Overseas Environmental Assessment
PIRO	Pacific Islands Regional Office
PMRF	Pacific Missile Range Facility
RCCTO	U.S. Army Rapid Capabilities and Critical Technologies Office
SSP	Strategic Systems Programs
U.S.	United States
USASMDC	United States Army Space and Missile Defense Command
U.S.C.	United States Code
USEPA	United States Environmental Protection Agency
WPRFMC	Western Pacific Regional Fishery Management Council

1.0 Introduction

1.1 Purpose and Objectives

The purpose of this Essential Fish Habitat (EFH) Assessment is to evaluate the potential effects of proposed Joint Flight Campaign (JFC) activities (Proposed Action) within United States (U.S.) Exclusive Economic Zone (EEZ) waters of Hawai‘i on designated EFH. The JFC program is a joint campaign of the United States Department of the Navy (DON) Strategic Systems Programs (SSP) and the U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO), the Action Proponents. This EFH Assessment has been prepared by the Navy SSP and U.S. Army RCCTO with the assistance of the U.S. Army Space and Missile Defense Command (USASMDC) in accordance with requirements of 50 Code of Federal Regulations (CFR) § 600.920(e). This EFH Assessment contains analysis and information required for consultation with the National Marine Fisheries Service (NMFS) under Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA).

The JFC Proposed Action involves up to six flight test launches per year, over the next 10 years, from multiple launch locations. After launch, tests would include vehicle flight over the Pacific and/or Atlantic Oceans and would involve splashdown of spent boosters as well as payload impact in Pacific and Atlantic broad ocean areas (BOA). Within the Hawaiian EEZ, JFC activities would include vehicle overflight, stage 1 booster splashdown, and potential vessel and aircraft operations. All flight tests with the potential for activities within the Hawaiian EEZ would involve vehicle launch from the Pacific Missile Range Facility (PMRF), Kaua‘i, Hawai‘i.

This EFH Assessment describes proposed JFC supplemental activities for the purposes of evaluating the potential effects of the Proposed Action on EFH within the Hawaiian U.S. EEZ. A summary of relevant background information and consultation history for the JFC action is included in **Section 1.3**, *Background and Consultation History*.

1.2 Regulatory Setting

This EFH Assessment addresses the potential effects of Proposed Action activities on EFH in compliance with Section 305(b)(2) of the MSA and National Oceanic and Atmospheric Administration (NOAA) Procedure 03-201-11, *Guide to EFH Consultations*.

Magnuson-Stevens Fishery Conservation and Management Act (MSA). The MSA (16 United States Code [U.S.C.] § 1801 et seq.) provides for the conservation and management of marine fisheries in U.S. waters. Under the MSA, EFH consists of the waters and substrate needed by fish to spawn, breed, feed, or grow to maturity. EFH may include U.S. waters within the EEZ (seaward boundary out to a distance of 370 kilometers [km] or 200 nautical miles [nm]) and covers all fish species within a fishery management unit (50 CFR § 600.805). Under the MSA, an adverse effect means any impact that reduces quality and/or quantity of EFH (50 CFR § 600.810). Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species

and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH (50 CFR § 600.810). EFH and its geographic boundaries are defined by regional fisheries management councils. Federal agencies must evaluate the effects of an action on EFH and must consult with NMFS on actions that may adversely affect EFH (50 CFR § 600.920).

1.3 Background and Consultation History

USASMDC, on behalf of the Action Proponents, coordinated with NMFS regarding the potential effects of the Proposed Action on EFH in a series of communications including the following:

- On 22 August 2023, USASMDC transmitted the Coordinating Draft Supplemental Environmental Assessment (EA)/Overseas Environmental Assessment (OEA) to NMFS with a request for review and comment. The JFC Supplemental EA/OEA briefly described EFH in the areas where proposed activities would occur, evaluated the potential effects of the Proposed Action on EFH, and stated conclusions regarding EFH impacts. In the EA/OEA, the Action Proponents concluded that "[g]iven the limited size and characteristics of components and the time between tests, direct contact and hazardous chemicals from the stage 1 boosters would not significantly reduce the quality and/or quantity of EFH" and that "[n]o impacts to EFH are expected as a result of the JFC Action."

- On 21 September 2023, the NMFS, Pacific Islands Regional Office (PIRO), Habitat Conservation Division sent a response to USASMDC with their concerns that "[t]he splash downs of rocket booster stages may result in adverse effects to EFH from physical damage to the benthos, including coral reef ecosystems <700m deep in the EEZ from sinking debris. Chemical contamination of the water column up to 1000m and benthos <700 m may result from unburned […] propellant residue, batteries, and petroleum from recovery vessels." NMFS did not agree with the Action Proponents' conclusion that JFC activities would not have adverse impacts to EFH and stated that "[a]lthough adverse impacts may be considered negligible, the SSP and RCCTO are still required to consult with NMFS PIRO Habitat Conservation Division regarding the potential splash downs of boosters from rocket launches at PMRF."

- On 2 October 2023, USASMDC responded to NMFS that they planned to consult with NMFS on the potential effects of the Proposed Action on EFH in the Hawaiian EEZ on behalf of the Action Proponents and that they would prepare an EFH assessment.

2.0 Description of the Proposed Action and Action Area

2.1 Description of the Proposed Action

The Proposed Action (JFC supplemental activities) would consist of up to six flight tests per year over 10 years, designed to prove various aspects of the JFC system's capabilities. The Proposed Action would entail ground preparations for the test, vehicle launch and flight, impact of the payload in the BOA, and post launch operations. The JFC launch vehicle, also known as an all-up-round missile, would consist of a two-stage booster system and a payload (**Figure 1**). The JFC vehicle would be approximately 1 meter (m; 3 feet [ft]) in diameter and 10 meters (m) (30 feet [ft]) in length. The first stage would be up to approximately 6 m (18 ft) long. The first and second stages would include a total of up to approximately 9,000 kilograms (20,000 pounds) of rocket propellant. Characteristics of the launch vehicle are presented in **Table 1**. The payload system characteristics are presented in **Table 2**.

