


Programmatic Environmental Assessment of Field Operations in the Pacific Islands National Marine Sanctuaries



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Cover Photo
A vibrant coral reef off Swains Island in National Marine Sanctuary of American Samoa.
Photo: Wendy Cover/National Marine Sanctuary of American Samoa





Table of Contents

Acknowledgments	iii
Introduction	vi
1.0 Purpose and Need	1
1.1 Purpose for the Action	1
1.2 Need for the Action	1
2.0 Description of Proposed Action and Alternatives	3
2.1 Alternative Considered But Not Analyzed in Further Detail	4
2.2 Alternative 1: No Action/Status Quo	4
2.2.1 <i>Field Operations at Hawaiian Islands Humpback Whale National Marine Sanctuary</i>	7
2.2.2 <i>Filed Operations at Papahānaumokuākea Marine National Monument</i>	13
2.2.3 <i>Field Operations at National Marine Sanctuary of American Samoa</i>	20
2.3 Alternative 2: Conduct Field Operations Without Voluntary and Precautionary Procedures for Vessel Operations	29
2.3.1 <i>Field Operations at Hawaiian Islands Humpback Whale National Marine Sanctuary</i>	29
2.3.2 <i>Filed Operations at Papahānaumokuākea Marine National Monument</i>	29
2.3.3 <i>Field Operations at National Marine Sanctuary of American Samoa</i>	29
3.0 Affected Environment	30
3.1 Hawaiian Islands Humpback Whale National Marine Sanctuary	31
3.1.1 Physical Environment	31
Physical Characteristics/Geology/Oceanography	31
Water and Air Quality	31
Acoustic Environment	31
3.1.2 Biological Environment	32
Habitat	32
Birds	32
Fish and Invertebrates	33
Protected Species	33
3.1.3 Socioeconomic Environment	34
Maritime Transportation/Traffic and Military Operations	34
Other Human Uses	35
Research and Education	36
3.1.4 Maritime Heritage and Cultural Environment	36
Maritime Heritage Resources	36
Cultural and Historic Resources	37
3.2 Papahānaumokuākea Marine National Monument	37
3.2.1 Physical Environment	37

	37
Physical Characteristics/Geology/Oceanography	37
Water and Air Quality	38
Acoustic Environment	38
3.2.2 Biological Environment	39
Habitat	39
Birds	39
Fish and Invertebrates	39
Protected Species	40
3.2.3 Socioeconomic Environment	41
Maritime Transportation/Traffic	41
Military Training and Testing	41
Other Human Uses	42
Research and Education	42
3.2.4 Maritime Heritage and Cultural Environment	42
Maritime Heritage Resources	42
Cultural and Historic Resources	43
3.3 National Marine Sanctuary of American Samoa	44
3.3.1 Physical Environment	44
Physical Characteristics/Geology/Oceanography	44
Water and Air Quality	44
Acoustic Environment	44
3.3.2 Biological Environment	45
Habitat	45
Birds	45
Fish and Invertebrates	46
Protected Species	46
3.3.3 Socioeconomic Environment	47
Maritime Transportation/Traffic and Military Operations	47
Other Human Uses	47
Research and Education	48
3.3.4 Maritime Heritage and Cultural Environment	48
Maritime Heritage Resources	48
Cultural and Historic Resources	48
4.0 Environmental Consequences	50
4.1 Alternative 1: No Action	51
4.1.1 Physical Environment	51
Physical Characteristics/Geology/Oceanography	51
Water Quality	56
Air Quality	59
Acoustic Environment	60
4.1.2 Biological Environment	64
Habitat	64
Invertebrates	71
Fish	76
Birds	80
Protected Species	85
4.1.3 Socioeconomic Environment	98
Maritime Transportation/Traffic	98
Research and Education	100
Human Use	104
4.1.4 Maritime Heritage and Cultural Environment	107

<i>Maritime Heritage Resources</i>	107
<i>Cultural and Historic Resources</i>	112
4.2 Alternative 2	115
4.2.1 Biological Environment	115
<i>Habitat</i>	115
<i>Invertebrates</i>	115
<i>Birds</i>	115
<i>Protected Species</i>	116
4.3 Cumulative Impacts	116
4.3.1 Cumulative Effects on Physical Environment	116
4.3.2 Cumulative Effects on Biological Environment	117
4.3.3 Cumulative Effects on Socioeconomic Environment	118
4.3.4 Cumulative Effects on Maritime Heritage and Cultural Environment	119
4.4 Conclusions	120
5.0 Consultations	127
5.1 Magnuson-Stevens Act	127
<i>5.1.1 Essential Fish Habitat Assessment</i>	128
5.2 Marine Mammal Protection Act	132
5.3 Endangered Species Act	134
5.4 National Historic Preservation Act	136
5.5 Executive Order 12989, Environmental Justice	137
5.6 Executive Order 13158, Marine Protected Areas	137
5.7 Coastal Zone Management Act	138
6.0 References	140
Appendix A: ONMS Vessels Operating in the Pacific Islands Region	150
Appendix B: Hearing Ranges of Marine Mammals in All Pacific Region Sanctuaries	151
Appendix C: Consultation Letters	153
Appendix D: BMPs for Vessel Operations	154
Appendix E: Species Lists	157



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Introduction

The National Oceanic and Atmospheric Administration's (NOAA) Office of National Marine Sanctuaries (ONMS) serves as the trustee for the thirteen national marine sanctuaries and two marine national monuments (Figure 1). Together these protected areas encompass more than 600,000 square miles of ocean and Great Lakes waters from Washington State to the Florida Keys, and from New England to American Samoa. National marine sanctuaries are special areas set aside for long-term protection, conservation and management, and are part of our nation's legacy to future generations. They contain deep ocean habitats of resplendent marine life, kelp forests, coral reefs, whale migration corridors, deep-sea canyons, historically significant shipwrecks, and other underwater archaeological sites. Each sanctuary is a unique place worthy of special protection. Because they serve as natural classrooms, cherished recreational spots and places for valuable commercial activities, national marine sanctuaries represent many things to many people. Organizationally, the national marine sanctuary system is divided into four regions: Northeast and Great Lakes; Southeast, Gulf of Mexico and Caribbean; West Coast; and Pacific Islands. This environmental assessment addresses field operations at Hawaiian Islands Humpback Whale National Marine Sanctuary, National Marine Sanctuary of American Samoa and Papahānaumokuākea Marine National Monument in the Pacific Islands Region.



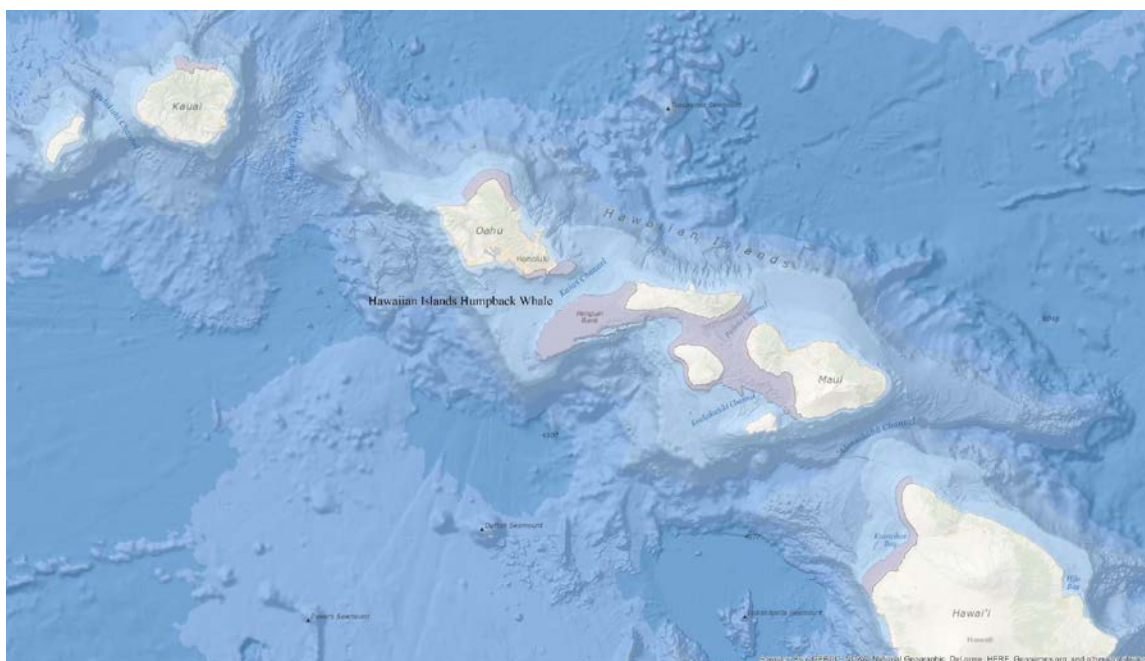
Figure 1: The National Marine Sanctuary System

The NMSA requires that ONMS develop and periodically review the management plans for each national marine sanctuary (Sec. 304 (a)(2)(A) and (e)). Since revision of a management plan often constitutes a federal action, ONMS typically analyzes changes to the management plan under NEPA. In many cases, this analysis tends to be very broad and does not adequately analyze the consequences of routine field operations, such as vessel operations and ongoing research programs. This programmatic environmental assessment is designed to analyze these types of activities and to detail any other routine operations not previously adequately analyzed under NEPA during the management plan review process.

The Pacific Islands National Marine Sanctuaries and Monument

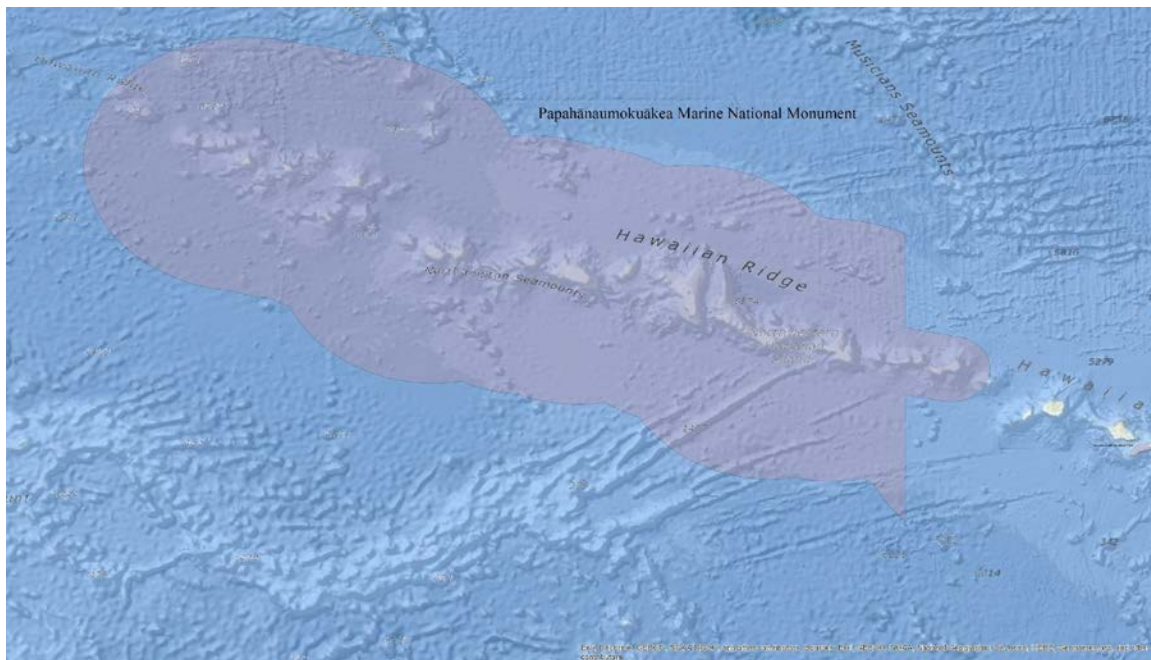
Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS) was created by Congress in 1992 to protect humpback whales and their habitat in Hawai‘i. It is administered by the Department of Commerce’s National Oceanic and Atmospheric Administration (NOAA) in partnership with the State of Hawai‘i’s Department of Land and Natural Resources. The sanctuary is located from the shoreline to the 100-fathom isobath (600 ft. depth) in the four island area of Maui; Penguin Bank; and off the north shore of Kaua‘i, the north and south shores of O‘ahu, and the north Kona and Kohala coasts of the Big Island. The sanctuary is currently undergoing a management plan review that began in 2010 and is expected to take several years to complete. The draft management plan was developed through an extensive public process and released for public comment on March 20, 2015. It will result in a new management plan for the sanctuary. As a result, this document analyzes both current and proposed¹ activities. For more information please visit <http://hawaiihumpbackwhale.noaa.gov/>.

¹ All proposed field operations would not be implemented by sanctuary staff until the new management plan and associated EIS are finalized.



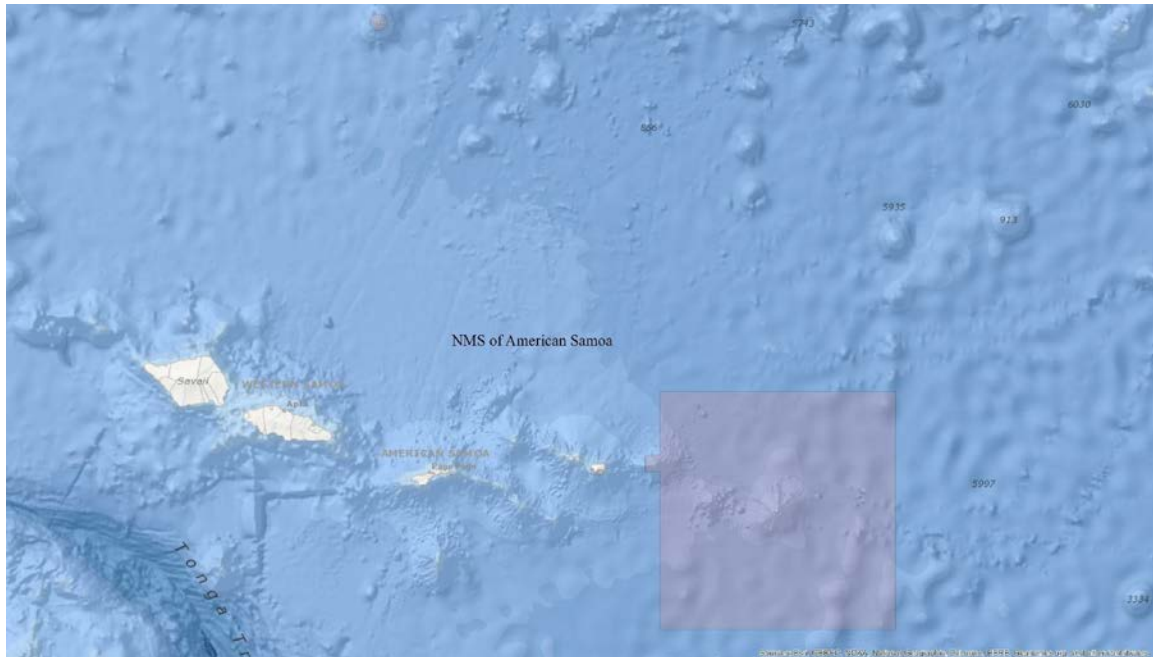
Papahānaumokuākea Marine National Monument (“Monument” or “PMNM”) is the single largest fully protected conservation area under the U.S. flag, and one of the largest marine conservation areas in the world. Designated on June 15, 2006, Papahānaumokuākea was established by Presidential Proclamation 8031 under the authority of the Antiquities Act (16 U.S.C. §§ 431-433) and expanded on August 26, 2016 by Presidential Proclamation 9478. It encompasses over 582,578 square miles of the Pacific Ocean (1,508,870 square kilometers) - an area larger than all the country's national parks combined. Over 400,000 square miles of Papahānaumokuākea contain geological and biological resources that are part of a largely pristine deep sea and open ocean ecosystem with unique biodiversity and important geological features that include more than 75 seamounts, as well as a non-volcanic ridge that extends southwest towards the Johnston Atoll. Together, these features form biodiverse hotspots in the open ocean that provide habitat for deep-sea species, including sponges, other invertebrates, fish, and colonies of corals many thousands of years old. The extensive coral reefs found in Papahānaumokuākea are home to over 7,000 marine species, one quarter of which are found only in the Hawaiian Archipelago. Many of the islands and shallow water environments are important habitats for rare species such as the threatened green turtle and the endangered Hawaiian monk seal, as well as the 14 million seabirds representing 22 species that breed, nest, and forage there. Land areas of the monument also provide a home for four species of birds found nowhere else in the world, including the world's most endangered duck, the Laysan duck. Papahānaumokuākea is of great importance to Native Hawaiians, with significant cultural sites found on the islands of Nihoa and Mokumanamana, both of which are on the National and State Register for Historic Places.

There are four monument Co-Trustee agencies – the Department of Commerce through the National Oceanic and Atmospheric Administration (NOAA), the Department of the Interior through the U.S. Fish and Wildlife Service (USFWS), and the state of Hawai‘i through the Department of Land and Natural Resources (DLNR) and the Office of Hawaiian Affairs (collectively, the Co-Trustees). This unique Co-Trustee partnership at PMNM allows for the protection of the entire ecosystem through a stringent joint permitting process. All activities not prohibited or exempted must be reviewed by the Co-Trustee agencies and authorized by a monument permit. All issued permits undergo a review process, during which time all relevant federal and state regulations and policies are complied with prior to issuance. In addition, issued permits contain General Terms and Conditions that satisfy Proclamation 8031, monument regulations, and relevant state and federal agency mandates and policies. Issued permits also specify the requirements for compliance with quarantine protocols to avoid introduction of alien species, and list prohibited activities such as the disturbance of cultural sites or historic artifacts. Special Conditions may also be applied to particular permits, placing additional restrictions on activities in order to minimize impacts to monument resources. This Programmatic Environmental Assessment analyzes field operations including vessel activity for which NOAA is the lead trustee. It does not consider activities within the national wildlife refuges that are the primary responsibility of the Fish and Wildlife Service. For more information please visit <http://www.papahānaumokuākea.gov/>.



National Marine Sanctuary of American Samoa, is comprised of Fagatele Bay, Rose Atoll, Fogama’a/Fagalua and waters around the islands of Aunu’u, Ta’u, and Swains. The National Marine Sanctuary of American Samoa is now the largest and most remote of the national marine sanctuaries. This sanctuary was formerly the smallest in the National Marine Sanctuary System,

as NOAA originally established the sanctuary in 1986 to protect and preserve the 0.25 square miles of coral reef ecosystem within Fagatele Bay. In 2012, NOAA expanded the sanctuary to include Fagalua/Fogama'a (the next bay east of Fagatele) on Tutuila Island, as well as areas at Aunu'u, Ta'u and Swains islands, and a marine protected area at Rose Atoll (which was named Muliāva as known by the Manu'a residents) including nearby Vailulu'u Seamount. The sanctuary contains many of the species native to this part of the Indo-Pacific biogeographic region. Turtles, whales, sharks and the giant clam all find refuge in these protected areas. For more information please visit <http://americansamoa.noaa.gov/>.



This programmatic environmental assessment is designed to address the environmental impacts of ONMS field operations at the regional level. In some cases, a detailed description of field activities was not yet available at time of publication of this PEA, and therefore a full analysis of the environmental consequences of these activities was not developed. New activities may come up with time. When more details become available for activities included in this document or when new field operations activities come up, we will assess whether their effects are adequately addressed in this PEA. If they are not, we will conduct additional environmental reviews, either tiering from this PEA (for future actions within the scope of activities described in this PEA, pursuant to 40 CFR §1502.20) or developing independent environmental compliance documentation. The subsequent environmental compliance documentation, when tiered from this programmatic analysis, would need only summarize the issues discussed in the broader statement, incorporate discussions from the broader statement by reference and, concentrate on the issues specific to a subsequent, more detailed action. The subsequent document would state where the earlier document is available. In this programmatic EA, ONMS identified and prepared a

qualitative analysis of environmental impacts for the broad scope of actions planned for field operations among the sanctuaries of the region.

Public Involvement

Under NEPA requirements, NOAA is not required to release a draft PEA for public comment. However, NOAA is soliciting public comment on this document for 45 days to ensure transparency and completeness of the final analysis. The input received as a result of both the public comments and the interagency consultations will be considered prior to publication of the final PEA. Public comment and consultation outcomes will be summarized in the final PEA.

1.0


PURPOSE AND NEED

1.1 Purpose for the Action

The purpose of the proposed action is to fulfill the requirements outlined in Section 301(b) of the NMSA in order to protect and manage the resources of each national marine sanctuary. Similarly, Papahānaumokuākea Marine National Monument (PMNM or monument) was established by Presidential Proclamation 8031 under the Antiquities Act to protect resources of the marine area and lands of the Northwestern Hawaiian Islands. Sanctuary and monument field operations are one aspect of resource management that assists with the accomplishment of the goals, objectives and priorities of each site. Field operations are activities on, in or above the water that support the NMSA’s and Presidential Proclamation 8031’s primary objective of resource protection, through direct management, research, and/or education. These field operations can include vessel, aircraft and scuba diving operations as well as deployment of instrumentation and presence of personnel. The field operations are evaluated on a regional basis taking into consideration the protected resources that may be present at each site.

1.2 Need for the Action

The need for the proposed action is to ensure that sanctuary resources are maintained and improved. The NMSA states that the System of National Marine Sanctuaries will “maintain for future generations the habitat and ecological services of the natural assemblage of living resources that inhabit [sanctuaries]” (16 U.S.C. § 1431(a)(4)(C)). The NMSA further recognizes that “while the need to control the effects of particular activities has led to enactment of resource-specific legislation, these laws cannot in all cases provide a coordinated and comprehensive approach to the conservation and management of the . . . marine environment.” (16 U.S.C § 1431(a)(3)). Accordingly, the ONMS subscribes to a broad and comprehensive management approach to meet the NMSA’s primary objective of resource protection. This comprehensive management approach differs from that of various other national and local agencies and laws directed at resource-specific management. Comprehensive sanctuary management serves as a



framework for addressing long-term protection of a wide range of living and non-living marine resources, while allowing multiple uses of the sanctuary to the extent that they are compatible with the primary goal of protecting sanctuary resources. Sanctuary field operations are a part of this comprehensive management strategy and are necessary to support resource protection, research and education objectives, as described in the site-specific management plans outlining short- to mid-term priority management actions.

In the case of the monument, in 2008 NOAA, the Fish and Wildlife Service and the State of Hawaii adopted a management plan that provides long-term guidance for management decisions over a 15-year horizon and sets forth desired outcomes, with strategies and activities to achieve those outcomes. The management framework for the monument includes key elements to move toward an ecosystem management approach that requires the implementation and coordination of multiple steps in a comprehensive and coordinated way. The management plan includes a coordinated field operations action plan to provide adequate infrastructure to ensure safe and efficient operations while avoiding impacts to ecosystems in the monument.

2.0

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

In accordance with NEPA, NOAA seeks to evaluate the proposed action and identify reasonable alternatives, including a status quo alternative, which meet the purpose and need for the proposed action, discussed above. In accordance with NEPA, NOAA seeks to evaluate the proposed action and identify reasonable alternatives, including a no action alternative, which meet the purpose and need for the proposed action, discussed above. For the purposes of this PEA, the No Action Alternative has been considered in two ways. First, ONMS presents Alternative 1, which describes the No Action as a “no change” from current sanctuary management. Because this is a feasible alternative from a legal and practical standpoint, it has been carried forward for further analysis. The second approach presents the No Action as no field operations to be conducted within each sanctuary (see section 2.1). This alternative has not been considered for further analysis because it does not fit within the purpose and need for the proposed action (*i.e.*, does not meet the mandates of the National Marine Sanctuaries Act). Three options are considered in this PEA.

Alternative (1) (No Action) is to conduct field operations to support sanctuary and monument goals and objectives in the same manner as they are currently conducted and to implement additional required mitigation measures as determined through consultations conducted and applicable permits issued as appropriate under the ESA, MMPA, National Historic Preservation Act (NHPA), and the EFH provisions of the MSA.

Alternative (2) is to conduct field operations as currently conducted with the exception of omitting ONMS vessel operations best management practices. In Alternative 3, ONMS vessels would be operated in accordance to NOAA Small Boat Program standards and other applicable requirements; however, ONMS vessel operations best management practices would be discontinued.

At this time, NOAA has not selected a preferred alternative, which is defined as the alternative which the agency believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical and other factors. Consultation under the statutes mentioned above is ongoing and the selection of the preferred alternative will be dependent upon the consultation process. Therefore, NOAA will select a preferred alternative based on public comment received on this document as well as on consultation processes and will identify the preferred alternative in the final EA.

2.1 Alternative Considered but Not Analyzed in Further Detail

NOAA considered an alternative in which no field operations would be conducted at HIHWNMS, PMNM or NMSAS. Under this alternative, field operations occurring on, in or above the water conducted as part of projects and programs that support sanctuary and monument management, research and education objectives would not occur. This alternative is not further analyzed in this PEA because it would not meet the purposes and need for the ONMS field operations at the PIR sanctuaries and monument. As described above, the purposes of and need for the field operations include fulfilling NOAA statutory obligations under various statutes administered by the Agency. NOAA relies upon field operations in large part to effectuate those statutory obligations within the sanctuaries and monument. Were NOAA to discontinue such operations, many of these obligations, particularly those under the NMSA, would not be met as NOAA would not be able to engage in the operations that directly implement these objectives in the PIR sanctuaries and monument. Accordingly, although NOAA did consider discontinuing all field operations, this alternative was not analyzed beyond the determination that it would fail to meet the purpose of, and need for, ONMS field operations in the PIR Region.

2.2 Alternative 1: No Action/Status Quo

Under Alternative 1, there would be no change from current sanctuary and monument management. This means that each of the sanctuaries and the monument in the region would annually conduct a number of field operations as part of projects that support the management, research and education objectives of each site. For the purposes of this PEA, it is assumed that the field operations at each site would continue to be conducted over the next five years. The field operations conducted would occur in the same manner as currently conducted, with the addition of any required mitigation measures as determined through consultations conducted and applicable permits issued as appropriate under the ESA, MMPA, NHPA, and the EFH provisions of the MSA. NOAA anticipates that mitigations arising from consultation with relevant authorities could include measures to minimize risk from vessel strikes, which may include reduced vessel speed, additional on-board observers, or restrictions on operating in adverse environmental conditions. In addition, NOAA is releasing this draft PEA to solicit public comment on the suite of ongoing field operations and the analysis of their potential environmental impact. NOAA could amend certain field operations (and the final PEA) based on required (Alternative 1) or recommended (Alternative 2) mitigations or monitoring that result from these permit and consultation processes and the public comment period.

Table 1 describes each category of field operations. Each sanctuary and the monument could have multiple projects that include a combination of the field operations listed below.

All ONMS vessels follow the protocols and procedures of the NOAA Small Boats Program. Vessel operators are highly trained and will apply the NOAA Small Boat Program (<http://www.sbp.noaa.gov/policy/manual.html>), and follow its requirements as well as sanctuary standing orders and procedures and will employ ONMS best management practices to avoid direct impacts to sanctuary resources and the affected environment. In addition, the NOAA Small Boat program mandates that all vessels longer than 40' feet be operated by personnel with an appropriate tonnage U.S. Coast Guard (USCG) license or equivalent NOAA Corps experience for the vessel size. Site-specific standing orders and procedures are described in further detail below. In general, operators of sanctuary vessels employ ONMS best management practices to minimize impacts. And, because they are operating ONMS assets that are very visible to the public, they are trained to serve as models of best practices to avoid harm to the environment.

Table 1. ONMS Field Operations² for Alternative 1

Categories of Field Operations	Definition
Vessel Operations	<p>Vessel operations include all activities conducted on the water from an ONMS small boat or sponsored mission such as, but not limited to, research, education, outreach, resource and habitat assessments, marine mammal disentanglement, and law enforcement. All ONMS vessels must comply with the operational protocols and procedures in the NOAA Small Boats Policy (NAO 209-125) and the best management practices identified in Appendix D.</p> <p>This category applies to all personnel, including crew, staff, visitors, volunteers, and students who may use or work upon any ONMS vessel, regardless of mission sponsor whether directly or indirectly involved. It includes vessel transiting to/from port, where to go, how long to stay there, what is needed to accomplish cruise purpose.</p>
Vessel Maintenance	<p>Regular activities are determined by the program engineer, vessel's crew and operations staff and performed on each vessel to ensure safety, compliance, and reduced risk. Includes vessel maintenance, disposal of waste, general ship operations and any standing orders that improve safety or reduce the potential for resource impacts.</p>

² Vessel support for field operations includes ONMS-owned and -contracted vessels. Vessel maintenance includes only ONMS vessels. Aircraft operations include ONMS-contracted aircraft. Deployment of equipment includes ONMS-owned and -contracted equipment.

Aircraft Operations	Activities include the use of motorized aircraft including unmanned aerial systems (UAS) for research and surveillance purposes.
Non-Motorized Craft	Activities include the use of any non-motorized craft, such as kayaks and canoes.
SCUBA or Snorkel Operations	Activities include any field work where personnel will be in the water. Includes numbers of divers, time underwater and location of dives.
Onshore Fieldwork	Activities include onshore or intertidal field work where personnel will be walking on shoreline. May include emergency response activities to address marine mammal strandings, vessel groundings, oil or chemical spill response, Shoreline Cleanup Assessment Team protocols, cultural resource assessments or natural resource damage assessments.
Deployment of AUVs/ROVs/gliders/drifters	Activities include equipment deployed from a vessel such as autonomous underwater vehicles, remotely operated vehicles, tow-boards, drifters and gliders.
Deployment of Remote Sensing Equipment	Activities include the deployment from a vessel of towed and hull mounted sensor arrays and the use of passive and active acoustic survey systems.
Deployment of Equipment on Seafloor	Activities include the deployment and maintenance of stationary buoys, moorings, anchored or weighted instrumentation, buoyed sensor arrays, and small marker buoys that are used for safe and efficient dive operations.
Other Sampling Activities	Activities include extractive sampling, placement and retrieval of sampling devices (e.g., constructed arrays, equipment, and traps), capturing, tagging and collection of animals, and other sampling protocols such as those associated with injury assessments.

Tables 2, 3 and 4 describe the specific projects at HIHWNMS, PMNM and NMSAS, respectively. These projects range from buoy maintenance to fish tagging and include the categories of field operations listed in Table 1. The potential environmental consequences of these projects at each site are analyzed in Chapter 4 of this document.

All field operations conducted by ONMS are evaluated in this PEA, including those activities that would require a site-specific general permit for the purposes of management (referred to as the Superintendent’s Permit or, in the monument, the Manager’s Permit). This PEA does not analyze field operations conducted as part of other ONMS permits. All permit applications are evaluated separately on a case-by-case basis and undergo a separate evaluation for compliance with NEPA and other environmental statutes at that time

2.2.1 Hawaiian Islands Humpback Whale National Marine Sanctuary Projects and Field Operations

Field operations at HIHWNMS have focused on the several projects including: research, education, and monitoring of whales, whale disentanglement, maritime heritage field activities, and vessel maintenance and crew training. The sanctuary is currently undergoing a management plan review that began in 2010. A draft management plan was developed through an extensive public process and released for public comment on March 26, 2015. However, due to NOAA’s final decision to withdraw the rulemaking published concurrently with the draft management plan, a new draft management plan is currently in development. Proposed activities are not formally approved until the new management plan is finalized; however, the following existing and proposed activities are being considered in this analysis in the event they are included in the forthcoming final management plan.

Table 2. HIHWNMS Projects/Activities under Alternative 1

Project Title	Summary Description of Project/Activity	Categories of Field Operations
Vessel maintenance and crew training	Vessel maintenance and crew training occur onboard the R/V <i>Kohola</i> and generally does not occur within the Sanctuary.	<ul style="list-style-type: none"> ● Vessel Operations ● Vessel Maintenance
Research and monitoring of whales	Photographs and videos of humpback whales are used for monitoring and research including scar analysis for assessing entanglements and ship-strikes. Activities include tagging, breath collection, biopsies and sample collections utilizing standard methodologies.	<ul style="list-style-type: none"> ● Vessel Operations ● SCUBA or Snorkel Operations ● Other Sampling Activities
Emergency Response Training	Vessels are used as a platform to train crew in conjunction with the U.S. Coast Guard in large whale radio beacon tagging and emergency towing.	<ul style="list-style-type: none"> ● Vessel Operations
Education	Vessels take partners, students and agency officials out on the water from Maalaea Harbor on Maui to view the sanctuary and humpback whales. The trips provide an opportunity to educate about the sanctuary and the marine environment.	<ul style="list-style-type: none"> ● Vessel Operations ● SCUBA or Snorkel Operations

Whale disentanglement	Vessels are used to transport crew in response to entangled whales. Equipment is used to tag whales and release any entangled gear. In the future, HIHWNMS plans to use UAS for monitoring during whale disentanglement efforts, dependent on fulfilling all NOAA requirements and permitting.	<ul style="list-style-type: none"> ● Vessel Operations ● Aircraft Operations ● Other Sampling Activities
Remote sensing survey*	AUVs, ROVs and towed sensor arrays (including magnetometers, optical and thermal cameras and CTDs) are deployed to monitor humpback whales and their habitat as well as surveying the seafloor for entanglement threats. Vessels are used to deploy passive acoustic equipment that is anchored to the seafloor. Staff may also tow or deploy passive acoustic equipment including hydrophones and associated hardware.**	<ul style="list-style-type: none"> ● Vessel Operations ● Aircraft Operations ● SCUBA or Snorkel Operations ● Deployment of Remote Sensing Equipment ● Deployment of AUVs/ROVs/Gliders/Drifters ● Deployment of Equipment on the Seafloor
Marine debris removal*	Marine debris is removed along shorelines and nearshore areas by staff on shore, snorkeling, or by vessels. Primary focus would be on removal of drifting nets, abandoned or lost fishing gear, and other debris that could entangle whales.	<ul style="list-style-type: none"> ● Vessel Operations ● SCUBA or Snorkel Operations ● Onshore Fieldwork ● Other Sampling Activities
Water quality sampling*	Collection of water samples for water quality monitoring to occur throughout the sanctuary with a focus on West and Southwest Maui and the Au'Au channel, with the goal to understand impacts of water quality and pollutants to humpback whales.	<ul style="list-style-type: none"> ● Vessel Operations ● SCUBA or Snorkel Operations ● Other Sampling Activities

* All proposed field operations identified with an asterisk would not be implemented by sanctuary staff until the new management plan and associated EIS are finalized.

** The sanctuary has no current plans to conduct surveys using remote sensing active acoustic equipment.

General Vessel Operations in HIHWNMS

General vessel operations are not a project in and of themselves, but they support a great many of the sanctuary's projects. ONMS small boats are operated according to all NOAA Small Boat Program guidelines (<http://www.sbp.noaa.gov/policy/manual.html>). In addition, the sanctuary vessel (*R/V Kohola*), which is considered a small boat, follows additional, self-imposed sanctuary standing orders (see Appendix) to minimize impacts on marine resources inside and outside the sanctuary, particularly humpback whales and other marine mammals. These standing orders are not required under any statute or regulation, but instead are self-imposed by ONMS management to ensure that sanctuary resources are given special consideration. They are to be followed generally from the months of December to May, but should also be followed anytime large whales are known to be present or believed to be present in an area of operation, regardless of time of year. The general standing orders direct ONMS small boat operators to:

- **Keep a sharp lookout** – Vessel operators are required to stay vigilant for marine mammals and other collision hazards.
- **Post a minimum of one dedicated whale lookout** – In addition to the operator, while operating in areas where large whales may be present.
- **Watch your speed** – General operating speeds should not exceed 16 knots, or when responding to a whale in distress, speeds should not exceed 20 knots.
- **Stay at the helm** – Vessel operators are required to keep hands on the wheel and throttle at all times while in areas where large whales can occur, and be ready to take action immediately to avoid whales.
- **Keep your distance** – If large whales are sighted, a distance of at least 100 yards should be maintained.
- **If large whales surface within 100 yards** – Vessel operators should stop immediately and use prudent seamanship to decide to either move away slowly or wait for the animal to move away on its own.
- **Operate vessels during daylight hours** – Due to the increased risk of collision at night, all operations should take place between ½ hour before sunrise and ½ hour after sunset. If night operations need to occur, the most experienced operator should take the helm, the speed should not exceed 10 knots, a minimum of 2 lookouts should be posted, and the operator should use all means to enhance visibility (*e.g.*, spotlights, electronics).

Specific Standing Orders for HIHWNMS Operations around Large Whales include:

The following speed restrictions will be followed when operating under normal conditions during daylight hours during the months of December thru May.

- General operating speeds **shall not exceed 16 kts.**
- When responding to a whale in distress, speed **shall not exceed 20 kts.**
- In emergencies, these speed restrictions may be exceeded. The operator has the discretion to take the appropriate action in any emergency.
- For night operations Due to the increased risk of collision at night, all operations should be planned and executed during daylight hours between ½ hour before sunrise and ½ hour after sunset. Vessel operations should be terminated at such a time as to arrive back at the harbor ½ after sunset.
- If for extenuating circumstances night operations need to occur the following rules shall be followed:

- The most experience operator shall take the helm and operate the vessel
 - Speed shall not exceed 10 kts
 - A minimum of 2 lookouts, in addition to the operator, shall be posted to look for whales.
 - The shore-side contact shall be informed if not already done so.
 - The operator shall use all means to enhance visibility, including using spotlights and electronics to reduce hitting a whale or floating debris.
- Maintain a distance of 100 yards (92 meters) from a whale.
 - Unacceptable maneuvers:
 - Never leapfrog or cut in front of a whale
 - Never cut a whale off from deep water
 - Never place the vessel between a mother and her calf.

Vessel Maintenance and Crew and Emergency Response Training in HIHWNMS

The sanctuary vessel, the R/V *Kohola* (38 feet, cruising speed of 21 knots), is hauled out for dry dock maintenance every other year. Minor maintenance such as oil changes and hull cleanings generally occurs 6 times per year and may occur both in and out of the water. Fueling occurs dockside, outside of the sanctuary and monument boundaries. Generally, vessel maintenance and fueling occur in harbors. Vessel crew training and safety drills occur 2 times per year. Crew trainings include working with the U.S. Coast Guard in large whale radio beacon tagging and emergency towing. Vessels practice towing, approaching, keggering, line removal, and disentanglement safety procedures using other small vessels in place of whales. This activity occurs two times per year and involves up to 11 individuals per activity and is conducted from boats including inflatables.

Research and Monitoring of Whales in HIHWNMS

Photographs and videos of humpback whales are used for monitoring and research including scar analysis for assessing entanglement and ship-strikes. Vessels are used as a platform to obtain surface imagery. Underwater imagery is collected by snorkeling from the vessel. Two individuals conduct in-water documentation up to 12 times per year between November and April for up to 10 minutes per animal/group for a total of one hour per day. Up to 8 persons onboard the vessel photo document animals at the surface. Research activities from onboard the vessel include tagging, breath collection, biopsies and sample collections utilizing standard methodologies. Day trip duration is 8 hours. Each year approximately 5 whales are tagged and 6 biopsies and other samples are collected (such as feces or placenta). This activity is permitted through the NOAA

Fisheries Office of Protected Resources Marine Mammal Health and Stranding Response Program under permit 932-1905(1).³

Education in HIHWNMS

Vessels take partners, students and agency officials out on the water to view the sanctuary and humpback whales. Up to 154 individuals including crew participate in this activity each year with an annual average of 14 round-trips with a maximum of 11 participants per trip. These trips depart from Maalaea Harbor in Maui. The trips provide an opportunity to educate participants about the sanctuary and the marine environment. Vessels are also used as platforms for filming to support media efforts to increase public awareness of the sanctuary. Snorkeling may occur on some trips to view marine life, however, there is no in-water approach to humpback whales. A few of the education trips (typically two per year) support the “Adopt a Drifter Program,” which is sponsored by the NOAA Office of Climate Observation. On such trips, a small drifter buoy is released over the side of the vessel by hand. The drifter buoy is left to drift and not picked up (see Adopt a Drifter Program - <http://www.adp.noaa.gov>).

Whale Disentanglement in HIHWNMS

Vessels are used to respond to whales entangled in ropes, lines, nets and other debris. A variety of vessels including small inflatables to larger 36-foot long vessels are used in these responses. Specialized equipment is used to tag and cut whales free of the entangling gear. All response is done pursuant to NOAA Fisheries permits. UAS systems may be used to identify entangled whales at sea, however, the use of UAS systems is dependent on permitting by NOAA Fisheries, and as appropriate, may occur up to 20 hours each year. Whale disentanglement responses are conducted onboard a 36-foot vessel with up to 11 crew and occur approximately 10 times each year. There are also other support vessels that may be in the area; however, support vessels do not approach the animal. Biopsies and tissue samples are opportunistically collected and whales are typically tagged during the disentanglement process. Responding staff and vessel crew are trained and highly skilled, following established protocols to minimize harm to the animal. In general, each year approximately five whales are disentangled, tagged, and biopsied. This activity is permitted through the NOAA Fisheries Office of Protected Resources Marine Mammal Health and Stranding Response Program under permit 932-1905 (1).

Remote Sensing Survey in HIHWNMS

Vessels are used, up to 7 days each year, to deploy AUVs, ROVs, and towed sensor arrays including: magnetometers; conductivity, temperature and depth sensors; and towed or deployed passive acoustic equipment. This equipment will be operated to monitor humpback whales and their habitat as well as surveying the seafloor for entanglement threats. No more than 7 AUV/ROV/towed sensor arrays are deployed each year. All remote sensing surveys will be

³ The current permit number, as of 7/1/15, is #18786.

conducted pursuant to valid permits and regulations including but not limited to: Endangered Species Act, Marine Mammal Protection Act, US Army Corps of Engineers (USACE) Nationwide Permit Pre-Construction Notification, USACE Scientific Measurement Devices, State of Hawaii Conservation District Use, Hawaii Coastal Zone Management Reviews, etc. AUVs are remotely piloted or pre-programmed autonomous underwater vehicles with a suite of sensors to collect oceanographic and biological data. ROVs are remotely operated vehicles which are commonly tethered to a vessel with a visible cable. ROVs are operated in real time on the topside of the vessel. ROVs can also have a suite of sensors or as well as robotic collection arms to safely collect biological samples. Conductivity, Temperature, Depth sensor arrays may be towed and configured with a variety of sensors. Potential sensor or collection payloads on AUVs, ROVs and CTDs include: bottles for water collection, optical (camera), temperature, conductivity, turbidity, chlorophyll, and depth sensors. Magnetometers are passive instruments (meaning they do not emit anything) that detect and quantify magnetic fields. They serve as ideal detection devices for submerged cultural materials of ferrous construction on or beneath the seabed, or encrusted in marine growth such as corals. The surface vessel tows a remote magnetometer at approximately 4 knots/hour on linear parallel tracks at or near the surface for shallow zones, recording variations in the localized magnetic field (gamma). Magnetometer tow lines are typically no longer than 170 m (558 ft.).

Vessels would be used, up to 24 days each year, to deploy passive acoustic equipment including recording hydrophones either attached to moorings which are anchored to the seafloor, or towed or tethered from a vessel using marine grade ropes or cables. Common equipment is approximately 2 ft long and 0.5 ft wide. Up to 30 staff and partners may be involved in these acoustic equipment deployment missions. Passive acoustic equipment may be deployed using snorkel, SCUBA, or by vessel.

A hydrophone is a specialized microphone that is designed to listen and record underwater sound. They may either transmit live or recorded information related to the presence/absence of cetaceans, vessel traffic, and general soundscape of the area. The recording units consist of microphone components, battery and storage components encased in a waterproof housing. Hydrophones can be tethered, towed, or moored.

Towing missions would occur monthly to quarterly. Deployment and retrieval of deployed equipment may occur up to 24 days annually. Equipment may be deployed in appropriate locations of the sanctuary using attachment by cable tie to existing infrastructure (e.g., buoys, channel markers), to weights that would be deployed or to rebar installed by SCUBA divers using pneumatic drills. Some equipment including: suction cup affixed sensors such as hydrophones, temperature loggers, accelerometers (hardware used to assess diving behavior), depth sensors, tagging devices, and electrodes (used for assessing neural activity) may be installed on marine mammals pursuant to National Marine Fisheries Service ESA and MMPA permits. Most of the focus of this research is anticipated to occur in the waters of Maui Nui, but may occur outside of or adjacent to any of the sanctuary boundaries.

