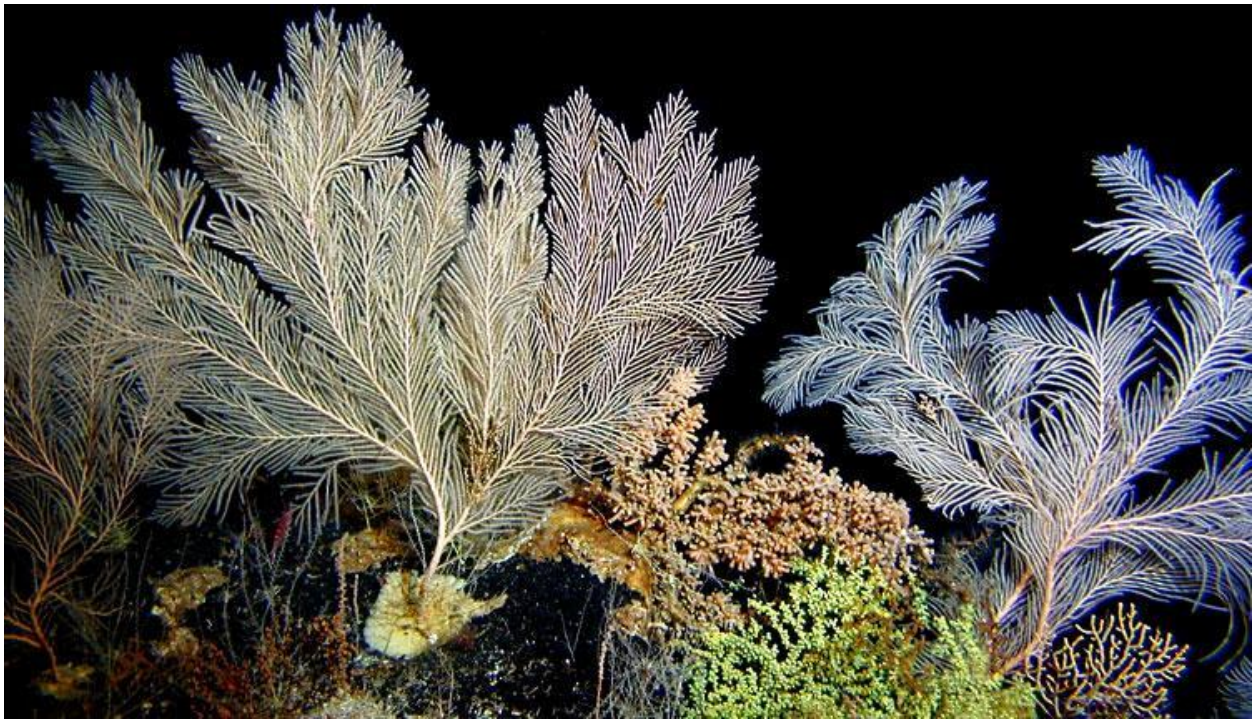
SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT For Phase II of Deep Sea Research within the Northwestern Hawaiian Islands



Papahānaumokuākea Marine National Monument
Northwestern Hawaiian Islands
Hawai‘i

National Oceanic and Atmospheric Administration
National Ocean Service, Office of National Marine Sanctuaries

September 2016

EXECUTIVE SUMMARY

This Supplemental Environmental Assessment (SEA) was prepared in accordance with the National Environmental Policy Act of 1969 (42 U.S.C. §§ 4321, *et seq*.), as implemented by the Council on Environmental Quality regulations (40 Code of Federal Regulations Parts 1500-1508), and National Oceanic and Atmospheric Administration (NOAA) Administrative Order (NAO) 216-6A, which describes NOAA policies, requirements, and procedures implementing NEPA. This document is meant to build on the Environmental Assessment for Papahānaumokuākea Marine National Monument (PMNM) dated October 2014, Supplement Environmental Assessment for Deep Sea Research within the Northwestern Hawaiian Islands dated September 2015, and Supplemental Environmental Assessment for Phase II of Deep Sea Research within the Northwestern Hawaiian Islands dated August 2016. For purposes of this SEA, the Deep Sea Research project is described in two phases: Phase I: Multibeam mapping, Autonomous Underwater Vehicle (AUV) activities, water sampling and deployment of a lander for one year to study the landscape of PMNM and beyond to identify appropriate site locations of deep sea landscapes that have been previously impacted by trawling, are still being impacted by trawling, and were never impacted by trawling activities to study the recovery rates of deep sea coral and sponge communities. Phase II: Water sampling, recovery and redeployment of the lander, and (Remotely Operated Vehicle) ROV and *Pisces IV* and *V* manned submersible activities to collect samples of deep sea corals and sponges for genetic and age analysis. The original EA and SEA in 2014, 2015, and 2016 respectively addressed Phase I and part of Phase II of the project.