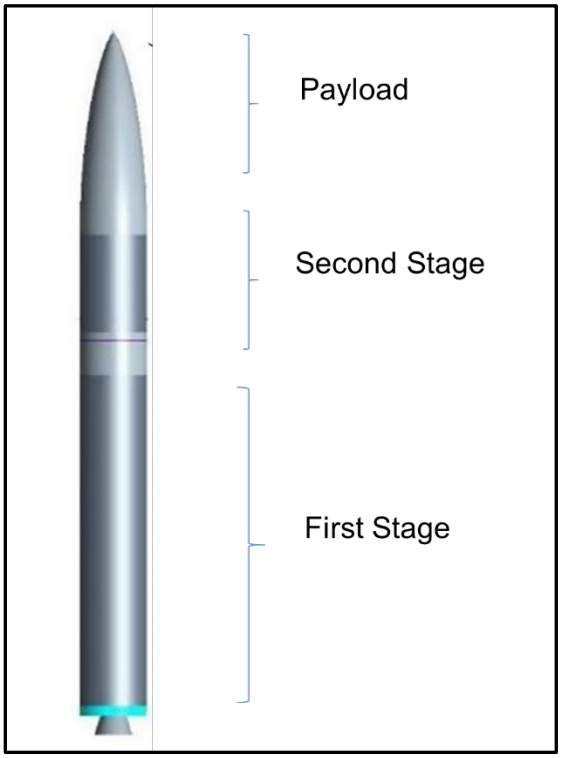


Figure 1. JFC Launch Vehicle

All Proposed Action launches would occur from existing launch facilities at up to four installations/facilities in the continental United States and Hawai'i. Launch activities would occur in compliance with the procedures for ongoing launch operations at the host installations/facilities. In Hawai'i, vehicle launches would take place at two launch sites at PMRF on the western side of Kaua'i. Flight tests utilizing launch sites at PMRF would be a subset of the up to six flight tests per year. While the exact number of flight tests per year with launch at PMRF is not known at this time it is likely that only one to three JFC launches would occur there per year with no more than six per year.

Within the Hawaiian EEZ, JFC activities would include the vehicle overflight at a high altitude, stage 1 booster splashdown, and potential vessel and aircraft operations for sensor coverage.

Table 1. Launch Vehicle Characteristics

Major Components	Rocket motors, propellant, magnesium thorium, nitrogen gas, halon, asbestos, battery electrolytes (lithium-ion, silver zinc)
Communications	Various 5- to 20-watt radio frequency transmitters; one maximum 400-watt radio frequency pulse
Power	Up to nine lithium ion polymer and silver zinc batteries, each weighing between 1.3 and 18 kilograms (3 and 40 pounds)
Propulsion/Propellant	Rocket propellant and approximately 1.3 kilograms (3 pounds) of pressurized nitrogen gas
Other	Small Class C (1.4) electro-explosive devices for flight termination

Table 2. Payload System Characteristics

Structure	Aluminum, steel, titanium, magnesium and other alloys, copper, fiberglass, chromate coated hardware, tungsten, plastic, Teflon, quartz, room temperature vulcanizing silicone
Communications	Two up-to 20-watt radio frequency transmitters
Power	Up to three lithium ion polymer batteries, each weighing between 1 and 23 kilograms (2 and 50 pounds)
Propulsion	None
Other	Class C (1.4) electro-explosive devices for safety and payload system subsystems operations

Flight Test

Flight test activities after launch would include vehicle flight and impact of the payload in the BOA. Following first-stage motor ignition and liftoff from the launch location, the first-stage motor would burn out downrange and separate from the second stage with the inter-stage assembly also being jettisoned. These components would splash down in the stage 1 booster drop zones (**Figure 2**). The second stage and payload would continue flight toward predesignated sites in the BOA that are beyond the U.S. EEZ. Splashdown of the second-stage motor, payload adaptor, and payload would occur at different points in the open ocean within the areas referred to as the stage 2 booster drop/payload impact zones (**Figure 3**).

If the launch vehicle were to deviate from its course or should other problems occur during flight that might jeopardize public safety, the onboard flight termination system would be activated. This action would initiate a predetermined safe mode for the vehicle, causing it to fall towards the ocean and terminate flight. The flight termination system would be designed to prevent debris from falling into any inhabited land area or marine protected area.