Marine Debris Removal in HIHWNMS

Marine debris would be removed along shorelines and nearshore areas by up to 4 staff on shore, snorkeling, SCUBA diving, or by vessels. The primary focus would be on removal of drifting nets, abandoned or lost fishing gear, and other debris that could entangle whales. Vessel operation would not exceed 120 days per year for this particular activity. Participants would walk or float in depths of water from 0-30 m using snorkel or SCUBA equipment to collect visual data. Pursuant to valid permits, participants would remove floating marine debris by hand. Marine debris on the benthos or shoreline will be removed by hand or mechanically with metal tools or mechanized equipment. Samples of marine debris are collected and stored in containers and transported for storage, analysis, and disposal on land. Monitoring would occur monthly to quarterly and removal projects may last for up to 120 days with up to one dive per marine debris monitoring effort (totaling up to 120 dives) each year with up to 4 participating staff (up to 480 people days each year).

Water Quality Sampling in HIHWNMS

Staff and partners would collect water samples by walking or floating in depths of water from 0-30 m using snorkel or SCUBA equipment or by vessel, with the goal to understand impacts of water quality and pollutants to humpback whales. Vessel operation days would not exceed 60 days each year and no more than 60 dives would occur each year pursuant to this activity. Pursuant to valid permits, individuals may physically collect samples manually by hand or mechanically with Niskin bottles or water pumps. Samples may be collected and stored in containers and transported for storage and analysis on land. Monitoring would occur daily to monthly, involve approximately 50 people and could last up to 365 days annually. Additionally, automated water sampling equipment would be anchored to the seafloor. Water quality sondes with sensors may be deployed in appropriate locations of the Au'Au channel, or in waters around Maui. The sondes would be attached by cable tie to existing infrastructure (e.g., buoys, channel markers), tied to deployed weights; or tied to rebar installed by SCUBA divers using pneumatic drills. Sediment trap pipes may also be installed vertically to capture sediment on near shore reefs using installed rebar or weights. Most of the focus of this research is anticipated to occur on West and Southwest Maui and the Au'Au channel.

2.2.2 Papahānaumokuākea Marine National Monument Projects and Field Operations

Field operations at PMNM focus on several projects that support a number of identified priorities within the PMNM management plan, which in turn support conservation and management activities within the monument. Projects include fish surveys, intertidal monitoring, alien species monitoring, maritime heritage field activities, mesophotic coral research, as well as an ongoing reef assessment and monitoring program (Table 3). Presidential Proclamation 8031 requires that activities, unless expressly prohibited or exempted, be permitted (see also 50 CFR Part 404). As

such, all ONMS field operations activities, except vessel maintenance and crew training (which take place outside of the monument), are separately permitted each year under a PMNM issued permit. To ensure proper environmental compliance and analysis are conducted on each permit issued, PMNM Permit Coordinators and technical staff work together to ensure that all agency staff are in agreement with the effects determination for each permit application's proposed activities as it relates to the following environmental regulations: NEPA, ESA, MMPA, EFH provisions of the MSA, and NHPA. Once an effects determination for each of the above-referenced laws is reached, appropriate consultation and analysis is initiated with the appropriate federal agency (NOAA and/or FWS). A NEPA analysis is conducted for each separately permitted activity, whereas consultations under ESA, NHPA, MMPA, and MSA are conducted when appropriate with the relevant federal agency. The field operation activities are described below to ensure that all ONMS field operations are taken into account in this comprehensive document; however, the environmental consequences of separately permitted activities are not further analyzed in this document. Table 3 below describes all field operations activities conducted in PMNM.

Table 3. PMNM Projects/Activities

Project Title	Summary Description of Project/Activity	Categories of Field Operations
Vessel maintenance and crew training	The R/Vs <i>Hihimanu</i> (36 ft, with a cruising speed of 21 kts), <i>Kaku</i> (19 ft, with a cruising speed of 15 kts), <i>Malolo</i> (19 ft, with a cruising speed of 15 kts), and <i>Halalū</i> (19 ft, with a cruising speed of 12 kts) are the primary training and proficiency platforms for ONMS/PMNM staff and for use within the monument.	<ul style="list-style-type: none"> ● Vessel Operations ● Vessel Maintenance ● SCUBA or Snorkel Operations
Remote sensing survey*	Use of remote sensing equipment to inventory resources and document new maritime heritage sites.	<ul style="list-style-type: none"> ● Vessel Operations ● Aircraft Operations ● SCUBA or Snorkel Operations ● Deployment of AUVs/ROVs/Glidern/Drifters ● Deployment of Remote Sensing Equipment
Midway Atoll programs*	Activities include SCUBA, snorkel, and onshore inventories of aquatic and archeological resources, and complete long term monitoring strategies. Outreach and education activities are conducted both on and off Midway Atoll National Wildlife Refuge.	<ul style="list-style-type: none"> ● SCUBA or Snorkel Operations ● Onshore Fieldwork ● Other Sampling Activities

Intertidal monitoring*	Identification, sampling, and quantifying intertidal benthic organisms and nearshore reef fish.	<ul style="list-style-type: none"> ● Vessel Operations ● SCUBA or Snorkel Operations ● Onshore Fieldwork ● Others Sampling Activities
Alien species monitoring*	Identification, sampling, and quantifying invasive and alien intertidal benthic organisms. ROVs are also utilized for survey and documentation.	<ul style="list-style-type: none"> ● Vessel Operations ● SCUBA or Snorkel Operations ● Onshore Fieldwork ● Deployment of AUVs/ROVs/Gliders/Drifters ● Other Sampling Activities
Maritime heritage field activities*	SCUBA, snorkel, and onshore inventories of aquatic and terrestrial resources, assessing impacts of climate change on maritime heritage resources, and long-term monitoring strategies.	<ul style="list-style-type: none"> ● Vessel Operations ● SCUBA or Snorkel Operations ● Onshore Fieldwork ● Deployment of AUVs/ROVs/Gliders/Drifters
Mesophotic diving*	SCUBA activities to characterize mesophotic (deep) coral reef ecosystems, establish long term monitoring to determine distribution and abundance of alien species, and to document climate change impacts.	<ul style="list-style-type: none"> ● Vessel Operations ● SCUBA or Snorkel Operations ● Deployment of AUVs/ROVs/Gliders/Drifters ● Other Sampling Activities
Reef Assessment and Monitoring Program*	Vessels are used to facilitate a scuba and snorkel survey to establish long term monitoring to determine distribution and abundance of alien species, long term monitoring to determine climate change resistance, and the habitat characterization of deep reef species.	<ul style="list-style-type: none"> ● Vessel Operations ● SCUBA or Snorkel Operations ● Deployment of AUVs/ROVs/Gliders/Drifters
Filming and photographic documentation	In-water and land-based filming and photography activities are conducted on an ad-hoc basis to collect imagery for conservation, management and outreach/education purposes.	<ul style="list-style-type: none"> ● Vessel Operations ● SCUBA or Snorkel Operations ● Onshore Fieldwork

* The impacts of these activities are analyzed under a separate NEPA review associated with separate permit processes and therefore not further analyzed in this document.

General Vessel Operations in PMNM

General vessel operations are not a project in and of themselves, but they support a great many of the monument's projects. All ONMS small boats are operated according to all NOAA Small Boat Program guidelines (<http://www.sbp.noaa.gov/policy/manual.html>). In addition, the monument vessels (R/V *Hihimanu*, *Kaku*, *Malolo* and *Halalū*) follow additional self-imposed best

management practices to minimize impacts on marine resources, particularly marine mammals and protected species as well as to reduce the likelihood of introduction of invasive species in the monument. These best management practices are not required under any statute or regulation, but instead are self-imposed by ONMS management to ensure that sanctuary resources are given special consideration. Larger research vessels operated by NOAA's Office of Marine and Aviation Operations also adhere to these same best practices when operating in support of ONMS activities in PMNM. These best management practices focus on:

Marine Alien Species Inspection

Prior to entering the monument, vessels must be free of any biofouling or from transporting any live or recently alive marine organisms. In addition, they must not discharge any ballast water in the monument.

Special Boat Operations near Federally-Listed (Under ESA and MMOA) Marine Species

Vessel operators must reduce vessel speed to 10 knots or less when in the proximity of marine mammals and to 5 knots when operating in areas of known or suspected turtle activity. Operators must postpone in-water activities if Hawaiian monk seal mom-pup pairs and humpback whales are within 100 yards or other protected species within 50 yards, and must put the engine in neutral if approached by a marine mammal or turtle. The policy was established to be consistent with NOAA Fisheries regulations, which establish a minimum distance for monk seal mom/pup pairs and humpback whales. However, for all other marine mammals, sea turtles, and monk seals (that are not a part of a mom/pup pair) NMFS only recommends the same restrictions, but does not require it.

Disease and Introduced Species Prevention Protocol

Equipment and gear used underwater must be treated according to a specific protocol to minimize the potential for the spread of disease and/or introduced species in the monument.

Vessel Maintenance and Crew Training in PMNM

The R/Vs *Hihimanu* (36 ft, cruising speed of 21 kts), *Kaku* (19 ft, cruising speed of 15 kts), *Malolo* (19 ft, cruising speed of 15 kts), and *Halalū* (19 ft, cruising speed of 12 kts) are the primary training and proficiency platforms for ONMS/PMNM staff and for use within the monument. They are trailer kept and usually launched for the day, but will be kept in water for one-week field evolutions approximately ten times per year. Minor maintenance such as oil changes and hull cleanings generally occur six times per year all out of the water and the vessels are taken to dry dock for maintenance every 2 years. In general, vessel maintenance and crew training operations do not occur within the monument. Vessel crew training and safety drills occur 12 times per year. Hull cleanings occur up to 7 times each year. SCUBA and snorkel activities associated with training and safety drills and hull cleanings and minor in-water maintenance occurs no more than 19 days each year.

Remote Sensing Survey in PMNM

OMAO vessels are used to deploy AUVs, ROVs, towed magnetometers, and side scan and multibeam mapping sonars in order to inventory resources and document new maritime heritage sites. Aircraft use LiDAR (annual average of 5 hours per year of aircraft operations within PMNM) for long-term monitoring to determine climate change effects on terrestrial habitats, and to characterize shallow-water benthic, intertidal and terrestrial habitats. On average, one AUV is expected to be deployed each year, one ROV is deployed every two years, and towed magnetometers are utilized one time per year. Side scan and multibeam sonar survey activities would occur no more than 45 days per year.

Magnetometers are passive instruments (meaning they do not emit anything) that detect and quantify magnetic fields. They serve as ideal detection devices for submerged cultural materials of ferrous construction on or beneath the seabed, or encrusted in marine growth such as corals. The surface vessel tows a remote magnetometer at approximately 4 knots/hour on linear parallel tracks at or near the surface for shallow zones, recording variations in the localized magnetic field (gamma). Magnetometer tow lines are typically no longer than 170 m (558 ft.).

Side-scan sonar is a remote sensing tool that records acoustic reflections to produce images of the seafloor. This type of sonar is used concurrently with magnetometers to conduct marine archaeology surveys. Side-scan sonar devices are typically towed by a surface vessel using tow lines no longer than 170 m (558 ft.).

Visual, photographic, and video surveys by diver are sometimes used to supplement normal remote sensing surveys and are particularly helpful in shallow areas of extreme topographical variation (up to 20 dives per year). Any potential diver tow boarding operations will be conducted following established training provided by NOAA NMFS and along established NOAA NMFS tow boarding protocols for the Northwestern Hawaiian Islands (NWHI). Any divers will be towed at approximately 3 knots/hour.

Side scan and multibeam mapping sonars are used to identify appropriate dive sites for ONMS related research activities, as well as to map the seafloor of the monument in order to inventory resources and document new maritime heritage sites. Sonar surveys are typically conducted using the NOAA ship *Hi'ialakai* which is a 224 ft long research vessel with a crew of 15 and a cruising speed of 15 knots. . The sonar system works by sending a focused pulse of sound (ping) straight down and listens for the reflected echo of the sea floor. The amount of time it takes for the noise to be sent, reflected, and received is converted into a depth measurement. The multi-beam systems used on the *Hi'ialakai* are the Kongsberg EM300 and EM302, which operate at frequencies of 70-100 kHz and 30 kHz, respectively, and typical source levels (SL) of 229 dB re 1 μ P and 232 – 237 dB re 1 μ P, respectively, which is defined as the number of decibels at 1m distance from the transducer. Power, amplitude, pulse, width and ping rate vary depending on the depths of the ocean in the area being mapped. The advertised depth ranges for the EM 300 and EM 302 systems are 3-2000 m and 10-7000 m, respectively. However, typically, the higher frequency EM 300 is primarily used for shallow water mapping (i.e., less than 500 m) whereas

the lower frequency EM 302 system is used for deep water mapping (i.e., greater than 500 m). Additionally, multibeam systems of other research vessels of opportunity (e.g., R/V *Falkor*) are used to map the seafloor of the monument and employ similar equipment.

Midway Atoll Programs in PMNM

USFWS owned small boats are used to facilitate SCUBA and snorkel inventories of aquatic resources (up to 30 dives each year), and complete long term monitoring strategies (up to 150 people days each year). Onshore surveys may occur with this program that entail surveying shorelines for archeological finds as well as sampling of alien and invasive species attached to marine debris. Outreach and education activities are also conducted both on and off Midway Atoll National Wildlife Refuge. U.S. Fish and Wildlife Service chartered aircraft are used to transport personnel and materials to the site. No more than five people travel to midway to conduct activities under this program. The duration of activities under this program is no longer than 30 days per year.

Intertidal Monitoring in PMNM

The R/V *Searcher*, an ONMS contracted vessel, and its small boats are used to take personnel on shore and conduct nearshore snorkeling to identify, sample, and quantify intertidal benthic organisms and nearshore reef fish. Surveys take place along the rocky intertidal shoreline areas of the basaltic islands within PMNM as well as in-water monitoring to conduct survey and collections of non-listed fish and invertebrates. In general, these monitoring efforts occur once a year for a duration no longer than 14 days. Up to 20 individuals participate in intertidal monitoring efforts in PMNM (totaling 168 people days per year) and up to 14 dives may occur during this annual activity. Monitoring goals include: determining distribution and abundance of intertidal species, determining climate change resistance and adaptation of intertidal species, and providing insight into genetic connectivity of intertidal species in the Northwestern Hawaiian Islands with the Main Hawaiian Islands (MHI) and Johnston Atoll. Annual collections include up to 415 limpets, 76 marine snails, 30 rock boring urchins, 45 crabs, 700 balls of algae, and 100 false limpets.

Alien Species Monitoring in PMNM

OMAO vessels, their respective small boats and ONMS' small boats are used, up to 21 days per year, to take personnel on shore and on SCUBA and snorkeling activities to identify, sample, and quantify invasive and alien intertidal benthic organisms (up to 21 dives occur each year). ROVs are also utilized for survey and documentation. One small ROV with one to two hour dive time at various reef spots throughout monument and are used for up to 7 days. Monitoring efforts are conducted up to 21 days per year within PMNM. Belt transects are 25 x 2 m (totaling 105 people days each year). Possible sampling of unknown alien invasive species for identification purposes would occur. Monitoring goals include: determining distribution and abundance of alien intertidal species, determining climate change resistance and adaptation of alien intertidal species, and

providing insight into genetic connectivity of intertidal species in the Northwestern Hawaiian Islands with the MHI and Johnston Atoll.

Maritime Heritage Field Activities in PMNM

OMAO vessels, their respective small boats and ONMS' small boats are used, up to 20 days each year, to facilitate SCUBA and snorkel inventories of aquatic resources, assessing impacts of climate change on maritime heritage resources (up to 20 divers per year), and to complete long-term monitoring strategies. Additionally, up to 20 tow-boarding surveys are annually conducted in order to survey larger areas. Divers may also conduct snorkel tow-board surveys in areas where historic vessels or aircraft are suspected to have been lost. Any tow-boarding operations are conducted only following established training provided by NOAA/NMFS and along with NOAA/NMFS tow boarding protocols for the Northwestern Hawaiian Islands and Pacific Islands Region. Boat speed is 2 to 3 knots during tow boarding activities and two tow-boarders are always in the water together with at least one spotter on the boat observing the tow-boarders at all times. Onshore archaeological surveys, as well as outreach and education activities are opportunistically conducted by three staff up to 20 days per year also occur during maritime heritage field research (totaling 60 people days per year).

Mesophotic Diving in PMNM

OMAO vessels, their respective small boats and ONMS' small boats are used, up to 60 days each year, to facilitate technical diving (rebreather) and ROV surveys (up to 20 deployments per year) to characterize mesophotic (deep) coral reef ecosystems, establish long term monitoring to determine distribution and abundance of alien species, and to document climate change impacts. Diver operations are conducted, within the monument, from the NOAA Ship *Hi'ialakai*, for up to 30 days per year, using both OMAO vessel's small boats (2 - 10 m launches) and PMNM's program boats (2 - 19 ft rigid hull inflatable boats). Up to 6 divers are deployed at each site, for single dives, working at depths up to 300 ft. Each dive lasts between 30 - 180 minutes per day for a maximum of 20 dive days per cruise, with up to two cruises occurring each year (totaling 40 divers per year). Belt transects of 25 x 2 m are conducted to document fish, corals and invertebrates and survey for presence of invasive species. ROVs are also used to survey and document presence/absence of species and habitat types using one small ROV with one to two hour dive times at various reef spots throughout monument and lasting up to 7 days. On average, divers collect no more than 20 non-listed fish species that provide insight into genetic connectivity of benthic species in NWHI with MHI (MHI), Johnston Atoll, and other areas.

Reef Assessment and Monitoring Program in PMNM

OMAO vessels, their respective small boats and ONMS' small boats are used, up to 30 days each year, to facilitate a SCUBA and snorkel survey to establish long term monitoring to determine distribution and abundance of alien species, long term monitoring to determine climate change resistance, and the habitat characterization of deep reef species. Dive operations are conducted, within the monument, from the NOAA Ships *Hi'ialakai* and *Oscar Elton Sette*, for up to 14 days

per year, using each respective OMAO vessel's small boats (2 - 19 ft rigid hull inflatable boats) and ONMS small boats. Up to 6 divers are deployed at each site, for single dives, working at depths up to 120 ft. Each dive lasts 60 minutes per day for a maximum of 14 dive days per cruise. This activity includes the temporary deployment of a 30 m transect reel and towing dive float using the stationary point count (SPC) method to document fish, corals and invertebrates. The data will provide insight into genetic connectivity of species in NWHI with MHI, Johnston Island, and other areas.

Filming and Photographic Documentation of PMNM Resources for Outreach and Conservation and Management Purposes in PMNM

Underwater imagery is collected via SCUBA or snorkeling from a small boat (up to 60 days each year) and imagery onshore is often collected to document protected species or habitat surveys on land. Filming of ESA-listed species is conducted in consultation with NMFS and in conjunction with all quarantine and PMNM Best Management Practices. On average, filming and photography activities occur up to 60 days per year (days are divided between two research cruises and one land based access). Approximately six people collect film and photographic imagery per year, working 8 hours a day.

2.2.3 National Marine Sanctuary of American Samoa Projects and Field Operations

Field operations at NMSAS focus on several projects that support the sanctuary's mission to identify, protect, conserve, and enhance the natural and cultural resources, values, and qualities of the sanctuary for current and future generations. Projects include visits to Fagatele Bay, Aunu'u, Ta'u, Rose Atoll, Swains, and Fogama'a/Fagalua sanctuary units, Crown of Thorn Starfish eradication, reef assessment and monitoring, water quality monitoring, marine mammal acoustic recording, whale surveys, dive accident drills, and vessel maintenance and crew training. All field operations are conducted in accordance with NMFS ESA permit no. 15240, issued to the Pacific Islands Fisheries Science Center for marine mammal research.

Table 4. NMSAS Projects/Activities

Project Title	Summary of Project/Activity	Category of Field Operations
Vessel maintenance and crew training	The R/V <i>Manuma</i> (33 ft) is hauled out for dry dock maintenance every year. Minor maintenance such as oil changes and hull cleanings generally occur 3 times per year and may occur both in and out of the water.	<ul style="list-style-type: none"> ● Vessel Operations ● Vessel Maintenance ● SCUBA or Snorkel Operations

Visits to Fagatele Bay/Aunu'u/Ta'u/Rose Atoll/ Swains/ Fagalu'a/ Fogama'a Sanctuary Units	Transport partners, school groups, visitors and agencies to sanctuary units to view and potentially swim, dive and/or snorkel. Trips provide an opportunity to educate about the sanctuary's mission, goals, and impacts in the Samoan Islands. Research activities including reef and fish monitoring and sampling, marine mammal acoustic recording, water quality sampling.	<ul style="list-style-type: none"> ● Vessel Operations ● SCUBA, closed circuit rebreather or Snorkel Operations ● Onshore Fieldwork ● Deployment of AUVs/ROVs/Gliders/ Drifters
Crown of Thorn Starfish (COTS) Eradication	Monitor, investigate and respond to the threat of Crown of Thorns Starfish in and around Sanctuary Units through direct eradication techniques.	<ul style="list-style-type: none"> ● Vessel Operations ● Manta tows ● SCUBA, closed circuit rebreather or Snorkel Operations ● Other Sampling Activities
Coral bleaching monitoring	Monitor coral bleaching (occurrence, prevalence, severity) in sanctuary management areas during the bleaching season (January to June)	<ul style="list-style-type: none"> ● Vessel Operations ● Manta tows ● SCUBA or Snorkel Operations ● Other Sampling Activities
American Samoa Reef Assessment and Monitoring Program (ASRAMP)	Reef Assessment and Monitoring Program, conducted every three years across American Samoa, and monitoring surveys and research are conducted on biodiversity and calcification.	<ul style="list-style-type: none"> ● SCUBA or Snorkel Operations ● Onshore Fieldwork ● Deployment of AUVs/ROVs/Gliders/Drifters
Annual monitoring program	Conduct annual surveys to monitor biodiversity, abundance, demography, biomass (coral, fish) in sanctuary management areas	<ul style="list-style-type: none"> ● Vessel Operations ● SCUBA or Snorkel Operations
Marine debris accumulation surveys	Conduct marine debris accumulation surveys at Fogama'a/Fagalua (quarterly) and Aunu'u (monthly)	<ul style="list-style-type: none"> ● Onshore Fieldwork
Whale surveys	Circumnavigate Tutuila 12 times per year to survey migratory humpback whales and other resident cetaceans.	<ul style="list-style-type: none"> ● Vessel Operations
Dive accident drill	Partner with U.S. Coast Guard in a dive accident drill and training. Participants practice in water rescue, the emergency dive accident plan, and go through	<ul style="list-style-type: none"> ● Vessel Operations ● SCUBA or Snorkel Operations

	training on how to improve the emergency plan.	
Intertidal monitoring*	Identification, sampling, and quantifying intertidal benthic organisms and nearshore reef fish.	<ul style="list-style-type: none"> ● Vessel Operations ● SCUBA or Snorkel Operations ● Onshore Fieldwork ● Others Sampling Activities
Alien species monitoring*	Identification, sampling, and quantifying invasive and alien intertidal benthic organisms. ROVs are also utilized for survey and documentation.	<ul style="list-style-type: none"> ● Vessel Operations ● SCUBA or Snorkel Operations ● Onshore Fieldwork ● Deployment of AUVs/ROVs/Gliders/ Drifters ● Other Sampling Activities
Maritime heritage field activities*	SCUBA, snorkel, and onshore inventories of aquatic and terrestrial resources, assessing impacts of climate change on maritime heritage resources, and long-term monitoring strategies.	<ul style="list-style-type: none"> ● Vessel Operations ● SCUBA or Snorkel Operations ● Onshore Fieldwork ● Deployment of AUVs/ ROVs/Gliders/Drifters
Mesophotic diving*	SCUBA activities to characterize mesophotic (deep) coral reef ecosystems, establish long term monitoring to determine distribution and abundance of alien species, and to document climate change impacts.	<ul style="list-style-type: none"> ● Vessel Operations ● SCUBA or Snorkel Operations ● Deployment of AUVs/ROVs/Gliders/ Drifters ● Other Sampling Activities
Reef Assessment and Monitoring Program*	Vessels are used to facilitate a scuba and snorkel survey to establish long term monitoring to determine distribution and abundance of alien species, long term monitoring to determine climate change resistance, and the habitat characterization of deep reef species.	<ul style="list-style-type: none"> ● Vessel Operations ● SCUBA or Snorkel Operations ● Deployment of AUVs/ROVs/Gliders/ Drifters
Filming and photographic documentation	In-water and land-based filming and photography activities are conducted on an ad-hoc basis to collect imagery for conservation, management and outreach/education purposes.	<ul style="list-style-type: none"> ● Vessel Operations ● SCUBA or Snorkel Operations ● Onshore Fieldwork



Acoustic monitoring	Acoustic monitoring of ambient marine sound	<ul style="list-style-type: none"> ● Vessel Operations ● SCUBA Operations
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General Vessel Operations in NMSAS

General vessel operations are not a project in and of themselves, but they support a great many of the sanctuary’s projects. ONMS vessels are operated according to all NOAA Small Boat Program guidelines (<http://www.sbp.noaa.gov/policy/manual.html>). The sanctuary vessel (R/V *Manuma*) does not have specific additional, self-imposed standing orders. However, as a matter of internal policy, the R/V *Manuma* always has a person on board with local knowledge of the area. Although not part of formal requirements, sanctuary management also attempts as much as possible to have a person fluent in the local language present for radio communication. Vessel operations occur approximately 207 days/year in NMSAS.

Vessel Maintenance and Crew Training in NMSAS

The R/V *Manuma* (33 ft) is hauled out for dry dock maintenance every year for 9 days. Minor maintenance such as oil changes and hull cleanings generally occur three times per year and may occur both in and out of the water. In general, vessel maintenance and crew training operations occur only when needed within the sanctuary (*e.g.*, when new crew arrive, or before a large program utilizing the vessel). Vessel crew training and safety drills occur approximately four times per year, necessitating scuba and snorkel activities.

Visits to Fagatele Bay/Aunu’u/Ta’u/Fagalu’a/Fagama’a Sanctuary Units in NMSAS

Ground and vessel transport is used to take partners, school groups, visitors and agencies out to sanctuary units to view and potentially swim, dive and/or snorkel. Approximately 15 trips occur each year, during which approximately 150 total individuals visit these sanctuary units. Trips provide an opportunity to educate about the sanctuary’s mission, goals, and impacts in the Samoan Islands. Over the next 5 years there will also be research, monitoring and education trips via charter to Swains Island and Rose Atoll.

Crown of Thorns Starfish Eradication in NMSAS

Monthly tows are conducted using the RV/*Manuma* to monitor Crown of Thorns Starfish (COST) numbers in sanctuary management areas. If an outbreak is detected during tows, the boat will return with divers to eradicate the outbreak using oxbile injections.

Coral Bleaching

Coral bleaching monitoring operations will be conducted using the R/V *Manuma*. Water temperature will be monitored continuously (every 30 mins) at 3 different depths (same strata as annual monitoring sites) – shallow (>20ft), mid (20-60 feet), and deep (60-90 feet) in the Aunu’u,

Fagatele, Fogama'a/Fagalua and Ta'u management area. HoBo temperature loggers will be deployed at the location of one permanent monitoring site per strata and per management area. Loggers will be attached to the rebar markers to ensure easy relocation. To minimize potential data loss, 2 replicate loggers per depth will be deployed at each site (6 loggers/site at 4 sites = 24 loggers). And additional 24 loggers will be needed to effectively change out loggers on a frequent basis.

Monthly tows are already conducted as part of the NMSAS science program. If bleaching is observed during the tows, surveys will be conducted to estimate percent of corals affected (bleached), severity of bleaching and species affected (large-scale assessment). Survey methods will be based on the American Samoa Coral Bleaching Response Protocol developed by local agencies and updated in 2017. During the height of bleaching a smaller-scale survey will be carried out to get quantitative data on bleaching prevalence and severity. This data will help NMSAS to assess the impact of coral bleaching on the reef ecosystem and if this pressure/threat is causing a decline in key coral species (this is especially important in the light of our changing climate).

American Samoa Reef Assessment and Monitoring Program (ASRAMP) Surveys

The NOAA Ship *Hi'ialakai* (an OMAO vessel) is used to facilitate the major monitoring effort for Fagatele Bay and throughout National Marine Sanctuary of American Samoa, which contributes to comparative data gathered throughout the Pacific. This survey is conducted every three years across American Samoa. During ASRAMP surveys, there are about 16 participants conducting collection activities and in-water monitoring, using SCUBA or snorkel diving (up to 30 days each time ASRAMP activities are conducted). A total of 480 people days are tallied during each ASRAMP expedition. In water monitoring efforts, on occasion, utilize ROVs for surveying and monitoring activities (no more than 1 ROV dive per year). All collection and research activities are conducted by the National Marine Fisheries Service, Ecosystem Science Division and all data is analyzed by them. A report is produced by after each research cruise.

Monthly tows are conducted using the RV/Manuma to monitor COTS numbers in sanctuary management areas. If an outbreak is detected during tows, the boat will return with divers to eradicate the outbreak using oxbile injections.

Annual Monitoring Program

Annual monitoring operations will be conducted using the R/V Manuma. This project will monitor benthic (substrate) cover, coral demography (coral sizes and diversity), and fish biomass and diversity at 3 different strata (i.e. depths – shallow: >20ft, mid: 20-60 feet, and deep: 60-90 feet) based on the NOAA National Coral Reef Monitoring Program protocols (Ecosystem Science Division). High resolution 3D models will be created to precisely quantify the composition and habitat structure at each survey site and Stationary Point Count (SPC) surveys will be conducted to determine fish diversity and biomass. Contractors from ESD will carry out the surveys to ensure data quality. Sites will be chosen haphazardly for the 3 different depth strata (based on

ESD survey design methods) and marked with stainless steel rebar for relocation purposes. At least two independent, permanent monitoring sites will be established for each depth strata within each sanctuary management area (around Tutuila and Ta'u) and monitored annually (biological surveys and 3D images).

Whale Surveys in NMSAS

The R/V *Manuma* or a chartered vessel is used to circumnavigate Tutuila 12 times per year to survey migratory humpback whales and other resident cetaceans. NOAA-OLE in partnership with NOAA-NMFS-PIRO and DMWR in American Samoa provides on-hand training to all participants prior to deployment. This training is specific to allowable distances and speeds in which to operate when conducting whale surveys.

Marine Debris Accumulation Surveys

On-shore marine debris accumulation surveys are conducted at Fogama'a/Fagalua (quarterly) and Aunu'u (monthly). The objective of this study is to determine the rate of debris deposition (# of items per unit area, per unit time) in sanctuary management areas. The study was initiated in January, 2018. Two permanent survey sites were set up around Aunu'u, two at Fogama'a and one at Fagalua. A GPS point was taken at the beginning and the end of the transects and the location was also marked with red flagging tape. Transects run along the shoreline just above the high water mark. All trash is catalogued and removed from a 2 m belt (1 meter on either side of the transect) along the entire transect.

Dive Accident Drills in NMSAS

Local agency vessels, the local hospital, and NOAA line offices are involved in taking crew out on the water to train with the U.S. Coast Guard in a dive accident drill and training. Participants practice in water rescue, the emergency dive accident plan, and go through training on how to improve the emergency plan. This activity occurs once every two years and up to 50 people participate.

Intertidal Monitoring in NMSAS

The R/V *Manuma and charter vessels*, may be used to take personnel on shore and conduct nearshore snorkeling to identify, sample, and quantify intertidal benthic organisms and nearshore reef fish. Surveys take place along the intertidal shoreline areas of NMSAS as well as in-water monitoring to conduct survey and collections of non-listed fish and invertebrates. In general, these monitoring efforts occur for a duration of 14 days. Up to 20 individuals participate in intertidal monitoring efforts in NMSAS (totaling 168 people days per year) and up to 14 dives may occur during this annual activity. Monitoring goals include: determining distribution and abundance of intertidal species, determining climate change resistance and adaptation of intertidal species, and providing insight into genetic connectivity of intertidal species in NMSAS.

Alien Species Monitoring in NMSAS

ONMS small boat R/V *Manuma* and charter vessels may be used, up to 21 days per year, to take personnel on shore and on SCUBA and snorkeling activities to identify, sample, and quantify invasive and alien intertidal benthic organisms (up to 21 dives occur each year). ROVs are also utilized for survey and documentation. One small ROV with one to two hour dive time at various reef spots throughout NMSAS and are used for up to 7 days. Monitoring efforts are conducted up to 21 days per year within NMSAS. Belt transects are 25 x 2 m (totaling 105 people days each year). Possible sampling of unknown alien invasive species for identification purposes would occur. Monitoring goals include: determining distribution and abundance of alien intertidal species, determining climate change resistance and adaptation of alien intertidal species, and providing insight into genetic connectivity of intertidal species in NMSAS

Maritime Heritage Field Activities in NMSAS

ONMS' small boat R/V *Manuma* and charter vessels may be used, up to 20 days each year, to facilitate SCUBA and snorkel inventories of aquatic resources, assessing impacts of climate change on maritime heritage resources (up to 20 divers per year), and to complete long-term monitoring strategies. Additionally, up to 20 tow-boarding surveys are annually conducted in order to survey larger areas. Divers may also conduct snorkel tow-board surveys in areas where historic resources are suspected to have been lost. Boat speed is 1 to 2 knots during tow boarding activities and two tow-boarders are always in the water together with at least one spotter on the boat observing the tow-boarders at all times. Onshore archaeological surveys, as well as outreach and education activities are opportunistically conducted by three staff up to 20 days per year also occur during maritime heritage field research (totaling 60 people days per year).

Mesophotic Diving in NMSAS

ONMS' small boat R/V *Manuma* and charter vessels may be used, up to 60 days each year, to facilitate technical diving (rebreather) and ROV surveys (up to 20 deployments per year) to characterize mesophotic (deep) coral reef ecosystems, establish long term monitoring to determine distribution and abundance of alien species, and to document climate change impacts. Diver operations are conducted, within NMSAS, from the R/V *Manuma* and charter vessels, for up to 30 days per year. Up to 6 divers are deployed at each site, for single dives, working at depths up to 300 ft. Each dive lasts between 30 - 180 minutes per day for a maximum of 20 dive days. Belt transects of 25 x 2 m are conducted to document fish, corals and invertebrates and survey for presence of invasive species. ROVs are also used to survey and document presence/absence of species and habitat types using one small ROV with one to two hour dive times at various reef spots throughout NMSAS and lasting up to 7 days. On average, divers collect no more than 20 non-listed fish species that provide insight into genetic connectivity of benthic species in NMSAS, and other areas.

Reef Assessment and Monitoring Program in NMSAS

ONMS' small boat R/V *Manuma* and charter vessels may be used, up to 30 days each year, to facilitate a SCUBA and snorkel survey to establish long term monitoring to determine

distribution and abundance of alien species, long term monitoring to determine climate change resistance, and the habitat characterization of deep reef species. Dive operations are conducted, within NMSAS, from the R/V *Manuma* and charter vessels, for up to 14 days per year. Up to 6 divers are deployed at each site, for single dives, working at depths up to 120 ft. Each dive lasts 60 minutes per day for a maximum of 14 dive days per cruise. This activity includes the temporary deployment of a 30 m transect reel and towing dive float using the stationary point count (SPC) method to document fish, corals and invertebrates.

Filming and Photographic Documentation of NMSAS Resources for Outreach and Conservation and Management Purposes in NMSAS

Underwater imagery may be collected via SCUBA or snorkeling from a small boat (up to 60 days each year) and imagery onshore is often collected to document protected species or habitat surveys on land. Filming of ESA-listed species is conducted in consultation with NMFS and in conjunction with all Best Management Practices. On average, filming and photography activities occur up to 60 days per year. Approximately six people collect film and photographic imagery per year, working 8 hours a day.

Acoustic Monitoring

Reefs in remote locations are difficult to monitor. NMSAS aims to record ambient marine sound to characterize the activities of marine organisms in Fagatele Bay. By deploying an Ecological Acoustic Recorder (EAR), we can learn about the presence and activities of marine mammals, fishes, crustaceans, and other sound-producing marine life. Additionally, engine sounds will be recorded that can be used to estimate illegal fishing activity in the bay. Long-term observations provide an understanding of interactions within coral reef communities. An EAR provides a cost-effective tool for monitoring biological processes and human activities in marine environments and can be left in place unattended for months at a time.

Table 5 below estimates the total field operations per year that will be conducted in the Pacific Islands Region in the next five years (2015-2020).

Table 5. Estimated Field Operation Days Per Year for Pacific Islands Region

Categories of Field Operations	HIHWNMS Annual Activities	PMNM Annual Activities	NMSAS Annual Activities	Annual estimate for Pacific Island Region for next five years
Vessel Operations (days/yr for all NOAA-owned and contracted vessels)	247	217	207	671
Vessel Maintenance	6	7	9	22
Aircraft Operations (hours/yr)	20	5	0	25

Non-Motorized Craft (days/yr)	0	0	0	0
SCUBA or Snorkel Operations (dives/yr)	204	238	100	542
Onshore Fieldwork People days (people x days)	520	843	630	1993
Deployment of AUVs/ROVs (deployments/yr)	7	643	1	50
Deployment of Remote Sensing Equipment (deployments/yr)	31	45	0	76
Deployment of Equipment⁴ on the Seafloor (Equipment/yr)	33	10	3	46
Other Sampling Activities (annual totals)	<p>Humpback Whale monitoring/research: ~5 tagged; ~4 biopsied; ~2 collections (feces, placenta)</p> <p>Water samples will be collected 365 days/yr</p> <p>Marine debris collected opportunistically</p>	<p>Midway: opportunistic collection of alien invasive species</p> <p>Intertidal: ~600 inverts; ~45 crabs; ~700 balls of algae</p> <p>Alien species: opportunistic collection of alien invasive species throughout PMNM</p> <p>Mesophotic: opportunistic collection of new and alien</p>	<p>Visits to Sanctuary Units: batteries changed in temperature gauges 10 times/yr</p> <p>COTS eradication ; over 50 miles tow-boarded in monitoring efforts (approximately 10 sea days)</p>	<p>Whales: 5 taggings; 4 biopsies; 2 misc. collections</p> <p>Intertidal: 700 inverts; 725 balls of algae</p> <p>Alien/New species: ~100 balls of alien algae; opportunistic collections of new/alien species as observed</p> <p>RAMP: 25 species of each specimen type (fish, inverts, corals, algae)</p> <p>Water samples: 365 days/yr</p>

⁴ Equipment includes hydrophone and temperature data loggers.



		species in PMNM's mesophotic zone		<p>Marine debris collected opportunistically</p> <p>~10,000 COTS eradicate/year</p> <p>Batteries changed through NMSAS 10 times per year</p>
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2.3 Alternative 2: Conduct Field Operations Without Voluntary and Precautionary Procedures for Vessel Operations

Alternative 2 is to conduct field operations as currently conducted with the exception of the enhanced vessel operations procedures described in Alternative 1. In Alternative 2, ONMS vessels would be operated in accordance with NOAA Small Boat Program standards and other applicable requirements but without the ONMS vessel operations best management practices. Therefore, Alternative 2 would contain all of the activities described in Alternative 1, except for the vessel operations described below. It would also not include any recommended mitigations identified during the permit and consultation processes discussed above.

2.3.1 Hawaiian Islands Humpback Whale National Marine Sanctuary

The standing orders described in Section 2 would not be followed under this alternative. There would be no vessel speed restrictions beyond existing requirements and any required mitigations, no restrictions to operate only during the day, no requirement for an observer on board to keep a lookout for marine mammals and other species.

2.3.2 Papahānaumokuākea Marine National Monument

The best management practices in Section 2.2 would not be followed under this alternative. There would be no restrictions on transporting live marine organisms into the monument beyond existing requirements and any required mitigations, fewer restrictions on ballast water discharge, no restrictions on speed in the presence or suspected presence of marine mammals or turtles, and no disinfecting of underwater research tools or gear.

2.3.3 National Marine Sanctuary of American Samoa

Since there are no voluntary measures in NMSAS, there would be no change in how vessel operations are conducted for that site compared to Alternative 1.

3.0

AFFECTED ENVIRONMENT

This section includes a brief summary of the physical, biological, socioeconomic and maritime heritage and cultural environments for each sanctuary and the monument in the region that may be affected by the proposed action. For a complete description of the environmental setting at each of the sanctuaries and the monument please see the [final EIS/management plan](#) (1997) and draft EIS/management plan (2015) for HIHWNMS, the [management plan](#) for PMNM, and the [final EIS / management plan](#) for NMSAS. These documents can be located at the following websites below:

- Final Management Plan for Hawaiian Islands Humpback Whale National Marine Sanctuary Part 2 p. 23-128 (HIHWNMS 1997)
http://hawaiihumpbackwhale.noaa.gov/documents/pdfs_management/Section1_FEIS1997.pdf.
- Draft Management Plan and EIS for Hawaiian Islands Humpback Whale Sanctuary Section 7 p. 72-134 and p. 134-175 for site-specific information (HIHWNMS 2015)
http://hawaiihumpbackwhale.noaa.gov/management/pdfs/mp2015_dmp_deis.pdf
- Management Plan for Papahāhānaumokuākea Marine National Monument Section 1 p. 1-57 (PMNM 2008)
http://www.papahāhānaumokuākea.gov/management/mp/vol1_mmp08.pdf
- Final Management Plan / Environment Impact Statement for National Marine Sanctuary of American Samoa Chapter 3 p. 81-193 (NMSAS 2012)
https://nmsamericansamoa.blob.core.windows.net/americansamoa-prod/media/docs/fbnms_mp_eis.pdf.

3.1 Hawaiian Island Humpback Whale National Marine Sanctuary

3.1.1 Physical Environment

Physical Characteristics/Geology/Oceanography

The Hawaiian Islands are volcanic rock and generally surrounded by coral reefs and contain numerous bays. Along some of the windward shorelines where perennial streams empty into the ocean, estuarine-like conditions prevail. Relatively abundant rainfall and persistent northeasterly trade winds contribute to the steady weathering of the islands. Sandy beaches are found along the shorelines of all the islands but are best developed on Kaua‘i and Ni‘ihau and least developed on Hawai‘i, where mountain-building and shoreline creation is still occurring. Sandy beaches are found along the shorelines of all the islands. There are no known oil and gas deposits within the nearshore area of the State, and manganese nodule deposits and cobalt rich crusts lie far offshore. Sand is the most commercially valuable nearshore mineral with large deposits located in a number of sites.

Water and Air Quality

Hawai‘i’s water quality standards (Chapter 11-54 Hawaii Administrative Rules) are broadly based to protect both terrestrial (groundwater and surface waters) and marine waters. While offshore water around Hawai‘i is remarkably clean, nearshore localized concentrations of pollutants occur near populated areas due to storm water discharges and permitted sanitary outfalls. A report on water quality monitoring and assessment is prepared annually by the Hawai‘i Department of Health. Turbidity is the most common pollutant in triggering a marine water listing for impairment, possibly due to polluted runoff. Hawai‘i’s overall coastal water quality is rated “good” through the Water Quality Index (Environmental Protection Agency 2012) and sediment quality index is rated “poor” by 2006 surveys. Overall condition of waters including water quality and sediment quality is rated “fair.” Overall there has been a decline in “good” water quality between 2002 and 2008 (Environmental Protection Agency 2012).

The atmospheric environment throughout the sanctuary is generally considered clean due to the fairly consistent trade wind conditions.

Acoustic Environment

Underwater sound in the ocean can come from a variety of natural and anthropogenic sources. Anthropogenic sources include shipping, general vessel traffic, tour boats, aircraft, research, energy and mineral exploration, underwater construction, seismic devices, pingers, and navy activities such as use of sonar and underwater explosions. Potential impacts of sound on marine organisms can range from no or very little effect to various levels of behavioral reactions, physiological stress, threshold shifts, auditory masking, and direct trauma. Responses to sound generally fall into three categories: behavioral, acoustic, and physiological. Noise pollution can

be intense and acute or less intense and chronic. Commercial shipping is considered to be the major contributor to low frequency noise within the sanctuary.