PMNM permits for the Deep Sea Research project were first issued in 2014. At that time, NOAA's Office of National Marine Sanctuaries (ONMS) issued two permits; (1) a research permit (PMNM-2014-028) to the Florida State University (FSU) for mapping and survey reconnaissance to understand the recovery rates of marine life in areas previously impacted by deep-sea trawling, and (2) a conservation and management permit (PMNM-2014-030) to the University of Alaska – Fairbanks (UAF), School of Fisheries and Ocean Sciences, Seward Marine Center allowing vessel operations to support the aforementioned FSU deep sea research, aboard the R/V *Sikuliaq,* utilizing the Autonomous Unmanned Vehicle (AUV) *Sentry* for underwater survey work.

In 2015, the research permittees requested two amendments to their research permit (permit number PMNM-2014-028 issued to FSU) to include new locations to survey for their Phase I research activities. To enhance the originally permitted research activities, ONMS issued two permit amendments (PMNM-2014-028-A1 and PMNM-2014-028-A2) to FSU to add survey locations, extend the depths at which surveys would be conducted to 200 – 700 m, and deploy additional instruments attached to a lander at depths between 300 – 700 m, which would stay in place on site and be recovered one year later (in 2016). In addition, a new conservation and management permit was issued to the University of Hawaii Marine Center (UHMC) to conduct vessel operations aboard the R/V *Kilo Moana* in support of the aforementioned FSU deep sea research (permit number PMNM-2015-028).

In August 2016, ONMS proposed issuing one research permit and one conservation and management permit to allow continuation of the above described research project. Activities that were not previously analyzed in the 2014 EA and 2015 SEA included operation of the

Deep Sea Research within the NWHI

Remotely Operated Vehicle (ROV) *Jason* for underwater survey work, and specimen collections to further the understanding of impacts to the seafloor from trawling activities and potential rates of recovery for these impacted areas, recovery of the lander and including French Frigate Shoals as an additional research site. In support of this continued research, ONMS reviewed the potential for permit issuance (proposed federal action), one research permit (PMNM-2016-021) to Florida State University (FSU) to conduct deep-sea marine research, and one conservation and management permit amendment (permit number PMNM-2015-028-A1 issued in 2015) to UHMC for vessel and operational support for the aforementioned FSU deep sea research, aboard the R/V *Kilo Moana* and the survey of one additional research site near French Frigate Shoals.

Before the research permit and conservation and management permit amendment were issued enabling work to begin that was analyzed by the August 2016 SEA, the permit applicants changed their project description. Specifically, the applicants determined that the use of a different research vessel - the R/V *Ka‘imikai-O-Kanaloa* (*KOK*) – and the use of different submersibles – the *Pisces IV* and *V* – would be necessary as the R/V *Kilo Moana* and ROV *Jason* were no longer available. As a result, ONMS now proposes to issue a research permit for the work aboard the R/V *KOK*, which would begin in October 2016. However, a new conservation and management permit will be issued for the R/V *KOK* and the use of the *Pisces IV* and *V* submersibles within PMNM. As such, ONMS is now proposing to issue one conservation and management permit to UHMC and the University of Hawai‘i (UH) School of Ocean and Earth Science and Technology (SOEST) Hawaii Undersea Research Laboratory (HURL) for vessel and operational support for the aforementioned FSU deep sea research using the R/V *KOK* and *Pisces IV* and *V* manned submersibles. Activities not previously analyzed in the August 2016 SEA include operation of the R/V *KOK* and *Pisces IV* and *V* manned submersibles, activities for underwater survey work and specimen collections, and redeployment of the lander at Southeast Hancock seamount for approximately 1 year. As a result of these modifications, this SEA supplements the August 2016 SEA by replacing the August 2016 Preferred Alternative (Alternative 1) with the preferred Alternative in this document. The preferred Alternative here is analyzed in comparison to the no action alternative previously addressed in the August 2016 SEA.

The proposed actions are not expected to result in any impacts to the following resource categories: terrestrial biological resources, soils and topography, land use, traffic, ambient noise, visual resources, natural hazards, and utilities and other infrastructure. The proposed action is not expected result in significant impacts to marine biological resources, cultural resources, physical conditions (water quality and air quality), solid waste, marine traffic, and hazardous and regulated materials. The proposed action would not create environmental health and safety risks that may disproportionately affect children and minority or disadvantaged populations, nor would it be expected to result in significant cumulative impacts to any environmental resource category.