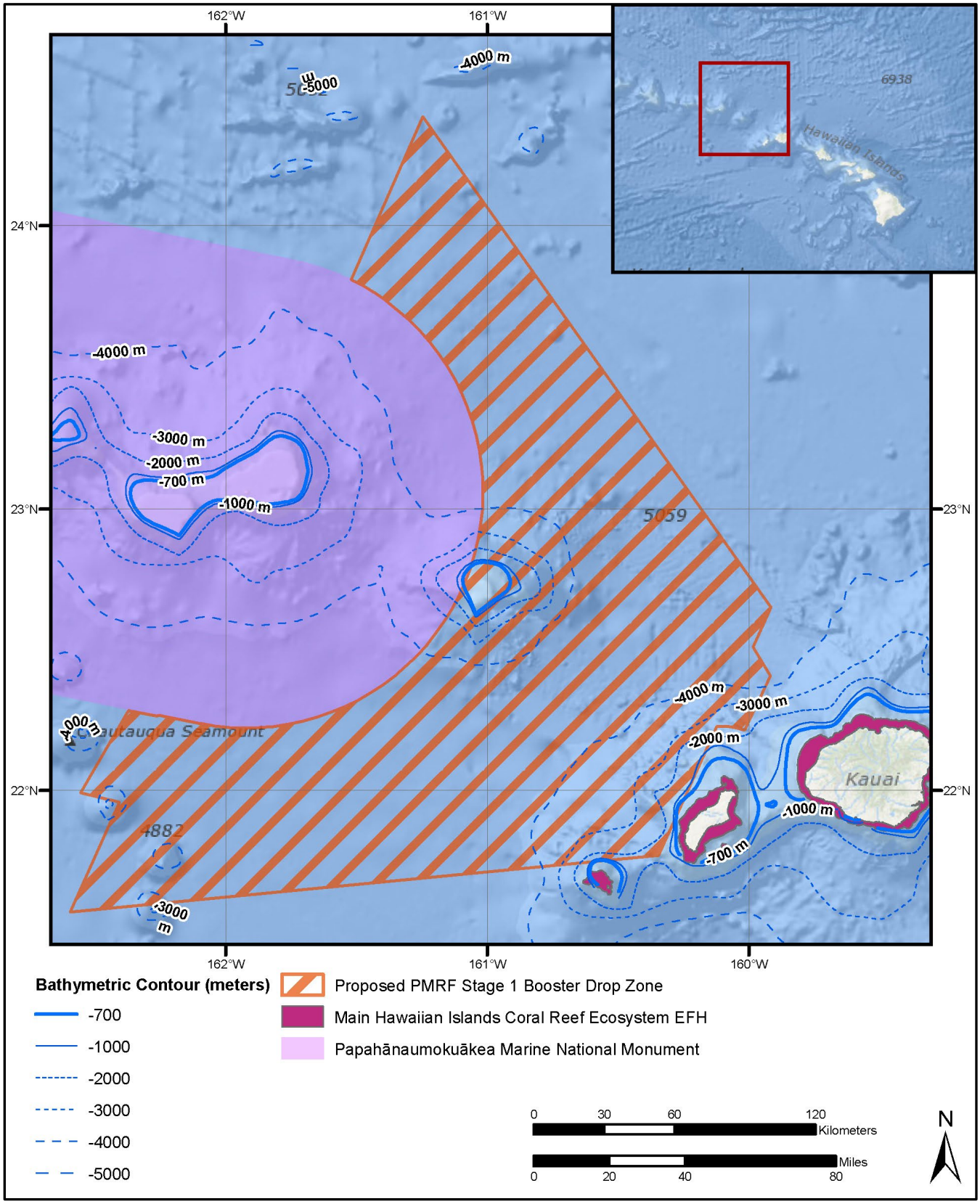


Figure 2. Proposed JFC PMRF Stage 1 Booster Drop Zone

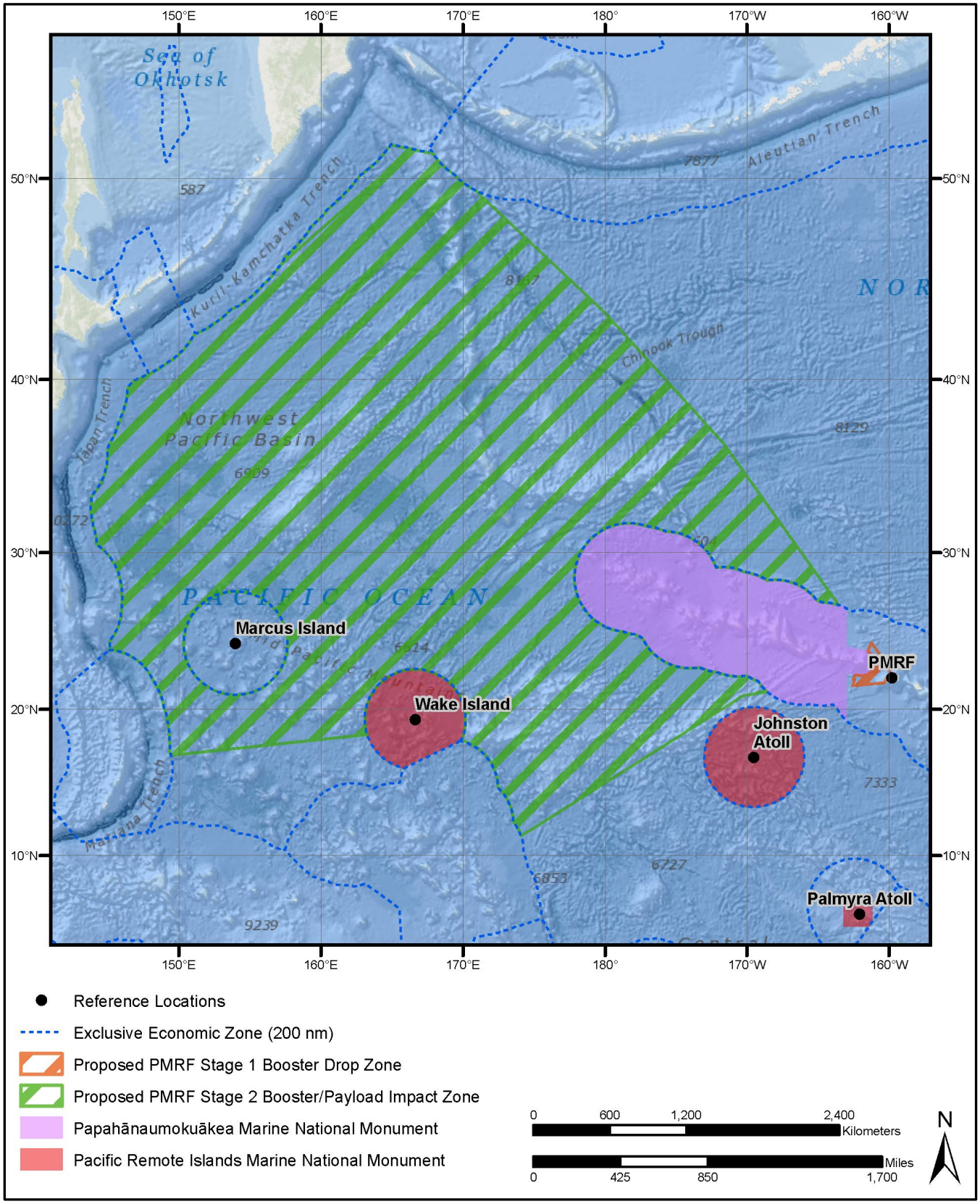


Figure 3. Proposed JFC Activity Locations for PMRF-Launched Flight Tests

The flight path would be monitored by a series of sensors with overlapping coverage of the flight from launch until payload impact in the BOA. All sensors are part of existing programs, would be utilized under the operating procedures for those programs, and would be scheduled for use based on availability. The sensors would include the following:

- Existing ground-based optics, telemetry, and radars.
- Sea based sensors include ship-based mobile instrumentation. In addition, ship-based unmanned aerial vehicles and drones may be used for telemetry, video, and surveillance.
- Existing sensors on board military or commercial aircraft.
- Safety Relay aircraft may be used as additional range safety support "off-axis" to ensure public safety. Takeoff and landing operations would occur as a part of ongoing operations for existing programs.