3.1.2 Biological Environment in HIHWNMS

Habitat

The sanctuary boundaries include a wide range of sub-tropical marine habitat types including coastal and shoreline areas, estuaries, seagrass, sandy, hard and rubble habitat, coral reefs, and deep ocean, all of which support diverse marine species. For the populated Hawaiian Islands, NOAA mapped 32 distinct habitat types (*i.e.*, 4 major and 14 detailed geomorphological structure classes; 7 major and 3 detailed biological cover types) within 13 nearshore zones using satellite imagery. The major biological cover types in the nearshore environment include coral, macroalgae, coralline algae, seagrass, turf, emergent vegetation or uncolonized cover.

There are two species of seagrass in Hawai'i, *Halophila hawaiiiana* and *Halophila decipiens*. *Halophila hawaiiiana* is an endemic species of seagrass that is only found in Hawai'i in soft bottom or sandy habitats. Seagrass provides many ecological services including stabilizing bottom sediments and particulate matter, providing food for grazers and detritivores, serving as shelter for small invertebrates and processing nutrients. Subtidal habitat generally ranges between 0-100 feet (0-30 m) and includes softbottom, rubble and hard substrate. Softbottom habitats support two species of seagrass, *Halophila hawaiiiana* (endemic) and *Halophila decipiens*, as well as native and introduced macroalgae. Sand dwelling species include crabs, goby fish, bonefish, flounder, scorpion fish, sting rays, and sea cucumbers. Hard bottom substrates support coral, crustose coralline algae as well as other kinds of algae, many invertebrates and fish species. Reef flats are generally nearshore and relatively shallow (0-100 feet or 0-30 m). They are mainly constructed of calcium carbonate skeletons of coral and coralline algae and support a diversity of algae, fish, coral and other invertebrates. The most common coral species in Hawai'i are the endemic Finger coral (*Porites compressa*), Rice coral (*Montipora capitata*), Lobe coral (*Porites lobata*), and Cauliflower Coral (*Pocillopora meandrina*). Banks, drowned reefs, and seamounts are generally found at depths of 100-500 feet (30-150 m) and provide a variety of fish habitats, sustain ecological communities, and enhance ocean mixing.

Birds

In the populated Hawaiian Islands, there are 22 species of breeding seabirds. Hawaiian seabirds are comprised of a diverse group of families including albatrosses, shearwaters, petrels, storm-petrels, frigatebirds, boobies, tropicbirds, terns, and noddies. They vary greatly in terms of abundance, with some species such as sooty terns being very numerous and widely distributed, whereas the listed species exhibit low numbers and limited distributions. The Hawaiian petrel (also known as dark-rumped petrel) (*Pterodroma sandwichensis*), was once the most abundant seabird on the populated Hawaiian Islands, and is now listed as endangered under the Endangered Species Act. The other listed breeding seabird is the threatened Newell's shearwater (*Puffinus*

newelli)⁵. The greatest threats to seabirds in Hawaii are introduced mammals and other invasive species, fishery interactions, contaminants, oil pollution, and climate change.

Fish and Invertebrates

Fish distribution across the sanctuary is affected by depth, substrate type, and composition. Many organisms live in the intertidal and splash zones including species of fish including gobies, and benthic invertebrates such as Nerite snails (Pipipi), limpets ('Opihi), barnacles, tube snails, crabs, and sea slugs. Fish in intertidal habitats are limited to tide pools or passing through the intertidal zone at high tide. Species of endemic and indigenous freshwater fish (such as gobies) and invertebrates (such as shrimp and snails) have lifecycles in freshwater bodies, estuaries and the open ocean.

While most reef-building corals live within 100 feet (30 m) of depth, some assemblages of reef-building coral species are known to thrive at mesophotic depths of generally 100-500 feet (30-150 m). The coral that grows at these depths can form extensive reef ecosystems such as in the Au'au Channel and at Penguin Bank in the populated Hawaiian Islands. In addition, black and precious corals also grow at these depths. In the 'Au'au Channel area there are also extensive meadows of green seaweed (*Halimeda sp.*) which serve as habitat for small fish. Deep water habitats (>500 feet or 150 m) are generally too deep for light to penetrate and have either basalt or carbonate hard bottom substrate on slopes and assemblages of sediment on flat surfaces. Deep sea animals include zooplankton, fish, squid, precious coral and other invertebrates. Pelagic organisms include phytoplankton, zooplankton, fish, and squid. There are no ESA-listed fish or corals that are known to occur within HIHWNMS.

Protected Species

The ranges of 13 threatened and endangered marine species overlap with the Hawaiian Islands Exclusive Economic Zone (EEZ), which extends to 200 nautical miles offshore (see Appendices B and E). These include the endangered Hawaiian monk seal (*Neomonachus schauinslandi*), five endangered baleen whale species (blue-*Balaenoptera musculus*, fin-*Balaenoptera physalus*, humpback⁶, sei-*Balaenoptera borealis*, and right-*Eubalaena japonica*), two endangered toothed whale species (insular false killer and sperm whale), three endangered turtle species (hawksbill-*Eretmochelys imbricata*, leatherback-*Dermochelys coriacea*, and loggerhead-*Caretta caretta*), and two threatened turtle species (green- *Chelonia mydas*, and olive ridley-*Lepidochelys belolivacea*).

In addition, marine mammals (which are all federally protected under the MMPA) that may occur within the Hawaiian Islands EEZ include: Bryde's whale (*Balaenoptera edeni*), Minke whale (*Balaenoptera acutorostrata*), Blainsville beaked whale (*Mesoplodon densirostris*), Common

⁵ Please see Appendix E for the comprehensive list of protected species.

⁶ NOAA Fisheries has delisted a number of humpback whale distinct population segments, including the population frequenting Hawaiian Islands Humpback Whale National Marine Sanctuary (81 FR 62259).

bottlenose dolphin (*Tursiops truncatus*), Cuvier's beaked whale (*Ziphius cavirostris*), Fraser's dolphin (*Lagenodelphis hosei*), Longman's beaked whale (*Indopacetus pacificus*), Melon-headed whale (*Peponocephala electra*), Pygmy sperm whale (*Kogia breviceps*), Dwarf sperm whale (*Kogia sima*), Risso's dolphin (*Grampus griseus*), Rough-toothed dolphin (*Steno bredanensis*), Short-finned pilot whale (*Globicephala macrorhynchus*), Spinner dolphin (*Stenella longirostris*), Pantropical spotted dolphin (*Stenella attenuate*), Pygmy killer whale (*Feresa attenuata*), Killer whale (*Orcinus orcus*), and the Striped dolphin (*Stenella coeruleoalba*).

3.1.3 Socioeconomic Environment in HIHWNMS

Maritime Transportation/Traffic and Military Operations

In 2003, Hawaiian Islands Humpback Whale National Marine Sanctuary convened a workshop to evaluate vessel strike of humpback whales in Hawai'i. The workshop concluded that vessel strike was not a critical issue at that time but encouraged continued research and education about the issue. Subsequently, the International Whaling Commission held a workshop in 2010 to develop strategies to reduce the risk of collisions between cetaceans and vessels. This workshop reviewed existing information, risk assessment, and mitigation measures and made recommendations for data collection, conservation measures, and reporting. Mitigation measures for reducing risk included routing options, speed restrictions, reporting systems, observers, and technological approaches, such as online databases for information management and sharing.

The Department of Defense (DOD) is one of the primary users of the marine environment in Hawai'i. In particular, the Department of Navy conducts training and testing activities in the Hawaii Range Complex, which encompasses the open ocean, offshore waters, and onshore areas located on or around the Hawaiian Islands, and overlaps with the HIHWNMS. Training supports naval operational readiness by providing a realistic training environment for forces assigned to the Pacific Fleet. The range is also used to test new and emerging technologies. Training and testing activities include the use of active sonar and explosives. The Navy conducts its activities under permits and authorizations under the ESA, the MMPA, and other relevant federal and state environmental laws. In addition, Navy mitigations provide for the protection of humpback whales prior to any training exercise or testing which may occur during whale season. Notable instrumented range facilities in the HRC include arrays of underwater hydrophones (listening devices) on the seafloor off Kauai and ship acoustic and electronic measurement capabilities off Oahu.

Within HIHWNMS, the Navy conducts large integrated anti-submarine major training exercises using sonar (such as Rim of the Pacific), medium integrated anti-submarine major training exercises (e.g., Undersea Warfare Exercise), and training and testing activities using in-water explosives. The HIHWNMS overlaps with the MHI Humpback Whale Reproduction Area. The Navy's use of sonar and other transducers primarily occur farther offshore than the designated boundaries of the Hawaiian Islands Humpback Whale Reproduction Area. Explosive events are typically conducted in areas that are designated for explosive use, which are areas outside of the

MHI Humpback Whale Reproduction Area. Since 2009, the Navy has adhered to a humpback whale cautionary area within the Sanctuary, an area identified as having one of the highest concentrations of humpback whales during the critical winter months. The use of mid-frequency active sonar training and testing within the existing cautionary area between December 15 and April 15 requires authorization by the Commander, U.S. Pacific Fleet. In Navy's current proposed training and testing environmental analysis, the Navy proposes to expand the size and extend the season of the current Humpback Whale Cautionary Area. The Navy will continue to issue an annual humpback whale awareness notification message to remind ships and aircraft to be extra vigilant during times of high densities of humpback whales while in transit and to maintain certain distances from animals during the operation of ships and aircraft.

More information on Navy activities in and near Hawai'i can be found in the Hawaii-Southern California Range Complex Environmental Impact Statement/Overseas Environmental Impact Statement <https://hstteis.com/>.

Other Human Uses

Human uses of the marine environment in Hawai'i include recreational and commercial fishing, offshore development, vessel traffic and harbors, and recreation and tourism. Approximately one quarter of the population participates in some form of recreational fishing at least one time per year. In addition, commercial fisheries in Hawai'i are extensive and include fish caught for sale, as well as charter fishing services. All commercial fishermen are required to acquire an annual renewable commercial marine license (CML). In 2013 there were 3,970 licensed commercial fishermen in the State of Hawaii. In 2011, over 29 million pounds of fish were caught for commercial purposes in the State, worth over \$71 million. A wide variety of species are landed commercially in Hawai'i. Bigeye tuna and billfish (particularly blue marlin, striped marlin, and swordfish) are the main target species for pelagic fishing but other species such as mahi mahi, ono (wahoo), and moonfish are also important. Target bottomfish species include snappers, jacks, and a single species of grouper that is concentrated at depths of 30 to 150 fathoms. The most desirable species are seven deepwater species known as the "Deep 7" (opkapaka, onaga, hapuupuu, ehu, kalekale, gindai, and lehi). Inshore fish species popular for commercial purposes include akule (which dominates nearshore commercial landings), soldierfish, surgeonfish, goatfish, squirrelfish, unicornfish, and parrotfish.

Other human uses include renewable energy production, aquaculture, tourism, and recreation. The tourism and recreation sector is the largest industry in the Hawai'i ocean economy. Approximately 8 million people visited Hawai'i in 2013 and recreation activities in Hawai'i are primarily centered on the ocean. Ocean based recreation includes surfing, pleasure boating, fishing, swimming, snorkeling, SCUBA-diving, whale-watching, water-skiing, kite-boarding, kayaking, relaxing at beaches, and cruises, among others (Monk Seal PEIS 2014). In addition, renewable energy production is expanding throughout the Hawaiian Islands. The primary renewable energy sources in Hawai'i are geothermal, Ocean Thermal Energy Conversion (OTEC), wind, biofuels, and solar power.

Research and Education

In Hawai'i, the sanctuary offices provide education programs that have focused on making constituents aware of humpback whales and the ocean they live in, with the understanding that ocean-literate citizens will help protect not only humpback whales, but also all natural resources. Sanctuary education staff on Oahu, Kauai, and Maui coordinate with non-profit organizations and the local communities to further promote messages of sustainable use and marine conservation. Events include naturalist trainings, public lecture series, and trainings for different user groups, citizen scientist projects, teacher workshops, student presentations, field studies, and community outreach events. The sanctuary office also offers education cruises for high school students on NOAA ships.

The sanctuary is an important partner in marine science research and education efforts in Hawai'i. Monitoring the health of the humpback whale population is an ongoing research activity conducted in partnership with several collaborators. New methodologies to identify the whales, improve disentanglement gear, collect biopsy tissues to assess body condition and potential diseases, stranding response protocols, and a variety of other projects, are a vital component of the research and monitoring program. Ongoing research projects include underwater behavior and passive acoustic study of humpback whales, air photo identification to determine a number of traits, assessment of probability of vessel strikes, function of whale songs, and reproductive and calving characteristics. In addition, since 2002, the sanctuary has been conducting its Large Whale Response Program within the broader framework of national and international programs aimed at gaining information to understand and reduce the threat of entanglement, whale-vessel collisions, and other threats for large whales in the North Pacific and elsewhere.

3.1.4 Maritime Heritage and Cultural Environment in HIHWNMS

Maritime Heritage Resources

Maritime heritage resources refer to cultural, archeological, and historical properties associated with coastal and marine areas and seafaring activities and traditions. These include shipwreck sites, historic aircraft sites, the remains of landings and dock facilities, prehistoric archaeological sites, and other types of materials. The existing maritime heritage resource inventory for resources within the sanctuary's boundaries is comprised of vessels and historic aircraft reported lost within the sanctuary, and vessels and historic aircraft wreck sites confirmed by surveys within the sanctuary. The inventory has been compiled from various sources, such as historical documents (Thrum's *Hawaiian Annual*, Thomas' *Hawaiian Registered Vessels*, *Pacific Commercial Advertiser*); federal databases (Naval Historical Center aviation and shipwreck databases, inventory report *US Navy Shipwrecks in Hawaiian Waters: an Inventory of Submerged Naval Properties*); non-agency researchers (Bob Lewis, Rick Rogers); and field site investigations (University of Hawai'i Marine Option Program, Hawai'i Undersea Research Laboratory, Smithsonian Institute).

Historic documents indicate at least 195 ships and aircraft have been lost within the current sanctuary boundaries and the boundaries that were proposed for Ni‘ihau in the March 2015 proposed rule. Of these losses, some have been salvaged and some completely broken up and lost over time. Approximately 33 sites have been confirmed by known location, and 18 have been archaeologically surveyed and assessed. More than 70 historic civilian, army, and navy aircraft were lost within the current sanctuary boundaries alone. The technical development of flying boats in Hawai‘i dates back to the 1920’s and 1930’s as do the oldest located submerged aviation crash sites. Many of these wrecks and aircraft crash sites are also grave sites that deserve appropriate respect and protection.

Cultural and Historic Resources

Cultural resources include material remains of past human activities, both from historic and Pre-European contact. In addition, cultural resources include traditional cultural properties, such as areas used for ceremonies or other cultural activities that may leave no material traces, and may have on-going use important to the maintenance of cultural practices. For cultural resources qualifying as historic properties, protection is afforded under the National Historic Preservation Act (NHPA). NHPA defines a historic property as “any Pre-European contact or historic district, site, building, structure, or object included in, or eligible for listing on the National register, including artifacts, records, and material remains related to such a property or resources” (36 C.F.R. § 800.16(l)(1)). There are cultural resources that have been identified as significant within sanctuary boundaries. These include traditional Hawaiian fishponds, and surfing and navigation sites. The Office of Hawaiian Affairs’ Kipuka Database is a geographical information system (GIS) that provides the location of and basic information on historic and culturally important sites in Hawai‘i, which are searchable by traditional Hawaiian land divisions (<http://www.kipukadatabase.com>).

3.2 Papahānaumokuākea Marine National Monument

3.2.1 Physical Environment

Physical Characteristics/Geology/Oceanography

PMNM encompasses 582,578 square miles (1,508,870 square km) of the Pacific Ocean, an area larger than all U.S. National Parks combined, and makes up the northern three-quarters of the Hawaiian archipelago, beginning in the northwest at Kure atoll, the most northerly coral reef atoll in the world, and extending approximately 1,200 miles (1,043 nm, 1,931 km) southeast to Nihoa, 165 miles northwest of Kaua‘i. There are ten main islands and atolls in the NWHI. The two southernmost islands, Nihoa and Mokumanamana, are basaltic islands. Four of the five middle landmasses are open atolls (French Frigate Shoals (FFS) and Maro Reef) and sandy islands (Laysan and Lisianski). La Perouse Pinnacle (at FFS) and Gardner Pinnacles are small basaltic outcrops, remnants of islands similar to Nihoa and Mokumanamana. The three northernmost landmasses, Pearl and Hermes, Midway, and Kure, are classical atolls. In addition, there are

approximately 30 submerged banks within the monument. Deepwater banks, seamounts and the abyssal plain are among the least studied environments of the NWHI. While most of the monument's area can be considered pelagic (open sea) habitat, submersible surveys on South Pioneer Ridge (Pioneer Bank) and two unnamed seamounts, one east of Laysan Island and the other east of Mokumanamana, have revealed the presence of various substrate types, deposited when these geologic features were at sea level. The estimated area of all parts of the monument with depths greater than 1,000 fathoms (6,000 ft., or 1.8 km.) is 117,375 square miles (304,000 square km.), or about 96 percent of the entire monument.

Water and Air Quality

The marine environment in the NWHI is generally considered to be relatively pristine. This is due to the remoteness of the NWHI, the fact that most of the islets and shoals remain uninhabited, and the oceanographic conditions of the central Pacific Ocean. Nutrient conditions in the NWHI may be influenced by local and regional factors. Upwelling may occur in response to localized wind and bathymetric features. The monument is located at the northern edge of the oligotrophic tropical Pacific, in the North Pacific central gyre ecosystem. Regional factors are largely influenced by the position of the subtropical front and associated high chlorophyll content of waters north of the front. High-chlorophyll waters intersect the northern portions of the NWHI during southward winter migrations of the subtropical front. The influx of nutrients to the NWHI from these migrations is considered a significant factor influencing different trophic levels in the NWHI. The monument is near the 64°F (18°C) sea surface isotherm, a major ecological transition zone in the northern Pacific. This boundary, also known as the “chlorophyll front,” varies in position both seasonally and annually, occasionally transgressing the monument boundary and surrounding the northern atolls of Kure and Midway. The movement of the front influences overall ocean productivity, and resultant recruitment of certain faunal elements such as Hawaiian monk seals and Laysan and black-footed albatrosses. The northernmost atolls also are occasionally affected by an episodic eastward extension of the Western Pacific warm pool, which can lead to higher summer ocean temperatures at Kure than are found in the more “tropical” waters of the MHI farther south.

The atmospheric environment throughout the NWHI is generally considered to be relatively pristine. This is due to the remoteness of the NWHI, the fact that most of the islets and shoals remain uninhabited, and the fairly consistent trade wind conditions.

Acoustic Environment

Underwater sound in the ocean can come from a variety of natural and anthropogenic sources. Anthropogenic sources include shipping, general vessel traffic, tour boats, aircraft, research, energy and mineral exploration, underwater construction, seismic devices, pingers, and Navy activities, such as use of sonar and underwater explosions. Potential impacts of sound on marine organisms can range from no or very little effect to various levels of behavioral reactions, physiological stress, threshold shifts, auditory masking, and direct trauma. Responses to sound generally fall into three categories: behavioral, acoustic, and physiological. Noise pollution can

be intense and acute or less intense and chronic. Commercial shipping is considered to be the major contributor to low frequency noise within the monument.

3.2.2 *Biological Environment in PMNM*

Habitat

The monument supports a diverse and unique array of both marine and terrestrial flora and fauna. With a spectrum of bathymetry and topography ranging from abyssal basins at depths greater than 15,000 ft. (4,572 m.) below sea level to rugged hill slopes and clifftops on Nihoa and Mokumanamana (Necker Island) with elevations up to 903 ft. (275.2 m.) above sea level, the monument represents a complete cross section of a Pacific archipelagic ecosystem. Habitats contained within the monument include deep pelagic basins, seamouts, abyssal plains, submarine escarpments, deep and shallow coral reefs, shallow lagoons, littoral shores, dunes, and dry coastal grasslands and shrublands. Relatively high percentages of most taxonomic groups in the NWHI are found nowhere else on earth.

The physical isolation of the Hawaiian Archipelago explains the relatively low species diversity and high endemism levels of its biota (DeMartini and Friedlander 2004). The direction of flow of surface waters explains biogeographic relationships between the NWHI and other sites, such as Johnston Atoll to the south, as well as patterns of endemism, population structure, and density of reef fish within the archipelago.

Birds

The terrestrial area of the monument is comparatively small but supports significant endemic biodiversity. These emergent lands are vital habitat to the 14 million resident and migratory seabirds, which rely on these islands for roosting and breeding habitat and on the surrounding waters for food and which are protected under the Migratory Bird Treaty Act. Included in the 5.5 million seabirds that nest in the NWHIs annually are 99 percent of the world's Laysan (*Phoebastria immutabilis*) and 98 percent of the world's black-footed (*Phoebastria nigripes*) albatross. In addition, found only in the NWHI are four endangered endemic bird species that are not seabirds (Laysan duck (*Anas laysanensis*), Laysan finch (*Telespiza cantans*), Nihoa finch (*Telespiza ultima*), and Nihoa millerbird (*Acrocephalus familiaris kingi*)) also breed on the islands.

Fish and Invertebrates

The shallow marine component of the monument is nearly pristine and has been described as a “predator-dominated ecosystem,” an increasingly rare phenomenon in the world's oceans. Large, predatory fish—such as sharks, giant trevally, and Hawaiian grouper—that are rarely seen and heavily overfished in populated areas of the world are extremely abundant in the waters of the monument. For instance, such species comprise only 3 percent of fish biomass in the heavily used MHI, but by contrast represent 54 percent of fish biomass in the waters of the monument. The NWHI are also characterized by a high degree of endemism in reef fish species, particularly at the

northern end of the chain, with endemics comprising more than 50 percent of the population in terms of numerical abundance.

The majority of the monument consists of deep pelagic waters that surround the island platforms. At least 15 banks lie at depths between 100 and 1,300 ft. (30 and 400 m.) within the monument, providing important habitat for bottomfish and lobster species as well as deepwater precious coral beds, including ancient gold corals whose growth rate is now estimated to be only a few centimeters every hundred years and whose ages may exceed 2,500 years. At depths below 1,640 feet (500 meters), a diverse community of octocorals and sponges flourish. Even deeper yet, the abyssal depths of the monument harbor low densities of organisms, and yet the total biomass of the abyssal community is quite large because of the large area of this habitat type within the monument. Occupying this habitat are unique and poorly documented fish and invertebrates, many with remarkable adaptations to this extreme environment.

Protected Species

The NWHI provides important habitat for many protected species (see Appendices B and E) such as the Hawaiian monk seal (*Monachus schauinslandi*), five species of sea turtles and an array of cetaceans and other marine mammals. Hawaiian monk seals utilize most of the monument, including the atolls, islands, and waters of the monument, with varying population (numbers and age structure) and some exchange within the NWHI and the MHI.

The five species of sea turtles that occur in the NWHI are the North Pacific distinct population segment of loggerhead (*Caretta caretta*), green (*Chelonia mydas*), olive ridley (*Lepidochelys olivacea*), leatherback (*Dermochelys coriacea*), and hawksbill (*Eretmochelys imbricata*), all of which are protected by the Endangered Species Act (ESA). While the sandy islets of FFS provide nesting sites for 90 percent of the threatened green turtle population breeding in the Hawaiian Archipelago, many more islets and atolls provide important nesting habitat for all five species of sea turtles.

The waters of the monument are also home to 20 cetacean species, six of them federally recognized as endangered under the ESA and recognized as depleted under the Marine Mammal Protection Act (MMPA). The great whales occur throughout the Pacific. Five baleen whales—blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), sei whale (*Balaenoptera borealis*), and North Pacific right whale (*Eubalaena japonica*), MHI false killer whale distinct population segment (*Pseudorca crassidens*)—and one toothed whale, the sperm whale (*Physeter macrocephalus*), are listed under the ESA. They are known to occur in this area of the north Pacific, but they are all considered relatively rare in Hawaiian waters. The humpback whale (*Megaptera novaeangliae*) DPS most relevant to this region has recently been de-listed (81 FR 62259). They are the most common baleen whales in the Hawaiian archipelago. Spinner and bottlenose (*Tursiops truncatus*) dolphins are year-round residents of the NWHI. They are not considered threatened or endangered under the ESA or depleted under the MMPA though they are protected under the MMPA. While both species are widely distributed throughout the world in tropical and warm temperate waters, they are considered separate stocks from other

populations due to their isolation in the Hawaiian archipelago (NOAA 2000). Both species occur from the island of Hawai‘i to Kure Atoll. Please see Appendix E for more information.

3.2.3 Socioeconomic Environment in PMNM

Maritime Transportation/Traffic and Military Operations

Entering the monument is prohibited except for passage without interruption, when responding to emergencies, for law enforcement, and activities and exercises of the armed forces or unless permitted. All U.S. vessels, passing through the monument without interruption, are subject to the prohibitions and must provide notification prior to entering and after leaving the monument (50 C.F.R. § 404.4(a)(3)). In addition, in 2003 the monument was designated as a Particularly Sensitive Sea Area (PSSA), and protective measures consisting of (1) expanding and consolidating the six existing recommendatory Areas to be Avoided (ATBA) in the monument into four larger areas and enlarging the class of vessels to which they apply; and (2) establishing a ship reporting system for vessels transiting the monument. The latter referenced ship reporting system requires all U.S. flag ships and foreign flag vessels, 300 gross tons or larger, that transit to or from a U.S. port to report specific location and vessel specification information (50 C.F.R. § 404.4(c), (d)). With the exception of a few small boats at Midway Atoll and Tern Island, no vessels have home ports in the NWHI. For this reason, almost all marine traffic in the waters surrounding the NWHI is made up of Department of Defense vessels conducting training and testing activities, transiting vessels, USCG ships, and separately permitted vessels.

The USCG may enforce all applicable federal laws within the boundaries of the monument. The USCG has the authority to enforce Monument regulations and restrictions concerning ship traffic pursuant to 14 U.S.C. §§ 2 and 89. Prohibitions in the monument regulations do not apply to activities necessary to respond to emergencies threatening life, property, or the environment, or to activities necessary for law enforcement purposes (50 C.F.R. § 404.8).

The monument also falls within the Navy’s HRC. Navy training and testing activities that could occur within the monument include training by individual ships transiting to and from the Western Pacific on deployment or occasional positioning of ships supporting testing or other events outside of the monument. Activities can include air warfare, surface warfare, anti-submarine warfare (using sonar), and electronic warfare. Infrequent missile overflight of the monument for test events can occur. However, the majority of test events do not require entry or overflight of the monument. More information on Navy activities in and near Hawai‘i can be found in the Hawaii- Southern California Range Complex Environmental Impact Statement/Overseas Environmental Impact Statement <https://hstteis.com/> (<http://www.govsupport.us/navynepahawaii/hawaiiyceis.aspx>).

Other Human Uses

The area the monument encompasses has a long history of use. Native Hawaiians explored these waters, established settlements, and conducted religious ceremonies for hundreds of years prior to

the arrival of the first Europeans. Most extractive uses, including guano mining, egg and feather collection, rabbit farming, whaling, and a variety of fishing ventures, ended by the early 1900s. The U.S. military used FFS and Midway Atoll, which are equipped with runways, as permanent bases during and after World War II. The USCG built a LORAN station with a 4,000-foot runway at Kure Atoll in 1960. The Navy conducts training and testing within the Hawai'i Operating Area, which includes a portion of the monument. In addition, the Department of Defense conducts missile defense testing, including missile intercepts, in and around the monument. The earliest intensive scientific expedition in the Northwestern Hawaiian Islands was the Rothschild Expedition in 1891. Research continues to be one of the primary activities occurring within the monument. Management activities conducted by the state of Hawai'i, FWS, and NOAA have been ongoing for decades. Human activities and use of the monument resources are carefully managed, considering historical uses and new threats through permitting, enforcement, and managing specific human uses, including Native Hawaiian cultural practices and visitors at Midway Atoll.

Research and Education

Compared to the past, there is little human activity in the monument today. With the departure of the military and the phasing out of all commercial fishing by 2011, the main marine-related activities are research, wildlife management, and transiting ships. Per Presidential Proclamation 8031, access to the monument may occur under six types of permitted activities: 1) research, 2) education, 3) conservation, 4) Native Hawaiian practices, 5) special ocean uses, and 6) recreational activities. In addition, access by the armed forces for emergency response, enforcement, and passage without interruption are allowed without permit by regulation. Separately permitted research and education activities that further the research, education and conservation and management of the monument occur on an annual basis.

3.2.4 Maritime Heritage and Cultural Environment in PMNM

Maritime Heritage Resources

The monument enjoys a rich maritime history, with ocean vessels from around the world having traveled into the NWHI—although not all that came in made it back out. Long before Western ships sighted the NWHI, it is believed that Native Hawaiians frequently sailed along the ancient voyaging routes that connect Kaua'i to the settlements on Nihoa and Mokumanamana. In addition to a rich Native Hawaiian cultural setting, maritime activities following Western contact with the Hawaiian Islands have left behind the historical and archaeological traces of a unique past. Currently, more than 60 ship losses are known among the NWHI, the earliest loss dating back to 1818. These, combined with 67 known aircraft crashes, amount to more than 120 potential maritime and military heritage resources.

All of these maritime activities have left a scattered material legacy around and on the islands: whaling ships, Japanese junks, Navy steamers, Hawaiian fishing sampans, Pacific colliers, salvage vessels, and Navy aircraft. Many of these sites are of national and international historical

significance. Programmatic mandates have been established to ensure their preservation and protection.

Cultural and Historic Resources

Physical remnants of wahi kūpuna (ancestral places), Hawaiian language archival and oral resources, and historical accounts provide evidence of the various past uses of the NWHI and the surrounding ocean by Native Hawaiians. Evidence indicates that the area served as a home and a place of worship for centuries. It is posited that the first Native Hawaiians to inhabit the archipelago frequented Nihoa and Mokumanamana for at least a 500- to 700-year period.

Nihoa and Mokumanamana are listed on the National Register of Historic Places, and there are more than 140 documented archaeological sites on these two islands. Though they are quite barren and seemingly inhospitable to humans, the number of cultural sites is testimony to the pre-Western-contact occupation and use of these islands. On Nihoa, a total of 89 archaeological sites are known, including residential features, agricultural terraces, ceremonial structures, shelters, cairns, and burials. This island also has significant soil development for agriculture along with constructed terraces, which suggest investment in agricultural food production. On Mokumanamana, a total of 52 archaeological sites have been documented, including 33 ceremonial features, which makes it the highest concentration of religious sites found anywhere in the Hawaiian archipelago. Cultural practices continue to remind and teach Native Hawaiians of the connections and relationships their ancestors have passed down from generation to generation.

Designated as a National Memorial, Midway Atoll preserves the physical remains of the rich historic past in the monument. With its defensive structures and military architecture, both residential and industrial, the atoll serves as a memorial to the pivotal Battle of Midway. While its role in that battle has earned Midway a prominent place in history, it was the atoll's strategic location that first drew the attention of the world nearly 100 years earlier. Since its designation in 2000, USFWS has managed Midway Atoll as the National Memorial to the Battle of Midway, ensuring that those who fought and died in that battle will always be remembered for their sacrifice. Among Midway's 63 existing National Register-eligible historic properties are six defensive structures related to the Battle of Midway that were listed together as a National Historic Landmark in 1986. These structures, together with the cable station buildings, the Albert Kahn-designed naval base, and war memorials, provide a tangible link to the past and the historic events that have transpired on this small speck of land in the middle of the Pacific.

3.3 National Marine Sanctuary of American Samoa

3.3.1 Physical Environment

Physical Characteristics/Geology/Oceanography

American Samoa constitutes the eastern portion of the Samoan archipelago, a 301 mile (485 km) long volcanic island chain in the South Pacific Ocean region of Polynesia. The archipelago lies in a west-northwest trending direction approximately 1,000 miles (1,600 km) south of the equator. American Samoa is the only U.S. territory south of the equator and is composed of seven land masses, including five volcanic islands, and two coral atolls. From west to east American Samoa's islands are Tutuila, Aunu'u, Ofu, Olosega, and Ta'u (the latter three are collectively known as the Manu'a Islands). Rose Atoll is about 100 miles (160 km) east of Olosega, and Swains Island is about 200 miles (320 km) northwest of Tutuila. American Samoa's total land mass is about 77 square miles (200 square kilometers), and its EEZ is approximately 150,580 square miles (390,000 square kilometers).

Water and Air Quality

Land-based pollution is the main threat to American Samoa's near-shore water quality. Major stressors, and the associated sources, on stream water quality include development along a stream that alters hydrology and shade; erosion from development within watersheds that increases turbidity in streams; and nutrients, low dissolved oxygen, pathogen indicators, and turbidity from intensive animal feeding operations, sewage, and animal waste collection and treatment system failure. Major stressors, and the associated sources, on ocean shoreline water quality and reef habitat generally come from land use. In addition, coastal waters and embayments are affected by nonpoint source runoff from development within watersheds and solid waste from improperly discarded trash. Stressors specific only to Pago Pago Harbor water quality include polychlorinated biphenyls and mercury.

Air quality in American Samoa is generally good due to the dominant trade winds. Temperatures are consistently mild throughout the year.

Acoustic Environment

Underwater sound in the ocean can come from a variety of natural and anthropogenic sources. Anthropogenic sources include shipping, general vessel traffic, tour boats, aircraft, research, energy and mineral exploration, underwater construction, seismic devices, pingers, and navy activities, such as use of sonar and underwater explosions. Potential impacts of sound on marine organisms can range from no or very little effect to various levels of behavioral reactions, physiological stress, threshold shifts, auditory masking, and direct trauma. Responses to sound generally fall into three categories: behavioral, acoustic, and physiological. Noise pollution can be intense and acute or less intense and chronic. Commercial shipping is considered to be the major contributor to low frequency noise within the Sanctuary boundaries.

3.3.2 Biological Environment in NMSAS

Habitat

Most of American Samoa's marine habitat is pelagic. There are 48 seamounts within the American Samoa EEZ with the majority rising from depths around 13,123 ft (4,000 m). Vailulu'u seamount is the only hydrothermally active seamount within the EEZ. Around the seaward rim of Tutuila's insular shelf lies an elevated ridge that consists of areas of high coral cover. Taema and Nafanua Banks are located in the nearshore environment along the south shore of Tutuila. Taema Bank, located directly outside of Pago Harbor is approximately 0.75 square miles (2 square km) in size. Nafanua Bank located east of Taema Bank, is approximately 1.25 square miles (3.3 square km) and is adjacent to the southern reef flat of Aunu'u Island.

Because of their proximity to land, these two banks are known to be frequented by small boat fishermen, trolling for small pelagic species (*e.g.*, dogtooth tuna) and bottomfish (*e.g.* snappers).

Coral reefs in American Samoa consist of fringing coral reef flats bordered by coral reef slopes. The Manu'a Islands, Rose Atoll, and Swains Island combined have approximately 12.3 square miles (31.9 square km) of coral reef habitat. There are approximately 2,700 known species associated with coral reef habitat in American Samoa. The benthic communities are dominated by crustose calcareous algae, followed by live hard corals, dead corals (less common), and macroalgae (very rare). Invertebrate filter feeders are rare, small, and physically similar in appearance, making total species counts problematic. Fish fauna is dominated by small to medium-sized herbivores, with some large reef fish species uncommon to rare. While two species of seagrasses are known in American Samoa, seagrass beds are uncommon, and seagrass distribution is not well documented. In addition, the American Samoa archipelago represents the easternmost natural extension of mangroves in the Indo-Pacific. Mangrove forests occur only on the islands of Tutuila and Aunu'u and it is estimated that approximately 0.008 square miles of mangrove forest are being lost per year.

Birds

American Samoa is host to 29 seabird species and 10 shore and water bird species, including the shearwater, tropicbird, noddy, tern, gull, booby, petrel, storm petrel, frigate bird, curlew, duck, godwit, heron, lapwing, plover, sanderling, tattler, and turnstone. From September through April, ruddy turnstones, Pacific golden plovers, and wandering tattlers migrate to American Samoa from their nesting grounds in Alaska and Northern Canada. While well south of its range, the ESA-threatened Newell's shearwater (*Puffinus auricularis newelli*) is reported as a visiting species (on Tutuila).

Although flying fox (large fruit bats) are terrestrial, they are considered part of the affected environment because Fagatele Bay is adjacent to the main roost for this endemic species. Of the two species of flying fox — *Pteropus samoensis* and *P. tonganus* — the former is endemic to the Samoan archipelago. Combined with one species of insect-eating bat (*Emballonura*

semicaudata), they are the only land mammals native to American Samoa. Thousands of *P. samoensis* roost in the coastal forest between Seumalo Ridge and Fagatele Point at the southwestern terminus of Fagatele Bay. These bat colonies are infrequently encountered in other locations on Tutuila and are susceptible to human disturbance.

Fish and Invertebrates

There are over 991 documented fish species in American Samoa. Of these, 890 are shallow (above 197 ft [60 m]) or reef species, 56 are deep (197 ft to 1,640 ft [500 m]) bottom species, and 45 are pelagic (below 656 feet [200 m]) species. There are approximately 40 documented endemic species found Samoa, which are also likely to occur in American Samoa. Total reef fish and large fish biomass was observed to be highest in American Samoa around the unpopulated islands of Rose Atoll and Swains Island and the least around the populated islands of Tutuila and Manu'a. In addition, herbivores make up more than 50 percent of total biomass of the archipelago's fish communities except at Swains Island, where they were only 10 percent of biomass and about 60 percent of biomass was large predators such as barracudas, snappers, and jacks.

American Samoa invertebrates include a diversity of coral, sponge, mollusk, echinoderm, crustacean, annelid, bryozoans, and tunicate species. A number of key macro-invertebrates, including crown-of-thorns starfish, giant clams, sea cucumbers, and sea urchins have been reported around American Samoa. Invertebrate densities are highly variable in time and space, but, in general, the highest mean densities can be found around Tutuila, Ofu, Olosega and Ta'u, and consistently very low mean densities at Rose Atoll and Swains Island. At least four lobster species occur in American Samoa: two rare spiny lobsters (*Panulirus penicillatus* and *P. versicolor*) and two slipper lobsters (*Parribacus caledonicus* and *P. antarcticus*).

Protected Species

Pacific sea turtle species include the olive ridley, leatherback, loggerhead, hawksbill, and green sea turtles. Hawksbill and green sea turtles are the most common species found in American Samoa. Leatherbacks are extremely rare, olive ridleys are uncommon. The primary nesting location for green sea turtles is at Rose Atoll. Hawksbills are most commonly found nesting at Tutuila and the Manu'a islands.

Of the two marine mammal groups in the Western Pacific region, cetaceans are the only marine mammals observed in American Samoa (see Appendices B and E). There are 33 species of marine mammals known to occur in the tropical South Pacific, of which 12 have been observed in American Samoan waters. These include two mysticetes (baleen whales): humpback, and minke whale; 10 odontocetes (toothed cetaceans): sperm whale, killer whale, short finned pilot whale, common bottlenose dolphin, spinner dolphin, pan-tropical spotted dolphin, rough toothed dolphin, Cuvier's beaked whale, dwarf sperm whale, and false killer whale. Humpbacks migrate to American Samoa's territorial waters to mate and deliver their calves (June through December). Spinner dolphins and rough-toothed dolphins are the most common cetaceans found in the waters

surrounding Tutuila. Genetic diversity of the spinner dolphins is high, indicating interbreeding with spinner dolphins from surrounding islands over generations. Other cetaceans around Tutuila appear to be more transient, with little known of their distribution and residency across the archipelago.

3.3.3 Socioeconomic Environment in NMSAS

Maritime Transportation/Traffic and Military Operations

American Samoa experiences a range of vessel traffic at Pago Pago and a number of smaller harbors. Pago Pago Harbor is the deepest and most sheltered embayment in the South Pacific, and therefore also one of the region's best natural harbors. It offers good facilities to fishing vessels, cruise ships, pleasure craft, and cargo ships that move more than 1,000 containers of cargo through the harbor each month. The smaller harbor facilities include those at Au'asi (on Tutuila), Aunu'u, Faleasao (on Ta'u), and Ofu. Both Faleasao and Ta'u harbors on Ta'u can be challenging to access during rough seas. Faleasao harbor has been dredged and can accommodate deeper vessels than Ta'u harbor. A daily ferry between Tutuila and Aunu'u is the primary means for Aunu'u residents to travel between these two islands, including daily crossings of primary school students from Aunu'u. Because of the shallow harbor, only small catamarans called *alias* can enter. Its operation is subject to weather, which on occasion has suspended service for multiple days.

Other Human Uses

People have been using the marine environment in American Samoa for various purposes since the first Polynesians settled the area roughly 3,000 years ago. The range of human uses of the marine environment in American Samoa includes fishing (artisanal, subsistence, recreational, and commercial), transportation, shipping, recreation and tourism, research and education, and Department of Defense activities.

Cultural harvest of marine and terrestrial species (e.g., fish, algae, birds) continues to occur seasonally and for important events, such as weddings or funerals. Of concern is potential overharvest of the giant clam due to the ease in accessibility as well as the destructive methods in which these clams are harvested. Additionally, ornamental fisheries are a concern because these fisheries target mother-of-pearl shells from Trochus (*Trochus niloticus*), black-lip pearl oyster (*Pinctada margaritifera*), and green snail (*Turbo marmoratus*). Subsistence and small-scale commercial fishing also occurs offshore as well as in shallow waters and along the shoreline. Fishermen target a wide variety of reef fish as well as lobsters and other invertebrates. On average, annual commercial landings for nearshore artisanal fisheries are approximately 1,300 lbs, compared to commercial landings of bottomfish which amounts to approximately 27,500 lbs annually. Commercial fishing occurs via a number of vessel platforms ranging in size from small catamarans called *alias* (30 ft long) to long-line vessels (averaging 89 ft long) as well as purse seine vessels ranging from 200 to 250 ft in length. Vessels larger than 50 ft are required by regulation to fish outside of the "large vessel prohibited areas," which encompass all waters

extending from shore to 50 nm around Tutuila, Swains Island, Rose Atoll, and the Manu‘a Islands.

Tourism and recreation occur throughout American Samoa. Activities include snorkeling and diving, boating, personal watercraft use, kayaking, and wildlife viewing. Such activities in remote areas such as Rose Atoll are limited by the remote location and access.

Research and Education

The sanctuary is an important partner in marine science research and education efforts in the territory. It currently operates one vessel that supports research, monitoring, and education. Research related to anthropogenic stressors of the coral reef ecosystem is ongoing and includes coral survival rates under elevated temperatures, nitrification and algal blooms on reef flats, impacts on fish species abundance, distribution and assemblages because of fishing pressure, as well as monitoring the crown-of-thorns starfish and conducting stock assessments for other species. Benthic habitat mapping, fish and invertebrate surveys, and oceanographic studies are conducted regularly.


3.3.4 Maritime Heritage and Cultural Environment in NMSAS

Maritime Heritage Resources

Maritime heritage resources in American Samoa reflect five different aspects of Samoan history. There are 10 known historic shipwrecks in American Samoa dating from 1828 to 1949. They include brigs, schooners, whalers, barkentines, destroyers, steamers, and tankers. They were lost at sea, in Pago Pago and Leone Bays, and offshore from Tutuila and Rose Atoll. They represent British colonization efforts, whaling heritage, and World War II. The tanker U.S.S. *Chehalis* in Pago Pago Harbor is the only historic shipwreck located to date. Aircraft wrecks include military aircraft associated with World War II patrols and training activities, and commercial craft. Between 1942 and 1944, 43 naval aircraft are reported as having ditched or crashed into American Samoan waters, however, none have been located. At least 81 coastal fortifications from the World War II era include remnants of numerous concrete pillboxes along the shoreline, gun emplacements, bunkers, air bases, the naval hospital, radar and radio stations, and foundations. Other aspects of maritime heritage in American Samoa include significant historical sites such as Massacre Bay on the northwest coast of Tutuila where 12 members of French explorer Jean-François de la Pérouse’s crew and 39 Samoans met an unfortunate end when a fight broke out among them. This site is on the National Register of Historic Places.

Cultural and Historic Resources

Some archaeological artifacts and sites occur repeatedly in the marine and coastal context: whet stones (stones used to sharpen knives and other cutting tools), petroglyphs, grinding holes and bait cups, and certain coastal villages. These artifacts and landscape and seascape features serve as visible touchstones of oral history and parts of the heritage record. There are at least 20 known coastal sites, including *tupua* (legendary, sacred stones, rocks or formations that represent ancient



humans), other natural features and specific locations, which represent stories and legends in American Samoa.