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1.0 PURPOSE AND NEED FOR ACTION

1.1 Summary of Proposed Actions

The National Oceanic and Atmospheric Administration (NOAA) proposes to issue one new Papahānaumokuākea Marine National Monument (PMNM or Monument) conservation and management permit and one research permit. This analysis focuses on the following activities for which these proposed permitting actions are necessary to allow access to PMNM to conduct specified activities. Specifically, NOAA's Office of National Marine Sanctuaries (ONMS) would issue a conservation and management permit to Mr. Ross Barnes of UHMC and Dr. Alexander Shor of SOEST, permit number PMNM-2016-028, for providing vessel operational support using the R/V *KOK* and *Pisces IV and V* manned submersibles and assisting in recovery and redeployment of a lander (deployment of the lander was separately permitted in 2015) and a research permit would be issued to Dr. Amy Baco-Taylor of Florida State University (FSU), PMNM-2016-021, to allow for specimen collections and retrieval/transport of the lander within PMNM. All newly permitted activities are a part of Phase II of the research to understand impacts and recovery rates of deep sea areas affected by trawling.

Purpose and Need

The purpose of issuing one PMNM permit is to allow for the continuation of deep sea coral and sponge research to aid in enhancing the understanding of Monument resources and improving resource management decision making (Monument Management Plan, 2008). These proposed actions are needed to support research operations that would provide for a better understanding of the deep-sea biota within the Monument through collection of new records and new species and bathymetric habitat mapping. In addition, this research would provide more insight into the impacts of trawling and the recovery potential for deep-sea coral and sponge bed communities. This information would allow for better management of deep water areas within the PMNM.

1.2 Background

Papahānaumokuākea Marine National Monument – Regulatory Environment

The purposes and management regime for the Monument, as well as restrictions and prohibitions regarding activities in PMNM, are set forth in Presidential Proclamation 8031 (71 Federal Register 36443, June 26, 2006) (Proclamation). For the purposes of this document, the term "regulated PMNM boundary" refers to the areas subject to Presidential Proclamation 8031[1]. Activities within the regulated PMNM boundary are subject to permit approval by the National Oceanic and Atmospheric Administration (NOAA), U.S. Fish & Wildlife Service (USFWS), and the State of Hawai'i as Monument Co-Trustees. All Federal permits, including PMNM permits, are subject to National Environmental Policy Act (NEPA) compliance. Proposed activities that impact State jurisdiction may also be subject to State of Hawaii, Hawaii Revised Statutes, Chapter 343 - Environmental Impact Statements. The proposed activities would be conducted in federal waters both in and around the Monument.

[1] During the development of the August 2016 Supplement Environmental Assessment, the President designated an area surrounding the existing Papahānaumokuākea Marine National Monument as a new Monument titled the "Papahānaumokuākea Marine National Monument Expansion." NOAA does not expect that this new designation will result in any changes to the environmental impacts anticipated in connection with the proposed actions discussed herein.

According to NAO 216-6A, the purpose for a Supplemental Environmental Assessment (SEA) is to determine whether significant environmental impacts could result from a proposed action. A SEA is appropriate when there is new information, or a change to a federal action that has completed environmental review and where environmental impacts from the proposed action are expected, but it is uncertain that those impacts would be significant. Specific factors that the PMNM believes are relevant include the potential effects of the proposed research on unique characteristics of this geographic region. A description of proposed research and vessel support activities was included in the following documents:

(1) Environmental Assessment for Papahānaumokuākea Marine National Monument dated October 2014 (Appendix A)

(2) Supplemental Environmental Assessment for Deep Sea Research within the Northwestern Hawaiian Islands dated September 2015 (Appendix B)

(3) Supplemental Environmental Assessment for Deep Sea Research within the Northwestern Hawaiian Islands dated August 2016 (Appendix C)

The previously permitted research and vessel support activities of the deep sea research project co-led by Dr. Baco-Taylor and Dr. Roark were analyzed in the above-referenced Environmental Assessment (EA) and its subsequent Supplemental Environmental Assessments (SEA), which are both incorporated by reference herein. These earlier research and vessel support activities comprised the now complete "Phase I" of Dr. Baco-Taylor's and Dr. Roark's research project. The necessary permitting for the "Phase II" activities of the research project, which would include vessel operations aboard the R/V *KOK,* the deployment and operation of *Pisces IV and V submersibles* and recovery of the lander from within the regulated PMNM boundary[2], is analyzed in this SEA.

2.0 DESCRIPTION OF PROPOSED ACTIONS AND ALTERNATIVES

Introduction

Described and analyzed below are two alternatives for the Proposed Actions: Alternative 1 involves issuing a new PMNM permit to conduct conservation and management activities operating the R/V *KOK* and *Pisces IV and V* submersibles, and one research permit for specimen collection and retrieval/transport outside the regulated PMNM boundary (Preferred Alternative), and Alternative 2 entails not issuing a new PMNM conservation and management permit and research permit to conduct proposed conservation and management activities (No Action Alternative). The No Action Alternative was analyzed in the August 2016 SEA, which is incorporated herein for purposes of this analysis.This chapter presents a description of the Preferred (same as proposed action) and No Action Alternatives. The Proposed Action and the No Action Alternatives are analyzed for their potential effects on the human environment.