Most test support vessels would operate at the terminal end of the flight path within the stage 2 booster drop and payload impact zone; however, some vessel traffic may occur within the stage 1 booster drop zone. The specific vessels to be used may vary based on availability and flight test requirements. The largest vessels which may be used to meet all mission requirements would be 91 m (300 ft) in length with a 6 m (20 ft) draft. Vessels used for test support are typically open ocean resupply vessels with large, open decks for mission equipment. Typical vessel transit speeds would be between 8 and 12 knots. Proposed activities would not involve any vessel anchoring.

Post-Test Operations

For the BOA drop zones, the proposed component impact would occur in deep ocean waters. Test components are expected to sink after splashdown or impact and no residual debris is expected. The BOA areas are too deep to allow safe recovery of any hardware that might survive the impact with the water and still have sufficient mass to sink. Visible debris still on the surface of the water would be recovered and removed as much as practicable.

2.2 Avoidance, Minimization, and Conservation Measures

The following avoidance and minimization measures would be implemented as part of project activities to minimize the potential effects of the Proposed Action on marine resources, including managed fish and invertebrate species EFH:

- Vessel and equipment operations would not involve any intentional discharges of fuel, toxic wastes, or plastics and other solid wastes that could harm marine life or habitats.
- Any accidental spills from support equipment operations would be contained and cleaned up. Spill response kits would be available on all support equipment.
- Vessel operations would only occur when weather and sea conditions are acceptable for safe travel.

2.3 Description of the Action Area

The Action Area for this assessment includes the PMRF Stage 1 booster drop zone within the Hawaiian EEZ where the vehicle would fly over the Pacific Ocean and where the spent first stage of the vehicle would splash down (**Figure 2**), and any Hawaiian EEZ areas where project-related vessels would operate.

The Action Area is composed mostly of deep ocean waters and the airspace above those waters. The PMRF stage 1 booster drop zone is approximately 39,200 square kilometers (km^2; 15,100 square miles [mi^2]) in area. The Action Area includes a diversity of pelagic and benthic habitats which support diverse marine communities. Water depths in the PMRF stage 1 booster drop zone are between 60 and 4,900 m (200 and 16,100 ft) deep (**Table 3**, **Figure 2**). Less than 1% of the drop zone contains waters 700 m (2,300 ft) or less in depth and over 90% of the drop zone has ocean depth greater than 3,000 m (9,800 ft) (**Table 3**). Specific information about the substrate within the booster drop zone is unknown but is likely a diverse mix of hard and soft substrates depending on localized depth and geology. The stage 1 booster drop zone occurs entirely within the U.S. EEZ (out to 370 km [200 nautical miles] from the territorial sea baseline).

Table 3. Ocean Depths within the Action Area

Depth Range	Area	Percent of Drop Zone
<700 m	289 km^2	0.7%
700 to 1,000 m	120 km^2	0.3%
1,000 to 2,000 m	766 km^2	2.0%
2,000 to 3,000 m	1,523 km^2	3.9%
3,000 to 4,000 m	3,988 km^2	10.2%
4,000 to 5,000 m	32,530 km^2	83.0%
Total	**39,216 km^2**	

Abbreviations: km^2 = square kilometers, m = meters

3.0 Designated Essential Fish Habitat in the Action Area

EFH is defined as those waters and substrate necessary for federally managed species to spawn, breed, feed, and/or grow to maturity (NOAA 2023a). EFH and its geographic boundaries within the Hawaiian EEZ have been designated by the Western Pacific Regional Fishery Management Council (WPRFMC) under the MSA. WPRFMC developed EFH designations for Management Unit Species (MUS) including Bottomfish and Seamount Groundfish, Crustaceans, and Precious Corals as well as for Coral Reef Ecosystem MUS (WPRFMC 2009a, NOAA 2023a). The current EFH designations for MUS in the Hawaiian Islands EEZ are summarized in **Table 4** (NOAA 2023a, NMFS 2023). EFH for these species' management units is discussed in detail by WPRFMC in the Fishery Ecosystem Plans and amendments for the Hawai'i Archipelago (WPRFMC 2009a) and Pacific Pelagic Fisheries of the Western Pacific (WPRFMC 2009b, WPRFMC 2023).

The marine water column from the surface to a depth of 1,000 m (3,280 ft) from the shoreline to the outer boundary of the EEZ, and the seafloor from the shoreline out to a depth of 700 m (2,300 ft) around each of the Hawaiian Islands, have been designated as EFH as detailed in **Table 4**. As such, the water column from the surface to a depth of 1,000 m (3,280 ft) within the entire stage 1 booster drop zone is designated EFH (**Table 4**). The MUS and life stages found in these water column habitats include eggs and larvae of Bottomfish MUS; all life stages of Pelagic MUS; and eggs and larvae of the lobster and crab Crustacean MUS. The water column and benthic habitats out to 400 m (1,310 ft) depth are EFH for juvenile and adult bottomfish MUS; however, this EFH only occurs in approximately 180 km^2 (70 mi^2) or 0.5% of the stage 1 booster drop zone. For the small portion of the stage 1 booster drop zone in waters 300 to 700 m (980 to 2,300 ft) deep, benthic habitats are also designated EFH for Crustacean MUS. Up to approximately 0.3% or 130 km^2 (50 mi^2) of the stage 1 booster drop zone contains this benthic EFH (**Table 4**). The MUS and life stages found in this benthic EFH include all life stages of deepwater shrimp Crustacean MUS. The specific types of habitat considered as EFH in the action area are hard substrate, soft substrate, deep-slope terraces, and pelagic/open ocean.

No designated EFH for seamount groundfish, precious corals, or coral reef ecosystem MUS occurs in the stage 1 booster drop zone. No designated Habitat Areas of Particular Concern within the EFH occur within the Action Area.