4.0

ENVIRONMENTAL CONSEQUENCES

This section evaluates the environmental consequences of the status quo alternative and the other two alternatives as described in Chapter 2 (Description of Proposed Action and Alternatives). The environmental effects of these alternatives are evaluated within the context of the physical, biological, socioeconomic and historic and cultural sanctuary setting. Information about the physical, biological, socioeconomic and historic and cultural sanctuary setting can be found in Chapter 3 (Affected Environment).

Characterizing Effects

NEPA requires consideration of the effects of major federal actions on the quality of the human environment (42 U.S.C. § 4332(c)). Effects are characterized as negligible, less than significant, or significant, and are also characterized by type (adverse or beneficial), context, intensity and duration (short- or long-term). Effects can be further characterized by whether they affect resources directly or indirectly. The following definitions and characterizations were used for this analysis:

- **Negligible effects** – level of impact that is below minor to the point of being barely detectable and therefore discountable.
- **Less than significant effects** – effects that do not rise to the level of significant as defined below, or these can be thought of as “minor” effects.
- **Significant effects** – effects resulting in an alteration in the health of a physical, biological, historic/cultural or socioeconomic resource. Long-term or permanent effects or with a high intensity of alteration to a resource, whether beneficial or adverse would be considered significant. The significance threshold is evaluated on a case-by-case basis, taking into consideration the context and intensity of each action.
- **Direct effects** – effects that are caused by the action and occur at the same time and place.

- **Indirect effects** – effects that are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

4.1 Alternative 1: No Action

Certain activities would be modified as a result of interagency consultation with NMFS and FWS pursuant to the MMPA, EFH and ESA, in order to minimize impact on protected species. While the specific mitigation measures required by the consulting or permitting agencies (if any) are not known at this time, NOAA assumes that adverse environmental impacts of field operations would be reduced. NOAA will complete consultation with NMFS and FWS prior to publishing the final EA. The final EA will clearly describe any mitigation measures issued as a result of this consultation process and will contain an additional analysis of the environmental consequences of this alternative at that juncture.

4.1.1 Physical Environment

Physical Characteristics/Geology/Oceanography

Activities with less than significant beneficial, less than significant adverse and negligible impacts

Onshore Fieldwork

In total, 2,373 people days per year are spent conducting a wide array of onshore fieldwork activities within the PIR sanctuary and monument sites. Onshore fieldwork, which may consist of the removal or relocation of large items such as grounded vessels or large amounts of marine debris, may have less than significant beneficial impacts to the physical environment by ensuring the prompt removal of grounded vessels or marine debris. Such activities ensure large or potentially damaging items are no longer a threat to the marine and nearshore environment.

On average, less than 5 large removal efforts occur across the Pacific Islands Region (PIR) sanctuaries and monument sites each year. Onshore fieldwork that consists of the removal or relocation of large items such as grounded vessels or large amounts of marine debris is rare and may have less than significant adverse impacts to the physical environment as the result of removing or moving large items from a shoreline area. For example, the removal of grounded vessels may require motorized equipment that may alter the surrounding environment and the relocation of large items may adversely impact the substrate upon which the vessel or marine debris was originally found during the removal or relocation process. However, adverse impacts to the physical environment of the area are expected to be less than significant because they are conducted within a localized area, for a short duration, amounting to a low impact and short term effect on the surrounding geologic environment and oceanography.

Onshore fieldwork that is limited to beach-walk and intertidal surveys through the movement of personnel engaged in collection and identification studies is expected to have negligible impacts on the physical environment. Short term and insignificant disturbance to the physical environment may occur during fieldwork sampling activities through incidental and unavoidable contact with physical resources from feet and hand-operated equipment. However, the effects of this contact are negligible as any contact with the physical environment is localized and short term (activities likely to occur a few days per year in any one area). In total, approximately 2,373 people days per year are spent conducting a wide array of onshore fieldwork activities within the three PIR sanctuary and monument sites.

Activities with both less than significant beneficial and less than significant adverse impacts

Deployment of Equipment on the Seafloor

The deployment of equipment on the seafloor facilitates the generation of scientific data on the PIR sanctuary and monument sites enabling a better characterization of the geologic and oceanographic processes in these areas. Placement of vessel moorings on less sensitive habitat helps to prevent anchor damage to the seafloor; and the use of weighted marker buoys for dive operations supports science and education projects that help managers take action to protect physical resources. Also, the occasional use of marker buoys for incident response operations can serve to ultimately benefit physical resources by enabling the removal of hazardous material and pollution threats resulting from emergency incidents.

Annually, 33 buoys or other instruments are deployed across the three PIR sanctuary and monument sites. This equipment, as described above, facilitates sanctuary and monument operations that increase our understanding of the protected resources and the relationship of those resources to the physical environment (*e.g.*, the relationship of sanctuary and monument fish to their physical environment). Thus, deployment of buoys and other seabed deployed instruments in the PIR sanctuaries and monument is expected to provide beneficial, indirect, short-term and long-term, and therefore, less than significant effects to the physical environment.

The deployment of some scientific, safety and monitoring equipment attached to the seafloor via weights or embedded anchors poses a chance of adversely affecting the physical environment through its direct contact with the bottom. Usually, the transitory nature of these devices (although some are placed on the seabed for a long period of time), their limited local effects, as well as the narrow scope of each study with regards to the size of the area are expected to keep these adverse effects minor. For example, the deployment of autonomous recording units (ARU) buoys on the seafloor may have a short-term, direct, slightly adverse effect on a small area (<3 m²) and any associated resources of the seafloor. Although efforts are made to secure buoys on open bottoms, storms and other physical events can move anchors into coral and other sensitive areas. In addition, dive marker weights are deployed in sandy areas of the bottom, attached to a line with a buoy at the surface. Marker buoys are removed at the termination of dive operations at each site visited and at the end of each diving day. The direct adverse effects on the physical

environment are expected to be less than significant, because effects are localized and short-term. Effects are localized and short-term, because their weight is light (10 pounds or less), and they are designed to quick release to prevent damage to ledge habitat if the current carries the line attached to the weight.

In total, no more than 33 deployments of equipment on the seafloor occur each year across the PIR sanctuary and monument sites. No deployments or fixtures occur in NMSAS or PMNM, and a total of 33 occur each year in HIHWNMS. As a result, fixed buoy deployments are expected to have less than significant adverse effects on a physical resource because of the nature of ground-secured buoys.

In addition to fixed buoys, drifter buoys are also occasionally deployed in NMSAS. Though only 30-40 cm in diameter, when deployed, drifter buoys, composed of weather-resistant hard plastic, remain at sea in the physical environment and thus may have a long-term effect on geologic resources. Drifter buoys are only retrieved when they wash up on shore. They are monitored via satellite and can provide information on sea surface temperature, currents, wind, barometric pressure, ocean color, salinity. On average one drifter buoy is deployed in NMSAS each year. As a result, the low number of permanent drifter buoys deployed per year results in less than significant impacts to the geology and physical environment.

Deployment of Remote Sensing Equipment

The scientific data generated through remote sensing efforts, of which a total of 76 deployments/year occur in the PIR sanctuary and monument sites, help create a better characterization of the geologic and oceanographic processes within these areas, thus increasing our understanding of PIR resources and their associated relationship to the physical environment (*e.g.*, the physical habitat used by fish), and aiding the development of education and outreach materials. This aids protection and management of these resources, even if indirectly. For example, the development of bathymetric maps is beneficial in developing better strategies for managing physical resources found on the seabed, which could result in indirect and less than significant beneficial effects for these resources.

The deployment of some remote sensing arrays poses a slight chance of directly affecting the physical environment through direct contact with the seafloor, either planned or unplanned, although normal operations usually preclude this possibility. Usually, the transitory nature of these devices (although some are placed on the seabed for a long period of time), their limited local effects, as well as the limited scope of each study with regards to the size of the region keep these adverse effects less than significant. These deployments are rare and all necessary activities that may impact the physical environment are carried out with care and, to the extent possible, on sandy substrate only, to ensure minimal disturbance to areas of known coral or sponge-beds. Across the three PIR sanctuary and monument sites, no more than 76 deployments occur each year, with the majority of the activity occurring in the populated MHI and no remote sensing activities occurring in American Samoa.

Other Sampling Activities

The scientific and monitoring data generated through other sampling activities help create a better characterization of the geologic and oceanographic processes within the PIR sites, which in turn increases our understanding of sanctuary and monument biologic resources and their associated relationship to the physical environment. These activities also generate information to raise public awareness of the nature and importance of the physical environment and the need to protect it; help illuminate potential impacts from human and natural sources; and aid the protection and management of marine resources, and support public stewardship for the sanctuaries and monument.

For example, in response to the current outbreak of coral eating crown-of-thorns starfish (COTS) or Alamea (*Acanthaster planci*), eradication efforts at priority reefs and sanctuary management areas around Tutuila and Aunu'u to protect the health and integrity of the marine ecosystem in National Marine Sanctuary of American Samoa were conducted. Benefits from these types of activities are indirect, long-term and less than significant.

The deployment of some other sampling activities poses a slight chance of directly affecting the physical environment through direct contact with the bottom, either planned or unplanned. For example, research projects that require sampling devices such as small PVC pipe quadrats placed on the seafloor to document species diversity, or sediment sampling procedures may affect the physical habitat of a sanctuary or monument and its resources. However, due to the small area impacted, and the brief time frame for these operations, the direct adverse effects are typically localized and short-term, and thus, less than significant. Throughout the PIR region, no permanent transects are placed on the seafloor for sampling or survey activities. Temporary transects, if used, are limited in time and duration and occur in different locations through the PIR sanctuary and monument sites and therefore, are expected to have less than significant adverse impacts to the physical environment.

Activities with only less than significant adverse impacts

Vessel Operations

In total, all three PIR sanctuary and monument sites conduct a cumulative total of 671 days/year operating ONMS owned or contracted vessels throughout PIR sites. The operation of vessels has the potential to have adverse but less than significant direct impacts to geological resources from anchoring and from unintentional striking or groundings. To mitigate this impact, fixed moorings are used whenever possible to avoid impacts from anchoring. Vessel operations are episodic and of low intensity, and few vessels are used to operate in a large area, so the risk of impact would not be concentrated in a small area. Vessel operators are also highly trained and will apply the NOAA Small Boat Program, and employ ONMS best management practices to avoid direct impacts to physical resources. In general, operators of sanctuary vessels employ ONMS best management practices to minimize impacts. And, because they are operating ONMS assets that

are very visible to the public they are trained to serve as models of best practices to avoid harm to geological resources.

Activities with negligible impacts

Aircraft Operations

Under typical circumstances, operation of unmanned aerial systems (UAS) and other remote aerial systems is expected to have negligible impacts to the physical environment due to their small size and remote aerial operation. UAS and other remote aerial systems are used for survey and monitoring activities. In the unlikely event a remotely operated aerial system requires an unintentional or emergency landing, trained operators would use care during landing operations and utilize the surrounding environment and coast to a soft landing, targeting an unpopulated area whenever possible to ensure minimal impact to the surrounding physical environment. In compliance with FAA regulations and NOAA standing orders, all remote aerial system operators are required to successfully complete training certifications specific to the UAS system being used and a health screening to operate such systems prior to operation within sanctuary boundaries. Similarly, under typical circumstances, operation of manned aircrafts is expected to have negligible effects to the physical environment due to the low frequency in which operations occur throughout the year. In addition, licensed FAA aircraft pilots are highly skilled and trained, maintaining compliance with FAA regulations. In the unlikely event a manned aircraft requires an emergency landing, immediate action would be taken to mitigate the situation and ensure the health and safety of individuals and the surrounding environment. As such, aircraft operations are expected to have negligible effects on sanctuary's physical environment. In the very rare event that aircraft operations are contracted for by ONMS, such operations are limited to transit across sanctuary boundaries, therefore, effects from these types of aircraft operations to the physical environment are expected to be negligible. Annual aircraft operations, both manned and unmanned, are anticipated to occur no more than 25 hours per year throughout the PIR's three sanctuary and monument sites, resulting in anticipated negligible impacts to sanctuary and monument resources within the PIR.

Deployment of AUV/ROV/Gliders/Drifters

Deployment of AUV/ROV/gliders/drifters is considered a discharge and most national marine sanctuaries have regulations restricting certain discharges. In those cases, a permit from the sanctuary superintendent will be required. Deployments of AUV/ROV/gliders/drifters are expected to result in negligible effects on geological and oceanographic resources due to disturbance of the water column or submerged lands in each sanctuary. While intentional or accidental improper operator techniques are possible, trained operators are conscious of utilizing assets that are very visible to the public and of serving as models of best practices. Therefore, they operate with great care not to disturb or impact resources carelessly. On average, 50 deployments occur each year within the three PIR sanctuary and monument sites and are operated by trained staff. As a result of the low number of annual deployments and the care in which the technologies are operated, these activities are expected to result in negligible effects.

SCUBA/Snorkel Operations

While approximately 757 dives occur each year across the PIR sanctuary and monument sites, SCUBA/snorkel operations are expected to result in negligible effects on geological and oceanographic resources due to the very limited disturbance of sediments and other submerged lands associated with these activities. While intentional or accidental improper techniques and overuse of specific locations can result in damage to these resources, sanctuary dive sites vary according to the different projects throughout each sanctuary preventing overuse of any specific location. In addition, both divers and snorkelers are highly trained, employ ONMS best management practices, are briefed on proper protocols, and supervised during in-water activities to avoid improper actions that can cause harm to physical habitat. Thus, these operations are expected to result in negligible effects.

Vessel Maintenance

The routine maintenance of sanctuary owned vessels is episodic, low intensity and accomplished by trained NOAA personnel and contractors to avoid impacts to the physical environment. Routine maintenance includes cleaning, fluid changes, and some repairs. It is highly unlikely that routine vessel maintenance will have any detectable effect on geological resources. Because sanctuary vessels are relatively small, heavy maintenance (*e.g.*, welding, grinding, painting) is typically accomplished on land in self-contained contractor's facilities which are highly regulated for industrial safety and environmental compliance by local, state and other federal entities. Therefore, the effects of vessel maintenance on geologic resources are expected to be negligible. Throughout the Pacific Islands Region sanctuary and monument sites, vessel maintenance activities are not expected to exceed 16 days per year.

Water Quality

Activities with only less than significant adverse impacts

Onshore Fieldwork

The majority of the 2,373 people days spent conducting onshore fieldwork is for onshore surveys. On occasion, however, large removal efforts are needed in response to vessel grounding events. Such efforts have the potential to result in spills that could result in impacts to water quality. On average, less than 5 large removal efforts occur across the PIR sanctuary and monument sites each year. When removal efforts are necessary, they are conducted by experienced ONMS staff, and care is taken to avoid additional spills during the process. As a result, any adverse effect to water quality is expected to be less than significant.

Vessel Operations

The general operation of ONMS vessels (cumulative total of 671 vessel operational days/year across the three PIR sanctuary and monument sites) has the potential to have adverse, but less than significant, direct impacts on water quality from unintended fuel, lubricant, sewage and garbage spills. Because there are existing state and federal regulations and in many cases

sanctuary or monument regulations prohibiting most discharges, impacts to water quality are highly unlikely. As stated above, ONMS vessel operators are highly trained and will apply the NOAA Small Boat Program mandates and employ ONMS best management practices to avoid impacts to water quality.

Activities with negligible impacts

Aircraft Operations

Many remote aerial systems are capable of landing on both land and water and are designed to float. The operation of UAS and other remote aerial systems may require a water landing, in which the operator lands and retrieves the aerial system in the ocean. In such instances, negligible effects to water quality are anticipated due to the fact that the systems are battery operated and sealed to ensure water does not enter the system, even when submerged, thereby minimizing the threat of a discharge during retrieval. In the unlikely event a remote aerial system unintentionally lands in the ocean and sustains damage, the damage to the surrounding environment is expected to be minimal because, per NOAA standing orders, the systems must be within eyesight of the remote operator resulting in an immediate retrieval following an emergency landing. In addition, systems are battery operated reducing any threat of spills as a result of an emergency landing and the infrequency in which overflights occur further reduces potential threat to the physical environment. Similarly, manned aircraft operations are expected to have negligible effects to water quality due to the low frequency in which operations occur throughout the year. In addition, aircraft pilots are highly skilled and trained, maintaining compliance with FAA regulations. In the unlikely event a manned aircraft requires an emergency landing in the ocean, immediate action would be taken to mitigate the situation and ensure the health and safety of individuals and the surrounding environment. Aircraft operations, both manned and unmanned, do not occur more than 25 hours/year in total throughout the three PIR sanctuary and monuments sites, as such, all potential effects to water quality are anticipated to be short-term, and thus, negligible.

Deployment of AUV/ROV/Gliders/Drifters

Deployment of AUV/ROV/gliders/drifters is considered a discharge and most national marine sanctuaries have regulations restricting certain discharges. In those cases, a permit from the sanctuary superintendent will be required. In general, the deployment of AUVs, ROVs, gliders, or drifters are expected to result in negligible effects on water quality due to the lack of discharge involved in operations of these tools. Up to 50 deployments occur each year, the majority of which are tow-boarding dives. Tow-boards allow divers to survey larger areas in short periods of time using a line to tow divers behind small boats. These operations are expected to result in negligible effects to affected water quality.

Deployment of Equipment on the Seafloor

No permanent equipment is deployed on the seafloor by ONMS staff, during field operations in PMNM and NMSAS. Up to 33 varying pieces of equipment are generally installed on the seafloor during regular field operations within HIHWNMS. The normal deployment and use of

equipment on the seafloor causes no discharge of harmful waste material into the water column and thus is expected to have negligible impact on water quality.

Deployment of Remote Sensing Equipment

Across the three PIR sanctuary and monument sites, no more than 76 deployments occur each year, with the majority of the activity occurring in the populated MHI and no remote sensing activities occurring in American Samoa. Normal remote sensing operations cause no discharge of harmful waste material into the water column and thus are expected to have negligible impact on affected water quality.

Other Sampling Activities

The use of other sampling technologies and operations, such as deploying instruments to measure oceanographic and water quality conditions, or tagging marine mammals to better understand their behavior, generally has no or a negligible effect on the physical environment. Normal operations cause no discharge of harmful substances into the water column, atmosphere or onto the seafloor. Further, these instruments do not emit any known harmful noises that may adversely impact marine mammals.

SCUBA/Snorkel Operations

SCUBA/snorkel operations are expected to result in negligible effects on water quality due to the lack of discharge involved in SCUBA diving or snorkeling activities. Each year no more than a total of 757 dives occur across the PIR sanctuary and monument sites, of which 419, 238, and 100 dives occur annually in HIHWNMS, PMNM, and NMSAS, respectively. Thus, these operations are expected to result in negligible effects to water quality due to the lack of discharges and the small number of dives in each location.

Vessel Maintenance

The routine maintenance of ONMS owned vessels is episodic, low intensity and accomplished by trained NOAA personnel and contractors to avoid impacts to the physical environment. It generally occurs outside of the sanctuaries and monument to minimize impact to those resources. In addition, less than 16 days per year are spent conducting minor vessel maintenance and training activities across the PIR sanctuary and monument sites. Where possible, bio-based lubricants and fluids (and, in some cases bio-based fuels) are used further reducing the threat to water quality resources in the unlikely event of a spill. Because these vessels are small and limited in total number at any location, heavy maintenance (*e.g.*, welding, grinding, painting) is typically accomplished on land in self-contained contractor facilities which are highly regulated for industrial safety and environmental compliance including spill prevention by local, state and other federal entities. Therefore, the effects of vessel maintenance on water quality resources are expected to be negligible.

Air Quality

Activities with only less than significant adverse impacts

Aircraft Operations

Even though unmanned aircraft operations are infrequent within sanctuary and monument boundaries (less than five flights per year with a total of less than 25 operational hours annually across all three sites), there are still some adverse but less than significant short-term effects on air quality associated with them. Unmanned remote aerial systems are generally battery operated and, often times, water and weather proofed to enable landings and retrievals in all weather conditions. These remotely operated systems are generally built to endure rugged environments and treatment. Like vessels, some manned aircraft use combustion engines to operate. Therefore, these aircraft emit pollutants similar to vessel emissions. Due to the small amount of pollutant emitted in the air and the infrequency in which manned aircrafts operate within sanctuary and monument boundaries, effects on air quality are expected to be direct and adverse, direct, and less than significant because the effects are localized and short-term.

Vessel Operations

The general operation of vessels (cumulative total of 671 vessel operational days/year across the three PIR sanctuary and monument sites) has the potential to have adverse, but less than significant impacts on air quality from engine and generator emissions. The overall intensity of the vessel operations is limited and episodic. On ONMS small vessels, four stroke and low emission outboard motors are used whenever possible.

Activities with negligible impacts

Deployment of AUV/ROV/Gliders/Drifters

Up to 50 deployments occur each year, the majority of which are tow-boarding dives. Tow-boards allow divers to survey larger areas in shorter periods of time using a line to tow divers behind small boats. In general, the deployment of AUVs, ROVs, gliders, or drifters result in negligible effects on air quality due to the lack of air emissions involved in operations of these tools. Thus, these operations in the PIR sanctuary and monument sites are expected to result in negligible effects.

Deployment of Equipment on the Seafloor

No permanent equipment is deployed on the seafloor by ONMS staff, during field operations in PMNM and NMSAS. Typically, up to 33 various types of equipment are installed on the seafloor during regular field operations within HIHWNMS. The normal deployment and use of equipment on the seafloor causes no discharge of air emission, and thus, these activities are expected to have negligible impact on affected air quality.

Deployment of Remote Sensing Equipment

Across the three PIR sanctuary and monument sites, no more than 76 remote sensing equipment deployments occur each year, with the majority of the activity occurring in the populated MHI and no remote sensing activities occurring in American Samoa. Normal remote sensing operations cause no air emissions, and thus, these activities are expected to have, at most, a negligible impact on the affected air quality.

Onshore Fieldwork

All onshore fieldwork is expected to have, at most, negligible impact to air quality as these activities generally do not involve air emissions.

Other Sampling Activities

The use of other sampling technologies and operations, such as deploying instruments to measure oceanographic and water quality conditions, or tagging marine mammals to better understand their behavior, generally has no or a negligible effect on the physical environment. Normal operations cause no discharge of harmful substances into the water column, atmosphere or onto the seafloor. Further, these instruments do not emit any known harmful noises that may adversely impact marine mammals.

SCUBA/Snorkel Operations

Each year, no more than a total of 757 dives occur across the PIR sanctuary and monument sites, of which 419, 238, and 100 dives occur annually in HIHWNMS, PMNM, and NMSAS, respectively. SCUBA/snorkel operations are expected to result in negligible effects on air quality due to the lack of air emissions involved in SCUBA diving or snorkeling activities. Thus, these operations are expected to result in, at most, negligible effects.

Vessel Maintenance

The routine maintenance of sanctuary owned vessels is episodic and low intensity and accomplished by trained NOAA personnel and contractors to avoid impacts to the physical environment. In addition, less than 16 days per year are spent conducting minor vessel maintenance and training activities across the PIR sanctuary and monument sites. Because these vessels are small and limited in total number at any location, heavy maintenance (e.g., welding, grinding, painting, etc.) is typically accomplished on land in contractor's facilities which are highly regulated for industrial safety and environmental compliance by local, state and other federal entities. Therefore, the effects of vessel maintenance on air quality resources are expected to be negligible.

Acoustic Environment

Activities with only less than significant adverse impacts

Aircraft Operations

These activities typically involve less than 25 operational flight hours each year, with 30 hours in HIHWNMS and 5 hours in PMNM. Although infrequent in their occurrence, unmanned and remote aerial systems conducting remote sensing survey activities often engage in repeat low overflights passes of PIR sanctuary and monument areas. While these flights do result in some noise pollution, the limited scope and time frame of these activities are expected to result in short-term, localized, and thus, less than significant adverse acoustic effects.

Manned aircraft also occasionally operate in the PIR sanctuary and monument sites. These aircraft are typically flown at an altitude where turbulence does not affect the water. Sound can penetrate the surface but would have less than significant adverse effects on the marine environment due to the high altitudes in which such aircrafts fly, therefore reducing the noise intensity that reaches the surface of the water and the underwater environment. While noise emissions will impact the acoustic environment, such adverse effects are expected to be less than significant because they are short-term, lasting only while the aircraft is overhead.

Deployment of AUV/ROV/Gliders/Drifters

Deployment of AUV/ROV/gliders/drifters (cumulative total of 50 deployments per year across the three PIR sanctuary and monument sites) are expected to result in less than significant adverse effects on the acoustic environment due to minor engine noise associated with vehicle function and occasional use of operational altimeters. This equipment introduces limited, short-term and localized noise into the acoustic environment. Thus, these operations are expected to result in less than significant effects to the acoustic environment of the PIR sanctuary and monument sites, because these effects are short-term and localized.

Deployment of Equipment on the Seafloor

The deployment of equipment attached to the seafloor (cumulative total of 33 deployments per year across the three PIR sanctuary and monument sites) may result in increased noise levels from their normal operations, such as the chain dragging on the seafloor due to wave action or currents. This disturbance is expected to be temporary and minimal in number of occurrences each year, resulting in an expected less than significant if not negligible impact to the acoustic environment.

Deployment of Remote Sensing Equipment

Within the PIR sanctuary and monument sites, no more than 76 remote sensing equipment deployments occur each year, with the majority of the activity occurring in the populated MHI and no remote sensing activities occurring in American Samoa. The normal use of side scan and multibeam sonar systems, and EK-60 fish finders may result in increased noise levels from use.

Sounds are often broadly categorized as impulsive or non-impulsive. Impulsive sounds have short durations, rapid rise-times, and higher peak sound pressures. Explosions, air guns, weapon firing, and impact pile driving are examples of highly impulsive sound sources. Multi beam and side scan sonars are often also characterized as impulsive due to their extremely short rise times,

despite their more constrained frequency content. Vessels (propellers, machinery, and trustees used in dynamic positioning) are the most common sources of non-impulsive anthropogenic sound. Naval sonars are also typically characterized as non-impulsive, despite some features in common with research sonars such as discussed here.

For the purposes of understanding and addressing their impacts, sounds are characterized by their frequency, intensity, duration and duty cycle, among other features. Frequency can be understood as “pitch”, where the higher the frequency the higher the pitch, and is measured in Hertz (Hz). Intensity is a measure of “loudness”, or sound amplitude, and can be measured in decibels (dB). For side scan and multi beam sonar, duration can be measured in seconds. Duty cycle is measured in number of pings per minute.

A specific sound source, such as side-scan and multi-beam sonars, depends on the “soundscape” (acoustic environment) of the PIR sites. The “soundscapes” of these sites are composed of anthropogenic (sounds produced by a variety of human activities), biological (sounds produced by animals) and geophysical (wind, waves and other physical forces that produce sound) components. These contributions vary significantly over time and space. Overall, the dominant contributions to the soundscape are living marine resource communications and both short and long-range vessel noise. Relatively rare use of highly directional, mid-high frequency, impulsive sources, such as the side-scan and multi-beam, represents a non-detectable change in the long-term (monthly, annual) acoustic conditions of an exposed location, and a near-non-detectable change over mid-duration (weekly) acoustic conditions. These adverse impacts to the soundscape are expected to be negligible. However, there is a research effort underway to more fully characterize the acoustic environment within PMNM and HIHWNMS, as well as nearby National Park waters within American Samoa. This work includes better understanding of contributions of human activities to the total underwater sound conditions in these regions.

Species-specific implications associated with the use of these active acoustic research sources are discussed further below in the “Biological Environment” and “Deployment of Remote Sensing Equipment”.

Vessel Operations

The general operation of vessels (cumulative total of 671 vessel operational days/year across the three PIR sanctuary and monument sites) has the potential to have adverse, but less than significant impacts on acoustics generated by the movement of vessels through water, the operation of propulsion machinery and other equipment including depth sounders. The overall intensity of the vessel operations is limited and episodic. ONMS vessel operations are expected to have limited, direct, and less than significant adverse impacts on the acoustic resources of the PIR sanctuary and monument sites. Sonar scientific and mapping operations are analyzed in another section of this document, under “4.1.2 Biological Environment” and “Deployment of Remote Sensing Equipment.”

Activities with negligible impacts

Onshore Fieldwork

All onshore fieldwork in the PIR sanctuary and monument sites is expected to have negligible impacts to the acoustic environment as these activities do not generally involve the generation of detectable noise in either the air or underwater.

Other Sampling Activities

The use of other sampling technologies and operations, such as deploying instruments to measure oceanographic and water quality conditions, or tagging marine mammals to better understand their behavior, generally has no or a negligible effect on the physical environment. Normal operations cause no discharge of harmful substances into the water column, atmosphere or onto the seafloor. Further, these instruments do not emit any known harmful noises that may adversely impact marine mammals.

SCUBA/Snorkel Operations

SCUBA/snorkel operations are expected to result in negligible effects on the acoustic environment due to the lack of significant noise emitted in SCUBA diving or snorkeling activities. While the breathing of a SCUBA diver can create noise, it is negligible and highly localized. In addition, each year no more than a total of 757 dives occur across the PIR sanctuary and monument sites, of which 419, 238, and 100 dives occur annually in HIIHWNMS, PMNM, and NMSAS respectively. Thus, these operations are expected to result in negligible acoustic effects to PIR sanctuary and monument resources.

Vessel Maintenance

Throughout the PIR sanctuary and monument sites, vessel maintenance activities are not expected to exceed 16 days/year. The routine maintenance of sanctuary owned vessels is episodic and low intensity and accomplished by trained NOAA personnel and contractors to avoid impacts to the physical environment. Because these vessels are small, heavy maintenance (*e.g.*, welding, grinding, painting) is typically accomplished on land in contractor's facilities which are highly regulated for industrial safety and environmental compliance including by local, state and other federal entities. Therefore, the acoustic effects of vessel maintenance sanctuary and monument resources are expected to be negligible.

Summary of Effects on Physical Resources

The effects on physical resources from the proposed alternatives are expected to be negligible or less than significant (beneficial and adverse, depending on the type of operations). The beneficial effects can be summarized as an improved characterization of geology and oceanography which would enhance conservation and management of resources, and improved prevention of anchor damage. The adverse effects from the proposed alternatives are expected to be short-term and of low intensity, and would result from minor seabed disturbance associated with buoy deployment, emissions from vessel operations, and noise contribution from vessel operations and deployment of active acoustic instruments.

4.1.2 Biological Environment

Habitat

Activities with less than significant beneficial, less than significant adverse and negligible impacts

Onshore Fieldwork

In total, 2,373 people days per year are spent conducting a wide array of onshore fieldwork activities within the three PIR sanctuary and monument sites. Programs that involve monitoring biological resources from shore directly benefit the biological environment directly and indirectly. Removal, disentanglement conducted from the shore and monitoring efforts provide a direct, short-term benefit to biological resources as immediate attention and action is employed when necessary to ensure the safety and health of marine and nearshore habitat and species (birds, invertebrates, fish, marine mammals, sea turtles, and cetaceans). Indirect beneficial effects are expected from the education and outreach materials generated by the studies conducted through onshore fieldwork operations. Public awareness and education is vital to helping public stakeholders understand the resources throughout the region. Improved public awareness and understanding of resources may inspire the public to cause fewer negative effects on resources, and to act to improve resource protection, both of which would benefit the resources in the long-term. These benefits remain less than significant effects due to the limited nature of the studies. Because these studies need to be repeated over time, impacts are generally short-term for each particular benefit associated with studies and outreach materials.

In the event of a vessel grounding or the presence of marine debris, necessitating the removal of large or bulky items, the prompt removal of such items would result in indirect, short and long-term benefits to the entire ecosystem by eliminating the threat of further damage to the marine and nearshore environment. Similarly, large congregations of marine debris create entanglement and entrapment hazards and prompt removal eliminates threats to both habitat and species. By the immediate attention to known threats and the elimination of threats caused by foreign objects, such as marine debris, response efforts will allow for species and habitat disentanglements. In summary, the totality of onshore fieldwork in the PIR sanctuary and monument sites is expected to result in direct and indirect benefits to the biological environment of these areas that are less than significant, because these effects are long and short-term.

On average, less than 5 large removal efforts occur across the PIR sanctuary and monuments sites each year. Inherent in any effort to remove large or bulky foreign items from the nearshore or marine environment is the potential for impact to the surrounding biological environment. Grounded vessels may be dragged along shoreline areas to eliminate threat to the environment. Similarly, large congregations of marine debris create entanglement and entrapment hazards, however, removal efforts may require the use of cranes or other equipment that could cause incidental damage to the surrounding area. In addition, the physical presence of staff conducting

general fieldwork may displace or disturb nearshore and marine species. Staff (ONMS and specialized contract staff) conducting such mitigation efforts are highly skilled and trained to ensure work is done carefully so as not to unnecessarily harm the surrounding environment. As such, field work activities, including efforts to remove and relocate large foreign objects, such as marine debris or grounded vessels, are expected to have a less than significant adverse impact on the surrounding biological environment.

Beach-walk and intertidal surveys through the movement of personnel engaged in collection and identification studies are expected to have negligible impacts to the surrounding ecosystem (including habitat, fish, invertebrates, birds, and protected species). Short term and insignificant disturbance to the surrounding area may, but is unlikely to, occur during fieldwork activities through necessary, incidental, and unavoidable contact within the surrounding area. However, the effects of this contact are expected to be negligible as any contact with the environment is localized and short term (activities likely to occur a few days per year in any one area) and care would be taken to avoid unnecessary or potentially harmful contact.

Activities with both less than significant beneficial and less than significant adverse impacts

Deployment of AUV/ROV/Gliders/Drifters

Deployment of AUV/ROV/gliders/drifters is considered a discharge and most national marine sanctuaries have regulations restricting certain discharges. In those cases, a permit from the sanctuary superintendent will be required. Deployment of AUV/ROV/gliders/drifters, which are used predominantly for scientific or educational purposes, increases the understanding and appreciation of the biological environment enhancing management strategies to protect biological habitat, invertebrates, fish, birds and protected species. This information serves to improve public stewardship of the PIR sanctuary and monument biological environments. Thus, these activities are expected to result indirect, long-term, and less than significant beneficial effects to the biological environment.

Up to 50 deployments occur each year, the majority of which are tow-boarding dives. Deployment of AUV/ROV/gliders/drifters is expected to result in less than significant adverse effects on biological habitat due to the small potential for disturbance of the water column or submerged lands in each sanctuary and monument. While intentional or accidental improper operator techniques are possible, these assets are deployed by trained operators who are encouraged to serve as models of best practices. As such, the likelihood of operator error or accidents associated with this activity is relatively low. Also, the high mobility of these tools prevents overuse of any specific location. Thus, these operations are expected to result in less than significant, short term, adverse effects.

Deployment of Equipment on the Seafloor

The use of seafloor deployed equipment has several indirect beneficial impacts on biological resources including data collection to increase understanding of individual species, biodiversity

and habitats; monitoring; boating and transit safety; and the indirect benefits of developing education and outreach materials. Increased public education, awareness and understanding of resource protection may inspire users to cause fewer negative effects on resources, and to act in ways that benefit resources in the long-term. These benefits are expected to be less than significant due to the limited nature of the studies of the entire region.

Seafloor deployed equipment, such as instrumentation placed on data buoys that focus on biological data collection and monitoring (as opposed to measuring oceanographic conditions as described above), can improve the conservation and management of species and habitats, and allow ONMS managers to better understand certain oceanographic conditions such as sea temperature, pH and carbon dioxide fluctuations that affect species and biological communities. This gives managers better information to use when developing future habitat characterizations and research and management plans that address environmental changes to ocean habitats. These benefits, usually derived from routine research and monitoring projects, are expected to remain less than significant due to the limited nature of the studies of the entire region.

Further, mooring buoys used by visiting boaters prevent anchor damage to the seafloor, thereby yielding direct beneficial effects to the biological environment that are less than significant, because these effects are localized, short-term and long-term.

No permanent equipment is deployed on the seafloor by ONMS staff, during field operations in PMNM and NMSAS. Up to 33 varying pieces of equipment are generally installed on the seafloor during regular field operations within HIHWNMS. Because virtually all seafloor substrates in sanctuaries host some organisms, disturbing the seafloor with buoy deployments can adversely affect habitats. Seafloor disturbance occurs in projects that involve buoy weights or moorings, often small buoys used for diving safety. However, every effort is made to place buoy anchors on bare bottom to limit any possible adverse disturbances. These buoys are removed at the termination of dive operations at each site visited. Temporary buoys and markers are also used to establish safety zones during response operations. These direct adverse effects on the physical environment are less than significant, because they are short-term and localized due to the fact that the buoys are light weight and designed for quick release to prevent damage to bottom habitats and organisms.

Further, deploying moored instruments on the seafloor is expected to have short-term, temporary effects including mortality only on the benthos directly impacted by the instrument or mooring and the small footprint of the instruments means that direct impacts would be minimal to the overall benthic community.

The long-term effects from the permanent placement of buoys and moorings may adversely affect surface or subsurface organisms that may either be crushed or blocked from accessing overlying waters. However, the affected area on the bottom is very small and the placement is intentionally selected to minimize impacts. Therefore, the adverse effects for long-term buoys and moorings are expected to be less than significant, long-term, direct and localized.

Deployment of Remote Sensing Equipment

Remote sensing can have several indirect beneficial impacts on biological resources including increased understanding of individual species, biodiversity and habitats; better education and outreach materials for public education, which can lead to indirect benefits to living marine resources; and the use of hydrographic mapping as a means to improve habitat characterization and protection of seabed living resources. Increased public education, awareness and understanding of resource protection may inspire users to cause fewer negative effects on resources, and to act in ways that benefit resources in the long-term. These benefits are expected to be less than significant due to the limited nature of the studies of the entire region.

Deployment of remote sensing equipment, such as instrumentation on data buoys, is beneficial as it allows sanctuary managers to better understand certain oceanographic conditions such as sea temperature, pH and carbon dioxide fluctuations that affect species and biological communities. This gives managers better information to use when developing future research and management plans that address environmental changes to ocean habitats (*i.e.*, ocean acidification), resulting in expected long-term, less than significant beneficial impacts. As another example, the use of remote sensing equipment to develop hydrographic maps is beneficial as they lead to more precise habitat characterization, including the water column and other specific ecosystems, by the ONMS and its partners. The limited nature of deployments of remote sensing equipment per year (32 per year for all three sites) indicates that the benefits are likely to be less than significant. Accordingly, the deployment of remote sensing equipment in PIR sanctuary and monument sites is expected to result in long-term, indirect, less than significant benefits.

Across the three PIR sanctuary and monument sites, no more than 76 remote sensing equipment deployments occur each year, with the majority of the activity occurring in the populated MHI and no remote sensing activities occurring in American Samoa. Possible adverse effects on habitat from remote sensing operations may occur if the equipment impacts or causes changes to habitat. Normal operations are designed to preclude this possibility, and any effects would be short-term, and thus, less than significant. Typically, remote sensing equipment is deployed in both PMNM and HIIHWNMS, 31 and 45 times respectively each year. As such, the deployment of remote sensing equipment is expected to result in less than significant adverse impacts to the habitat of the PIR sanctuary and monument sites. The effects of noise introduced by active acoustic research sources are discussed by species type below, in the “Fish”, “Birds”, “Invertebrates” and “Protected Species”. As discussed above, side-scan and multi-beam use within the PIR can be characterized as impulsive, relatively rare, and highly localized acoustic events. The possibility of direct or indirect implications of these events on individual animals are discussed below; however, in addition, we can consider whether these sources degrade the acoustic condition of the habitats that support ecological processes within the PIR sites. Such considerations hinge on the greater role that acoustics play in the ability of animals to detect sounds in their environment, often opportunistically, such as settlement cues for larval fish from coral reefs, predator detection, prey detection and other intraspecific listening. The “masking” of such signals is of concern when sources are more continuous, more prevalent and lower-range in

frequency. The sources under consideration here have none of these risk factors, and are likely to have little to no masking consequence for species. Implications for acoustic habitat degradation are thus insignificant to negligible.

Other Sampling Activities

During the conduct of these sampling activities, marine debris and alien species are opportunistically collected for further research and analysis. This effort is expected to result in long-term, less than significant, beneficial impacts to sanctuary and monument resources. The use of other sampling techniques and instrumentation is beneficial to habitats as it allows sanctuary managers to better understand certain oceanographic conditions such as sea temperature, pH and carbon dioxide fluctuations that affect species and biological communities; can result in improved characterization of habitats and protection of seabed living resources; and improves the monitoring of habitat conditions and changes. This gives managers better information to use when developing future research and management plans. One example is coral disease mitigation and reversal studies that allow divers to directly remove diseased portions of coral colonies to test their recovery abilities.

Other sampling activities can also provide the indirect benefits of increased awareness and the development of education and outreach materials for public education that may inspire the public to cause fewer negative effects on resources, and to act in ways that benefit the sanctuary in the long-term. These benefits are expected to be less than significant due to the limited nature of the studies of the entire region.

The use of other sampling technology and operations, particularly those involving collecting, capturing and tagging individual animals, may have some adverse impacts to habitats. For example, virtually all seafloor substrates provide habitat to various organisms. As a result, seafloor sampling activities may disturb these environments and result in adverse effects to habitat. Although adverse, these impacts to habitat are expected to be less than significant because most monitoring and sampling devices deployed on the seafloor are relatively small in size and few in number, and are generally temporary or stay in place for a long-time (*i.e.*, undisturbed). Effects are minimized by conducting sampling efforts over a large area (across the three PIR sanctuary and monument sites) and over the course of an entire year (as opposed to collecting all samples from the same place during a single event). Sampling areas are identified in an attempt to minimize impact to resources while ensuring sound research data is obtained. Across the three sites, no more than 700 invertebrates are collected each year and no more than 725 balls of algae are sampled.

Additionally, some adverse impacts may occur as a result of restoration activities, survey efforts and species monitoring and injury assessment throughout the sanctuary and monument sites. However, the habitat impacts associated with these activities are expected to be less than significant due to the very small percentage of the sanctuaries and monument affected each year. Recommended minimization, avoidance and mitigation measures provided by NMFS will be

employed to the maximum extent practicable. Therefore, the direct impacts are overall expected to be less than significant, because these effects are short-term and localized.

SCUBA/Snorkel Operations

SCUBA/snorkel operations, which are conducted predominantly for scientific or educational purposes, increase the understanding and appreciation of biological resources enhancing management strategies to protect biological habitat, invertebrates, fish, birds and protected species. This information serves to improve public stewardship of the PIR sanctuary and monument biological environments. Thus, this activity is expected to result in indirect, long-term, and less than significant beneficial effects to the biological environment.

SCUBA/snorkel operations (up to 542 dives each year across the three PIR sites) are expected to result in less than significant adverse effects on biological habitat and sessile invertebrates due to the minor and limited disturbance of the water column and bottom habitats (live bottom, coral, etc.) of each PIR site. While intentional or accidental improper techniques and overuse of specific locations can result in damage to these resources, PIR dive sites vary according to the different projects throughout each site preventing overuse of any specific location. In addition, ONMS divers and snorkelers are highly trained and employ ONMS best management practices to avoid improper actions that can cause harm to living marine resources. Finally, when conducting SCUBA or snorkel activities within PMNM, all participants must abide by best management practices that were established to eliminate the potential spread of invasive species as well as minimize impact to the marine environment and marine species. Thus, these operations are expected to result in adverse effects that are less than significant, because they are short-term and localized.

Vessel Operations

All three PIR sanctuary and monument sites conduct a cumulative total of 671 days/year operating ONMS owned or contracted vessels throughout sanctuary and monument sites. In general, conducting vessel operations allows ONMS personnel to be on the water providing direct and indirect, less than significant beneficial impacts to habitat, invertebrates, fish, birds and protected species through enforcement activities and by providing education to users so that they may avoid adverse impacts to biological resources. This would include slight beneficial impacts to the assemblages designated as Essential Fish Habitat under the MSA, which are described in Chapter 3 for HIHWNMS and NMSAS specifically. In addition, conducting vessel operations allows ONMS personnel to respond to emergency incidents involving other users and wildlife (all sub categories).

The operation of vessels (no more than 671 vessel operational days per year across the three PIR sites) has the potential to have adverse but less than significant direct impacts to habitat resources from anchoring and from unintentional striking or groundings. This would include short-term, and thus, less than significant impacts to the assemblages designated as Essential Fish Habitat under the MSA, which are described in Chapter 3 for HIHWNMS and NMSAS specifically.

Fixed moorings are used whenever possible to minimize impacts from anchoring. Vessel operations are episodic and low intensity. Vessel operators are highly trained and will apply the NOAA Small Boat Program and employ ONMS best management practices and procedures to avoid direct impacts to habitat resources. In general, operators of sanctuary vessels are trained to employ ONMS best management practices to minimize impacts, resulting in less than significant impacts.

Activities with less than significant beneficial and negligible impacts

Aircraft Operations

Monitoring efforts conducted via unmanned aircraft operations can lead to better characterization of habitat and species in remote areas. These efforts can also reduce the need for a physical presence in remote areas, which may in turn reduce disturbances to physical and biological environments. Similarly, enforcement efforts can be enhanced by aircraft operations (both manned and unmanned) with surveillance flights (both planned and unplanned). As such, while infrequent in occurrence, the use of unmanned aircraft for habitat and species monitoring activities and to support law enforcement is expected to result in further protection of sanctuary resources, and thereby provide indirect and long-term, less than significant, beneficial effects to the biological environment.

Unmanned or remote aircraft operations (up to 25 operational flight hours occur each year across all three PIR sites) are expected to have a negligible effect on sanctuary and monument habitat resources. The nature of aircraft operations is such that there is expected to be no direct interaction with marine habitat. In the unlikely event an aircraft is required to land due to an emergency, care would be taken, where possible, to ensure minimal impact to the surrounding physical environment. All aircraft operators are highly trained and licensed to operate their respective aircraft within PIR boundaries per FAA regulations and NOAA standing orders.

Activities with negligible impacts

Vessel Maintenance

The routine maintenance of sanctuary owned vessels is episodic, low intensity and accomplished by trained NOAA personnel and contractors to avoid impacts to the biological environment. Where possible, bio-based lubricants and fluids (and, in some cases bio-based fuels are used) further reducing the threat to habitat resources in the unlikely event of an unintentional spill. Because these vessels are small and limited in total number at any location, heavy maintenance (e.g., welding, grinding, painting) is typically accomplished on land in self-contained contractor facilities which are highly regulated for industrial safety and environmental compliance including spill prevention by local, state and other federal entities. In total, less than 16 days per year are spent conducting minor vessel maintenance and training activities across the three PIR sites. Due to the care with which on-water maintenance is undertaken as well as the fact that major

maintenance is not conducted on the water, the effects of vessel maintenance on habitat resources are expected to be negligible.

Invertebrates

Activities with less than significant beneficial, less than significant adverse and negligible impacts

Onshore Fieldwork

In total, 2,373 people days per year are spent conducting a wide array of onshore fieldwork activities within the three PIR sanctuary and monument sites. Programs that involve monitoring biological resources from shore directly benefit the biological environment directly and indirectly. Removal, disentanglement conducted from the shore and monitoring efforts provide a direct, short-term benefit to biological resources as immediate attention and action is employed when necessary to ensure the safety and health of marine and nearshore habitat and species (birds, invertebrates, fish, marine mammals, sea turtles, and cetaceans). Indirect beneficial effects are expected from the education and outreach materials generated by the studies conducted through onshore fieldwork operations. Public awareness and education is vital to helping public stakeholders understand the resources throughout the region. Improved public awareness and understanding of resources may inspire the public to cause fewer negative effects on resources, and to act to improve resource protection, both of which would benefit the resources in the long-term. These benefits remain less than significant effects due to the limited nature of the studies. Because these studies need to be repeated over time, impacts are generally short-term for each particular benefit associated with studies and outreach materials.

In the event of a vessel grounding or the presence of marine debris, necessitating the removal of large or bulky items, the prompt removal of such items would result in indirect, short and long-term benefits to the entire ecosystem by eliminating the threat of further damage to the marine and nearshore environment. Similarly, large congregations of marine debris create entanglement and entrapment hazards and prompt removal eliminates threats to both habitat and species. By the immediate attention to known threats and the elimination of threats caused by foreign objects, such as marine debris, response efforts will allow for species and habitat disentanglements. In summary, the totality of onshore fieldwork in the PIR sanctuary and monument sites is expected to result in direct and indirect, long and short-term, less than significant benefits to the biological environment of these areas.

On average, less than 5 large removal efforts occur across the PIR sanctuary and monuments sites each year. Inherent in any effort to remove large or bulky foreign items from the nearshore or marine environment is the potential for impact to the surrounding biological environment. Grounded vessels may be dragged along shoreline areas to eliminate threat to the environment. Similarly, large congregations of marine debris create entanglement and entrapment hazards, however, removal efforts may require the use of cranes or other equipment that could cause incidental damage to the surrounding area. In addition, the physical presence of staff conducting

general fieldwork may displace or disturb nearshore and marine species. Staff (ONMS and specialized contract staff) conducting such mitigation efforts are highly skilled and trained to ensure work is done carefully so as not to unnecessarily harm the surrounding environment. As such, field work activities, including efforts to remove and relocate large foreign objects, such as marine debris or grounded vessels, are expected to have a less than significant adverse impact on the surrounding biological environment.

Beach-walk and intertidal surveys through the movement of personnel engaged in collection and identification studies are expected to have negligible impacts to the surrounding ecosystem (including habitat, fish, invertebrates, birds, and protected species). Short term and insignificant disturbance to the surrounding area may, but is unlikely to, occur during fieldwork activities through necessary, incidental, and unavoidable contact within the surrounding area. However, the effects of this contact are expected to be negligible as any contact with the environment is localized and short term (activities likely to occur a few days per year in any one area) and care would be taken to avoid unnecessary or potentially harmful contact.

Activities with both less than significant beneficial and less than significant adverse impacts

Deployment of AUV/ROV/Gliders/Drifters

Deployment of AUV/ROV/gliders/drifters, which are used predominantly for scientific or educational purposes, increases the understanding and appreciation of the biological environment enhancing management strategies to protect biological habitat, invertebrates, fish, birds and protected species. This information serves to improve public stewardship of the PIR sanctuary and monument biological environments. Thus, these activities are expected to result indirect, long-term, and less than significant beneficial effects to the biological environment.

Deployment of AUV/ROV/gliders/drifters is expected to result in less than significant adverse effects on the behavior of mobile invertebrates, fish, protected species and birds due to the generally minor, limited, and short-term impact caused by these tools. While intentional or accidental improper operator techniques are possible, such occurrences are unlikely given that operators are required to complete training courses specific to the craft that would be operated. In addition, operators utilize highly visible assets and, accordingly, serve as models of best practices. In addition, the high mobility of these tools prevents overuse of any specific location. An average of 50 deployments per year occur within the three PIR sanctuary and monument sites. As a result of the low number of annual deployments and the care in which the devices are operated, these activities are expected to result in less than significant, short term, adverse effects.

Deployment of Equipment on the Seafloor

The use of seafloor deployed equipment has several indirect beneficial impacts on biological resources including data collection to increase understanding of individual species, biodiversity and habitats; monitoring; boating and transit safety; and the indirect benefits of developing education and outreach materials. Increased public education, awareness and understanding of

resource protection may inspire users to cause fewer negative effects on resources, and to act in ways that benefit resources in the long-term. These benefits are expected to be less than significant due to the limited nature of the studies of the entire region.

No permanent equipment is deployed on the seafloor by ONMS staff during field operations in PMNM and NMSAS. Up to 33 varying pieces of equipment are generally installed on the seafloor during regular field operations within HIHWNMS. The physical placement of equipment on the seafloor, the direct contact with sessile benthic organisms by the gear itself, and the possible deterioration of buoy material that subsequently lands on the bottom may lead to the smothering and mortality of some invertebrates. The transitory nature of most of these devices, as well as the limited scope of each study with regards to the size of the region, however, is expected to result in less than significant adverse effects to invertebrates.

Deployment of Remote Sensing Equipment

Remote sensing can have several indirect beneficial impacts on biological resources including increased understanding of individual species, biodiversity and habitats; better education and outreach materials for public education, which can lead to indirect benefits to living marine resources; and the use of hydrographic mapping as a means to improve habitat characterization and protection of seabed living resources. Increased public education, awareness and understanding of resource protection may inspire users to cause fewer negative effects on resources, and to act in ways that benefit resources in the long-term. These benefits are expected to be less than significant due to the limited nature of the studies of the entire region.

Current understanding of the acoustic sensitivity and sound-production by invertebrate species remains limited. However, many species such as crabs, lobsters, urchins and corals are known to either produce sounds in intraspecific interactions and/or use acoustic cues in settlement phases. For these species, and these documented acoustic use contexts, the highest risk associated with human-induced impacts would be associated with more continuous and prevalent source types that could, in conditions of high or biologically vulnerable co-occurrence, lead to reduced ability to detect important cues (“masking”). The highly localized, relatively rare and impulsive nature of echo-sounder and multi-beam sonar use profiled here for PIR sites suggests that implications for the use of acoustics in settlement cueing and communication by species such as crabs, lobsters, urchins and other known acoustically-active species are likely to be negligible.

Other Sampling Activities

During the conduct of these sampling activities, marine debris and alien species are opportunistically collected for further research and analysis. This effort is expected to result in long-term, less than significant, beneficial impacts to sanctuary and monument resources.

Other sampling activities can have several indirect beneficial impacts on biological resources including data collection for future study; increased understanding of individual species, biodiversity and habitats, which leads to improved conservation and management of resources; as well as the indirect benefits of increased awareness and the development of education and

outreach materials for public education that may inspire the public to cause fewer negative effects on resources, and to act in ways that benefit the sanctuary in the long-term. These benefits are expected to be less than significant due to the limited nature of the studies of the entire region.

It is possible that other sampling activities may indirectly adversely affect invertebrates through behavioral disturbances caused by the instruments themselves; or more directly through contact of sessile benthic organisms (including some invertebrates) by the gear itself. The transitory nature of these devices, as well as the limited scope of each study with regards to the size of the region, is expected to keep these effects less than significant. In addition, some adverse impacts may occur as a result of species monitoring and survey efforts throughout the monument sanctuary sites. Intertidal monitoring efforts occur within PMNM and HIHWNMS. In PMNM, these efforts are separately permitted and scrutinized through the PMNM permit process. As such, collaboration and sample sharing is, to the extent practicable, encouraged and over collection is avoided. In addition, invertebrate collections in PMNM are limited to less than 1% of the population density in any given area, therefore minimizing impact to the total population. Specifically, impacts are reduced by conducting sampling efforts over a large area (across the three PIR sanctuary and monument sites) and over the course of an entire year (as opposed to collecting all samples from the same place during a single event). Sampling areas are identified in an attempt to minimize impact to resources while ensuring sound research data is obtained. Across the three sites, no more than 700 invertebrates are collected each year and no more than 725 balls of algae are sampled. As such, direct impacts from these other sampling activities are overall expected to be less than significant, because impacts are short-term and localized.

SCUBA/Snorkel Operations

SCUBA/snorkel operations, which are conducted predominantly for scientific or educational purposes, increase the understanding and appreciation of biological resources enhancing management strategies to protect biological habitat, invertebrates, fish, birds and protected species. This information serves to improve public stewardship of the PIR sanctuary and monument biological environments. Thus, this activity is expected to result in indirect, long-term, and less than significant beneficial effects to the biological environment.

SCUBA/snorkel operations (up to 542 divers per year across the three PIR sites) are expected to result in less than significant adverse effects on mobile invertebrates that may choose to move away from the divers due to the minor and limited, short-term impact on animal behavior in each area. While intentional or accidental improper techniques and overuse of specific locations can result in increased disturbance of animals, sanctuary dive sites vary according to the different projects throughout each site generally preventing prolonged disturbance of animals in any one location. In addition, ONMS divers and snorkelers are highly trained and will employ ONMS best management practices to avoid improper actions that can cause undue harm to sanctuary or monument living marine resources. Thus, these operations are expected to result in adverse effects that are less than significant, because they are short-term and localized.

Vessel Operations

All three PIR sanctuary and monument sites conduct a cumulative total of 671 days/year operating ONMS owned or contracted vessels throughout sanctuary and monument sites. In general, conducting vessel operations allows ONMS personnel to be on the water providing direct and indirect, less than significant beneficial impacts to habitat, invertebrates, fish, birds and protected species through enforcement activities and by providing education to users so that they may avoid adverse impacts to biological resources. This would include slight beneficial impacts to the assemblages designated as Essential Fish Habitat under the MSA, which are described in Chapter 3 for HIHWNMS and NMSAS specifically. In addition, conducting vessel operations allows ONMS personnel to respond to emergency incidents involving other users and wildlife (all sub categories).

The operation of vessels (up to 671 vessel operational days each year occur across the three PIR sanctuary and monument sites) has the potential to have adverse, but less than significant direct and indirect impacts to invertebrates from anchoring and from temporary displacement due to vessel movement. The effects of anchoring and vessel movement are expected to be short term, and whenever possible, are conducted in locations (*i.e.*, sand) where concentrations of invertebrates are low.

Activities with only less than significant beneficial impacts

Aircraft Operations

Monitoring efforts conducted via unmanned aircraft operations can lead to better characterization of habitat and species in remote areas. These efforts can also reduce the need for a physical presence in remote areas, which may in turn reduce disturbances to physical and biological environments. Similarly, enforcement efforts can be enhanced by aircraft operations (both manned and unmanned) with surveillance flights (both planned and unplanned). As such, while infrequent in occurrence, the use of unmanned aircraft for habitat and species monitoring activities and to support law enforcement is expected to result in further protection of sanctuary resources, and thereby provide indirect and long-term, less than significant, beneficial effects to the biological environment. Up to 25 operational flight hours occur each year across all three PIR sites.

Activities with negligible impacts

Vessel Maintenance

Throughout the PIR sanctuary and monument sites, vessel maintenance activities are not expected to exceed 16 days/year. The routine maintenance of sanctuary owned vessels is episodic, low intensity and accomplished by trained NOAA personnel and contractors to avoid impacts to the biological environment including invertebrates. Where possible, bio-based lubricants and fluids (and, in some cases bio-based fuels are used) further reducing the threat to habitat resources in the unlikely event of an unintentional spill. Because these vessels are small and limited in total

number at any location, heavy maintenance (e.g., welding, grinding, painting, etc.) is typically accomplished on land in self-contained contractor facilities which are highly regulated for industrial safety and environmental compliance including spill prevention by local, state and other federal entities. Therefore, the effects of vessel maintenance on invertebrate resources are expected to be negligible.

Fish

Activities with less than significant beneficial, less than significant adverse and negligible impacts

Onshore Fieldwork

In total, 2,373 people days per year are spent conducting a wide array of onshore fieldwork activities within the three PIR sanctuary and monument sites. Programs that involve monitoring biological resources from shore directly benefit the biological environment directly and indirectly. Removal, disentanglement conducted from the shore and monitoring efforts provide a direct, short-term benefit to biological resources as immediate attention and action is employed when necessary to ensure the safety and health of marine and nearshore habitat and species (birds, invertebrates, fish, marine mammals, sea turtles, and cetaceans). Indirect beneficial effects are expected from the education and outreach materials generated by the studies conducted through onshore fieldwork operations. Public awareness and education is vital to helping public stakeholders understand the resources throughout the region. Improved public awareness and understanding of resources may inspire the public to cause fewer negative effects on resources, and to act to improve resource protection, both of which would benefit the resources in the long-term. These benefits remain less than significant effects due to the limited nature of the studies. Because these studies need to be repeated over time, impacts are generally short-term for each particular benefit associated with studies and outreach materials.

In the event of a vessel grounding or the presence of marine debris, necessitating the removal of large or bulky items, the prompt removal of such items would result in indirect, short and long-term benefits to the entire ecosystem by eliminating the threat of further damage to the marine and nearshore environment. Similarly, large congregations of marine debris create entanglement and entrapment hazards and prompt removal eliminates threats to both habitat and species. By the immediate attention to known threats and the elimination of threats caused by foreign objects, such as marine debris, response efforts will allow for species and habitat disentanglements.

In summary, the totality of onshore fieldwork in the PIR sanctuary and monument sites is expected to result in direct and indirect, long and short-term, and thus, less than significant benefits to the biological environment of these areas.

On average, less than 5 large removal efforts occur across the PIR sanctuary and monuments sites each year. Inherent in any effort to remove large or bulky foreign items from the nearshore or marine environment is the potential for impact to the surrounding biological environment.

Grounded vessels may be dragged along shoreline areas to eliminate threat to the environment. Similarly, large congregations of marine debris create entanglement and entrapment hazards, however, removal efforts may require the use of cranes or other equipment that could cause incidental damage to the surrounding area. In addition, the physical presence of staff conducting general fieldwork may displace or disturb nearshore and marine species. Staff (ONMS and specialized contract staff) conducting such mitigation efforts are highly skilled and trained to ensure work is done carefully so as not to unnecessarily harm the surrounding environment. As such, field work activities, including efforts to remove and relocate large foreign objects, such as marine debris or grounded vessels, are expected to have a less than significant adverse impact on the surrounding biological environment.

Beach-walk and intertidal surveys through the movement of personnel engaged in collection and identification studies are expected to have negligible impacts to the surrounding ecosystem (including habitat, fish, invertebrates, birds, and protected species). Short term and insignificant disturbance to the surrounding area may, but is unlikely to, occur during fieldwork activities through necessary, incidental, and unavoidable contact within the surrounding area. However, the effects of this contact are expected to be negligible as any contact with the environment is localized and short term (activities likely to occur a few days per year in any one area) and care would be taken to avoid unnecessary or potentially harmful contact.

Activities with both less than significant beneficial and less than significant adverse impacts

Deployment of AUV/ROV/Gliders/Drifters

Deployment of AUV/ROV/gliders/drifters, which are used predominantly for scientific or educational purposes, increases the understanding and appreciation of the biological environment enhancing management strategies to protect biological habitat, invertebrates, fish, birds and protected species. This information serves to improve public stewardship of the PIR sanctuary and monument biological environments. Thus, these activities are expected to result indirect, long-term, and less than significant beneficial effects to the biological environment.

Deployment of AUV/ROV/gliders/drifters is expected to result in less than significant adverse effects on the behavior of mobile invertebrates, fish, protected species and birds due to the generally minor, limited, and short-term impact caused by these tools. While intentional or accidental improper operator techniques are possible, such occurrences are unlikely given that operators are required to complete training courses specific to the craft that would be operated. In addition, operators utilize highly visible assets and, accordingly, serve as models of best practices. In addition, the high mobility of these tools prevents overuse of any specific location. An average of 50 deployments per year occur within the three PIR sanctuary and monument sites. As a result of the low number of annual deployments and the care in which the devices are operated, these activities are expected to result in less than significant, short term, adverse effects.

Deployment of Remote Sensing Equipment

Remote sensing can have several indirect beneficial impacts on biological resources including increased understanding of individual species, biodiversity and habitats; better education and outreach materials for public education, which can lead to indirect benefits to living marine resources; and the use of hydrographic mapping as a means to improve habitat characterization and protection of seabed living resources. Increased public education, awareness and understanding of resource protection may inspire users to cause fewer negative effects on resources, and to act in ways that benefit resources in the long-term. These benefits are expected to be less than significant due to the limited nature of the studies of the entire region.

Information on the movements of commercially and recreationally important fish species gained from remote sensing operations and tagging could be used to better manage species and protect fish habitat, which could result in potential long-term, indirect less than significant beneficial impacts on fish.

The possible adverse effects of remote sensing operations, of which a total of 76 deployments occur each year across the PIR sites, on fish have not been well studied or documented and are therefore not well known. However, it is possible that remote sensing equipment may indirectly adversely affect fish through behavioral disturbance caused by the instruments themselves; or more directly through direct contact of fish by the gear itself. The highly localized, impulsive and rare nature of the side scan and multi-beam sonars profiled here for use in PIR sites suggests negligible implications for the broader ability of fish to use sound for such functions as to communicate, detect predators and prey, and for larval settlement cueing. The transitory nature of these devices, as well as the limited geographic scope of each study relative to the size of the region, however, is expected to result in less than significant adverse effects on fish.

Other Sampling Activities

During the conduct of these sampling activities, marine debris and alien species are opportunistically collected for further research and analysis. This effort is expected to result in long-term, less than significant, beneficial impacts to sanctuary and monument resources.

Information gleaned from other sampling operations may be helpful in determining the movements of commercially and recreationally important fish species (*e.g.*, the tagging of fish can be used to better manage species and protect their habitat), which could result in potential long-term, indirect less than significant beneficial impacts on fish.

Other sampling activities can have several indirect beneficial impacts on biological resources including data collection for future study; increased understanding of individual species, biodiversity and habitats, which leads to improved conservation and management of resources; as well as the indirect benefits of increased awareness and the development of education and outreach materials for public education that may inspire the public to cause fewer negative effects on resources, and to act in ways that benefit the sanctuary in the long-term. These benefits are expected to be less than significant due to the limited nature of the studies of the entire region.

ONMS field staff does not, in the process of conducting regular field operations as described in Chapter 2, collect fish. Collections of fish conducted by ONMS staff may occur in partnership with other research entities for a distinct purpose, separate from ONMS field operations, all of which are separately permitted and undergo separate NEPA processes, therefore, such collections are not further analyzed in this document. In general, however, other sampling activities may indirectly adversely affect fish through behavioral disturbances caused by the instruments themselves; or more directly through contact of fish by the gear itself. The transitory nature of these devices, as well as the limited scope of each study with regards to the size of the region, however, is expected to result in less than significant adverse effects to fish.

Activities with less than significant beneficial and negligible impacts

Deployment of Equipment on the Seafloor

The use of seafloor deployed equipment has several indirect beneficial impacts on biological resources including data collection to increase understanding of individual species, biodiversity and habitats; monitoring; boating and transit safety; and the indirect benefits of developing education and outreach materials. Increased public education, awareness and understanding of resource protection may inspire users to cause fewer negative effects on resources, and to act in ways that benefit resources in the long-term. These benefits are expected to be less than significant due to the limited nature of the studies of the entire region.

No permanent equipment is deployed on the seafloor by ONMS staff, during field operations in PMNM and NMSAS. Up to 33 varying pieces of equipment are generally installed on the seafloor during regular field operations within HIHWNMS. Seafloor deployed instrumentation are expected to exhibit no or negligible impacts to sanctuary resources unless they inadvertently come in contact with an organism that is harmed by the operation.

Activities with only less than significant beneficial impacts

Aircraft Operations

Monitoring efforts conducted via unmanned aircraft operations can lead to better characterization of habitat and species in remote areas. These efforts can also reduce the need for a physical presence in remote areas, which may in turn reduce disturbances to physical and biological environments. Similarly, enforcement efforts can be enhanced by aircraft operations (both manned and unmanned) with surveillance flights (both planned and unplanned). As such, while infrequent in occurrence, the use of unmanned aircraft for habitat and species monitoring activities and to support law enforcement is expected to result in further protection of sanctuary resources, and thereby provide indirect and long-term, less than significant, beneficial effects to the biological environment. Up to 25 operational flight hours occur each year across all three PIR sites.

SCUBA/Snorkel Operations

SCUBA/snorkel operations, which are conducted predominantly for scientific or educational purposes, increase the understanding and appreciation of biological resources enhancing management strategies to protect biological habitat, invertebrates, fish, birds and protected species. This information serves to improve public stewardship of the PIR sanctuary and monument biological environments. Thus, this activity is expected to result in indirect beneficial effects to the biological environment that are less than significant, because they are long-term.

Vessel Operations

All three PIR sanctuary and monument sites conduct a cumulative total of 671 days/year operating ONMS owned or contracted vessels throughout sanctuary and monument sites. In general, conducting vessel operations allows ONMS personnel to be on the water providing direct and indirect, less than significant beneficial impacts to habitat, invertebrates, fish, birds and protected species through enforcement activities and by providing education to users so that they may avoid adverse impacts to biological resources. This would include slight beneficial impacts to the assemblages designated as Essential Fish Habitat under the MSA, which are described in Chapter 3 for HIHWNMS and NMSAS specifically. In addition, conducting vessel operations allows ONMS personnel to respond to emergency incidents involving other users and wildlife (all sub categories).

Birds

Activities with less than significant beneficial, less than significant adverse and negligible impacts

Onshore Fieldwork

In total, 2,373 people days per year are spent conducting a wide array of onshore fieldwork activities within the three PIR sanctuary and monument sites. Programs that involve monitoring biological resources from shore directly benefit the biological environment directly and indirectly. Removal, disentanglement conducted from the shore and monitoring efforts provide a direct, short-term benefit to biological resources as immediate attention and action is employed when necessary to ensure the safety and health of marine and nearshore habitat and species (birds, invertebrates, fish, marine mammals, sea turtles, and cetaceans). Indirect beneficial effects are expected from the education and outreach materials generated by the studies conducted through onshore fieldwork operations. Public awareness and education is vital to helping public stakeholders understand the resources throughout the region. Improved public awareness and understanding of resources may inspire the public to cause fewer negative effects on resources, and to act to improve resource protection, both of which would benefit the resources in the long-term. These benefits remain less than significant effects due to the limited nature of the studies. Because these studies need to be repeated over time, impacts are generally short-term for each particular benefit associated with studies and outreach materials.

In the event of a vessel grounding or the presence of marine debris, necessitating the removal of large or bulky items, the prompt removal of such items would result in indirect, short and long-term benefits to the entire ecosystem by eliminating the threat of further damage to the marine and nearshore environment. Similarly, large congregations of marine debris create entanglement and entrapment hazards and prompt removal eliminates threats to both habitat and species. By the immediate attention to known threats and the elimination of threats caused by foreign objects, such as marine debris, response efforts will allow for species and habitat disentanglements. In summary, the totality of onshore fieldwork in the PIR sanctuary and monument sites is expected to result in direct and indirect, long and short-term, and thus, less than significant benefits to the biological environment of these areas.

On average, less than 5 large removal efforts occur across the PIR sanctuary and monuments sites each year. Inherent in any effort to remove large or bulky foreign items from the nearshore or marine environment is the potential for impact to the surrounding biological environment. Grounded vessels may be dragged along shoreline areas to eliminate threat to the environment. Similarly, large congregations of marine debris create entanglement and entrapment hazards, however, removal efforts may require the use of cranes or other equipment that could cause incidental damage to the surrounding area. In addition, the physical presence of staff conducting general fieldwork may displace or disturb nearshore and marine species. Staff (ONMS and specialized contract staff) conducting such mitigation efforts are highly skilled and trained to ensure work is done carefully so as not to unnecessarily harm the surrounding environment. As such, field work activities, including efforts to remove and relocate large foreign objects, such as marine debris or grounded vessels, are expected to have a less than significant adverse impact on the surrounding biological environment.

Beach-walk and intertidal surveys through the movement of personnel engaged in collection and identification studies are expected to have negligible impacts to the surrounding ecosystem (including habitat, fish, invertebrates, birds, and protected species). Short term and insignificant disturbance to the surrounding area may, but is unlikely to, occur during fieldwork activities through necessary, incidental, and unavoidable contact within the surrounding area. However, the effects of this contact are expected to be negligible as any contact with the environment is localized and short term (activities likely to occur a few days per year in any one area) and care would be taken to avoid unnecessary or potentially harmful contact.

Activities with both less than significant beneficial and less than significant adverse impacts

Aircraft Operations

Monitoring efforts conducted via unmanned aircraft operations can lead to better characterization of habitat and species in remote areas. These efforts can also reduce the need for a physical presence in remote areas, which may in turn reduce disturbances to physical and biological environments. Similarly, enforcement efforts can be enhanced by aircraft operations (both manned and unmanned) with surveillance flights (both planned and unplanned). As such, while

infrequent in occurrence, the use of unmanned aircraft for habitat and species monitoring activities and to support law enforcement is expected to result in further protection of sanctuary resources, and thereby provide indirect and long-term, less than significant, beneficial effects to the biological environment. Up to 25 operational flight hours occur each year across all three PIR sites.

While unmanned aircraft operations are infrequent (less than 25 hours each year across the PIR's three sanctuary and monument sites), some adverse direct effects are anticipated on biological resources associated with potential seabird strikes and behavioral disturbance from aircraft noise. Unmanned or remote aircraft operating at low altitudes conducting remote sensing surveys may have indirect effects on biological resources via seabird disturbances (*i.e.*, low overflights could result in seabird flushing). In order to minimize the likelihood of interactions with birds, aircraft operations do not generally occur below 200 feet in elevation and generally operate at elevations of 500 feet or more. Aircraft operations are also very limited in scope and duration. Therefore, they are expected to result in adverse effects on biological resources that are less than significant, because effects are short-term and localized.

Deployment of AUV/ROV/Gliders/Drifters

Deployment of AUV/ROV/gliders/drifters, which are used predominantly for scientific or educational purposes, increases the understanding and appreciation of the biological environment enhancing management strategies to protect biological habitat, invertebrates, fish, birds and protected species. This information serves to improve public stewardship of the PIR sanctuary and monument biological environments. Thus, these activities are expected to result indirect, long-term, and less than significant beneficial effects to the biological environment.

Deployment of AUV/ROV/gliders/drifters is expected to result in less than significant adverse effects on the behavior of mobile invertebrates, fish, protected species and birds due to the generally minor, limited, and short-term impact caused by these tools. While intentional or accidental improper operator techniques are possible, such occurrences are unlikely given that operators are required to complete training courses specific to the craft that would be operated. In addition, operators utilize highly visible assets and, accordingly, serve as models of best practices. In addition, the high mobility of these tools prevents overuse of any specific location. An average of 50 deployments per year occur within the three PIR sanctuary and monument sites. As a result of the low number of annual deployments and the care in which the devices are operated, these activities are expected to result in less than significant, short term, adverse effects.

Other Sampling Activities

Other sampling activities can have several indirect beneficial impacts on biological resources including data collection for future study; increased understanding of individual species, biodiversity and habitats, which leads to improved conservation and management of resources; as well as the indirect benefits of increased awareness and the development of education and outreach materials for public education that may inspire the public to cause fewer negative effects

on resources, and to act in ways that benefit the sanctuary in the long-term. These benefits are expected to be less than significant due to the limited nature of the studies of the entire region.

Sampling activities that focus on learning more about birds that reside in or visit a sanctuary or monument, such as surveys, applying satellite tags for tracking, and studying tissue samples, aid the management and protection of these animals, could result in potential long-term, indirect less than significant beneficial impacts on birds. During the conduct of these sampling activities, marine debris and alien species are opportunistically collected for further research and analysis. This effort is expected to result in long-term, less than significant, beneficial impacts to sanctuary and monument resources.

Other sampling activities, such as alien species surveys and collections, may adversely impact birds in the monument or sanctuary sites. Examples include conducting standardized transects with a research vessel to count seabirds which may temporarily affect their behavior; and applying micro-satellite tracking tags and obtaining tissue samples from seabirds which may result in short-term, temporary injury. Collectively, these activities are expected to result in adverse effects to birds that are less than significant, because these effects are short-term.

Vessel Operations

All three PIR sanctuary and monument sites conduct a cumulative total of 671 days/year operating ONMS owned or contracted vessels throughout sanctuary and monument sites. In general, conducting vessel operations allows ONMS personnel to be on the water providing direct and indirect, less than significant beneficial impacts to habitat, invertebrates, fish, birds and protected species through enforcement activities and by providing education to users so that they may avoid adverse impacts to biological resources. This would include slight beneficial impacts to the assemblages designated as Essential Fish Habitat under the MSA, which are described in Chapter 3 for HIHWNMS and NMSAS specifically. In addition, conducting vessel operations allows ONMS personnel to respond to emergency incidents involving other users and wildlife (all sub categories).

In total, 671 days/year of vessel operations are conducted on ONMS-owned or -contracted vessels throughout the monument and sanctuary sites. These operations may result in temporary displacement or changes in behavior due to the presence of vessels in the monument or sanctuary areas. While highly unlikely, because birds are able to fly away at the sound or sight of an incoming vessel, there is also the potential for direct impacts to bird populations by floating and diving birds being struck by a moving vessel. Additionally, PMNM staff will limit activities around birds during breeding season when possible. These habitats usually have peak densities during mid-summer for many species around the monument and during these times, staff will attempt to limit research activities near these sensitive areas. It should be noted that there is no scientific evidence supporting a disturbance of nesting or breeding seabirds in the presence of a ship surveying in nearshore waters. Collectively, these impacts are expected result in adverse, but less than significant, short term direct and indirect impacts to birds.

Activities with less than significant beneficial and negligible impacts

Deployment of Equipment on the Seafloor

The use of seafloor deployed equipment has several indirect beneficial impacts on biological resources including data collection to increase understanding of individual species, biodiversity and habitats; monitoring; boating and transit safety; and the indirect benefits of developing education and outreach materials. Increased public education, awareness and understanding of resource protection may inspire users to cause fewer negative effects on resources, and to act in ways that benefit resources in the long-term. These benefits are expected to be less than significant due to the limited nature of the studies of the entire region.

No permanent equipment is deployed on the seafloor by ONMS staff, during field operations in PMNM and NMSAS. Up to 33 varying pieces of equipment are generally installed on the seafloor during regular field operations within HIHWNMS. Seafloor deployed instrumentation are expected to exhibit no or negligible impacts to sanctuary resources unless they inadvertently come in contact with an organism that is harmed by the operation.

Activities with only less than significant beneficial impacts

Deployment of Remote Sensing Equipment

Remote sensing can have several indirect beneficial impacts on biological resources including increased understanding of individual species, biodiversity and habitats; better education and outreach materials for public education, which can lead to indirect benefits to living marine resources; and the use of hydrographic mapping as a means to improve habitat characterization and protection of seabed living resources. Increased public education, awareness and understanding of resource protection may inspire users to cause fewer negative effects on resources, and to act in ways that benefit resources in the long-term. These benefits are expected to be less than significant due to the limited nature of the studies of the entire region.

SCUBA/Snorkel Operations

SCUBA/snorkel operations, which are conducted predominantly for scientific or educational purposes, increase the understanding and appreciation of biological resources enhancing management strategies to protect biological habitat, invertebrates, fish, birds and protected species. This information serves to improve public stewardship of the PIR sanctuary and monument biological environments. Thus, this activity is expected to result in indirect, long-term, and less than significant beneficial effects to the biological environment.

Activities with negligible impacts

Vessel Maintenance

Throughout the PIR sanctuary and monument sites, vessel maintenance activities are not expected to exceed 16 days/year. The routine maintenance of sanctuary owned vessels is episodic, low

intensity and accomplished by trained NOAA personnel and contractors to avoid impacts to the biological environment including invertebrates. Where possible, bio-based lubricants and fluids (and, in some cases bio-based fuels are used) further reducing the threat to habitat resources in the unlikely event of an unintentional spill. Because these vessels are small and limited in total number at any location, heavy maintenance (e.g., welding, grinding, painting, etc.) is typically accomplished on land in self-contained contractor facilities which are highly regulated for industrial safety and environmental compliance including spill prevention by local, state and other federal entities. Therefore, the effects of vessel maintenance on invertebrate resources are expected to be negligible.

Protected Species

Activities with less than significant beneficial, less than significant adverse and negligible impacts

Onshore Fieldwork

In total, 2,373 people days per year are spent conducting a wide array of onshore fieldwork activities within the three PIR sanctuary and monument sites. Programs that involve monitoring biological resources from shore directly benefit the biological environment directly and indirectly. Removal, disentanglement conducted from the shore and monitoring efforts provide a direct, short-term benefit to biological resources as immediate attention and action is employed when necessary to ensure the safety and health of marine and nearshore habitat and species (birds, invertebrates, fish, marine mammals, sea turtles, and cetaceans). Indirect beneficial effects are expected from the education and outreach materials generated by the studies conducted through onshore fieldwork operations. Public awareness and education is vital to helping public stakeholders understand the resources throughout the region. Improved public awareness and understanding of resources may inspire the public to cause fewer negative effects on resources, and to act to improve resource protection, both of which would benefit the resources in the long-term. These benefits remain less than significant effects due to the limited nature of the studies. Because these studies need to be repeated over time, impacts are generally short-term for each particular benefit associated with studies and outreach materials.

In the event of a vessel grounding or the presence of marine debris, necessitating the removal of large or bulky items, the prompt removal of such items would result in indirect, short and long-term benefits to the entire ecosystem by eliminating the threat of further damage to the marine and nearshore environment. Similarly, large congregations of marine debris create entanglement and entrapment hazards and prompt removal eliminates threats to both habitat and species. By the immediate attention to known threats and the elimination of threats caused by foreign objects, such as marine debris, response efforts will allow for species and habitat disentanglements. In summary, the totality of onshore fieldwork in the PIR sanctuary and monument sites is expected to result in direct and indirect, long and short-term, and thus, less than significant benefits to the biological environment of these areas.

On average, less than 5 large removal efforts occur across the PIR sanctuary and monuments sites each year. Inherent in any effort to remove large or bulky foreign items from the nearshore or marine environment is the potential for impact to the surrounding biological environment. Grounded vessels may be dragged along shoreline areas to eliminate threat to the environment. Similarly, large congregations of marine debris create entanglement and entrapment hazards, however, removal efforts may require the use of cranes or other equipment that could cause incidental damage to the surrounding area. In addition, the physical presence of staff conducting general fieldwork may displace or disturb nearshore and marine species. Staff (ONMS and specialized contract staff) conducting such mitigation efforts are highly skilled and trained to ensure work is done carefully so as not to unnecessarily harm the surrounding environment. As such, field work activities, including efforts to remove and relocate large foreign objects, such as marine debris or grounded vessels, are expected to have a less than significant adverse impact on the surrounding biological environment.

Beach-walk and intertidal surveys through the movement of personnel engaged in collection and identification studies are expected to have negligible impacts to the surrounding ecosystem (including habitat, fish, invertebrates, birds, and protected species). Short term and insignificant disturbance to the surrounding area may, but is unlikely to, occur during fieldwork activities through necessary, incidental, and unavoidable contact within the surrounding area. However, the effects of this contact are expected to be negligible as any contact with the environment is localized and short term (activities likely to occur a few days per year in any one area) and care would be taken to avoid unnecessary or potentially harmful contact.

Activities with both less than significant beneficial and less than significant adverse impacts

Deployment of AUV/ROV/Gliders/Drifters

Deployment of AUV/ROV/gliders/drifters, which are used predominantly for scientific or educational purposes, increases the understanding and appreciation of the biological environment enhancing management strategies to protect biological habitat, invertebrates, fish, birds and protected species. This information serves to improve public stewardship of the PIR sanctuary and monument biological environments. Thus, these activities are expected to result indirect, long-term, and less than significant beneficial effects to the biological environment.

Deployment of AUV/ROV/gliders/drifters is expected to result in less than significant adverse effects on the behavior of mobile invertebrates, fish, protected species and birds due to the generally minor, limited, and short-term impact caused by these tools. While intentional or accidental improper operator techniques are possible, such occurrences are unlikely given that operators are required to complete training courses specific to the craft that would be operated. In addition, operators utilize highly visible assets and, accordingly, serve as models of best practices. In addition, the high mobility of these tools prevents overuse of any specific location. An average of 50 deployments per year occur within the three PIR sanctuary and monument sites.

As a result of the low number of annual deployments and the care in which the devices are operated, these activities are expected to result in less than significant, short term, adverse effects.

Entanglement of protected resources – primarily marine mammals (some endangered) - in ROV cable is possible, but unlikely because the duration of operations is very limited and the operation is attended at all times. In addition, tow-board divers are pulled behind a small boat via a tow line and therefore, while risk of entanglement exists, it is minimized by the presence of observers onboard the small boats towing the divers and the fact that the line is tight while operational and only slacked when towing activities are done, after which the line is immediately retrieved from the water. Should an animal be observed in the vicinity of these operations, PMNM best management practices (BMP) require that all existing lines in the water column be quickly retrieved. The same BMP does not currently exist in HIHWNMS and NMSAS. In addition, the deployment of AUVs, ROVs, gliders, drifts, and other towed devices in the monument and sanctuary areas occurs with limited frequency (no more than 70 times each year across the three PIR sites). Thus, these operations are expected to result in adverse, direct, short-term, and thus, less than significant effects on protected species.

Deployment of Equipment on the Seafloor

The use of seafloor deployed equipment has several indirect beneficial impacts on biological resources including data collection to increase understanding of individual species, biodiversity and habitats; monitoring; boating and transit safety; and the indirect benefits of developing education and outreach materials. Increased public education, awareness and understanding of resource protection may inspire users to cause fewer negative effects on resources, and to act in ways that benefit resources in the long-term. These benefits are expected to be less than significant due to the limited nature of the studies of the entire region.

Seafloor deployed equipment can be used for monitoring marine mammal behavior, thus reducing the possible deleterious impacts of human interactions with these animals. These deployments are expected to yield less than significant, long-term, indirect beneficial impacts.

No permanent equipment is deployed on the seafloor by ONMS staff during field operations in PMNM and NMSAS. Up to 33 varying pieces of equipment are generally installed on the seafloor during regular field operations within HIHWNMS. Most of the seafloor equipment does not use active sonar or other noise-generating technology as part of its normal operations, however, if it does, there is a possibility that marine mammals may be adversely affected, perhaps causing behavioral changes such as altering their foraging, diving or vocalization patterns. Another possible adverse impact to marine mammals may be the slight chance of entanglement with a mooring cable. Due to the limited number of deployments of seafloor equipment each year and the fact that observers and trained operators would be present to ensure proper installation of the equipment (including ensuring mooring cables are tight to minimize entanglement hazards), adverse impacts are expected to be short-term and localized, and thus, less than significant.

Deployment of Remote Sensing Equipment⁷

Remote sensing activities include the use of both active (sound producing) and passive (listening only) technologies for a variety of uses (e.g., monitoring humpback whales and their habitat, and inventorying resources and documenting maritime heritage sites) and can have several indirect beneficial impacts on biological resources in PIR sites. Such benefits include increased understanding of individual species, biodiversity and habitats; better education and outreach materials for public education, which can lead to indirect benefits to living marine resources; and the use of hydrographic mapping as a means to improve habitat characterization and protection of seabed living and maritime heritage resources. Increased public education, awareness and understanding of resource protection may inspire users to cause fewer negative effects on resources, and to act in ways that benefit resources in the long-term. These benefits are expected to be less than significant due to the limited nature of the studies of the entire region.

As discussed above, active acoustic sources (side-scan and multi-beam sonars) may be used in HIIWNMS and PMNM for up to 76 hours a year. The multi-beam systems used on the *Hi'ialakai* are the Kongsberg EM300 and EM302, which operate at frequencies of 70-100 kHz and 30 kHz, respectively, and typical source levels (SL) of 229 dB re 1 μ P and 232 – 237 dB re 1 μ P, respectively. Power, amplitude, pulse, width and ping rate vary depending on the depths of the ocean in the area being mapped. The *HI'IALAKAI's* EM 302 system will be operated in waters 1000 meters and deeper; in shallower water, the 300 system and/or lower settings on the 302 system will be used that emit lower source levels, making the calculations for “deep mode”. Additionally, multibeam systems of other research vessels of opportunity (e.g., R/V *Falkor*) are used to map the seafloor of the monument and employs similar equipment.

Evaluation of noise impacts to individual species necessitates characterization of source features and use profiles (discussed above), and affiliation of those features with co-occurrence, context and sensitivity of exposed animals. In extreme cases, the aligning of these risk factors can result, in soft tissue injuries and even fatality if animals are exposed to very high intensity sounds in very proximate conditions. Higher intensity exposures within animal's frequency range of hearing also can cause injury in the form of permanent hearing damage, also referred to as permanent threshold shift (PTS). Exposure to moderate intensity sounds within relevant frequency ranges can cause temporary threshold shifts (TTS) in hearing, which are recoverable over a subsequent period of non-exposure. Sometimes over great distances from the source, exposure to sound can result in behavioral effects for affected species that can result in alteration of biologically important activities such as feeding, mating or migration. In more extreme cases, behavioral responses can lead indirectly to death, such as animals having strong aversion responses and rising from deep waters too quickly or traveling into shallow waters and beaching. Finally, also

⁷While sonar scientific and mapping operations are technically included in vessel operations, the analysis presented here calls them out separately to facilitate the analysis of potential impacts of active acoustic equipment use on marine mammals and protected species.

over a broad range of distances, exposure to non-invasive sounds or cumulative acoustic energy from a variety of sound sources leading to higher “background” noise levels, can result in masked communications and/or degraded ability for animals to hear acoustic environmental cues used to support biologically important activities (again, such as navigation, feeding, reproduction).