Table 4. Essential Fish Habitat in the Action Area

Management Unit Species Group	Life Stage(s)	EFH Designation	EFH Occurs in Action Area?	Approximate Area within Stage 1 Drop Zone	Approximate Proportion of Stage 1 Drop Zone
Bottomfish	Eggs	The water column down to 700 m depth, extending from the shoreline to 50 nm from the official U.S. baseline	Yes	14,800 km^2	38%
	Larvae	The water column down to 700 m depth, extending from the shoreline to the outer EEZ boundary	Yes	39,200 km^2	100%
	Juveniles/Adults	The water column and all bottom from the shoreline down to 400 m depth	Yes	180 km^2	0.5%
Seamount Groundfish	Eggs/Larvae	Water column down to 200 m depth for all EEZ waters north of 28° and west of 180°	No	-	-
	Juveniles/Adults	Water column and bottom from 120 m depth to 600 m depth for all EEZ waters north of 28° and west of 180°	No	-	-
Pelagics	Eggs/Larvae	Water column down to 200 m depth from the shoreline to the outer EEZ boundary	Yes	39,200 km^2	100%
	Juvenile/Adult	Water column down to 1,000 m depth from the shoreline out to the outer EEZ boundary	Yes	39,200 km^2	100%
Precious Corals	All	Known precious coral beds in the Hawaiian Islands located at Keahole Point, between Milolii and South Point, the Auau Channel, Makapuu, Kaena Point, the southern border of Kauai, Wespac Bed, Brooks Bank Bed, and 180 Fathom Bank	No	-	-
Coral Reef Ecosystem	All	Water column and all bottom down to 100 m depth from shoreline out to EEZ boundary.	No	-	-
Crustaceans: Lobsters/Crabs	Eggs/Larvae	The water column down to 150 m depth from the shoreline to the outer EEZ boundary	Yes	39,200 km^2	100%
	Juveniles/Adults	All bottom habitat from the shoreline down to 100 m depth	No	-	-
Crustaceans: Deepwater shrimp	Eggs/Larvae	The outer reef slopes between 550 and 700 m depth	Yes	60 km^2	0.2%
	Juveniles/Adults	The outer reef slopes between 300 and 700 m depth	Yes	130 km^2	0.3%

Sources: NOAA 2023a, NMFS 2023
Abbreviations: EEZ = Exclusive Economic Zone, EFH = Essential Fish Habitat, km^2 = square kilometers, m = meters, nm = nautical miles, "-" = does not occur in the Action Area

3.1 Bottomfish EFH

As described in detail in the WPRFMC Hawaiian archipelago fishery management plan and amendments, the distribution of adult bottomfish in the Western Pacific Region is closely linked to suitable physical habitat (WPRFMC 2009a). EFH designations for bottomfish were based on the ecological relationships among species and their preferred habitats (WPRFMC 2009a). Adult bottomfish are usually found in habitats characterized by a hard substrate of high structural complexity such as steep drop-offs and high-relief habitat (WPRFMC 2009a). EFH for juvenile and adult bottomfish includes the water column and benthos within the 400 m (1,310 ft) depth range (WPRFMC 2016). Eggs and larvae of bottomfish are pelagic, float at the surface until hatching, and are subject to prevailing ocean currents (WPRFMC 2009a). Since eggs and larvae are pelagic, EFH for these stages is only within the water column and is based on likely spawning locations for bottomfish MUS (WPRFMC 2016).

3.2 Pelagics EFH

The Pelagic MUS are by definition pelagic, being found in tropical and temperate waters throughout the Pacific Ocean (WPRFMC 2009b). EFH for Pelagic MUS is based on the preferred habitat of these species (WPRFMC 2009b) which often hinges on the availability of prey. The vertically migrating mesopelagic fishes and squids are important prey organisms for Pelagic MUS and are seldom abundant below 1,000 m (3,280 ft) (WPRFMC 2009b). Based on the best information on life histories and habitat utilization patterns, the designated EFH for juvenile and adult Pelagic MUS is the water column from the surface down to a depth of 1,000 m (3,280 ft) throughout the Hawaiian EEZ. EFH for eggs and larvae also consists of the water column but is confined to the epipelagic zone from the surface to approximately 200 m (660 ft) depth (WPRFMC 2009b).

3.3 Crustacean EFH

As described in detail in the WPRFMC Hawaiian archipelago fishery management plan and amendments, adult and juvenile MUS lobsters and crabs are typically found in association with coral reefs and EFH for this life stage does not occur in the Action Area. Eggs and larvae of lobster and crab MUS are planktonic and found mostly near the surface (WPRFMC 2009a). Therefore, EFH for these life stages is found within the water column from the surface down to 150 m (490 ft) depth (NOAA 2023a).

Deepwater shrimp are generally found at depths of 200 to 1,200 m (660 to 3,940 ft) on the outer reef slopes and deepwater banks (WPRFMC 2009a). The EFH for deepwater shrimp consists of benthic habitats of outer reef slopes between 300 and 700 m (980 and 2,300 ft) (**Table 4**) (NOAA 2023a).

This page intentionally left blank

4.0 Effects of the Proposed Action

The Proposed Action has the potential to directly or indirectly affect EFH through physical damage to habitat structure or other ecosystem components, increased turbidity, and exposure to hazardous chemicals. The assumptions relevant to the potential stressors and the EFH types the stressors may occur in are summarized in **Table 5** and described in this section. Following a description of the stressors, this section includes an evaluation of the effects of the Proposed Action on EFH.

In this section, adverse effects are defined as direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH as in 50 CFR § 600.810. Furthermore, a negligible or insignificant effect is defined here as an effect which would have undetectable or unmeasurable effects on the quantity or quality of EFH. A discountable effect is defined as an effect that is extremely unlikely to occur or not expected to occur. As defined by NMFS (NMFS 2023) short-term effects are those which would last less than 2 years, long-term effects would last 2 years to the life of the project (10 years), and permanent effects would last longer than the life of the project.