In order to predict whether a marine mammal’s exposure to a sound source will result in either temporary or permanent changes in their hearing ability, NMFS has developed Technical Guidance which provides acoustic thresholds for onset of permanent threshold shift (PTS) and temporary threshold shifts (TTS) in marine mammals for all sound sources. Specifically, it identifies the levels of received sound at which individual marine mammals are predicted to experience changes in their hearing sensitivity (either temporary or permanent) for acute, incidental exposure to underwater anthropogenic sound sources. The current NMFS threshold for the onset of PTS in cetaceans from exposure to in-water sounds is ≥ 180 dB re 1 μ Pa. The same threshold for pinnipeds is ≥ 190 dB re 1 μ Pa. Exposure to impulsive in-water sounds at ≥ 160 dB re 1 μ Pa is the threshold for the onset of TTS and behavioral disturbance for all marine mammals, whereas the same threshold for exposure to non-impulsive sound (continuous noise) is ≥ 120 dB re 1 μ Pa.

The sonar systems to be used in this action are considered impulsive sources. Thus, the 160 dB re 1 μ Pa threshold for predicting the onset of TTS and behavioral disturbance is applied, and significant exposure above that level at a frequency within the animal’s hearing range is considered an adverse impact. However, not all cetaceans and pinnipeds will experience TTS or behavioral responses at the 160 dB threshold. Hearing capabilities vary among marine mammal groups, and mapping sonars only overlap with the hearing range of regionally-occurring mid-frequency cetaceans (toothed whales/Sperm whale) and pinnipeds (monk seal).

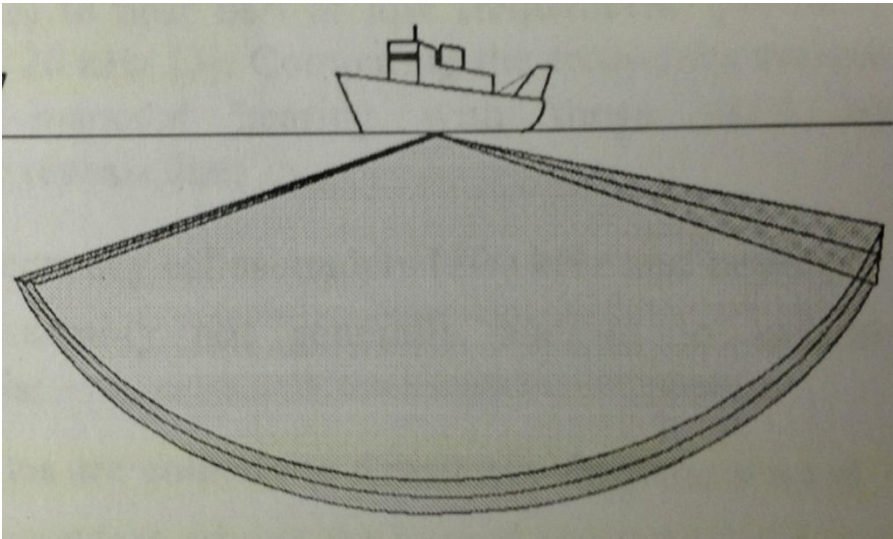
In order to assess the likelihood that an animal will be exposed to sound levels at or greater 160 dB re 1 μ Pa, we must determine the propagation, or spreading, in meters, of the sound from the source (in this case, the vessel). Figures 2a and 2b provides diagrams excerpted from Lurton & DeRuiter (2011) that show the general sound propagation (isopleth) of a multibeam sonar system from both horizontal (Fig 2a) and overhead (Fig. 2b) perspectives. The 160 dB received level isopleth forms a ring around the vessel at 200 meters, except within the fan-shaped ensonification volume (as pictured in Figure 1) where it extends out to approximately 750 meters. Any marine mammal within this isopleth would receive sound levels of 160 dB or higher⁸.

Accurately predicting the 160 dB re 1 μ Pa isopleth from any sound source is difficult, but particularly so for multibeam sonar. First, propagation of sound produced underwater is highly dependent on environmental characteristics such as bathymetry, bottom type, water depth, temperature, and salinity. The sound received at a particular location will be different than near the source due to the interaction of many factors, including propagation loss; how the sound is reflected, refracted, or scattered; the potential for reverberation; and interference due to multi-

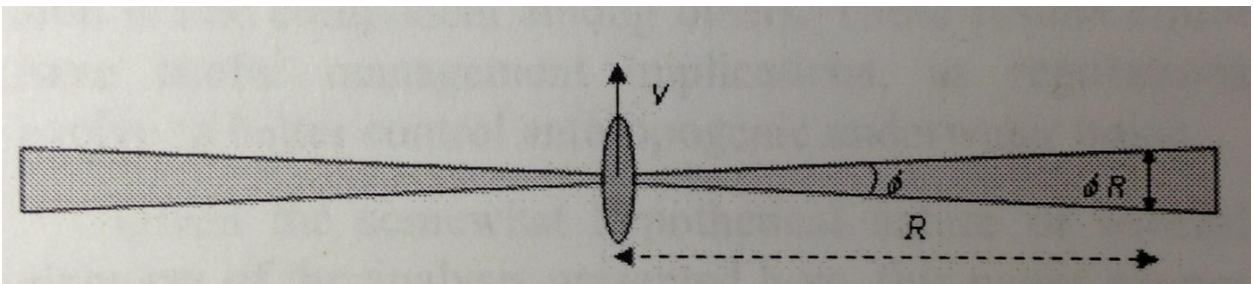
⁸ PMNM 2014. The model was done for the *Falkor* which uses the same system as the *Hi`ialakai*.

path propagation. In addition, absorption greatly affects the distance over which higher-frequency sounds propagate. Detailed information on these naturally occurring factors in the marine environment is rarely available and consequently they are generally not considered in the equations.

Multibeam sonar are focused sonar arrays that use “selective angular directivity” and furthermore transmit “very short pulses at limited ping rates” (Lurton & DeRuiter 2011). These two characteristics of this type of sonar decrease the probability of the animals being subjected to TTS threshold intensity levels. Fig 2b also provides the variables used to estimate the exposure time of a stationary animal as the ship passes on its survey track. The exposure time can be estimated by $\phi R/V$ where ϕ is the longitudinal transmitting lobe aperture in radians, R is the range from the source to the animal, and V is the speed of the ship. The aperture of the *HĪĪALAKAI* EM 302 and 300 systems are 1.0° and 0.5° respectively, yielding ϕ values of 0.01 and 0.02 rads. The ship will be mapping at 8 knots. At 200m distance, the exposure times for a stationary animal caught in the ensonification plane of the EM 302 and EM 300 systems are therefore calculated to be 0.5 and 1.0 second, respectively. This exposure time increases with R so that at 1000 m distance, the exposure times are 2.4 and 4.9 seconds, respectively.



a)



b)

Figure 2. Diagrams showing a typical multibeam ensonification volume from a) the horizontal and b) the

overhead prospective (From Lurton & DeRuiter 2011).

Submerged animals more than 200m from the ship that are caught in the ensonification volume as the ship passes will be only briefly subjected to the elevated sound levels occurring inside the transmitter beam pattern. Furthermore, the narrow fan-shaped beam patterns of the HI'IALAKAI systems provide ample possibilities for the animals to quickly escape the sound. The only possible scenario for more extended exposure would be if the animal were to suddenly start moving in the exact direction and speed as the ship, which is unlikely.

Finally, transmit pulse forms and rates further distinguish multibeam sonar from other types of sonar and acoustic sources and further reduce their potential threat to marine mammals. Sound is not transmitted continuously from these systems but rather in extremely short pulses (i.e., pings). According to technical specifications, ping durations obtained from the EM302 manual⁹ are very brief -- 0.7 to 5.0 milliseconds. The ping rate or in other words, how frequently pings are emitted, is depth dependent that at a depth of 400 m, the ping rate is 30 pings/min, decreasing to 3.6/min at 4000 m. For example, when the ship is mapping in 400 m of water, any submerged marine mammal caught in the ensonification volume will be subjected to only a 0.7 millisecond ping every 2 seconds. Similarly, when the ship is mapping in 4,000 m of water, the mammal will hear only a 5 millisecond ping every 17 seconds. Based on an 8 nm/hr mapping speed and using this width as an example, this distance will be traversed by the ship in 1.8 seconds. Therefore, while the ship is surveying depths of 400 m, submerged stationary marine mammals that are 750m from the ship within the fan-shaped ensonification volume, or 200m from the ship in all other directions would be subjected to at most two pings at 160 dB of 0.7 milliseconds of duration. Likewise, if the encounter occurs where the water depth is 4,000 m, the mammals would only be subjected to no more than a single 5 millisecond ping at 160 dB. Due to the very narrow swath of ensonified volume out to 750 m, the likelihood of a marine mammal being exposed to received levels of sound of 160 dB or above is discountable.

Another consideration is the hearing range of the various species found in the survey areas. Figure 3 provides a general diagram of the hearing ranges of the various groups of marine mammals. The figure was modified to include only mammal groups under consideration for this review. The frequency range of the HI'IALAKAI systems was also superimposed on the bars. The first observation from this figure is that neither system is expected to produce sound audible to the LF cetacean group (baleen whale or Mysticetes) whose hearing range is believed to be below 30 kHz. As such, we conclude that mysticetes, including the humpback whale, are not likely to be adversely affected by exposure to elevated sound levels.

⁹ The manual can be found at [https://www.km.kongsberg.com/ks/web/nokbg0397.nsf/AllWeb/253E4C58DB98DDA4C1256D790048373B/\\$file/160692_em_datagram_formats.pdf?OpenElement](https://www.km.kongsberg.com/ks/web/nokbg0397.nsf/AllWeb/253E4C58DB98DDA4C1256D790048373B/$file/160692_em_datagram_formats.pdf?OpenElement)

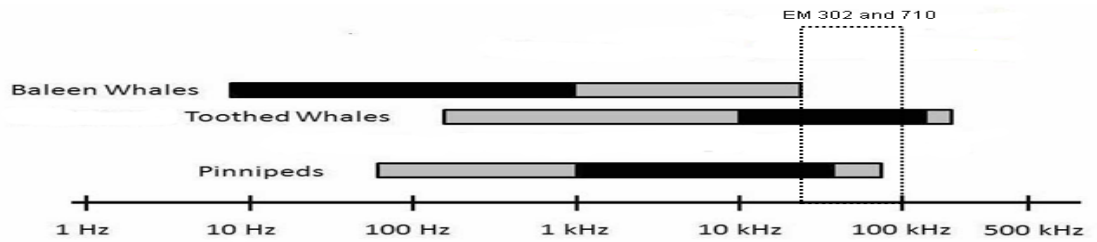


Figure 3. Hearing ranges of marine mammal groups in Hawaiian waters. Black bars show the most sensitive portion of these ranges. This figure was modified from Fig. 4.2-3 of the SWFSC draft Programmatic EA (see text for more details). The EM 710 and EM 300 have identical sound emissions.

The second observation is that both systems are also transmitting at the upper portion of the pinniped hearing range. Together, these observations suggest that toothed whales, primarily the sperm whale and false killer whale (during transits), are likely to be potentially most affected by the *HI'IALAKAI* mapping activities. Within monument waters, the sperm whale (*Physeter macrocephalus*) is the only species of toothed whales that is ESA listed.

Finally, to further address the unlikely impacts to marine mammals, observers on the *HI'IALAKAI*'s bridge or the marine mammal observation deck will carefully monitor for the presence of marine protected species, and permitted personnel would follow the BMPs listed above, thereby minimizing disturbance. Shallow water mapping would be conducted during daylight hours as much as possible and only with cetacean observers present. If cetaceans are present within 200 meters of the ship, the vessel would stop until the animals depart the area. The multibeam systems will remain on throughout the cruises to avoid the possibility of startle responses by marine mammals that could be in the vicinity of the ship, particularly at night. Leaving them on also provides marine mammals advanced warning that the ship is in the vicinity, further reducing the possibility of a collision. If the systems are shut down for any reason, such as turning off the EM 302 during an extensive area of shallow water mapping, the multibeam soft start mode – a delay function, also referred to as “ramp up”, whereby sonar transmissions are started at a low output level and gradually increase - would be used to minimize any startle responses.

For those cetaceans exposed to the 160 isobeth, the impacts are likely limited to temporary, minor behavioral disturbances. Based on the best information available, including the mobility of marine mammals in the water column, the propensity for marine mammals to avoid obtrusive sounds, and the proposed mitigation measures above, mild alert and startle responses, avoidance of the survey vessel, and brief or minor modification of vocal behaviors are the most probable responses to exposure. In addition, the relatively rare, impulsive and highly localized implications

of these source types result in non-existent (humpbacks) to negligible (toothed whales) implications for acoustic masking of communication signals or other important biological signals within mid-higher frequency hearing ranges. No measurable impacts are expected to occur on the ability of exposed cetaceans to forage, shelter, navigate, reproduce, and avoid predators and other threats such as vessels. Therefore, the impacts expected to result from exposure to noise from active acoustic research sources would have insignificant effects on cetaceans that may be in the area.

Exposed pinnipeds may experience behavioral responses as the result of exposure to the project's sonar noise. Based on the best information available, including the motility of free-ranging marine mammals in the water column, the propensity for marine mammals to avoid obtrusive sounds, and the proposed mitigation measures above, mild alert and startle responses, avoidance of the survey vessel, and alteration in diving patterns are the most probable Hawaiian monk seal responses to exposure. In addition, the relatively rare, impulsive and highly localized implications of these source types result in negligible implications for acoustic masking of communication signals or other important biological signals within mid-higher frequency hearing ranges. No measurable impacts are expected to occur on the ability of exposed seals to forage, shelter, navigate, reproduce, and avoid predators and other threats such as vessels. Therefore, the impacts expected to result from exposure to the project's sonar noise would have insignificant effects on Hawaiian monk seals.

Mitigation and Monitoring

PMNM incorporates operational mitigation measures into its survey activities to reduce or avoid impacts wherever practicable. Vessels operate a slow speed (4-8 knots) during survey effort. PMNM uses downward-facing, mid to high frequency sources outside of the highest hearing sensitivity ranges for most offshore-centric local cetacean species. In addition, the sonars are operated at the lowest power setting and are turned off when any marine mammals have been sighted within 1nm of the vessel.

PMNM requires that a designated lookout stand watch on the ship's bridge during transit and survey operations, scanning the water for humans, animals, vessels, and other objects. Observers will therefore pay particular attention to spotting and avoiding marine mammals. Personnel on board NOAA ships and contractor vessels are required to monitor and report locations of marine mammal sightings as part of their regular operational protocol. Currently, the lookout records any sightings of marine mammals on either a paper marine mammal log or by an automated marine mammal report logging system such as SpotterPro, a smartphone application for filing reports. Regardless of format or mode of delivery, the observation report records the species, number of animals, behavior, time, and location of the sighting. Each year, NOAA ships are required to include 24 hours of "safety stand down" training activities for on-board personnel. NOAA is incorporating basic strategies for marine mammal detection and monitoring into standard ocean observatory roles for personnel.

Additionally, PMNM staff will limit activities around known rookeries and pupping grounds for endangered marine mammals and, as discussed above, birds, during breeding and pupping seasons when possible. These habitats usually have peak densities during mid-summer for many species around the monument and during these times, staff will attempt to limit research activities near these sensitive areas. Due to all of these factors it is expected that ONMS remote sensing operations will have less than significant impacts on protected species.

In summary, remote sensing operations including the use of active or side-scan sonar in HIIWNMS and the monument may adversely impact protected species, particularly marine mammals (some endangered), through the generation of increased noise in the environment. This and other anthropogenic underwater noise may adversely affect marine mammals in several ways including causing some behavioral changes such as altering their foraging, diving or vocalization patterns, but they would not likely result in physical injury to the marine mammals in the form of a permanent or temporary threshold shift (hearing loss). While less than likely, exposures are anticipated to arise to behavioral disturbances that are expected to be short-term and localized, and thus, less than significant. Employment of observers and best management procedures are anticipated to further minimize any impacts. Documentation of marine mammal encounters will ensure best management practices are employed and effective.

Other Sampling Activities

Various sampling operations aimed at better protection and management of marine mammals include applying tags to record and study whale behavior, and deploying instruments into the water column to measure internal waves as a means of understanding their effects on whale foraging. These operations contribute to long-term scientific studies that aid in the management of PIR sanctuary and monument sites.

Further, large whale disentanglements, which typically involve also collecting tissue or other samples, are often very public opportunities for direct interaction with these large, often endangered mammals. These operations directly benefit the animals by freeing them from harmful, entangling fishing gear, and provide a substantial indirect benefit from heightened public attention and educational opportunities. The effects of this type of activity are expected to be beneficial and less than significant, but may be short-term as the publicity from any single event may fade quickly unless education and outreach programs continue to inform the public of the dangers of entanglements.

During the conduct of these sampling activities, marine debris and alien species are opportunistically collected for further research and analysis. This effort is expected to result in long-term, less than significant, beneficial impacts to sanctuary and monument resources.

Other sampling activities can have several indirect beneficial impacts on biological resources including data collection for future study; increased understanding of individual species, biodiversity and habitats, which leads to improved conservation and management of resources; as well as the indirect benefits of increased awareness and the development of education and

outreach materials for public education that may inspire the public to cause fewer negative effects on resources, and to act in ways that benefit the sanctuary in the long-term. These benefits are expected to be less than significant due to the limited nature of the studies of the entire region.

Tagging whales with digital tags that adhere to the skin with suction cups is separately permitted under MMPA and not further analyzed here.

Where sampling activities include extractive sampling for research purposes, there is generally some limited, less than significant adverse effects to the collected species. Sampling activities are conducted over a large area (across the three PIR sanctuary and monument sites) and spread out throughout the year. PMNM employs a suite of Best Management Practices to minimize potential impacts on natural resources and animals.¹⁰ Similarly, HIHWNMS ensures proper protocols are followed when conducting sampling efforts. For example, during whale monitoring and research activities, staff operate in accordance with the NOAA Fisheries Marine Mammal Health and Stranding Response Program permit # 932-1905-1¹¹. In addition, sampling areas are identified with a goal of minimizing impact to resources, including protected species, while ensuring sound research data is obtained. Collectively, these activities are expected to result in less than significant, adverse impacts to protected species.

Vessel Operations

All three PIR sanctuary and monument sites conduct a cumulative total of 671 days/year operating ONMS owned or contracted vessels throughout sanctuary and monument sites. In general, conducting vessel operations allows ONMS personnel to be on the water providing direct and indirect, less than significant beneficial impacts to habitat, invertebrates, fish, birds and protected species through enforcement activities and by providing education to users so that they may avoid adverse impacts to biological resources. This would include slight beneficial impacts to the assemblages designated as Essential Fish Habitat under the MSA, which are described in Chapter 3 for HIHWNMS and NMSAS specifically. In addition, conducting vessel operations allows ONMS personnel to respond to emergency incidents involving other users and wildlife (all sub categories).

In total, 671 days/year of vessel operations are conducted on ONMS owned or contracted vessels throughout the monument and sanctuary sites. These operations may result in indirect impacts to protected species through temporary displacement or changes in behavior due to the presence of vessels in the monument or sanctuary areas. While highly unlikely, there is also the potential for direct impacts to protected species by vessel strikes. Small vessels typically operate at higher speeds and generally exhibit higher maneuverability and shallower drafts compared to larger

¹⁰ For a current list of monument Best Management Practices and Policies visit, <http://www.papahanaumokuakea.gov/permit/bestmanagement.html>

¹¹ The permit number is # 18786.

vessels. Therefore, small vessels, such as those used by ONMS in the PIR, are even less likely to collide with and injure protected species because they can change direction to avoid collisions and do not ride as low in the water as larger, hard-bottom hull vessels. Except for law enforcement vessels, larger, hard-bottom hull vessels such as ONMS small vessels tend to move slower and have increased crew requirements per the NOAA Small Boat Program and sanctuary program standing orders to make up for their lesser maneuverability compared to small vessels.

Regardless of boat size, operators of vessels owned and contracted by ONMS or NOAA employ ONMS best management practices to minimize impacts and follow ESA and marine mammal regulations. And, because they are highly trained and are operating assets that are very visible to the public so they are trained to employ ONMS best management practices to avoid harm to protected species and sanctuary and monument resources. Examples of best practices (described in Chapter 2) include maintaining lookouts for protected species, interacting with other vessel operators (*e.g.*, whale watch boats), receiving real time survey information on the locations and concentration of marine mammals in particular, reducing speeds, and maintaining safe distances.

The combination of a limited number of days at sea, a large geographic area comprised by the monument and sanctuary sites, and the small number of vessels operated by ONMS further decreases the likelihood of overall impacts to protected species residing in the monument and sanctuaries. Therefore, impacts of vessel operations are expected to be less than significant.

Activities with only less than significant beneficial impacts

Aircraft Operations

Monitoring efforts conducted via unmanned aircraft operations can lead to better characterization of habitat and species in remote areas. These efforts can also reduce the need for a physical presence in remote areas, which may in turn reduce disturbances to physical and biological environments. Similarly, enforcement efforts can be enhanced by aircraft operations (both manned and unmanned) with surveillance flights (both planned and unplanned). As such, while infrequent in occurrence, the use of unmanned aircraft for habitat and species monitoring activities and to support law enforcement is expected to result in further protection of sanctuary resources, and thereby provide indirect and long-term, less than significant, beneficial effects to the biological environment. Up to 25 operational flight hours occur each year across all three PIR sites.

SCUBA/Snorkel Operations

SCUBA/snorkel operations, which are conducted predominantly for scientific or educational purposes, increase the understanding and appreciation of biological resources enhancing management strategies to protect biological habitat, invertebrates, fish, birds and protected species. This information serves to improve public stewardship of the PIR sanctuary and monument biological environments. Thus, this activity is expected to result in indirect, long-term, and less than significant beneficial effects to the biological environment.

Activities with negligible impacts

Vessel Maintenance

Throughout the PIR sanctuary and monument sites, vessel maintenance activities are not expected to exceed 16 days/year. The routine maintenance of sanctuary owned vessels is episodic, low intensity and accomplished by trained NOAA personnel and contractors to avoid impacts to the biological environment including invertebrates. Where possible, bio-based lubricants and fluids (and, in some cases bio-based fuels are used) further reducing the threat to habitat resources in the unlikely event of an unintentional spill. Because these vessels are small and limited in total number at any location, heavy maintenance (e.g., welding, grinding, painting, etc.) is typically accomplished on land in self-contained contractor facilities which are highly regulated for industrial safety and environmental compliance including spill prevention by local, state and other federal entities. Therefore, the effects of vessel maintenance on invertebrate resources are expected to be negligible.

Summary of Effects on Biological Resources

The effects on biological resources from the preferred alternative would generally be negligible or less than significant (beneficial and adverse, depending on the type of operations). The beneficial effects can be summarized as improved compliance with sanctuary regulations; increased characterization of biological resources enhancing conservation and management of living resources; data collection for future study; and increased awareness and educational opportunities.

The adverse effects on biological resources from all field operations including those that physically alter a biological resource are expected to be less than significant, because these effects are short-term and temporary. They would result from seabird disturbance from aircraft operations; behavior modification for mobile invertebrates, fish, protected species and birds by AUV/ROV/gliders/drifters; habitat modification as well as invertebrate, fish, bird, and protected species disturbance due to removal of debris during fieldwork and anchoring or unintentionally grounding vessels, and diving. Small changes to habitat or behavior of protected species could also result from remote sensing equipment or equipment deployed on the seafloor.

ONMS has determined that activities that employ active acoustic equipment (exclusive to PMNM) will result in very little risk of injury to marine mammals and other endangered species in PMNM, as well as very little risk of injury to additional sanctuary resources such as fish and marine invertebrates. Risk is minimized due to source characteristics (higher frequency highly directional sources), their use context (during time periods and within regions of the sanctuary with less overlap with protected and endangered species), and additional mitigations applied (observer-triggered shut downs, low power selections).

4.1.3 Socioeconomic Environment

Maritime Transportation/Traffic

Activities with both less than significant beneficial and less than significant adverse impacts

Other Sampling Activities

The information gleaned from the use of other sampling operations advances scientific study and inquiry, creates greater awareness and appreciation of the monument and sanctuary resources, and promotes public and commercial uses, all of which indirectly benefit the monument and sanctuary resources overall. The socioeconomic environment stands to benefit as a result since many trade, tourism, recreation, research and commercial ventures depend on the vitality of the sanctuary or monument. Similarly, by studying the general population and health of specific marine species in PMNM, scientists and managers garner valuable information related to specific marine species and their environments and can utilize such information to make informed management decisions in further of PMNM resources as well as provide sound science for management decisions related to the marine species and marine ecosystems in the MHI. Given the long-term nature of scientific study and ONMS resource management these beneficial effects are considered less than significant. A less than significant long-term benefit to many users, however, would be the increased knowledge of PIR resources that leads to better resource management, more public education and outreach, and improved partnerships between ONMS managers, users and constituents.

Occasionally, other sampling operations conducted by ONMS staff and partners may temporarily interfere with the conduct of commercial or recreational activities, but these effects are expected to be short-term, localized, and thus, less than significant if not negligible. Impacts to commercial or recreational activities are not expected to be significant in PMNM due to the fact that most activities are rare in the monument because they are prohibited without a permit. In addition, throughout HIHWNMS and NMSAS, ONMS staff and partners work with commercial fishermen to ensure all activities can be conducted safely and with minimal impact to each other.

Activities with less than significant beneficial and negligible impacts

Aircraft Operations

In general, aircraft operations (no more than 25 operational hours occur each year across the three PIR sanctuary and monument sites), whether primarily used for species and habitat surveys or surveillance and monitoring for compliance within sanctuary and monument boundaries, are expected to have a less than significant beneficial effect on the socioeconomic environment resulting in both long-term and short-term benefits. For example, surveillance flights aid in short-term enforcement efforts as well long-term compliance with regulations. Furthermore, aircraft-supported research can lead to better characterization of habitats and species aiding in education

and outreach efforts, which aims to increase informed management decisions and policy. Thus, less than significant beneficial, indirect and short and long-term effects are expected to result.

Deployment of Equipment on the Seafloor

The data generated by seabed deployed equipment can increase knowledge of sanctuary resources, leading to better resource management, more public awareness and appreciation, increased safety, improved partnerships between ONMS managers, users and constituents, and the promotion of public and commercial uses all of which benefit the monument and sanctuary resources overall. Thus, the socioeconomic environment stands to benefit indirectly since trade, tourism, recreation, research and commercial ventures depend on the vitality of the sanctuary or monument. While these operations occur on a limited basis (no more than 33 deployments each year across the three PIR sites), given the long-term nature of scientific study and ONMS management these beneficial effects are considered less than significant. A less than significant long-term benefit to many users, however, would be the increased knowledge of PIR resources that leads to better resource management, more public education and outreach, increased safety for boaters, and improved partnerships between ONMS managers, users and constituents.

The deployment of equipment, including buoys, on the seafloor to aid navigation is beneficial to marine transport as it assists in preventing groundings in shallow areas. Similarly, moorings allow for safe and effective harboring of vessels as well as minimizing further impact to the seafloor by anchors and chains. Given the limited scope of these deployments, overall benefit to maritime transport is expected to be less than significant.

The normal use of seabed deployed equipment (no more than 33 deployments each year across the three PIR sites), primarily focused on scientific study and data generation, monitoring activities and safety would generally have negligible impacts on users of the sanctuaries and monument. Occasionally, buoys, mooring lines and other equipment may temporarily interfere with the conduct of commercial or recreational activities (such as fishing or transit), but the effect is expected to be short-term and negligible as most of the operations are limited in scope and time.

Deployment of Remote Sensing Equipment

The data generated by remote sensing operations can increase knowledge of sanctuary and monument resources and result in better characterizations of habitats. This can lead to better resource management, more public education and outreach, and improved partnerships between ONMS managers, users and constituents. Given the long-term nature of scientific study and ONMS management, and the fact that these operations are limited (up to 32 deployments each year across the three PIR sites), the beneficial effects of remote sensing equipment deployments on human uses are expected to be less than significant. A less than significant long-term benefit to many users, however, will be the increased knowledge of sanctuary resources that leads to better resource management, more public education and outreach, and improved partnerships between sanctuary managers, users and constituents.

The use of remote sensing to develop bathymetric maps is beneficial to marine navigation as it assists in preventing groundings. While operations are limited, the knowledge obtained by these activities is expected to result in less than significant benefits to maritime transport because remote sensing can help develop better navigation tools.

The normal use of remote sensing equipment, primarily focused on scientific study and data generation, would generally have only negligible impacts on resource users of the sanctuary and monument as the operations are limited in scope and time. No more than 76 deployments occur each year across the three PIR sites, so the likelihood of user conflict is very low. Occasionally, scientific activities conducted by ONMS such as transect surveys may temporarily interfere with the conduct of commercial or recreational activities, but any such effect is expected to be short-term, and thus, negligible.

Activities with negligible impacts

Vessel Maintenance

Vessel maintenance activities (up to 16 days each year across the three PIR sanctuary and monuments sites) are highly unlikely to have more than a negligible effect on marine transport because they are low intensity, episodic and typically conducted pierside or on-land.

Research and Education

Activities with less than significant beneficial, less than significant adverse and negligible impacts

Other Sampling Activities

The information gleaned from the use of other sampling operations advances scientific study and inquiry, creates greater awareness and appreciation of the monument and sanctuary resources, and promotes public and commercial uses, all of which indirectly benefit the monument and sanctuary resources overall. The socioeconomic environment stands to benefit as a result since many trade, tourism, recreation, research and commercial ventures depend on the vitality of the sanctuary or monument. Similarly, the general health of each species being monitored benefits from such surveys (and collections) and in return, communities benefit from the availability of such species for consumption. Given the long-term nature of scientific study and ONMS resource management these beneficial effects are considered less than significant. A less than significant long-term benefit to many users, however, would be the increased knowledge of PIR resources that leads to better resource management, more public education and outreach, and improved partnerships between ONMS managers, users and constituents.

ONMS research and education that derives from other sampling operations include such activities as reef assessment and monitoring programs; video and photographic documentation of whales; maritime heritage field activities; whale disentanglement training; and the development of public outreach materials, all designed to both better protect and manage sanctuary and monument

resources and offer related socioeconomic opportunities to users and constituents. These activities are expected to result in short or long-term, direct or indirect, and less than significant benefits.

Occasionally, other sampling operations conducted by ONMS staff and partners may temporarily interfere with the conduct of commercial or recreational activities, but these effects are expected to be short-term and localized, and thus, less than significant if not negligible. Impacts to commercial or recreational activities are not expected to be significant in PMNM due to the fact that most activities are rare in the monument because they are prohibited without a permit. In addition, throughout HIIWNMS and NMSAS, ONMS staff and partners work with commercial fishermen to ensure all activities can be conducted safely and with minimal impact to each other.

Other sampling activities, which are primarily focused on scientific study, data generation, monitoring, and education and increased awareness, would generally have negligible impacts on users of the sanctuary and monument. Extractive sampling efforts would result in take of less than a fraction of a percent of the total population of species and plants being studied and would not be expected to interfere with other users' ability to legally harvest and/or collect marine species for subsistence or commercial purposes. In addition, much of the species being studied are invasive species, of which, abundance is great.

Activities with less than significant beneficial and negligible impacts

Deployment of Equipment on the Seafloor

Research and educational materials developed from data gathered from buoys and other seabed deployed instrumentation foster a greater awareness and appreciation for sanctuary and monument resources, which in turn promotes public use of the sanctuary (*e.g.*, diving, kayaking, snorkeling, glass bottom boat excursions). Local businesses benefit from this heightened use. For example, small, weighted buoys temporarily deployed for dive operations provide safety for divers. While these operations occur on a limited basis (no more than 33 deployments each year across the three PIR sites), given the long-term nature of scientific study and ONMS management these beneficial effects are considered less than significant. A less than significant long-term benefit to many users, however, would be the increased knowledge of PIR resources that leads to better resource management, more public education and outreach, increased safety for boaters, and improved partnerships between ONMS managers, users and constituents.

The normal use of seabed deployed equipment (no more than 33 deployments each year across the three PIR sites), primarily focused on scientific study and data generation, monitoring activities and safety would generally have negligible impacts on users of the sanctuaries and monument. Occasionally, buoys, mooring lines and other equipment may temporarily interfere with the conduct of commercial or recreational activities (such as fishing or transit), but the effect is expected to be short-term and negligible as most of the operations are limited in scope and time.

Deployment of Remote Sensing Equipment

Remote sensing activities aid research efforts to better protect and manage sanctuary and monument resources, increase public awareness, and offer educational opportunities to users and constituents. Increased awareness and educational opportunities generally do not result in significant impacts from a human or natural resource standpoint, thus, the effects of deployed remote sensing equipment are expected to be indirectly beneficial, but less than significant, because these effects are short-term and long-term and localized.

The normal use of remote sensing equipment, primarily focused on scientific study and data generation, would generally have only negligible impacts on resource users of the sanctuary and monument as the operations are limited in scope and time. No more than 76 deployments occur each year across the three PIR sites, so the likelihood of user conflict is very low. Occasionally, scientific activities conducted by ONMS such as transect surveys may temporarily interfere with the conduct of commercial or recreational activities, but any such effect is expected to be short-term, and thus, negligible.

Activities with only less than significant beneficial impacts

Aircraft Operations

In general, aircraft operations (no more than 25 operational hours occur each year across the three PIR sanctuary and monument sites), whether primarily used for species and habitat surveys or surveillance and monitoring for compliance within sanctuary and monument boundaries, are expected to have a less than significant beneficial effect on the socioeconomic environment, because these effects result in benefits that are long-term and short-term. For example, surveillance flights aid in short-term enforcement efforts as well long-term compliance with regulations. Furthermore, aircraft-supported research can lead to better characterization of habitats and species aiding in education and outreach efforts, which aims to increase informed management decisions and policy. Thus, less than significant beneficial, indirect and short and long-term effects are expected to result.

Deployment of AUV/ROV/Gliders/Drifters

Deployment of AUV/ROV/gliders/drifters in the monument and sanctuaries is expected to have a less than significant, long-term beneficial effect on sanctuary and monument research and education resources. This is because all projects are designed to enhance knowledge of the monument and sanctuaries so that managers can better protect resources. By undertaking these operations, resource management decisions will be better informed, and as such, are expected to result in better protected, restored, or preserved resources within the monument and sanctuary. Because of this, the socioeconomic environment in each sanctuary or monument stands to gain a benefit since many trade, tourism, recreation, research, and commercial ventures depend on the vitality of the monument and sanctuaries.

Onshore Fieldwork

ONMS projects associated with onshore fieldwork activities are intended to enhance awareness and understanding of sanctuary and monument natural and cultural resources. This heightened awareness can have a direct and indirect beneficial effect on socioeconomic resources. Research and monitoring efforts lead to a better understanding of interactions of species with each other and their surrounding environment, which in turn aids in better and more informed management of resources. For example, an understanding of seabird foraging habits can help fishermen employ measures and techniques to reduce the risk of interacting and harming seabirds. In addition, the presence of staff conducting onshore survey and monitoring efforts can afford an opportunity for public interaction and education. Public education is vital to helping public stakeholders understand the resources throughout the region. Improved public awareness and understanding of resources may inspire the public to cause fewer negative effects on resources, and to act to improve resource protection, both of which would benefit the resources in the long-term. Thus, the effects of onshore fieldwork are expected to be indirectly beneficial, but less than significant, because these effects are-term and long-term and localized.

SCUBA/Snorkel Operations

SCUBA/snorkel operations are expected to have a less than significant long-term beneficial effect on PIR research and education resources. This is because all operations are designed enhance knowledge of the monument and sanctuaries so that managers can better protect resources. By undertaking these operations, resource management decisions will be better informed, and as such, are expected to result in better protected, restored, or preserved resources with the monument and sanctuary areas. Because of this, the socioeconomic environment in each sanctuary stands to gain a benefit since many trade, tourism, recreation, research, and commercial ventures depend on the vitality of the monument and sanctuaries.

Vessel Operations

Vessel operations are expected to have a less than significant long-term beneficial effect on PIR research and education resources. Across the three PIR sites, a total of 671 vessel operational days are spent conducting ONMS field operations each year. Beneficial impacts include educational opportunities, and at sea research, all of which are activities dependent on vessel operations. However, vessel operations are episodic and of low intensity, and few vessels are used to operate in a large area, so the risk of beneficial impact to education and research would not be concentrated in a small area, resulting in less than significant beneficial impacts overall. Vessel operations allow ONMS personnel to be on the water providing direct and indirect less than significant beneficial impact to human uses through education, research and general awareness provided to users so that they may avoid impacts to PIR resources and learn more about these resources through science.

Activities with negligible impacts

Vessel Maintenance

Vessel maintenance activities (up to 16 days each year across the three PIR sanctuary and monuments sites) are highly unlikely to have more than a negligible effect on research and education because they are low intensity, episodic and typically conducted pierside or on-land.

Human Use (Fishing, Recreation, Tourism)

Activities with both less than significant beneficial and less than significant adverse impacts

Deployment of Equipment on the Seafloor

The data generated by seabed deployed equipment can increase knowledge of sanctuary resources, leading to better resource management, more public awareness and appreciation, increased safety, improved partnerships between ONMS managers, users and constituents, and the promotion of public and commercial uses all of which benefit the monument and sanctuary resources overall. Thus, the socioeconomic environment stands to benefit indirectly since trade, tourism, recreation, research and commercial ventures depend on the vitality of the sanctuary or monument. While these operations occur on a limited basis (no more than 33 deployments each year across the three PIR sites), given the long-term nature of scientific study and ONMS management these beneficial effects are considered less than significant. A less than significant long-term benefit to many users, however, would be the increased knowledge of PIR resources that leads to better resource management, more public education and outreach, increased safety for boaters, and improved partnerships between ONMS managers, users and constituents.

Information on the movements of commercially and recreationally important fish species from seabed deployed instrumentation can be used to better manage species and protect their habitat. This is expected to result in a less than significant benefit to fishermen and those associated with the fishing industry.

The only identified adverse impact to human uses from seabed deployed instrumentation is the slight possibility of contact with or entanglement in mooring lines. Were this to occur, it would be expected to be a very localized, short-term, and thus, less than significant adverse effect on human uses. No permanent buoys have been recently deployed in PMNM or NMSAS by ONMS staff. All equipment or buoys attached to the seafloor in HIHWNMS (totaling 33 each year) are strategically placed and made well known to local users thereby minimizing the potential for adverse impacts to users in the area.

Other Sampling Activities

Other sampling activities can foster a greater awareness and appreciation for monument and sanctuary resources, which in turn, promotes public use of these areas (*e.g.*, through diving, kayaking, snorkeling, glass bottom boat excursions). Local businesses may benefit from this heightened. For example, applying digital tags to whales benefits whale watching activities by providing additional information for the on-board naturalists to discuss with their passengers thus enhancing their experience and appreciation for whales, and supporting the whale-watching industry. Further, information on the movements of commercially and recreationally important

fish species from sampling techniques and tagging can be used to better manage species, protect their habitat and streamline fishing effort. Collectively, these other sampling activities are expected to result in a less than significant but measurable benefit to human users of the monument and sanctuary sites. Similarly, the general health of each species being monitored benefits from such surveys (and collections) and in return, communities benefit from the availability of such species for consumption. Given the long-term nature of scientific study and ONMS resource management these beneficial effects are considered less than significant. A less than significant long-term benefit to many users, however, would be the increased knowledge of PIR resources that leads to better resource management, more public education and outreach, and improved partnerships between ONMS managers, users and constituents.

Occasionally, other sampling operations conducted by ONMS staff and partners may temporarily interfere with the conduct of commercial or recreational activities, but these effects are expected to be short-term, localized, and thus, less than significant if not negligible. Impacts to commercial or recreational activities are not expected to be significant in PMNM due to the fact that most activities are rare in the monument because they are prohibited without a permit. Extractive sampling efforts would result in take of less than a fraction of a percent of the total population of species and plants being studied and would not be expected to interfere with other users' ability to legally harvest and/or collect marine species for subsistence or commercial purposes. In addition, much of the species being studied are invasive species, of which, abundance is great. In addition, throughout HHHWNMS and NMSAS, ONMS staff and partners work with commercial fishermen to ensure all activities can be conducted safely and with minimal impact to each other.

Activities with less than significant beneficial and negligible impacts

Aircraft Operations

In general, aircraft operations (no more than 25 operational hours occur each year across the three PIR sanctuary and monument sites), whether primarily used for species and habitat surveys or surveillance and monitoring for compliance within sanctuary and monument boundaries, are expected to have a less than significant beneficial effect on the socioeconomic environment, because these effects result in benefits that are long-term and short-term. For example, surveillance flights aid in short-term enforcement efforts as well long-term compliance with regulations. Furthermore, aircraft-supported research can lead to better characterization of habitats and species aiding in education and outreach efforts, which aims to increase informed management decisions and policy. Thus, less than significant beneficial, indirect and short and long-term effects are expected to result.

Aircraft operations (no more than 25 operational hours occur each year across the three PIR sanctuary and monument sites) are not expected to impact maritime users as manned aircraft operations occur at significantly high altitudes. Unmanned aerial systems are typically operated from a vessel and the system remains within eyesight and under the control of the operator at all

times. As such, interactions with human use activities such as fishing (recreational or commercial) and tourism are expected to be negligible.

Deployment of Remote Sensing Equipment

Monument and sanctuary remote sensing equipment operations foster a greater awareness and appreciation for PIR resources, which in turn promotes public use of a sanctuary (e.g., diving, kayaking, snorkeling, glass bottom boat excursions), which may benefit local businesses supporting these activities. Further, information on the movements of commercially and recreationally important fish species from remote sensing operations and tagging can be used to better manage species and protect their habitat. As such, deployment of this equipment is expected to result in a less than significant benefit human users of the monument and sanctuaries.

The normal use of remote sensing equipment, primarily focused on scientific study and data generation, would generally have only negligible impacts on resource users of the sanctuary and monument as the operations are limited in scope and time. No more than 76 deployments occur each year across the three PIR sites, so the likelihood of user conflict is very low. Occasionally, scientific activities conducted by ONMS such as transect surveys may temporarily interfere with the conduct of commercial or recreational activities, but any such effect is expected to be short-term, and thus, negligible.

Activities with only less than significant beneficial impacts

Onshore Fieldwork

Beach cleanups and large scale removal efforts have both direct and indirect less than significant beneficial socioeconomic human use impacts. Beach cleanups both aid in the overall health of a nearshore area and afford the general public an opportunity to be involved and assist in conservation activities. In addition, participation in such activities can lead to a heightened level of consciousness in regards to conservation and preservation of cultural and natural resources.

Vessel Operations

Conducting vessel operations allows monument and sanctuary personnel to be on the water providing direct and indirect less than significant beneficial impact to human uses through compliance enforcement with sanctuary and other regulations and by providing education and general awareness to other users so that they may avoid impacts to sanctuary and monument resources. In addition, conducting vessel operations allows monument and sanctuary personnel to respond to emergency incidents involving other users.

Activities with only less than significant adverse impacts

SCUBA/Snorkel Operations

SCUBA/snorkel operations are expected to have adverse effects on sanctuary users due to the potential for temporary displacement of fishing activity when divers or snorkelers are present

conducting sanctuary operations. Effects are less than significant, because they are short-term and localized. Impacts are expected to be even less in PMNM due to the fact that most activities (such as commercial fishing) are prohibited. The majority of dive activities (419 dives each year) occur in PMNM. No more than 238 dives occur each year in HIIHWNMS and up to 100 dives occur each year in NMSAS. ONMS staff and partners at both HIIHWNMS and NMSAS work with commercial fishermen and other users to ensure all activities can be conducted safely and with minimal impact to each other.

Activities with negligible impacts

Vessel Maintenance

Vessel maintenance activities (up to 16 days each year across the three PIR sanctuary and monuments sites) are highly unlikely to have more than a negligible effect on other human uses because they are low intensity, episodic and typically conducted pierside or on-land.

Summary of Effects on Socioeconomic Resources

The effects on socioeconomic resources are expected to be predominantly positive and beneficial. The information gained from scientific study and inquiry would create greater awareness and appreciation of sanctuary and monument resources, and promote public and some commercial uses. These advantages would outweigh any anticipated short-term, and therefore, less than significant adverse effects on socioeconomic activities.

4.1.4 Maritime Heritage and Cultural Environment

Maritime Heritage Resources

Activities with less than significant beneficial, less than significant adverse and negligible impacts

Other Sampling Activities

The use of other sampling activities in a monument or sanctuary has many positive and beneficial effects on maritime heritage resources because it may help managers locate and document new archaeological sites, lead to enhanced resource characterization, protection and management; raise public awareness; and allow researchers and all interested people to gain a better understanding and appreciation of an area's maritime archaeological history. Further, the measurement of oceanographic and water quality conditions through other sampling activities at an archaeological site aids researchers in developing more efficient field work protocols.

This process of discovery, documentation, collection and sometimes extraction of artifacts for educational and research purposes is designed to enhance knowledge of PIR resources so that managers and partners can work together to better protect and preserve these historic resources. The information gathered by these operations would not likely result in a major revision of the

protection schemes in place for these resources. Therefore, the beneficial impacts from these activities are expected to be less than significant, because impacts are long-term and localized.

Some sampling activities could potentially occur in the vicinity of historic and cultural resources and may, thus, adversely affect these resources, but as these operations are evaluated in advance for proximity to known historic resources on the seafloor, and are conducted by personnel with experience and knowledge of NHPA protocols designed to minimize harm to historic resources, possibility of any significant harm is expected to be remote.

Many of the routine resource and protection sampling operations that occur within a monument or sanctuary have negligible effects on historic and cultural resources because they either do not occur in close proximity to cultural or historical sites or extreme care and consultation is required to conduct activities in areas of close proximity to cultural or historical sites. For example, for activities conducted on or around Nihoa or Mokumanamana, NHPA consultations are required and do occur with an archeologist on the ONMS/PMNM staff to ensure activities' impacts on historic resources are mitigated. Such activities include intertidal monitoring, whale disentanglement, reef assessments, disease reversal research, and whale surveys. As such these activities are expected to have, at most, a negligible effect on monument or sanctuary cultural or historic resources.

The possible, but highly unlikely, adverse impacts to maritime heritage resources from other sampling operations include physical impact of the equipment on a shipwreck, and destruction or damage of historic resources through extractive sampling techniques such as using grabs or corers on the seafloor in close proximity to an artifact. Protocols employed during such activities, including a scanning the area for historic properties prior to sampling, are designed to mitigate this risk. Accordingly, given the remote likelihood of these impacts, combined with the limited nature and scope of these activities in the monument and sanctuary sites, it is expected that this work will result in a less than significant adverse impact on maritime heritage resources.

Activities with both less than significant beneficial and less than significant adverse impacts

Deployment of AUV/ROV/Gliders/Drifters

All projects are designed to learn more about each site so that managers can better protect sanctuary and monument resources. By undertaking these projects, the historical environment is expected to be better protected, restored, or preserved. The information gathered by these operations would not likely result in a major revision of the protection schemes in place for these resources. Thus, these resources stand to gain a benefit from these activities. Therefore, deployment of AUV/ROV/gliders/drifters in the monument and sanctuaries is expected to have a less than significant, long-term beneficial effect on maritime heritage resources, cultural resources and historic properties.

Deployment of AUV/ROV/gliders/drifters in monument and sanctuary areas is expected to have a less than significant adverse effect on maritime heritage resources, cultural resources and historic

properties. While intentional or accidental improper operator techniques are possible, trained operators are utilizing assets that are very visible to the public and operators are trained to serve as models of best practices. In addition, such activities are limited in scope, time, and location, with no more than 50 deployments each year, the majority of which are dive tow-boarding in which divers are towed behind a small boat and an observer is on watch throughout the activity ensuring minimal impact to the surrounding environment and safety to the diver. Thus, these operations are expected to result in less than significant adverse effects.

Deployment of Equipment on the Seafloor

The use of seabed deployed equipment has an overall positive and beneficial effect on maritime heritage resources in the monument and sanctuary sites because it may help managers locate and document new archaeological sites, and better characterize and monitor these resources.

These operations, which occur across the PIR sites no more than 33 times each year, have the potential to locate and document new archaeological sites; lead to enhanced resource characterization, protection and management; raise public awareness; prevent anchoring on historic resources; and allow researchers and all interested people to gain a better understanding and appreciation of a sanctuary's or monument's maritime archaeological history. Further, the measurement of oceanographic and water quality conditions using equipment deployed on the seafloor at an archaeological site aids researchers in developing more efficient field work protocols. The information gathered by these operations would not likely result in a major revision of the protection schemes in place for these resources. Therefore, these impacts are expected to be long-term, localized, and thus, less than significant.

No more than 33 deployments occur each year in HIHWNMS and no deployments occur in PMNM and NMSAS. As such, the limited scope, short duration of time, and localized area in which these activities are conducted further minimizes the potential for adverse impacts to maritime heritage and cultural resources.

A possible adverse impact to maritime heritage resources from seabed deployment of instrumentation is the highly improbable physical impact of the equipment on a heritage resource such as a shipwreck. Maritime archaeological operations, however, are performed by highly skilled and experienced researchers and divers that employ NHPA protocols to minimize the risk of any serious harm to historic artifacts. Therefore, the effects of these operations, if any, are expected to be long-term, localized, and thus, less than significant.

Some other benthic sampling activities, involving the deployment of equipment on the seafloor, could potentially occur in the vicinity of historic and cultural resources and may, thus, adversely affect these resources. These operations, however, are evaluated in advance for proximity to known historic resources on the seafloor, and as a result, the chance of adverse impacts is expected to be remote.

There is also a slight risk in studying and identifying historic and culturally-significant sites as this may lead to looters and memento-seekers carrying off important historic resources, but again this possibility is expected to be quite small as the great majority of divers respect the historic and cultural significance of these artifacts. Moreover, great care is given to how and when information is made public for newly discovered sites, resulting in less than significant adverse impacts.

Collectively, these deployments are expected to result in an overall less than significant adverse impact to maritime heritage and cultural resources within the PIRs sanctuaries and monument.

Deployment of Remote Sensing Equipment

The effects on maritime heritage resources are expected to be predominantly positive and beneficial. These operations locate and document new archaeological sites; lead to enhanced resource characterization, protection and management; raise public awareness; and allow researchers and all interested people to gain a better understanding and appreciation of the maritime archaeological history in the monument and sanctuary sites.

The NHPA mandates that sanctuaries and monuments inventory and document historic resources. Consequently, every effort is made to survey areas prior to sampling and to use all available technologies to contribute to the inventory of historic resources. Precautionary measures are taken to avoid disturbance of known historic resources.

The use of remote sensing equipment has a beneficial effect on maritime heritage resources in a monument or sanctuary because it helps managers locate and document new archaeological sites, and better characterize and monitor these resources. For example, hydrographic mapping can be used to locate and protect maritime heritage resources, improve understanding of these resources, and allow researchers to better assess the significance of these resources to develop more refined management approaches. Further, the measurement of oceanographic and water quality conditions at an archaeological site aids researchers in developing more efficient field work protocols.

The information gathered by these operations would not likely result in a major revision of the protection schemes in place for these resources. As a result, the deployment of remote sensing equipment in the monument and sanctuary sites is expected to result in a less than significant beneficial effect on maritime heritage resources.

Up to 76 deployments occur each year for use and operation of remote sensing equipment, of which 31 deployments occur in HIHWNMS, 1 deployment each year occurs in PMNM and no deployments occur in NMSAS. The main possible adverse impact to maritime heritage resources from remote sensing operations would be the highly improbable physical impact of the equipment on a heritage resource such as a shipwreck. There is also a slight risk in studying and identifying historic and culturally-significant sites as this may lead to looters and memento-seekers carrying off important historic resources. However, those instances are not likely to occur because staff

deploying the remote sensing equipment are trained on avoiding heritage resources. Moreover, great care is applied in divulging information on the location of a newly discovered site so as to minimize any potential looting activity. Given the remote likelihood of these impacts occurring, combined with the limited nature of these deployments, it is expected that these operations will have a less than significant adverse effect on maritime heritage resources in the monument and sanctuary sites.

Onshore Fieldwork

Onshore fieldwork that involves resource documentation and monitoring has a less than significant beneficial effect on the study and preservation of historic and maritime heritage and cultural sanctuary resources as well as the practice of cultural activities within sanctuary and monument sites. Such activities promote improved understanding and protection of these resources that can lead to enhanced environmental stewardship. All projects are of a short duration and limited scope and do not interfere with cultural traditions; instead they serve to better characterize the region, including its cultural and historic resources. Additionally, these projects are designed to not interfere with known historical artifacts in the region.

Up to 2,373 people days each year are utilized for onshore fieldwork activities, a fraction of which is used for incident response, as the need arises. During routine fieldwork, great care is taken to avoid historic and cultural resources. During incident response efforts, there is a small likelihood to disturb maritime heritage, historical and/or cultural resources since the location of the incident cannot be carefully planned in advance. Staff (ONMS and specialized contract staff) conducting incident response efforts are highly skilled and trained to employ ONMS best management practices to ensure work is done carefully so as not to unnecessarily harm the surrounding environment. In addition, if these activities are conducted in areas near historic or cultural resources, appropriate experts (*e.g.*, cultural or archeologic) experts are consulted prior to extraction. As a result, onshore fieldwork in the monument and sanctuary sites is expected to have a less than significant adverse effect on maritime heritage and the cultural environment.

SCUBA/Snorkel Operations

All projects are designed to enhance knowledge of each monument and sanctuary so that managers can better protect all these resources. By undertaking these projects, historical resources are expected to be better protected, restored, or preserved; thus gaining benefit from these activities. The information gathered by these operations would not likely result in a major revision of the protection schemes in place for these resources. Therefore, SCUBA/snorkel operations are expected to have a less than significant, long-term beneficial effect on maritime heritage resources, cultural resources and historic properties.

SCUBA/snorkel operations are expected to have a less than significant adverse effect on maritime heritage resources, cultural resources and historic properties in the PIR sites. While intentional or accidental improper diving or snorkeling techniques and overuse of specific locations can result in damage to these resources, ONMS divers and snorkelers are highly trained and will employ

ONMS best management practices to avoid improper actions that can cause harm to historical resources. Snorkel and scuba activities are limited in scope, time, and space and occur throughout the three PIR sites with no more than 542 dives conducted annually. Thus, these operations are expected to result less than significant adverse effects.

Activities with negligible impacts

Aircraft Operations

Aircraft operations, while infrequent, can aid in the identification of historic and cultural sites within monument or sanctuary boundaries. However, due to the infrequency of flights (less than 25 operational hours per year), the fact that most monument or sanctuary resources are underwater, and the need for specialized equipment to survey marine resources from aircrafts, effects on historic and cultural resources, if any, are expected to be negligible.

Vessel Maintenance

Vessel maintenance activities are highly unlikely to have detectable effect on historical or cultural resources uses because they are low intensity, episodic and typically conducted pierside or on-land.

Vessel Operations

Vessel operations (up to 671 operational days/year) are highly unlikely to have a detectable effect on maritime heritage resources, cultural resources or historical properties. Impacts from anchoring and unintentional striking or groundings are rare, but may occur. Vessel operations are episodic and of low intensity with only a few vessels operating in a large area, so the risk of impact is not expected to be concentrated in a small area. To mitigate potential impacts from anchoring a vessel, fixed moorings are used whenever possible. Vessel operators are highly trained and will apply the NOAA Small Boat Program, and follow sanctuary standing orders and procedures and employ ONMS best management practices in an effort to avoid direct impacts to physical resources as well as maritime heritage or cultural resources.

Cultural Resources

Activities with both less than significant beneficial and less than significant adverse impacts

Deployment of AUV/ROV/Gliders/Drifters

All projects are designed to learn more about each site so that managers can better protect sanctuary and monument resources. By undertaking these projects, the historical environment is expected to be better protected, restored, or preserved. The information gathered by these operations would not likely result in a major revision of the protection schemes in place for these resources. Thus, these resources stand to gain a benefit from these activities. Therefore, deployment of AUV/ROV/gliders/drifters in the monument and sanctuaries is expected to have a

less than significant, long-term beneficial effect on maritime heritage resources, cultural resources and historic properties.

Deployment of AUV/ROV/gliders/drifters in monument and sanctuary areas is expected to have a less than significant adverse effect on maritime heritage resources, cultural resources and historic properties. While intentional or accidental improper operator techniques are possible, trained operators are utilizing assets that are very visible to the public and operators are trained to serve as models of best practices. In addition, such activities are limited in scope, time, and location, with no more than 50 deployments each year, the majority of which are dive tow-boarding in which divers are towed behind a small boat and an observer is on watch throughout the activity ensuring minimal impact to the surrounding environment and safety to the diver. Thus, these operations are expected to result in less than significant adverse effects.

SCUBA/Snorkel Operations

All projects are designed to enhance knowledge of each monument and sanctuary so that managers can better protect all these resources. By undertaking these projects, historical resources are expected to be better protected, restored, or preserved; thus gaining benefit from these activities. The information gathered by these operations would not likely result in a major revision of the protection schemes in place for these resources. Therefore, SCUBA/snorkel operations are expected to have a less than significant, long-term beneficial effect on maritime heritage resources, cultural resources and historic properties.

SCUBA/snorkel operations are expected to have a less than significant adverse effect on maritime heritage resources, cultural resources and historic properties in the PIR sites. While intentional or accidental improper diving or snorkeling techniques and overuse of specific locations can result in damage to these resources, ONMS divers and snorkelers are highly trained and will employ ONMS best management practices to avoid improper actions that can cause harm to historical resources. Snorkel and scuba activities are limited in scope, time, and space and occur throughout the three PIR sites with no more than 542 dives conducted annually. Thus, these operations are expected to result less than significant adverse effects.

Activities with only less than significant beneficial impacts

Onshore Fieldwork

Onshore fieldwork that involves resource documentation and monitoring has a less than significant beneficial effect on the study and preservation of historic and maritime heritage and cultural sanctuary resources as well as the practice of cultural activities within sanctuary and monument sites. Such activities promote improved understanding and protection of these resources that can lead to enhanced environmental stewardship. All projects are of a short duration and limited scope and do not interfere with cultural traditions; instead they serve to better characterize the region, including its cultural and historic resources. Additionally, these projects are designed to not interfere with known historical artifacts in the region.

In many locations, cultural beliefs, traditions, and practices inform the planning and scope of onshore fieldwork activities in the monument and sanctuary. As a result, local and traditional knowledge is utilized to further protect both cultural resources in these areas, which is expected to lead to more culturally sensitive management of cultural resources and practices. As a result, these activities are expected to provide a less than significant beneficial impact to cultural resources.

Activities with negligible impacts

Aircraft Operations

Aircraft operations, while infrequent, can aid in the identification of historic and cultural sites within monument or sanctuary boundaries. However, due to the infrequency of flights (less than 25 operational hours per year), the fact that most monument or sanctuary resources are underwater, and the need for specialized equipment to survey marine resources from aircrafts, effects on historic and cultural resources, if any, are expected to be negligible.

Deployment of Remote Sensing Equipment

Remote sensing activities are limited in scope, space, and time and occur up to 76 times each year across the three PIR sites. As such, these operations are expected to have no or negligible effect on maritime heritage and cultural resources as they usually will not come in contact with these resources at all.

Vessel Maintenance

Vessel maintenance activities are highly unlikely to have detectable effect on historical or cultural resources uses because they are low intensity, episodic and typically conducted pierside or on-land.

Vessel Operations

Vessel operations (up to 671 operational days/year) are highly unlikely to have a detectable effect on maritime heritage resources, cultural resources or historical properties. Impacts from anchoring and unintentional striking or groundings are rare, but may occur. Vessel operations are episodic and of low intensity with only a few vessels operating in a large area, so the risk of impact is not expected to be concentrated in a small area. To mitigate potential impacts from anchoring a vessel, fixed moorings are used whenever possible. Vessel operators are highly trained and will apply the NOAA Small Boat Program, and follow sanctuary standing orders and procedures and employ ONMS best management practices in an effort to avoid direct impacts to physical resources as well as maritime heritage or cultural resources.

Summary of Effects on Historic and Cultural Resources

The effects of ONMS field operations on historic and cultural resources in the PIR is expected to be predominantly beneficial and less than significant. These field operations serve to locate and document new archaeological sites; lead to enhanced resource characterization, protection and

management; raise public awareness; and allow researchers and all interested people to gain a better understanding and appreciation of a site's maritime archaeological history, all of which are beneficial effects to historic and cultural resources. Although there are some potential adverse effects identified with these operations, ONMS staff employ precautionary measures to mitigate disturbance of, or damage to, known historic and cultural resources.

4.2 Alternative 2: Conduct Field Operations without Voluntary and Precautionary Procedures for Vessel Operations

The environmental consequences of Alternative 2 would be very similar to those of Alternative 1 because the majority of field operations would be identical between the two alternatives. Specifically, impacts to geology, water quality, air quality, acoustics, socioeconomics, maritime heritage resources, and cultural environment are the same as those described for Alternative 1. Vessel operations in HIHWNMS and the monument would be slightly different in Alternative 2. Current ONMS vessel operations best management practices would be discontinued. Since there are no voluntary measures in NMSAS, there would be no change in environmental consequences for that site compared to Alternative 1.

4.2.1 Biological Environment

Monument and sanctuary vessel best management practices, as described in Chapter 2, focus on reducing potential impacts to marine mammals, other federally-listed species from vessel strikes as well as on reducing the risk of introducing invasive species in the monument. Therefore, discontinuing these best management practices would likely have an adverse effect on habitat, invertebrates, birds, and protected species.

Habitat

In the waters of the monument, operating without the best management practices could result in the introduction of invasive species or diseases because vessels would not be required to be free of biofouling or from transporting any live or recently live marine organisms. This would result in potential introduction of invasive species altering the existing habitat in the monument, which could have an indirect, less than significant adverse impact specifically on the coral reef habitat.

Invertebrates

In the waters of the monument, operating without following the best management practices could result in the introduction of invasive species or diseases because vessels would not be required to be free of biofouling or from transporting any live or recently live marine organisms. This would result in potential introduction of invasive species either competing with or preying upon existing invertebrates in the monument, which could have an indirect, less than significant adverse impact specifically on the coral species as well as other invertebrate species.

Birds

In the waters of HIIHWNMS and the monument, operating vessels without the best management practices could result in vessel strikes or behavioral disturbance of seabirds, as the vessels would be able to operate a higher speeds and would not be required to have a dedicated observer on board to reduce the risk of collision. A collision or disturbance would likely only affect an individual bird and not a bird colony, since it would occur on the water and not on land, reducing the impact to bird communities as a whole. Therefore, this could have a direct, less than significant adverse impact on seabirds.

Protected Resources

In the waters of HIIHWNMS and the monument, operating vessels without the best management practices could result in vessel strikes or behavioral disturbance of marine mammals and turtles, as the vessels would be able to operate a higher speeds and would not have a dedicated observer on board to reduce the risk of collision. While it is conceivable that faster vessel speed, resulting in less on-the-water time, could result in a lower risk of collision with protected species, such vessel speeds generally results in higher likelihood of serious injury or death during a collision as well as less time to react when a protected species is observed in the vessel's path. Therefore, especially during the season between December and May, when the concentration of humpback whales in HIIHWNMS is highest, discontinuing best management practices would likely result in greater risk of a vessel strike causing serious injury or death. Because the monument and sanctuary have few vessels that are not on the water every day, the overall likelihood of a vessel strike with marine mammals or turtles is still low. Therefore, this risk would be expected to result in a direct, but less than significant adverse impact on protected species.

4.3 Cumulative Impacts

The cumulative effect of the proposed action is the incremental environmental effect that the proposed action has when added to other past, present, and foreseeable future actions in the affected environment. Cumulative effects are critical to explore because it is often the combined effect of many actions in one area or region that causes the most significant adverse impacts. To identify potential cumulative effect concerns, ONMS considered the adverse effects of the operations identified under the proposed alternative in conjunction with the adverse effects associated with other past, present, and foreseeable future actions in the affected environment.

The operations that were identified as having some potential to contribute to cumulative effects include those that could result in seafloor disturbance and/or noise pollution, those that include vessel operations, and those aimed at resource protection. These effects are described below.

4.3.1 Cumulative Effects on Physical Environment

Field operations that could result in disturbance to the physical environment include:

- Vessel Operations
- Aircraft Operations

- SCUBA and Snorkel Operations
- Onshore Fieldwork
- Deployment of AUVs/ROVs
- Deployment of Remote Sensing Equipment
- Deployment of Buoys¹²

The following ONMS-directed scientific activities could contribute adversely to the cumulative effects of **seafloor disturbance**: deploying moored buoys, obtaining benthic samples, anchoring research vessels, conducting species or habitat monitoring efforts, and exploring shipwrecks and archaeological artifacts. These activities are likely to all result in minor, short-term disturbance of the seafloor. In addition to these ONMS-directed activities, there are a host of other external activities that, when combined with the ONMS-directed activities, may have cumulative effects on the seafloor. The principal external activities that disturb the seafloor are commercial fishing (e.g., trawling, dredging, gillnetting, lobster trapping) and the laying of cables and pipelines, the latter of which would require a sanctuary or monument permit. In general, anchoring is not prevalent in the monument and sanctuary sites during either ONMS operations or external activities. This is, in large part, due to the depth and roughness of the water in these areas. Compared to the large-scale, long-term effects of commercial fishing, the sanctuary-directed activities mentioned above are relatively minor, short-term, and affect a very small area, and thus are not expected to contribute significantly to overall cumulative effects on the seafloor. More detail on each activity can be found in Table 5 in Chapter 2.

The following ONMS-directed scientific activities could contribute adversely to the cumulative effects of **noise pollution**: operating research vessels to conduct surveys and transects; the transiting of a research vessel; operating aircraft for surveys; and deploying AUVs/ROVs and towed arrays to survey habitats and biological activity. In addition to these ONMS-directed activities, there are a host of other external activities that when combined with the ONMS-directed activities may have cumulative effects on noise pollution. The principal external activities that contribute to noise pollution are commercial shipping (e.g. tankers, freighters, LNG carriers, tug and barge, cruise ships), military activities, and commercial fishing. Compared to the large-scale, chronic effects of noise pollution from commercial shipping, military activities and commercial fishing, the ONMS-directed sources of noise are relatively minor, short-term, and have a small footprint and thus are not expected to contribute significantly to overall cumulative effects of noise pollution. More detail on each activity can be found in Table 5 in Chapter 2

4.3.2 Cumulative Effects on Biological Environment

Field operations that could result in disturbance to the biological environment include:

¹² This may include installation of mooring buoys and monitoring buoys.

- Vessel Operations
- SCUBA and Snorkel Operations
- Onshore Fieldwork
- Deployment of AUVs/ROVs
- Deployment of Remote Sensing Equipment
- Deployment of Buoys
- Other Sampling Activities

The following ONMS-directed scientific activities could contribute to the adverse cumulative effects impacting **living marine resources**: operating research vessels and SCUBA dives to conduct surveys and transects; transiting of a research vessel; deploying AUVs/ROVs and towed arrays to survey habitats and biological activity, and locate archaeological artifacts. In addition to these ONMS-directed activities, there are a host of other external activities that when combined with the ONMS-directed activities may have cumulative effects on living marine resources. The principal external activities that contribute to effects on living marine resources are vessel operations are commercial shipping (e.g., tankers, freighters, LNG carriers, tug and barge, cruise ships), vessel operations related to military activities, commercial and recreational fishing, whale watching, and recreational boating. Compared against existing vessel and shipping traffic, the addition of sanctuary vessel operations has less than significant impact on air quality. Compared to the considerable level of external (i.e., non-ONMS related) vessel operations, and the fact that ONMS-directed vessel operations are speed-restricted, conducted by highly trained personnel, and prohibit wastewater discharge, the ONMS-directed vessel operations are relatively minor and highly regulated and thus are expected to contribute significantly to overall adverse cumulative effects on water quality or living marine resources.

In addition, the proposed alternative is not expected to significantly contribute to any substantive adverse impacts on living marine resources. Other external activities that contribute to marine resource protection are other NOAA research, research conducted by local non-profit organizations, cooperative fishery research sponsored by NOAA, and research conducted by academic institutions. Given that these marine resource protection activities are intended to improve the health of species and ecosystems through improved understanding and knowledge, and that these activities are conducted in a precautionary manner by highly trained professionals, it is highly unlikely that the cumulative effect of these activities would be adverse.

4.3.3 Cumulative Effects on Socioeconomic Environment

The field operations analyzed in this environmental assessment are expected to result in overall direct and indirect and less than significant beneficial impact to the socioeconomic environment throughout the PIR. Continued marine protection and enforcement capacity provided by ONMS

field operations are expected to result in a healthy marine ecosystem, which in turn should provide a socioeconomic benefit to all marine users. Other commercial and recreational operations (e.g., shipping traffic, fishing, alternative energy or aquaculture projects) that are external to ONMS field operations and occur in the surrounding marine environments may result in a long-term adverse impact to the socioeconomic environment, however, ONMS field operations and other local government agency efforts to manage and protect the marine environment aim to balance the use and impact to marine resources through continued conservation efforts and a mere presence at sea. Relative to the other, non-OMNS activities affecting the socioeconomic environment in this region, the level of ONMS field operations described in this assessment represent a comparatively small level of activities, which, when considered in light of the other ongoing activities in the region, would not be expected to result in significant cumulative effects to the socioeconomic environment.

In addition, in the case of PMNM, the majority of activities that occur within PMNM require a permit and are highly scrutinized throughout the permit process to ensure activities and methods are conducted with minimal impact to the environment, so it is expected there would not be many external activities to take into account. As discussed above, the ONMS operations are not expected to significantly contribute to any adverse cumulative effects on the socioeconomic environment and are expected to further protect marine resources from overuse by recreational and commercial users.

4.3.4 Cumulative Effects on Maritime Heritage and Cultural Environment

None of the field operations analyzed in this environmental assessment are expected to result in significant effects on the maritime heritage and cultural environment; however, it is possible that accidental or improper physical contact with an historic artifact could occur as a result of these activities. This is highly unlikely as ONMS divers and snorkelers are highly trained and will employ ONMS best management practices to avoid actions that can cause harm to historic resources. In addition, maritime archaeological operations are performed by highly skilled and experienced researchers and divers with complete knowledge of NHPA protocols so the possibility of any serious harm to historic artifacts is quite small. With activities not affiliated with ONMS field operations (e.g., fishing, alternative energy or aquaculture projects, land based and vessel based discharges), there is a slight risk of impact to cultural or maritime heritage resources due to improper handling or contact with resources. In PMNM, all activities are required to go through a stringent permit process which generally results in the imposition of special conditions and PMNM best management practices that serve to mitigate all potential stressors to the environment for the highest level of protection while conducting activities. While certain activities conducted by third parties within HIIWNMS and NMSAS are not permitted, the presence of field operations staff in and around each of the respective sanctuaries serves as an added enforcement mechanism to help manage and protect maritime heritage and cultural resources. All of the effects to the maritime heritage and cultural environment are thus expected to be either negligible or less than significant beneficial to the protection and management of

sanctuary and monument resources. As such, the operations are not expected to tangibly contribute to any cumulative effects on the maritime heritage and cultural environment.

4.4 Conclusions

Alternative 1 (No Action or Status Quo field operations with additional required mitigations resulting from consultations and permits) has overall beneficial effects to the environment as managers gain more information and take actions to better protect resources; the public becomes more educated about sanctuary resources; and damaged resources are restored. While there are some adverse effects expected with this alternative, these effects are not expected to be significant and should be short-term. Through the consultation and permitting process, NOAA would gain a better understanding of any additional beneficial effects or operational costs associated with the required mitigation. However, it is expected that any additional required mitigation would further reduce potential adverse effects on protected resources such as marine mammals and threatened and endangered species.

Alternative 2 (Alternative 1 plus additional recommended mitigation) would also have the same beneficial and adverse effects as Alternative 1, but would conceivably provide further benefits to protected resources and habitat from the implementation of additional recommended mitigation. Again, through the consultation and permitting process, NOAA would gain a better understanding of any additional beneficial effects or operational costs.

In comparison, Alternative 3 (Status Quo field with ONMS vessel operations best management practices) would still yield beneficial effects to the environment, but would have more potential risk for adverse effects to protected resources and habitat, as ONMS standing orders and other existing voluntary measures serving to mitigate adverse effects would not be followed.

Table 7. Summary of Effects by Resource Element and Alternative for the entire Pacific Island Region.

	Alternative 1	Alternative 2
RESOURCE ELEMENTS		
Physical Environment		
<u>Geology</u>	<p>Activities have both less than significant adverse and less than significant beneficial impacts (onshore fieldwork, deployment of equipment on the seafloor, deployment of remote sensing equipment, other sampling activities). One activity has only less than significant adverse impacts (vessel operations).</p> <p>Justification: Adverse impacts caused by onshore marine debris removal activities, seafloor disturbance from deployment activities, anchoring, unintentional groundings, and other sampling activities are expected to be short-term, of low intensity, and localized.</p> <p>The improved prevention of anchor damage as a result of BMPs, which avoid sensitive areas for anchoring, would be small.</p>	Same as Alternative 1
<u>Water Quality</u>	<p>Activities have less than significant adverse impacts (onshore fieldwork, vessel operations).</p> <p>Justification: Impacts caused by emissions from vessel operations from onshore operations are expected to be short-term and of low intensity. The risk of fuel, lubricant, sewage and garbage spills is low because state and federal regulations prohibit most discharges. ONMS vessel operators are trained to follow the NOAA Small Boat Program mandates and BMPs to avoid impacts; removal efforts are conducted by experienced ONMS staff when necessary.</p>	Same as Alternative 1
<u>Air Quality</u>	<p>Activities have less than significant adverse impacts (aircraft operations, vessel operations).</p> <p>Justification: The adverse impacts caused by vessel and aircraft emissions are expected to be short-term and of low intensity.</p>	Same as Alternative 1

<p><u>Acoustic Environment</u></p>	<p>Activities have less than significant adverse impacts (aircraft operations, deployment of AUV/ROV/gliders/drifters, deployment of buoys, deployment of remote sensing equipment, vessel operations).</p> <p>Justification: Noise disturbance from vessel operations, aircraft operations, and deployment of active acoustic instruments are expected to be short-term and of low intensity. We do not know how loud the sound scape is currently, but we believe the contribution of these activities is small relative to the whole. PNMMS and AS NMS use a low-intensity and directional echosounder (50/200kHz), which we believe is a small and temporary contribution to the acoustic environment.</p>	<p>Same as Alternative 1</p>
<p>Biological Environment</p>		
<p><u>Habitat</u></p>	<p>Activities have both less than significant adverse and less than significant beneficial impacts (onshore fieldwork, deployment of AUV/ROV/gliders/drifters, deployment of equipment on the seafloor, deployment of remote sensing equipment, other sampling activities, SCUBA/snorkel operations, vessel operations). One activity has less than significant beneficial impacts (aircraft operations).</p> <p>Justification: Adverse impacts from removal of debris during fieldwork, anchoring, other sampling activities, unintentionally grounding vessels and diving are expected to be short-term, localized and limited in scope. Training and BMPs teach users to avoid harm to habitat, eliminate the spread of invasive species, and inform users how to avoid improper operation of equipment. Increased surveillance may lead to improved compliance with sanctuary regulations and onshore activities may result in outreach materials that raise public awareness, but both will be limited in scope.</p>	<p>Same as Alternative 1, but there will be an additional indirect, less than significant adverse impact on coral reef habitat in HIHWNMS and the monument due to the discontinuation of current vessel procedures. Operating without best management practices could increase the likelihood of introducing invasive species. These invasive species could alter existing coral reef habitat. However, harm will be limited in scope.</p>
<p><u>Invertebrates</u></p>	<p>Activities have both less than significant adverse and less than significant beneficial impacts (onshore fieldwork, deployment of AUV/ROV/gliders/drifters, deployment of equipment on the seafloor, deployment of remote sensing equipment, other sampling activities, SCUBA/snorkel operations, vessel operations). One activity has less than significant beneficial impacts (aircraft operations).</p> <p>Justification: Indirect adverse impacts (e.g., temporary behavior modification), are expected to be short-term and localized. Injury or mortality are expected to be minimal due to the limited scope and transitory nature of activities. ONMS divers and snorkelers are trained to avoid harm to resources and avoid over collection. Increased surveillance may lead to improved compliance with sanctuary regulations and onshore activities may result in outreach materials that raise public awareness, but both will be limited in scope.</p>	<p>Same as Alternative 1, but there will be an additional indirect, less than significant adverse impact in the monument due to the discontinuation of current vessel procedures. Vessels would no longer be required to be free of biofouling or not be transporting any live organisms. This would increase the likelihood of introducing invasive species. These invasive species may impact coral and other invertebrate species. However, harm will be limited in scope.</p>

<p><u>Fish</u></p>	<p>Activities have both less than significant adverse and less than significant beneficial impacts (onshore fieldwork, deployment of AUV/ROV/gliders/drifters, deployment of equipment on the seafloor, deployment of remote sensing equipment, other sampling activities). One activity has less than significant beneficial impacts (aircraft operations).</p> <p>Justification: Adverse impacts, like temporary behavior modification or direct contact with gear, are expected to be short-term and localized. Increased surveillance may lead to improved compliance with sanctuary regulations and onshore activities may result in outreach materials that raise public awareness, but both will be limited in scope.</p>	<p>Same as Alternative 1, but there will be an additional indirect, less than significant adverse impact due to the discontinuation of current vessel procedures. With no BMPs, the impact on fish will be the same as Alternative 1 or worse. However, harm will be limited in scope.</p>
<p><u>Birds</u></p>	<p>Activities have both less than significant adverse impacts and less than significant beneficial impacts (onshore fieldwork, aircraft operations, deployment of AUV/gliders/drifters, other sampling activities, vessel operations). Some activities have less than significant beneficial impacts (deployment of equipment on the seafloor, deployment of remote sensing equipment, SCUBA/snorkel activities).</p> <p>Justification: Adverse impacts, like temporary behavior modification or displacement from the presence of vessels and aircraft or onshore fieldwork, are expected to be short-term and localized. Direct collisions with aircraft are expected to unlikely because aircraft operate above 200 feet in elevation. Increased surveillance may lead to improved compliance with sanctuary regulations and onshore activities may result in outreach materials that raise public awareness, but both will be limited in scope.</p>	<p>Same as Alternative 1, but there will be an additional direct, less than significant adverse impact due to increased collisions and disturbance in HIHWNMS and the monument due to the discontinuation of current vessel procedures. Collision or disturbance by vessels would likely only affect an individual bird or bird colony. Thus, the impact is not significant.</p>

<p><u>Marine Mammals and Sea Turtles</u></p>	<p>Activities have both less than significant adverse and less than significant beneficial impacts (onshore fieldwork, deployment of AUV/ROV/gliders/drifters, deployment of equipment on the seafloor, deployment of remote sensing equipment, other sampling activities, vessel operations). Some activities have only less than significant beneficial impacts (aircraft operations, SCUBA/snorkel operations). One activity has only less than significant adverse impacts (sonar scientific and mapping operations).</p> <p>Justification: Adverse impacts (e.g., behavior modification from AUV/ROV/gliders/drifters, equipment deployed on the seafloor, and onshore activities), are expected to be short-term and localized. Impacts from vessel operations, sonar and mapping are minimized through BMPs which require an observer to be on deck, conduct activities during daylight hours, use multibeam systems that use focused sonar arrays and emit short pulses at limited ping rates, and keeping multibeam systems on throughout cruises to avoid startle responses by marine mammals. PNMMS and AS NMS use echosounder (50/200kHz) which is outside of the hearing range for whales that occur within NMS. Increased surveillance may lead to improved compliance with sanctuary regulations. Onshore activities and SCUBA/snorkel operations may result in outreach materials that raise public awareness. Benefits will be limited in scope.</p>	<p>Same as Alternative 1, but there will be an additional direct, less than significant adverse impact due to increased collisions and disturbance in HIHWNMS and the monument due to the discontinuation of current vessel procedures. Collision or disturbance by vessels is still expected to be uncommon due to the low presence of vessels within sanctuary and Monument boundaries even though the risk of collision and disturbance is expected to increase. Harm is expected to be limited in scope.</p>
<p>Socioeconomic Environment</p>		
<p><u>Maritime Transportation</u></p>	<p>Activities have less than significant beneficial and negligible impacts (deployment of equipment on the seafloor, deployment of remote sensing equipment). One activity has both less than significant adverse and less than significant beneficial impacts (other sampling activities).</p> <p>Justification: Limited scope; development of bathymetric maps and equipment deployment will assist prevention of groundings and & in navigation. Activities may temporarily interfere with transit, but the effect is expected to be short-term and most activities are limited in scope and time.</p>	<p>Same as Alternative 1</p>



<p><u>Research and Education</u></p>	<p>Activities have less than significant beneficial and negligible impacts (deployment of equipment on the seafloor, deployment of remote sensing equipment). Some activities have only less than significant beneficial impacts (aircraft operations, deployment of AUV/ROV/gliders/drifters, onshore fieldwork, SCUBA/snorkel operations, vessel operations). One activity has both less than significant adverse and less than significant beneficial impacts (other sampling activities).</p> <p>Justification: Temporary interference of commercial or recreational activities from other sampling activities is expected to be short-term and localized. Increased awareness & appreciation of sanctuary resources. Increased knowledge gained from deployed instrumentation & other sampling activities may promote public & commercial uses, & provide a means of data collection for future study. Beneficial impacts are short-term and limited in scope.</p>	<p>Same as Alternative 1</p>
<p><u>Human Uses</u></p>	<p>Activities have less than significant beneficial and negligible impacts (aircraft operations, deployment of remote sensing equipment). Some activities have only less than significant beneficial impacts (onshore fieldwork, vessel operations). Some activities have both less than significant adverse and less than significant beneficial impacts (deployment of equipment on the seafloor, other sampling activities). One activity has only less than significant adverse impacts (SCUBA/snorkel operations).</p> <p>Justification: Temporary interference of commercial or recreational activities from other sampling activities is expected to be short-term and localized. Promotes increased awareness & appreciation of sanctuary resources (e.g., beach cleanups). Increased knowledge gained from deployed instrumentation & other sampling activities may promote public & commercial uses. Beneficial impacts are short-term and limited in scope.</p>	<p>Same as Alternative 1</p>

<p><u>Maritime Heritage Resources</u></p>	<p>Activities have both less than significant adverse and less than significant beneficial impacts (deployment of AUV/ROV/gliders/drifters, deployment of equipment on the seafloor, deployment of remote sensing equipment, onshore fieldwork, other sampling activities, SCUBA/snorkel operations).</p> <p>Justification: Adverse effects, including disturbance of and damage to known historic and cultural resources, will be mitigated through the application of precautionary measures. These include not divulging information on the location of newly discovered sites. ONMS staff performing research will be trained to employ existing protocols that describe how to avoid harm to historic artifacts. Beneficial impacts will indirectly lead to enhanced resource characterization, protection and management. These activities will also help raise public awareness, understanding, and appreciation of maritime archaeological history. Benefits are short-term and limited in scope.</p>	<p>Same as Alternative 1</p>
<p><u>Cultural and Historic Resources</u></p>	<p>Activities have both less than significant adverse and significant beneficial impacts (deployment of AUV/ROV/gliders/drifters, SCUBA/snorkel operations). One activity only has less than significant beneficial impacts (onshore fieldwork).</p> <p>Justification: There is a small likelihood of disturbance to resources because staff are trained prior to underwater survey work to minimize their impact. Activities are localized and limited in scope. Beneficial impacts from locating and documenting new archaeological sites will indirectly lead to enhanced resource characterization, protection and management. These activities will also help raise public awareness, understanding, and appreciation of maritime archaeological history. Benefits are short-term and limited in scope.</p>	<p>Same as Alternative 1</p>

*Supplemental information will be developed following NMFS consultations.
 ND=Not Described

5.0

CONSULTATIONS

5.1 Magnuson-Stevens Act

In 1976, Congress passed the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801, et seq.). The MSA fosters long-term biological and economic sustainability of the nation's marine fisheries out to 200 nautical miles from shore. Key objectives of the MSA are to prevent overfishing, rebuild overfished stocks, increase long-term economic and social benefits, and ensure a safe and sustainable supply of seafood. Two of the main purposes of the MSA (16 U.S.C. §§ 1801, et seq.) are to promote domestic commercial and recreational fishing under sound conservation and management principles, and to provide for the preparation and implementation, in accordance with national standards, of FMPs which will achieve and maintain, on a continuing basis, the optimum yield from each fishery. The 10 National standards of the MSA require that FMPs contain certain conservation and management measures, including measures necessary to prevent overfishing, to rebuild overfished stocks, to insure conservation, to facilitate long-term protection of Essential Fish Habitat (EFH), and to realize the full potential of the Nation's fishery resources. Furthermore, the MSA also declares that the National Fishery Conservation and Management Program utilizes, and is based upon, the best scientific information available; involves, and is responsive to the needs of interested and affected States and citizens; considers efficiency; and draws upon federal, state, and academic capabilities in carrying out research, administration, management, and enforcement.

The EFH provisions of the MSA require NMFS to provide recommendations to federal and state agencies for conserving and enhancing EFH, for any actions that may adversely impact EFH. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity". Federal agencies must consult with NMFS and assess the effects of their actions on EFH. There is no separate permit or authorization process; EFH consultation is typically addressed during the NEPA process and incorporated into other permits. ONMS will use this draft PEA to consult with the Southeast Region EFH Coordinator to assess the impacts of ONMS field operations on EFH. The EFH assessment submitted to NMFS is below. NMFS concurred with the general concurrence.

5.1.1 Essential Fish Habitat Assessment

Introduction

The consultation requirements of section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA; 15 U.S.C. 1855(b)) provide that:

- federal agencies must consult with the Secretary on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect essential fish habitat (EFH);
- the Secretary shall provide recommendations (which may include measures to avoid, minimize, mitigate, or otherwise offset adverse effects on EFH) to conserve EFH to federal or state agencies for activities that would adversely affect EFH;
- the federal action agency must provide a detailed response in writing to the National Marine Fisheries Service (NOAA Fisheries) and to any Council commenting under § 305(b)(3) of the MSA within 30 days after receiving an EFH Conservation Recommendation.

Essential Fish Habitat in the Region

The two national marine sanctuaries and one national monument in the region overlap with pelagic, bottomfish, crustacean, precious coral, and coral reef ecosystem EFH. A complete description of the EFH designations and the criteria used to determine them is available in the Western Pacific Fishery Management Council's *Fishery Ecosystem Plan for the Hawaii Archipelago*, *Fishery Ecosystem Plan for the American Samoa Archipelago* and the *Pelagics Fishery Ecosystem Plan*.

Bottomfish

The species complex designations include bottomfish (shallow water and deep water complexes) and seamount groundfish. The designation of these complexes is based on the ecological relationships among species and their preferred habitat. The Western Pacific Fishery Management Council designated EFH for adult and juvenile bottomfish as the water column and all bottom habitat extending from the shoreline to a depth of 400 meters (200 fathoms) encompassing the steep drop-offs and high-relief habitats that are important for bottomfish throughout the Western Pacific Region. Because of the existing scientific uncertainty about the distribution of the eggs and larvae of bottomfish, the Council designated the water column extending from the shoreline to the outer boundary of the EEZ to a depth of 400 meters as EFH for bottomfish eggs and larvae throughout the Western Pacific Region.

On the basis of the best available data, the Council designated the EFH for the adult life stage of the seamount groundfish complex as all waters and bottom habitat bounded by latitude 29°–35° N and longitude 171° E–179° W between 80–600 meters. EFH for eggs, larvae, and juveniles is the

epipelagic zone (0-200 m) of all waters bounded by latitude 29°–35° N and longitude 171° E–179° W. This EFH designation encompasses the Hancock Seamounts, part of the northern extent of the Hawaiian Ridge, located 1,500 nautical miles northwest of Honolulu.

Crustacean

The Council designated EFH for larvae of the crustacean complex (spiny and slipper lobster and kona crab) as the water column from the shoreline to the outer limit of the EEZ down to a depth of 150 meters throughout the Western Pacific Region. The EFH for juvenile and adult crustaceans is designated as the bottom habitat from the shoreline to a depth of 100 meters throughout the Western Pacific Region. The EFH for deepwater shrimp eggs and larvae is designated as the water column and associated outer reef slopes between 550 m and 700m, and the EFH for juveniles and adults is designated as the outer reef slopes at depths between 300-700 m.