Table 5. Potential Stressors Resulting from Proposed JFC Activities in the Action Area

Stressor	Description of Stressor	Potential Effects to Pelagic/Water Column EFH	Potential Effects to Benthic EFH
Direct Physical Contact/ Damage	One spent booster stage per flight test would splash down into the ocean and sink to the ocean floor. Approximate dimensions: up to 6 m long x 1 m diameter; maximum footprint 6 m^2. Maximum six booster splashdowns per year over 10 years.	Potential for short-term direct biological alterations of waters due to loss of prey species in water column.	Potential for short-term to long-term physical alterations of benthic habitat structure in less than 1% of the Action Area.
Introduction of Chemicals or Debris	Introduction of launch vehicle materials into ocean waters, including rocket motors, trace amounts of unused propellant, battery electrolytes, and heavy metals. Components and materials expected to sink to the bottom or rapidly dilute. Maximum six booster splashdowns per year over 10 years.	Potential for short-term chemical alterations of water.	Potential for short-term to long-term chemical alterations of the substrate.
Increased Turbidity	There may be a temporary increase in turbidity as spent stage 1 boosters settle to the ocean bottom. Potential increases in turbidity would only be expected if booster settlement occurred in the 1% of the Action Area where water depths are 1,000 m or less.	Potential short-term increase in turbidity, only in EFH locations where water depths are 1,000 m or less (1% of Action Area).	Potential short-term, localized alteration of benthic habitats due to sedimentation.

Abbreviations: m = meter(s), m^2 = square meters, % = percent

4.1 Direct Physical Contact/Damage

Sources of Direct Physical Contact/Damage

The Proposed Action would result in spent stage 1 booster splashdown in the PMRF stage 1 booster drop zone. During a flight test, a falling booster would enter marine habitats and have the potential to directly contact marine organisms and benthic habitats. Based on the dimensions of the stage 1 booster, there would be a maximum direct contact/damage area of up to 6 square meters (m^2; 60 square feet [ft^2]) for a single test. The JFC program would include up to six tests per year over 10 years. These tests could take place from several installations, including PMRF, and it is not known at this time how many tests would occur annually from PMRF. Therefore, for analysis purposes it is assumed that all tests could be from PMRF as a conservative approach for estimating the potential effects to EFH. Even assuming a maximum of six stage 1 booster splashdowns per year, there would be a maximum direct contact/damage area of approximately 36 m^2 (360 ft^2) per year.

Effects of Direct Physical Contact/Damage on EFH

Pelagic EFH. Sinking components have the potential to affect pelagic EFH if they damage EFH components. The only potential for damage of EFH components in the water column would be loss of prey resources if the sinking booster killed prey species. After splashdown, the stage 1 booster is expected to sink through the water column where the drag force of the surrounding ocean waters would slow the descent of the booster. Even if some prey resources in the water column were lost, any loss would be expected to be extremely small given the small size and number of test components entering the EFH and would be undetectable. Any potential biological alterations would be extremely short-term. Any effects to water column EFH would be insignificant and would not result in measurable or detectable changes in quantity or quality of designated water column EFH for any MUS.

Benthic EFH. After sinking through the water column, the stage 1 boosters would settle on the ocean floor. When a stage 1 booster settles on the ocean floor it has the potential to affect the physical structure of benthic habitat as well as prey resources which might occur on the bottom. Any potential effects on the physical structure of benthic habitats would be short-term to long-term and would be limited to the booster footprint (6 m^2 [60 ft^2]). Except for the small footprint of the booster on the ocean floor, no other physical damage to benthic habitat is expected as the velocity of the descending booster would be slowed by the drag forces of the ocean waters. The settling stage 1 booster may injure or kill a small number of individual prey but would not change the relative abundance or availability of any prey resources in benthic EFH. Proposed Action effects to prey species relative abundance and distribution as well as effects on local physical habitat would likely be nonexistent to extremely small and unmeasurable. This conclusion is supported by evidence from studies of military bombing ranges which provide evidence that even in shallow-water habitats, only minor physical disturbances were observed and no significant adverse long-term impacts to algae, corals, macroscopic benthic invertebrates, or fishes were detected that could be attributed to military testing (Smith and Marx 2016).

It is important to note that these effects would only be realized if a stage 1 booster settled in designated benthic EFH, which is very unlikely. Only 0.7% of the seafloor within the Action Area is designated benthic EFH and all of these benthic EFH areas are on the margins of the Action Area (**Figure 2**). Even assuming equal probability of a booster impacting anywhere in the stage 1 booster drop zone and assuming six tests with booster splashdown in the Action Area in a year, the probability of at least one booster settling within benthic EFH is only 0.041 or 4.1% per year. The booster drop zones are delineated by incorporating a margin of error for potential stage splashdown; therefore, the chances of a booster descending into benthic EFH would be substantially less than this estimate.

Overall, it is considered discountable that a booster would settle within designated benthic EFH. Even if a booster did settle into benthic EFH, the physical effects on EFH quantity or quality would be temporary and negligible.

4.2 Introduction of Chemicals or Debris

Sources of Hazardous Materials

Any substances of which a spent booster is constructed or that are contained in the stage and not consumed during flight or jettison (**Table 1**) would fall into marine habitats. **Table 1** includes materials for both stage 1 and stage 2 boosters. It is assumed that up to approximately 5,000 kilograms (11,000 pounds) of rocket propellant would be used on the stage 1 booster. The remaining propellant would be contained in the stage 2 booster and would not enter the Action Area. Since information for specific materials and quantities in only the stage 1 booster is not available for most other constituents, it is assumed all components could occur within the stage 1 booster for these analyses. The principal source of potential impacts on water and sediment quality would be unburned rocket propellant residue and batteries.

The rocket motor boosters would completely expend onboard propellant before dropping into the ocean. Rocket propellant normally contains 50 to 85% ammonium perchlorate by weight and 5 to 22% aluminum powder, a fuel additive (DON 2018). Based on U.S. Environmental Protection Agency (USEPA) and other studies evaluating munitions constituents at military sites where explosives and propellants have been used, the USEPA concluded that perchlorate was generally not detected at test ranges and that perchlorate is so soluble in water that surface accumulation (on land) does not occur (DON 2018). Studies have concluded that the motors used in rockets and missiles are highly efficient, consuming over 99% of the rocket propellant perchlorate during use (DON 2018). It is expected that only trace amounts, likely at undetectable levels, of propellant would remain in a booster when it splashes down into the ocean (DON 2018).

Substances carried on or of which the boosters are composed which are listed as hazardous materials under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (40 CFR § 302.4) include nitrogen gas, asbestos, lithium, silver, and zinc (**Table 2**). The nitrogen gas is expected to be primarily used or expelled prior to splashdown, thus the gas contained in the boosters would be below the CERCLA reportable quantity of greater than 4.5

kilograms (10 pounds) at splashdown. The amount of asbestos on the vehicle is unknown at this time, but it would be within the structure of the second stage. Lithium would be contained within batteries on the vehicle stages. The exact amount of lithium which would be contained within the stage 1 batteries is not available. However, if it is assumed that all lithium batteries on the boosters (up to nine) would be the maximum size (18 kilograms or 40 pounds) and that they would contain an average amount of lithium for these types of batteries (Pagliaro and Meneguzzo 2019), a maximum quantity of lithium on the boosters would be 2.2 kilograms (4.9 pounds). CERCLA reportable quantities of lithium are greater than 4.5 kilograms (10 pounds); therefore, lithium on the booster would not exceed reportable quantities. The metals listed as hazardous materials under CERCLA which would be part of the vehicle have reportable quantities of 454 kilograms (1,000 pounds) (for silver and zinc). Quantities of these metals in the stage 1 booster are not expected to exceed CERCLA reportable quantities.

De minimus residual quantities of some hazardous materials may remain on the boosters and fairings (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 2018). Residual materials would slowly dissolve, and substances would be redistributed and diluted by physical ocean mixing and diffusion (DON 2018). 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 sites, studies have revealed low concentrations of metals, generally below minimum detection limits (DON 2018). Expected metal concentrations at Action Area sites where the stage 1 boosters enter the ocean would be expected to be significantly lower than at active bombing ranges given the size of the drop zone and likely low quantity and sparse distribution of test components. Therefore, metals would likely be undetectable in surrounding sea water and sediments.

Limited vessel operations may occur within the Action Area; however, vessel and equipment operations would not involve any intentional discharges of fuel, toxic wastes, or plastics and other solid wastes that could harm marine life or habitats. Standard spill response kits and procedures would be in place for all vessel operations and no chemical effects are expected due to vessel operations.

Overall, the area potentially affected by the dissolution of chemicals would be relatively small because of the size of stage 1 booster components and the minimal amount of residual hazardous materials they would contain. Any chemicals introduced to the water column would be quickly diluted and dispersed by wave action, ocean currents, and the large volume of water. Based on past studies of military test ranges, chemicals of concern would likely be undetectable in ocean waters and sediments of the Action Area.

Effects of Hazardous Materials

Hazardous materials would have insignificant or discountable effects on designated EFH in the Action Area.

Pelagic EFH. Chemical alterations of the water due to material in sinking or sunk spent boosters have the potential to affect pelagic EFH if they are found in concentrations high enough to damage EFH components. Test debris would sink to the ocean bottom where it would not have any potentially longer-term effects on water column EFH unless a booster settled in the 1% of the booster drop zone where waters are 1,000 m (3,280 ft) deep or less. The only potential for damage of EFH components in the water column would be very short-term loss of prey resources if chemicals were found in concentrations high enough to kill prey species. As described above, for all chemicals and materials which would be found in the booster, it is not expected that chemicals would be found in concentrations which would harm marine life or habitats. Based on past studies of military test ranges, hazardous chemicals would likely be undetectable in ocean waters of the Action Area, especially given the relatively small number of spent boosters which might be introduced into the area and their likely sparse distribution. Even if some prey resources in the water column were lost, any loss would be expected to be extremely small and would be undetectable. Any potential chemical or biological alterations would be extremely short-term as chemicals would disperse and dilute quickly given the large volume of sea water and prevailing ocean currents. Any effects to water column EFH would be insignificant and would not result in measurable or detectable changes in quantity or quality of designated water column EFH for any MUS.

Benthic EFH. Chemical alterations of sediments due to material leeching out of a sunk spent booster have the potential to effect benthic EFH if they are found in concentrations high enough to damage EFH components. Because hazardous chemicals might leech out of spent boosters for a number of years, potential chemical alternations might be short-term to long-term. As described in *Sources of Hazardous Materials* above, it is not expected that chemicals would be found in substrates in concentrations high enough to harm marine life or alter habitats. Based on past studies of military test ranges, hazardous chemicals would likely be undetectable in sediments of the Action Area long-term. In addition, as described in *Effects of Direct Physical Contact/Damage* above, the probability of a booster landing in a portion of the action area containing benthic EFH is so low as to be discountable. Given the low probability of a booster settling in benthic EFH and that chemicals are not expected to be found in concentrations high enough to alter benthic habitats, any chemical effects to EFH would be insignificant and would not result in measurable or detectable changes in the quantity or quality of benthic EFH for any MUS.

4.3 Increase in Turbidity

Sources of Turbidity

There may be a temporary increase in turbidity as a spent stage 1 booster settles to the ocean floor, disturbs bottom sediments, and resuspends those sediments. Suspended sediment concentrations may be influenced by local and site-specific conditions and may depend on sediment type, current, and the duration and depth of the sediment disturbance (NOAA 2023b). No information was available concerning the amount and duration of suspended sediment expected for settlement of this type of object on the seafloor. However, any increase in suspended sediments resulting from settlement of a stage 1 booster on the seafloor would likely

be minimal, localized, and very short term. Estimates of turbidity concentrations and persistence are available for activities such as pile driving and dredging (NOAA 2023b) which would, in general, have a longer duration of substrate disturbance and a larger disturbance footprint than proposed activities. While activities such as pile driving would be expected to result in higher turbidity concentrations and longer duration of elevated turbidity than settling of a booster, turbidity data for pile driving is used here as a worst-case comparison for potential turbidity resulting from proposed activities. For sediment disturbance activities such as pile driving or removal, minor suspended sediment increases only occur within a couple hundred meters of the activity, suspended sediment levels are below those shown to have adverse effects on fish and benthic communities, and levels are expected to return to ambient conditions within 24 to 48 hours (NOAA 2023b). Additionally, potential increases in water column turbidity due to the Proposed Action would only be expected if booster settlement occurred in the 1% of the Action Area where water depths are 1,000 m (3,280 ft) or less. Any increase in turbidity is expected to be very short-term, on the order of up to a couple of hours.