Precious Coral

The Council designated the six known beds of precious corals in the Hawaiian Archipelago as EFH. In addition, the Council designated three black coral beds in the MHI—between Milolii and South Point on Hawaii, Auau Channel between Maui and Lanai, and the southern border of Kauai—as EFH.

Coral Reef Ecosystem

The Council also designated EFH for coral reef ecosystems using a two-tiered approach for Currently Harvested Coral Reef Taxa (CHCRT) and Potentially Harvested Coral Reef Taxa (PHCRT) categories. In the first tier, EFH has been identified for species that (a) are currently being harvested in state and federal waters and for which some fishery information is available and (b) are likely to be targeted in the near future based on historical catch data. In the second tier, the Council has used the precautionary approach in designating EFH for PHCRT so that enough habitat is protected to sustain managed species.

EFH for egg and larvae of CHCRT and PHCRT is the water column extending from the shoreline to the outer boundary of the EEZ to a depth of 50 fm. EFH for adult and juvenile life stages of CHCRT and PHCRT consists of all bottom and the adjacent water column from 0 to 50 fm. Complete tables of EFH descriptions are available on pages 190-192 of the Fishery Ecosystem Plan for the Hawaii Archipelago and pages 131-133 of the Fishery Ecosystem Plan for the American Samoa Archipelago.

Pelagics

The Council designated EFH for pelagic species (temperate species, tropical species, sharks and squid) for eggs and larvae as the epipelagic zone water column down to a depth of 200 m (100 fm) from the shoreline to the outer limit of the EEZ.

The Council designated EFH for pelagic species (temperate species, tropical species, sharks and squid) for juveniles and adults as the water column down to a depth of 1,000 m (500 fm) from the shoreline to the outer limit of the EEZ.

Complete tables of EFH descriptions are available on page 175 of the *Fishery Ecosystem Plan for Pacific Pelagic Fisheries of the Western Pacific Region*.

Assessment of Effects on Essential Fish Habitat

NOAA Fisheries' Office of Habitat Conservation has identified the following ONMS activities as those that may adversely affect Essential Fish Habitat (all activities are described in detail in Section 2 of this document):

General ONMS Field Operations across the Pacific Islands Region

Vessel Operations

Potential impacts may include anchor damage and risk of vessel grounding, which may adversely affect bottom habitat. Pollutant discharge from vessels may adversely affect pelagic habitat in the water column.

SCUBA /Snorkel Operations

Potential impacts may include divers kicking bottom, which may adversely affect bottom habitat. Diving gear acting as vectors for invasive species spread may adversely affect both bottom habitat and pelagic habitat.

Deployment of AUVs/ROVs/Gliders/Drifters

Potential impacts may include unintentional contact with coral on bottom and grounding risk from either the survey equipment or the main vessel from which it is deployed.

Deployment of Equipment on the Seafloor (e.g., buoys; instrumentation; permanent anchors)

Potential impacts may include contact with coral or seagrass on bottom during installation of such equipment or in the event that such equipment breaks free from its moorings.

Other Sampling Activities

Specific Projects in Hawaiian Humpback Whale National Marine Sanctuary

Alien Species Monitoring and Removal

Potential impacts may include propagule spread from removal of alien species or inadvertent removal of native species. These impacts would primarily affect bottom habitat.

Reef Assessment and Monitoring Program*

Potential impacts may include diving activities, attaching pins and lines and deploying equipment on the bottom.

Habitat and Algal Restoration*

Potential impacts may include conversion or degradation of fish habitat, with impacts to both bottom habitat and pelagic habitat.

Marine Debris Removal

Potential impact may include abrasion to coral and damage to coral or seagrass.

* All proposed field operations identified with an asterisk would not be implemented by sanctuary staff until the new management plan and associated EIS are finalized

Specific Projects in Papahānaumokuākea Marine National Monument

Mesophotic Diving**

Potential impacts may include divers kicking bottom, which may adversely affect bottom habitat. Diving gear acting as vectors for invasive species spread may adversely affect both bottom habitat and pelagic habitat.

Reef Assessment and Monitoring Program**

Potential impacts may include diving activities, attaching pins and lines and deploying equipment on the bottom.

**The impacts of these activities are analyzed under a separate NEPA review associated with separate permit processes and therefore not further analyzed in this document.

Specific Projects in National Marine Sanctuary of American Samoa

None

Proposed Mitigation Measures

ONMS staff and contractors currently follow a set of best management practices (BMP) to minimize any potential damage to bottom habitat or the water column to the greatest extent possible. In PMNM, per Proclamation 8031, anchoring on coral is prohibited. In addition, across all three sites in the region, managers limit activities in accordance with the following BMPs: instruments are deployed and lowered onto sandy substrate whenever possible; deployment of instruments occurs slowly and under constant supervision to minimize risk and mitigate impacts if a collision or entanglement occurs; and while vehicles or personnel are deployed, spotters monitor the activities at all times. Lastly, ONMS typically does not allow night operations.

During marine debris removal operations, all removals are done by hand. If the in-water derelict fishing gear (DFG) is caught on a structure, it is cut loose with knives, loaded into inflatable boats

and transported to a secure site for storage. Mechanical wrenches are involved when the DFG is too heavy to be loaded by hand. If the DFG is located on shore, it is removed by hand and either transported by vehicles on land or loaded aboard inflatable boats and taken to a secure storage site. Secure storage sites can be land-based areas that will not allow the reintroduction of the DFG to the sea or ship based containers that are secured to the deck.

In Hawaiian Islands Humpback Whale National Marine Sanctuary, all collection and research activities are conducted by the National Marine Fisheries Service, Coral Reef Ecosystem Division.

In PMNM, any operations to tow divers or remote sensing equipment are conducted following established training provided by NOAA NMFS and along established NOAA NMFS tow boarding protocols for the Northwestern Hawaiian Islands. Any divers will be towed at approximately 3 knots/hour.

Conclusion

ONMS expects the adverse effects on EFH from the field operations described above to be minimal. This conclusion is based on the relatively small number of days at sea, divers and equipment deployments conducted annually, as well as the rigorous best management practices and training protocols in place for ONMS staff and contractors.

Revision, Tracking, and Review

If any changes are made to the ONMS PIR field operations such that there may be different adverse effects on EFH, ONMS will notify NMFS and the agencies will discuss whether the programmatic Conservation Recommendations issued by NMFS should be revised. ONMS will provide NOAA Fisheries with an annual report of all field operations undertaken under the PEA. Every five years, NOAA Fisheries will review these programmatic EFH Conservation Recommendations and determine whether they should be updated to account for new information or new technology.

5.2 Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) of 1972 (16 U.S.C. 1361 et seq.), as amended, prohibits, with certain exceptions, the “take” of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S. The MMPA defines “take” as: “to harass, hunt, capture, or kill, or attempt to harass, hunt, capture or kill any marine mammal.” 16 U.S.C. § 1362. Harassment means any act of pursuit, torment, or annoyance that has the *potential to injure* a marine mammal or marine mammal stock in the wild (Level A harassment); or that has the *potential to disturb* a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding,

feeding, or sheltering, but does not have the potential to injure a marine mammal or marine mammal stock in the wild (Level B harassment). 16 U.S.C. § 1362¹³. 16 U.S.C. § 1362¹⁴.

Section 101(a)(5)(A-D) of the MMPA provides a mechanism for allowing, upon request, the "incidental," but not intentional, taking, of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing or directed research on marine mammals) within a specified geographic region. The NMFS Office of Protected Resources (OPR) processes applications for incidental takes of small numbers of marine mammals. Authorization for incidental takes may be granted if NMFS finds that the taking would be of small numbers, have no more than a "negligible impact" on those marine mammal species or stocks, and not have an "unmitigable adverse impact" on the availability of the species or stock for "subsistence" uses. NMFS' issuance of an incidental take authorization also requires NMFS to make determinations under NEPA and Section 7 of the ESA¹⁵.

The purpose of issuing incidental take authorizations (ITAs) is to provide an exemption to the take prohibition in the MMPA, and to ensure that the action complies with the MMPA and NMFS's implementing regulations. ITAs may be issued as either: 1) regulations and associated Letters of Authorization (LOAs); or 2) Incidental Harassment Authorizations (IHAs). An IHA can only be valid for 1 year and LOAs can be valid for up to 5 consecutive years. An IHA may be issued when the action has the potential to result in harassment only (Level B Harassment, i.e., injury or disturbance). If the action has the potential to result in serious injury or mortality, or to result in harassment only and is planned for multiple years, then an IHA may not be issued, but an LOA and regulations may be issued if NMFS makes the required findings.

In addition, NMFS can in some circumstances authorize directed take of marine mammals through the following types of permits:

- Scientific Research Permit
- General Authorization for Scientific Research
- Public Display Permit
- Commercial or Educational Photography Permit

Pursuant to Section 101(a)(5)(A) of the MMPA, NMFS, upon application from ONMS, may plan to propose regulations to govern the unintentional taking of marine mammals, by harassment, incidental to the proposed field operations for ONMS in the Atlantic Ocean, Pacific Ocean, and Gulf of Mexico. The issuance of MMPA incidental take regulations and associated LOAs to the ONMS is a federal action, thereby requiring NMFS to analyze the effects of the action on the human environment pursuant to NEPA, which is covered in this PEA.

¹³ "Harassment" is defined by Level A Harassment, which has the potential to injure a marine mammal or marine mammal stock in the wild; and Level B Harassment which has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering

¹⁴ Source: <http://www.nmfs.noaa.gov/pr/dontfeedorharass.htm>

¹⁵ http://www.westcoast.fisheries.noaa.gov/protected_species/marine_mammals/mmpa_esa.html

ONMS intends to submit a request for technical assistance to NMFS as to whether we have provided enough information to support our likely to not adversely affect marine mammals determination. If, based on technical assistance, NMFS recommends that ONMS seek a LOA, then NMS will submit an application for a for the incidental taking of small numbers of marine mammals that could occur during their vessel operations and active acoustic equipment use. This PEA will provide informational support for a LOA application, if needed, and the rulemaking process and provide NEPA compliance for the authorization, if granted.

5.3 Endangered Species Act

The Endangered Species Act (ESA) of 1973 as amended (16 U.S.C. § 1531, et seq.), provides for the conservation of species that are endangered or threatened throughout all or a significant portion of their range, and the conservation of the ecosystems on which they depend. The ESA directs all federal agencies to work to conserve endangered and threatened species and to use their authorities to further the purposes of the Act. NMFS works with U.S. Fish and Wildlife Service (USFWS) to manage ESA-listed species. Generally, NMFS manages marine species, while USFWS manages land and freshwater species.

A species is considered endangered if it is in danger of extinction throughout all or a significant portion of its range. A species is considered threatened if it is likely to become an endangered species within the foreseeable future. When listing a species as threatened or endangered, NMFS or FWS also designate critical habitat for the species to the maximum extent prudent and determinable. 16 USC § 1533(a)(3).

Section 7(a)(2) of the ESA states that each federal agency shall, in consultation with the Secretary, insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. In fulfilling these requirements, each agency must use the best scientific and commercial data available. The consultation process is further developed in regulations promulgated at 50 CFR §402.

The ESA requires action agencies to consult or confer with the Services when there is discretionary federal involvement or control over the action. When a federal agency's action "may affect" a protected species, that agency is required to consult formally with NMFS or FWS, depending upon the endangered species, threatened species, or designated critical habitat that may be affected by the action (50 CFR § 402.14 (a)). Federal agencies are exempt from this general requirement if they have concluded that an action "may affect, but is not likely to adversely affect" endangered species, threatened species, or designated critical habitat and NMFS or the USFWS concurs with that conclusion (50 CFR § 402.14 (b)). This is commonly referred to as "informal consultation". This finding can be made only if ALL of the reasonably expected effects

of the proposed action will be beneficial, insignificant, or discountable. An action agency shall confer with the Services if the action is likely to jeopardize the continued existence of a proposed species or result in the destruction or adverse modification of proposed critical habitat.

Most consultations are conducted informally with the federal agency or a designated non-federal representative. When the biological assessment or other information indicates that the action has no likelihood of adverse effect (including evaluation of effects that may be beneficial, insignificant, or discountable), the Services provide a letter of concurrence, which completes informal consultation. The agency is not required to prepare a biological assessment for actions that are not major construction activities, but, if a listed species or critical habitat is likely to be affected, the agency must provide the Services with an account of the basis for evaluating the likely effects of the action.

Action agencies initiate formal consultation through a written request to the Services. To comply with the section 7 regulations, the initiation package is submitted with the request for formal consultation and must include the materials listed in 50 CFR §402.14(c). If a biological assessment is required, formal consultation cannot be initiated until the biological assessment is completed. The contents of biological assessments prepared pursuant to the Act are largely at the discretion of the action agency although the regulations provide recommended contents (50 CFR §402.12(f)). Formal consultations determine whether a proposed agency action(s) is likely to jeopardize the continued existence of a listed species (jeopardy) or destroy or adversely modify critical habitat (adverse modification), and they are documented by a biological opinion (BiOp). They also determine and authorize the amount or extent of anticipated incidental take in an incidental take statement, identify reasonable and prudent alternatives, if any, when an action is likely to result in jeopardy or adverse modification, and identify ways the action agencies can help conserve listed species or critical habitat when they undertake an action.

In addition, ESA Section 10(a)(1)(A) authorizes the NMFS and FWS to issue permits for scientific purposes or to enhance the propagation or survival of listed species. The permitted activity must not operate to the disadvantage of the species and must be consistent with the purposes and policy set forth in section 2 of the Act. Section 10(a)(1)(A) permits are also required:

- when a reasonable and prudent alternative calls for scientific research that will result in take of the species (this includes scientific research carried out by the Services);
- when the agency, applicant or contractor plans to carry out additional research not required by an incidental take statement that would involve direct take (if this is part of the action and direct take is contemplated, a permit is not needed); and
- for species surveys associated with biological assessments (usually developed during informal consultation) that result in take, including harassment.

ONMS began informal consultation with NMFS Office of Protected Species Division, at the onset of developing this draft PEA. These discussions have been oriented toward assuring the

draft PEA covers all listed species and potential effects from ONMS field operations and provides the appropriate analysis in support of formal section 7 consultation, which will begin with the publication of the draft PEA.

5.4 National Historic Preservation Act

Section 106 of the National Historic Preservation Act of 1966 (NHPA) (54 U.S.C. § 300101 et. seq.) requires federal agencies to take into account the effects of their undertakings on historic properties in accordance with regulations issued by the Advisory Council on Historic Preservation (ACHP) at 36 C.F.R. Part 800. The regulations require that federal agencies consult with states, tribes, and other interested parties (consulting parties) when making their effect determinations.

The regulations establish four basic steps in the NHPA 106 process: determine if the undertaking is the type of activity that could affect historic properties, identify historic properties in the area of potential effects, assess potential adverse effects, and resolve adverse effects.

The first step in the process is for the responsible federal agency to determine whether the undertaking is a type of activity that could affect historic properties. Undertakings consist of any project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including those carried out by or on behalf of a federal agency; those carried out with federal financial assistance; those requiring a federal permit, license or approval; and those subject to State or local regulation administered pursuant to a delegation or approval by a federal agency. Historic properties are properties that are included in the National Register of Historic Places or that meet the criteria for the National Register. If so, the agency must identify the appropriate State Historic Preservation Officer/Tribal Historic Preservation Officer (SHPO/THPO) to consult with during the process. <http://www.achp.gov/shpo.html>. It should also plan to involve the public, and identify other potential consulting parties. Consulting parties may include Indian tribes and Native Hawaiian organizations, local governments, permit or license applicants, and interested members of the public. If it determines that it has no undertaking, or that its undertaking is a type of activity that has no potential to affect historic properties, the agency has no further Section 106 obligations.

If the agency's undertaking could affect historic properties, the agency must identify historic properties in the area of potential effects. If the agency finds that no historic properties are present or affected, it provides documentation to the appropriate State Historic Preservation Officer/Tribal Historic Preservation Officer (SHPO/THPO) and, barring any objection in 30 days, proceeds with its undertaking.

If the agency finds that historic properties are present, it proceeds to assess possible adverse effects, in consultation with the SHPO/THPO. If the parties agree that there will be no adverse effect, the agency proceeds with the undertaking and any agreed-upon conditions. If a) they find

that there is an adverse effect, or if the parties cannot agree and ACHP determines within 15 days that there is an adverse effect, the agency begins consultation to seek ways to avoid, minimize, or mitigate the adverse effects.

The agency consults to resolve adverse effects with the SHPO/THPO and others, who may include Indian tribes and Native Hawaiian organizations, local governments, permit or license applicants, and members of the public. ACHP may participate in consultation when there are substantial impacts to important historic properties, when a case presents important questions of policy or interpretation, when there is a potential for procedural problems, or when there are issues of concern to Indian tribes or Native Hawaiian organizations.

Consultation usually results in a Memorandum of Agreement (MOA), which outlines agreed-upon measures that the agency will take to avoid, minimize, or mitigate the adverse effects. In some cases, the consulting parties may agree that no such measures are possible, but that the adverse effects must be accepted in the public interest. The ACHP provides helpful checklists on its website for drafting and reviewing agreements.

If consultation proves unproductive, the agency or the SHPO/THPO, or ACHP itself, may terminate consultation. If a SHPO terminates consultation, the agency and ACHP may conclude an MOA without SHPO involvement. However, if a THPO terminates consultation and the undertaking is on or affecting historic properties on tribal lands, ACHP must provide its comments. The agency head must take into account ACHP's written comments in deciding how to proceed.

ONMS will provide a copy of this draft PEA to the SHPOs and THPOs in areas affected by the research activities examined in this draft PEA. ONMS will consider all comments from SHPO, THPO, and other consulting parties, and take steps to comply with NHPA.

5.5 Executive Order 12989, Environmental Justice

EO 12898 directs federal agencies to take the appropriate and necessary steps to identify and address disproportionately high and adverse effects of federal projects on the health or environment of minority and low-income populations to the greatest extent practicable and permitted by law. No such effects are identified in this draft PEA.

5.6 Executive Order 13158, Marine Protected Area

The purpose of this order is to strengthen and expand the Nation's system of MPAs to enhance the conservation of our Nation's natural and cultural marine heritage and the ecologically and economically sustainable use of the marine environment for future generations. The order encourages federal agencies to use science-based criteria and protocols to identify and prioritize natural and cultural resources in the marine environment that should be protected to secure valuable ecological services and to monitor and evaluate the effectiveness of MPAs. Each federal agency whose actions affect the natural or cultural resources that are protected by an MPA shall

identify such actions. To the extent permitted by law and to the maximum extent practicable, each federal agency, in taking such actions, shall avoid harm to the natural and cultural resources that are protected by an MPA. ONMS has considered its potential effects on MPAs, such as the sites included in the National Marine Sanctuary System, in this draft PEA and found that the impacts are minor.


5.7 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA, 16 U.S.C. § 1451) was enacted in 1972 to encourage coastal states, Great Lake states, and U.S. Territories and Commonwealths (collectively referred to as “coastal states” or “states”) to preserve, protect, develop, and where possible, to restore or enhance the resources of the nation’s coastal zone. The CZMA is a voluntary program for states; currently, thirty-four coastal states have a federally approved coastal management program except Alaska, which voluntarily withdrew from the program in 2011. Section 307 of the CZMA is known as the “federal consistency” provision.

The federal consistency provision requires federal actions (inside or outside a state’s coastal zone) that affect any land or water use or natural resource of a state’s coastal zone, to be consistent with the enforceable policies of the state coastal management program (CMP). The term “effect on any coastal use or resource” means any reasonably foreseeable effect on any coastal use or resource resulting from the activity, including direct and indirect (cumulative and secondary) effects. The federal consistency regulations at 15 C.F.R. part 930 set forth detailed timeframes and procedures that must be followed carefully.

The two types of federal actions addressed in the federal consistency regulations that NOAA programs most frequently encounter are federal agency activities (15 C.F.R. part 930, subpart C), and federal license or permit activities (subpart D). In addition, subpart E of the regulations addresses outer continental shelf plans and subpart F applies to federal financial assistance provided to state and local governments. A federal action that will have reasonably foreseeable coastal effects, but which does not fall under 15 C.F.R. subpart D, subpart E, or subpart F should be treated as a federal agency activity under subpart C.

Federal agency activities (subpart C) are activities and development projects performed by a federal agency, or a contractor for the benefit of a federal agency. For federal agency development projects occurring inside a state’s coastal zone, the federal agency must submit a Consistency Determination to the state. For all other federal agency activities, inside or outside the coastal zone, the federal agency must submit a Consistency Determination to the state if the federal agency determines the activity may have reasonably foreseeable effects on the state’s coastal uses or resources. Federal agencies need only prepare one Consistency Determination for the proposed action and not for individual authorizations or reviews associated with the proposed action, such as NEPA documents, Endangered Species Act consultations, federal permits the agency may need, etc. Federal agency activities must be consistent to the maximum practicable



with the enforceable policies of the state's Coastal Zone Management Plan (CMP). If there are no reasonably foreseeable effects, the federal agency may be required to provide a Negative Determination to the state. See 15 C.F.R. § 930.35.

ONMS will provide a copy of this draft PEA and a consistency determination to the state coastal management agency in every state with a federally-approved coastal management program whose coastal uses or resources are affected by these field operations. Each state has sixty days in which to agree or disagree with the determination regarding consistency with that state's approved coastal management program. If a state fails to respond within sixty days, the state's agreement may be presumed.

6.0

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APPENDIX A

ONMS VESSELS OPERATING IN THE PACIFIC ISLANDS REGION

Name	Sanctuary	Homeport	Length	Range	Cruising Speed
R/V Kohola	Hawaiian Islands Humpback Whale	Mā‘alaea Harbor	38 ft	200 nm	21 kts
R/V Hihimanu	Papahanaumokuākea	Pearl Harbor, Oahu	36 ft	126 nm	21 kts
R/V Kaku	Papahanaumokuākea	Pearl Harbor, Oahu	19 ft	N/A	15 kts
R/V Malolo	Papahanaumokuākea	Pearl Harbor, Oahu	19 ft	N/A	15 kts
R/V Halalu	Papahanaumokuākea	Pearl Harbor, Oahu	19 ft	157 nm	15 kts
R/V Hi‘ialakai*	Papahanaumokuākea	Pearl Harbor, Oahu	224 ft	20,232 nm	10 kts
R/V Searcher*	Papahanaumokuākea	Kewalo Harbor, Oahu	96 ft	3500 nm	9 kts
R/V Manuma	American Samoa	Pago Pago	33 ft	80 nm	21 kts

* The R/V *Hi‘ialakai* is a NOAA research vessel (not an ONMS vessel). The R/V *Searcher* is a contracted vessel. More information about this vessel can be found at <http://www.searcherhawaii.com/SearcherSpecifications.html>.

APPENDIX B

HEARING RANGES OF MARINE MAMMALS IN ALL PACIFIC REGION SANCTUARIES

Common Name	Scientific Name	Local Population ESA Listing	Functional Hearing Group*	Functional Hearing Range	Present in HIHW NMS	Present in Papa MNM	Present in NMS of American Samoa
North Pacific Right Whale	<i>Eubalaena japonica</i>	Endangered	LFC	7 Hz to 30 kHz	✓	✓	
Humpback Whale	<i>Megaptera novaeangliae</i>	Endangered *	LFC	7 Hz to 30 kHz	✓	✓	✓
Minke Whale	<i>Balaenoptera acutorostrata</i>	None	LFC	7 Hz to 30 kHz	✓		✓
Bryde's Whale	<i>Balaenoptera edeni</i>	None	LFC	7 Hz to 30 kHz	✓		
Blue Whale	<i>Balaenoptera musculus</i>	Endangered	LFC	7 Hz to 30 kHz	✓	✓	
Fin Whale	<i>Balaenoptera physalus</i>	Endangered	LFC	7 Hz to 30 kHz	✓	✓	
Sei Whale	<i>Balaenoptera borealis</i>	Endangered	LFC	7 Hz to 30 kHz	✓	✓	
Sperm Whales	<i>Physeter macrocephalus</i>	Endangered	MFC	150 Hz to 160 kHz	✓	✓	✓
Dwarf Sperm Whale	<i>Kogia sima</i>	None	HFC	200 Hz to 180 kHz	✓		✓
Pygmy Sperm Whale	<i>Kogia breviceps</i>	None	HFC	200 Hz to 180 kHz	✓		
Killer Whale	<i>Orcinus orca</i>	None	MFC	150 Hz to 160 kHz	✓		✓
Pygmy Killer Whale	<i>Feresa attenuata</i>	None	MFC	150 Hz to 160 kHz	✓		

False Killer Whale	<i>Pseudorca crassidens</i>	None	MFC	150 Hz to 160 kHz	✓	✓	✓
Blainsville Beaked Whale	<i>Mesoplodon densirostris</i>	None	MFC	150 Hz to 160 kHz	✓		
Cuvier's Beaked Whale	<i>Ziphius cavirostris</i>	None	MFC	150 Hz to 160 kHz	✓		✓
Longman's Beaked Whale	<i>Indopacetus pacificus</i>	None	MFC	150 Hz to 160 kHz	✓		
Melon-Headed Whale	<i>Peponocephala electra</i>	None	MFC	150 Hz to 160 kHz	✓		
Risso's Dolphin	<i>Grampus griseus</i>	None	MFC	150 Hz to 160 kHz	✓		
Short-Finned Pilot Whale	<i>Globicephala macrorhynchus</i>	None	MFC	150 Hz to 160 kHz	✓		✓
Pantropical Spotted Dolphin	<i>Stenella attenuata</i>	None	MFC	150 Hz to 160 kHz	✓		✓
Striped Dolphin	<i>Stenella coeruleoalba</i>	None	MFC	150 Hz to 160 kHz	✓		
Fraser's Dolphin	<i>Lagenodelphis hosei</i>	None	MFC	150 Hz to 160 kHz	✓		
Rough-Toothed Dolphin	<i>Steno bredanensis</i>	None	MFC	150 Hz to 160 kHz	✓		✓
Spinner Dolphin	<i>Stenella longirostris</i>	None	MFC	150 Hz to 160 kHz	✓	✓	✓
Bottlenose Dolphin	<i>Tursiops truncatus</i>	None	MFC	150 Hz to 160 kHz	✓	✓	✓
Hawaiian Monk Seal	<i>Neomonachus schauinslandi</i>	Endangered	MFP	75 Hz to 75 kHz (in water)	✓	✓	

* NOAA Fisheries has delisted a number of humpback whale distinct population segments, including the population frequenting Hawaiian Islands Humpback Whale National Marine Sanctuary (81 FR 62259).



APPENDIX C

CONSULTATION LETTERS FOR THE PACIFIC ISLANDS REGION

As described in Chapter 5, ONMS will use this draft PEA to meet consultation requirements under a variety of environmental statutes. The final PEA will include copies of all consultation documentation in this Appendix.

APPENDIX D

Best Management Practices (BMPs) for Vessel Operations

The following BMP's, which ONMS intends to include in the PEAs, are used as applicable by vessels during ONMS related operations. These are meant to complement what is already required in the NOAA Small Boat Standards and Procedures Manual:

Lookouts/Staying at the helm

- While underway, vessel operators should always stay alert for marine mammals, sea turtles, and other collision hazards.
- While transiting in areas where marine mammals and sea turtles are likely to occur, vessel operators should post a minimum of one dedicated lookout and operators should remain vigilant at the helm controls (keeping hands on the wheel and throttle at all times) and be ready to take action immediately to avoid an animal in their path.
- When operating in areas where marine mammals and sea turtles are present, a dedicated lookout is required in addition to the operator. A second lookout may be posted in circumstances where visibility is restricted.
- When marine mammals are riding the bow wake, or porpoising nearby, operators should exercise caution and take actions that avoid possible contact or collisions.
- When operating within visual range of whales, vessel operators should follow NOAA National Marine Fisheries Service (NMFS) Whale Watching guidelines unless otherwise covered by a NMFS permit, and only then with extreme caution.

Vessel Speed

- All vessels must reduce to prudent speed when marine mammals and sea turtles are visible within 1 nautical mile (nm) of the vessel and should not exceed 10 knots.

Maintaining Distance

- Once large whales¹⁶ are sighted, vessel operators should stay at least 100 yards away, 200 yards away from killer whales and 50 yards away from sea turtles.
- If large whales surface within 100 yards, vessel operators should stop immediately and use prudent seamanship to decide to either move away slowly or wait for the animal to move away on its own.
- In the case of northern right whales, a distance of at least 500 yards should be maintained per [NMFS regulations](#).

Towing Divers

- Divers will be towed at approximately 3 kts/hour.

Operation of vessels during daylight hours

- Due to the increased risk of collision at night, vessel operations, whenever possible, should be planned for daylight hours (*i.e.*, between ½ hour before sunrise and ½ hour after sunset when possible).
- Restricted visibility can hinder an operator's ability to see and respond to a marine mammals and sea turtles. Prudent seamanship should be applied, including posting an additional lookout when there is the potential for marine animals in the vicinity.

Operation of vessels during night hours

- Standing Order for Nighttime Operations – If night time operations are essential and integral to the mission, the principal investigator must discuss mitigations for avoiding whales and other objects within the vessel operation corridor and incorporate them into the cruise plan. Mitigation measures could include: speed restrictions, additional lookouts, use of navigation lights, and use of sound signals, etc.

Standing Order for Operations around Marine Mammals

- This order requires several precautionary measures such as: incorporating whale sighting information in cruise planning, slowing to 10 kts in a Seasonal or Dynamic Management Area, following the Whale Watching Guidelines, maintaining a constant lookout for whales, and following specific procedures if a whale is struck.

Anchoring and deployment of instruments

- In the Pacific Islands region, anchoring will be limited to sandy-bottom substrates to avoid damage to seagrasses and coral habitat.

¹⁶ For the purposes of this document, large whales include: blue, bowhead, bryde's, fin, grey, humpback, minke, right, sei, and sperm whales. [Information based on Marine Wildlife Laws & Guidelines for Boaters, Paddlers and Viewers](#)

- In the Pacific Islands region, sargassum interaction is limited, as much as is reasonable feasible, to prevent impact on sea turtle hatchling habitat.
- In general, instruments are deployed and lowered onto sandy substrate whenever possible; deployment of instruments occurs slowly and under constant supervision to minimize risk and mitigate impacts if a collision or entanglement occurs; and while vehicles or personnel are deployed, spotters monitor the activities at all times.

Safety

- Safety Briefings: All ONMS vessel captains include safety information during pre-cruise briefings for staff and volunteers.
- All divers working on ONMS vessels are diver-certified and follow NOAA Diving Regulations as set forth by the NOAA Dive and Safety Standards Manual and subsequent revisions.

APPENDIX E

Species Lists

HIHWNMS

		ESA Listing Status (E=endangered, T=threatened, F=foreign, XN=nonessential experimental population, SAT=threatened due to similarity of appearance)
Inverted Common Name	Scientific Name	
Fish:		
<u>Marine/Adromous Species</u>		
Shark, Scalloped Hammerhead	<i>Sphyrna lewini</i>	E in Eastern Pacific DPS; E in Eastern Atlantic DPS; T in Central & Southwest Atlantic and Indo-West Pacific DPSs
Marine Mammals:		
<u>Dolphins</u>		
Bottlenose dolphin	<i>Tursiops truncatus</i>	MMPA
Fraser's dolphin	<i>Lagenodelphis hosei</i>	MMPA
(Pantropical) spotted dolphin	<i>Stenella attenuata</i>	MMPA
Risso's (Grampus) dolphin	<i>Grampus griseus</i>	MMPA
Rough-toothed dolphin	<i>Steno bredanensis</i>	MMPA
Short-beaked common dolphin/Common dolphin	<i>Delphinus delphis</i>	MMPA
Spinner dolphin (long-snouted)	<i>Stenella longirostris</i>	MMPA
Spotted dolphin	<i>Stenella plagiodon</i>	MMPA
Striped dolphin	<i>Stenella coeruleoalba</i>	MMPA
<u>Whales</u>		
Beluga whale	<i>Delphinapterus leucas</i>	E, MMPA
Blainville beaked whale	<i>Mesoplodon densirostris</i>	MMPA
Blue Whale	<i>Balaenoptera musculus</i>	E, MMPA
Bryde's whale	<i>Balaenoptera edeni</i>	MMPA
Cuvier's beaked whale	<i>Ziphius cavirostris</i>	MMPA

Dwarf sperm whale	<i>Kogia simus</i>	MMPA
False killer whale	<i>Pseudorca crassidens</i>	E, MMPA
Fin Whale	<i>Balaenoptera physalus</i>	E, MMPA
Ginkgo-toothed whale	<i>Mesoplodon ginkgodens</i>	MMPA
Humpback Whale	<i>Megaptera novaeangliae</i>	MMPA (DPS Delisted (de-listed (81 FR 62259))
Killer whale	<i>Orcinus orca</i>	E, MMPA
Longman's beaked whale	<i>Indopacetus pacificus</i>	MMPA
Melon-headed whale	<i>Peponocephala electra</i>	MMPA
Minke whale	<i>Balaenoptera acutorostrata</i>	MMPA
North Pacific right whale	<i>Eubalaena japonica</i>	E, MMPA
Pygmy killer whale	<i>Feresa attenuata</i>	MMPA
Pygmy sperm whale	<i>Kogia breviceps</i>	MMPA
Sei Whale	<i>Balaenoptera borealis</i>	E, MMPA
Short-finned pilot whale	<i>Globicephala macrorhynchus</i>	MMPA
Sperm Whale	<i>Physeter macrocephalus</i>	E, MMPA
<u>Phocid Pinnipeds (Seals)</u>		
Hawaiian monk seal	<i>Neomonachus schauinslandi</i>	E, MMPA
Reptiles:		
<u>Turtles</u>		
Green Sea Turtle	<i>Chelonia mydas</i>	T entire range; Central North Pacific, East Pacific, North Atlantic, South Atlantic DPSs T; E in Central South Pacific, Central West Pacific DPSs
Hawksbill	<i>Eretmochelys imbricata</i>	E
Leatherback	<i>Dermochelys coriacea</i>	E
Loggerhead	<i>Caretta caretta</i>	E North Pacific Ocean DPS; T Northwest Atlantic DPS
Pacific (Olive) Ridley	<i>Lepidochelys olivacea</i>	T
<u>Seabirds/Shorebirds:</u>		
Coot, Hawaiian	<i>Fulica americana alai</i>	E, MBTA
Petrel, Hawaiian	<i>Pterodroma sandwichensis</i>	E, MBTA
Shearwater, Newell's Townsend's	<i>Puffinus auricularis newelli</i>	T, MBTA
Stilt, Hawaiian	<i>Himantopus mexicanus knudseni</i>	E
Land Species:		
<u>Birds</u>		
Duck, Laysan	<i>Anas laysanensis</i>	E

PMNM

		ESA Listing Status (E=endangered, T=threatened, F=foreign, XN=nonessential experimental population, SAT=threatened due to similarity of appearance)
Inverted Common Name	Scientific Name	
Marine Mammals:		
<u>Dolphins</u>		
Short beaked common dolphin	<i>Delphinus delphis</i>	MMPA
Bottlenose dolphin	<i>Tursiops truncatus</i>	MMPA
(Pantropical) spotted dolphin	<i>Stenella attenuata</i>	MMPA
Risso's (Grampus) dolphin	<i>Grampus griseus</i>	MMPA
Rough-toothed dolphin	<i>Steno bredanensis</i>	MMPA
Spinner dolphin (long-snouted)	<i>Stenella longirostris</i>	MMPA
Spotted dolphin	<i>Stenella plagiodon</i>	MMPA
Striped dolphin	<i>Stenella coeruleoalba</i>	MMPA
<u>Whales</u>		
Blainsville beaked whale	<i>Mesoplodon densirostris</i>	MMPA
Blue Whale	<i>Balaenoptera musculus</i>	E, MMPA
Bryde's whale	<i>Balaenoptera edeni</i>	MMPA
Cuvier's beaked whale	<i>Ziphius cavirostris</i>	MMPA
Dwarf sperm whale	<i>Kogia simus</i>	MMPA
False killer whale	<i>Pseudorca crassidens</i>	E, MMPA
Fin Whale	<i>Balaenoptera physalus</i>	E, MMPA
Ginkgo-toothed whale	<i>Mesoplodon ginkgodens</i>	MMPA
Humpback Whale	<i>Megaptera novaeangliae</i>	MMPA (DPS Delisted (de-listed (81 FR 62259)))
Killer whale	<i>Orcinus orca</i>	E, MMPA
Longman's beaked whale	<i>Indopacetus pacificus</i>	MMPA
Melon-headed whale	<i>Peponocephala electra</i>	MMPA
Minke whale	<i>Balaenoptera acutorostrata</i>	MMPA
North Pacific right whale	<i>Eubalaena japonica</i>	E, MMPA
Pygmy killer whale	<i>Feresa attenuata</i>	MMPA
Pygmy sperm whale	<i>Kogia breviceps</i>	MMPA
Sei Whale	<i>Balaenoptera borealis</i>	E, MMPA
Short-finned pilot whale	<i>Globicephala macrorhynchus</i>	MMPA
Sperm Whale	<i>Physeter macrocephalus</i>	E, MMPA
<u>Phocid Pinnipeds (Seals)</u>		
Hawaiian monk seal	<i>Neomonachus schauinslandi</i>	E, MMPA
Reptiles:		

<u>Turtles</u>		
Green Sea Turtle	<i>Chelonia mydas</i>	T entire range; Central North Pacific, East Pacific, North Atlantic, South Atlantic DPSs T; E in Central South Pacific, Central West Pacific DPSs
Hawksbill	<i>Eretmochelys imbricata</i>	E
Leatherback	<i>Dermochelys coriacea</i>	E
Loggerhead	<i>Caretta caretta</i>	E North Pacific Ocean DPS; T Northwest Atlantic DPS
Pacific (Olive) Ridley	<i>Lepidochelys olivacea</i>	T
Seabirds/Shorebirds:		
Albatross, short-tailed	<i>Phoebastria (=Diomedea) albatrus</i>	E, MBTA
Albatross, black-footed	<i>Phoebastria nigripes</i>	MBTA
Albatross, Laysan	<i>Pheobastria immutabilis</i>	MBTA
Brown Booby	<i>Sula leucogaster</i>	MBTA
Masked Booby	<i>Sula dactylatra</i>	MBTA
Red-footed Booby	<i>Sula sula rubripes</i>	MBTA
Great Frigatebird	<i>Fregata minor palmerstoni</i>	MBTA
Blue Noddy	<i>Procelsterna cerulea</i>	MBTA
Black Noddy	<i>Anous minutus</i>	MBTA
Brown Noddy	<i>Anous stolidus pileatus</i>	MBTA
Bonin Petrel	<i>Pterodroma hypoleuca</i>	MBTA
Bulwer's Petrel	<i>Bulweria bulwerii</i>	MBTA
Tristram's Storm Petrel	<i>Oceanodroma tristrami</i>	MBTA
Christmas Shearwater	<i>Puffinus nativitatis</i>	MBTA
Wedge-tailed Shearwater	<i>Puffinus pacificus</i>	MBTA
Gray-backed Tern	<i>Onychoprion lunatus</i>	MBTA
Sooty Tern	<i>Onychoprion fuscatus</i>	MBTA
White Tern	<i>Gygis alba rothschildi</i>	MBTA
Bristle-thighed Curlew	<i>Numenius tahitiensis</i>	MBTA
Pacific Golden Plover	<i>Pluvialis fulva</i>	MBTA

Sanderling	<i>Calidris alba</i>	MBTA
Ruddy Turnstone	<i>Arenaria interpres</i>	MBTA
Wandering Tattler	<i>Heteroscelus incanus</i>	MBTA
Land Species:		
<u>Birds</u>		
Laysan duck	<i>Anas laysanensis</i>	E
Laysan finch (honeycreeper)	<i>Telespyza cantans</i>	E
Nihoa finch	<i>Telespyza ultima</i>	E
Nihoa millerbird	<i>Acrocephalus familiaris kingi</i>	E
<u>Plants</u>		
Loulu/fan palm	<i>Pritchardia remota</i>	E
Kamanomano	<i>Cenchrus agrimonioides</i>	E
Ohai	<i>Sesbania tomentosa</i>	E
No common name	<i>Amaranthus brownii</i>	E
No common name	<i>Mariscus pennatiformis</i>	E
No common name	<i>Schiedea verticillata</i>	E
Pōpolo	<i>Solanum nelsonii</i>	E

NMSAS

		ESA Listing Status (E=endangered, T=threatened, F=foreign, XN=nonessential experimental population, SAT=threatened due to similarity of appearance)
Inverted Common Name	Scientific Name	
<u>Corals</u>		
No common name	<i>Acropora globiceps</i>	T
No common name	<i>Acropora jacquelineae</i>	T
No common name	<i>Acropora speciosa</i>	T
No common name	<i>Acropora retusa</i>	T
No common name	<i>Euphyllia paradivisa</i>	T
No common name	<i>Isopora crateriformis</i>	T
<u>Marine/Adromous Species</u>		
Shark, Scalloped Hammerhead	<i>Sphyrna lewini</i>	E in Eastern Pacific DPS; E in Eastern Atlantic DPS; T in Central & Southwest Atlantic and Indo-West Pacific DPSs

Marine Mammals:		
<u>Dolphins</u>		
Bottlenose dolphin	<i>Tursiops truncatus</i>	MMPA
Fraser's dolphin	<i>Lagenodelphis hosei</i>	MMPA
(Pan-tropical) spotted dolphin	<i>Stenella attenuata</i>	MMPA
Risso's (Grampus) dolphin	<i>Grampus griseus</i>	MMPA
Rough-toothed dolphin	<i>Steno bredanensis</i>	MMPA
Spinner dolphin (long-snouted)	<i>Stenella longirostris</i>	MMPA
Striped dolphin	<i>Stenella coeruleoalba</i>	MMPA
<u>Whales</u>		
Blainville beaked whale	<i>Mesoplodon densirostris</i>	MMPA
Blue Whale	<i>Balaenoptera musculus</i>	E, MMPA Depleted (known to occur in western Pacific, but have not been observed in AS)
Bryde's whale	<i>Balaenoptera edeni</i>	MMPA
Cuvier's beaked whale	<i>Ziphius cavirostris</i>	MMPA
Dwarf sperm whale	<i>Kogia simus</i>	MMPA
False killer whale	<i>Pseudorca crassidens</i>	E, MMPA
Fin Whale	<i>Balaenoptera physalus</i>	E, MMPA Depleted, CITES Appendix I (known to occur in western Pacific, but have not been observed in AS)
Ginkgo-toothed whale	<i>Mesoplodon ginkgodens</i>	MMPA
Humpback Whale	<i>Megaptera novaeangliae</i>	MMPA (DPS Delisted (de-listed (81 FR 62259))
Killer whale	<i>Orcinus orca</i>	E, MMPA
Longman's beaked whale	<i>Indopacetus pacificus</i>	MMPA
Melon-headed whale	<i>Peponocephala electra</i>	MMPA
Minke whale	<i>Balaenoptera acutorostrata</i>	MMPA
Pygmy killer whale	<i>Feresa attenuata</i>	MMPA
Pygmy sperm whale	<i>Kogia breviceps</i>	MMPA
Sei Whale	<i>Balaenoptera borealis</i>	E, MMPA (known to occur in w. Pacific, but not been observed in AS)
Short-finned pilot whale	<i>Globicephala macrorhynchus</i>	MMPA
Sperm Whale	<i>Physeter macrocephalus</i>	E, MMPA
<u>Reptiles:</u>		
<u>Turtles</u>		

Green Sea Turtle	<i>Chelonia mydas</i>	E in Samoa; Central North Pacific, East Pacific, North Atlantic, South Atlantic DPSs T; E in Central South Pacific, Central West Pacific DPSs
Hawksbill	<i>Eretmochelys imbricata</i>	E
Kemp's Ridley	<i>Lepidochelys kempii</i>	E
Leatherback	<i>Dermochelys coriacea</i>	E
Loggerhead	<i>Caretta caretta</i>	E North Pacific Ocean DPS; E in Samoa
Pacific (Olive) Ridley	<i>Lepidochelys olivacea</i>	T
Seabirds/Shorebirds:		
Newell's shearwater	<i>Puffinus auricularis newelli</i>	T, MBTA



AMERICA'S UNDERWATER TREASURES