Effects of Turbidity

In general, increases in turbidity/suspended sediments have the potential to affect fish, invertebrates, primary producers, and benthic communities (NOAA 2023b). High suspended sediment levels can cause reductions in dissolved oxygen levels and can also decrease productivity by blocking sunlight or prey availability by obscuring prey (NOAA 2023b, USEPA 2023). The eggs and larvae of fish species seem to be the life stages most sensitive to suspended sediments and sediment deposition (NOAA 2023b). Studies of the effects of turbidity on fish indicate that concentrations of suspended solids can reach thousands of milligrams per liter before becoming toxic to fish (NOAA 2023b).

Pelagic EFH. Proposed Action increases in turbidity/suspended sediments have the potential to cause very short-term, localized effects on prey availability. Using turbidity levels associated with pile driving and removal activities (NOAA 2023b) as a worst-case comparison, increases in turbidity resulting from proposed activities would only occur within a couple hundred meters of the booster, would not be high enough to harm fish, and would return to ambient levels within a few hours (NOAA 2023b). Given sea floor depths in the Action Area, no impact to primary productivity due to light availability or to dissolved oxygen concentrations are expected. As described in the fishery management plans for Bottomfish and Pelagics MUS, the pelagic egg and larval stages of these fish occur primarily in the epipelagic zone and are unlikely to be exposed to elevated turbidity. Therefore, effects on water column EFH would be insignificant and would not change the quality or quantity of water column EFH.

Benthic EFH. Turbidity and sedimentation due to settling of boosters on the ocean floor have the potential to affect benthic EFH. Adverse effects on benthic communities have been shown to occur when suspended sediments exceed 390 milligrams per liter (NOAA 2023b). Adverse effects on benthic communities may occur due to temporary impacts on the availability of prey species within direct impact areas, but impacted areas are generally recolonized within a short period of time (NOAA 2023b). As described in *Sources of Turbidity*, no estimates of turbidity concentration or persistence are available for an activity such as a booster settling onto the

ocean bottom. Since estimates are available for activities such as pile driving, expected turbidity levels for pile driving are used as a worst-case comparison for potential turbidity resulting from proposed activities. Using turbidity levels associated with pile driving and removal activities (5 to 10 milligrams per liter increase within 91 m [300 ft] of activities) (NOAA 2023b) as a worst-case comparison for proposed activities, increases in turbidity resulting from booster settlement would only occur within a couple hundred meters of a booster, would not be high enough to affect benthic communities, and would return to ambient levels within a few hours (NOAA 2023b). The effects of increases in turbidity and sedimentation due to proposed activities would be discountable and there would be no change to the quality or quantity of benthic EFH.

This page intentionally left blank

5.0 Conclusions

Based on the evaluation of all the potential effects of the Proposed Action on designated EFH, the Action Proponents have concluded that there would be no substantial adverse effects which would reduce the quantity or quality of EFH in the Action Area. All potential adverse effects of the Proposed Action on designated EFH would be insignificant or discountable, meaning that they would be undetectable, unmeasurable, or extremely unlikely to occur.

The following avoidance and minimization measures would be implemented as part of proposed activities to minimize the potential effects of the Proposed Action on marine resources, including managed fish and invertebrate species EFH:

- Vessel and equipment operations would not involve any intentional discharges of fuel, toxic wastes, or plastics and other solid wastes that could harm marine life or habitats.
- Any accidental spills from support equipment operations would be contained and cleaned up. Spill response kits would be available on all support equipment.
- Vessel operations would only occur when weather and sea conditions are acceptable for safe travel.

Since any adverse effects of the Proposed Action on EFH would be negligible modifications and would not reduce the quality or quantity of EFH, the Action Proponents have determined that no additional mitigation measures are warranted for proposed activities.

This page intentionally left blank

6.0 Literature Cited

DON (Department of the Navy). 2018. Hawaii-Southern California Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement. October 2018.

NMFS (National Marine Fisheries Service). 2023. National Marine Fisheries Service: Essential Fish Habitat Assessment Template. Template Version Draft 2. October 2023.

NOAA (National Oceanic and Atmospheric Administration).2023a. Consultations. Frequently Asked Questions: Essential Fish Habitat in the Pacific Islands. Available online at: <https://www.fisheries.noaa.gov/pacific-islands/consultations/frequently-asked-questions-essential-fish-habitat-pacific-islands>. Accessed October 2023.

NOAA. 2023b. Section 7 Effects Analysis: Turbidity in the Greater Atlantic Region. Available online at: <https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-effects-analysis-turbidity-greater-atlantic-region>. Accessed October 2023.

Pagliaro, M., and F. Meneguzzo. 2019. Lithium battery reusing and recycling: A circular economy insight. Heliyon 5:e01866.

Smith, S. H., and D. E. Marx, Jr. 2016. De-facto Marine Protection from a Navy Bombing Range: Farallon De Medinilla, Mariana Archipelago, 1097 to 2012. Marine Pollution Bulletin 102:187-198.

USEPA (United States Environmental Protection Agency). 2023. Sediments. From the Causal Analysis/Diagnosis Decision Information System (CADDIS), Learn About Stressors. Available online at: <https://www.epa.gov/caddis-vol2/sediments>. Accessed October 2023.

WPRFMC (Western Pacific Regional Fishery Management Council). 2009a. Fishery Ecosystem Plan for the Hawaii Archipelago. September 2009.

WPRFMC. 2009b. Fishery Ecosystem Plan for Pacific Pelagic Fisheries of the Western Pacific Region. September 2009.

WPRFMC. 2016. Amendment 4 to the Fishery Ecosystem Plan for the Hawaii Archipelago. January 2016.

WPRFMC. 2023. Hawaii Archipelago Fishery Ecosystem Plans. Available online at: <https://www.wpcouncil.org/fisheries/hawaii-archipelago/>. Accessed October 2023.

This page intentionally left blank

7.0 List of Preparers

Government Preparers

David Fuller, National Environmental Policy Act Program Manager
M.S., 1980, Biology, Pittsburg State University
B.S., 1978, Biology, Missouri Southern State University
Years of Experience: 43

Contractor Preparers

Karen Hoksbergen, Biologist, KFS, LLC
M.S., 2004, Biology, Northern Michigan University
B.S., 2001, Biology and Wildlife, University of Wisconsin Stevens Point
Years of Experience: 22

Amy McEniry, Technical Editor, KFS, LLC
B.S., 1988, Biology, University of Alabama in Huntsville
Years of Experience: 35

This page intentionally left blank