The PMNM permit process considers a range of conditions and ways to mitigate effects (e.g., timing, location, methods, and materials) and, where warranted, special terms and conditions are placed on PMNM permits, prior to issuance to ensure protection of natural and cultural resources within the regulated PMNM boundary. Special terms and conditions evaluated in this document under the preferred alternative are discussed throughout and include, but are not limited to, actions that would mitigate potential impacts to endangered species and the environment during vessel and research operations.

[2] Redeployment of the lander is to occur outside the regulated PMNM boundary.

2.1 Alternative 1 - Proposed Actions: Issue one conservation and management permit to allow for proposed vessel support operations and one research permit for specimen collection and lander retrieval/transport to occur in and outside of regulated PMNM boundary(Preferred Action Alternative)

ONMS proposes to issue one conservation and management permit (PMNM-2016-028) for operating the R/V *KOK* and *Pisces IV* and *V* submersibles to Mr. Ross Barnes and Dr. Alexander Shor. In addition, ONMS is proposing to issue a research permit would be issued to Dr. Amy Baco-Taylor of Florida State University (FSU), PMNM-2016-021, to allow for specimen collections and retrieval/transport of the lander within PMNM. This Alternative addresses authorization of conservation and management and research activities – including R/V *KOK* and *Pisces IV* and *V* operations and assisting in transport and redeployment of a lander - that have not been previously analyzed in earlier environmental assessments.

Previously Analyzed Deep Sea Research Phase I Activities: multi-beam, AUV *Sentry*, lander, mapping and other research activities

All activities proposed in the first phase of the aforementioned deep sea research project have been completed. The purpose of Phase I was to identify suitable locations and survey each identified site to quantitatively assess megafaunal community abundance at each location and to pinpoint large beds of precious corals for sampling during Phase II of the project. All Phase I activities have been previously described and analyzed in the original EA (October 2014) and subsequent SEA (September 2015). Therefore, these previously described activities are not further discussed in this document.

Proposed Alternative 1 Deep Sea Research Phase II Activities: R/V *KOK, Pisces IV & Pisces V*, lander redeployment

R/V *Ka'imikai-o-Kanaloa* (*KOK*)

The UH Marine Center operates R/V *KOK*, owned by the State of Hawai'i. On average, the *KOK* accommodates 30 personnel on each cruise, with a maximum capacity of 32 crew members. In addition to traditional berthing and living spaces, the *KOK* has wet and dry laboratory space, a rock lab, a clean room, and a dark room. The vessel is ballasted with fresh potable water from the dock in Honolulu. There are no ballast water exchanges at sea. The length overall (LOA) for the *KOK* is 223 feet (For specifications see Table 1). While in the Monument, the *KOK* would only anchor in emergency situations, and efforts would be made to drop anchor in areas that are relatively free of coral.

The *KOK* is dry docked every three years and the bottom and sides are cleaned using a high pressure water system to remove dirt and growth on the hull. The hull is then repainted with an anti-fouling paint, which is approved by the U.S. Environmental Protection Agency (EPA) to retard marine growth and preserve the bottom surface. The hull is also painted with a marine paint for protection in the salt water environment. When the *KOK* is not in dry-dock, divers routinely scrub the hull and propellers to remove marine growth and reduce drag.

The *KOK* has a Redfox Marine Sanitation Device (MSD), which uses aerobic bacteria to break down the waste material from the ships sewage system. The Redfox MSD discharges into the grey water holding tank. The *KOK* can retain sewage and grey water on board for an average of two days before the holding tank reaches capacity and grey water must be discharged. All

sewage would be treated and the grey water retained until at a minimum of 3 nautical miles (nm) from all PMNM Special Preservation Area (SPA) boundaries.

The ship would carry up to 101,000 gallons of diesel fuel and up to 1,000 gallons of lubrication oil, ten 16-ounce cans of WD-40 and 20 gallons of an EPA approved solvent. These are kept in the designated holding tanks located in the engine room. Used oil is stored in a designated labeled drum until return to port. Excess oils from maintenance and repairs are cleaned up with cloth rags and/or oil absorbent pads. Used rags are stored in designated, labeled bins until return to port. The ship also carries approximately 40 gallons of paint and paint thinners that are stored in a large box on deck. Waste and excess paint is retained on board until the ship returns to port for proper disposal.

Although an oil spill at sea is unlikely, the crew would address the spill in accordance with the *KOK* Shipboard Oil Pollution Emergency Plan as approved by the U.S. Coast Guard (USCG). A Non-Tank Vessel Response Plan has also been submitted to the USCG. In the case of a hazardous material spill, the crew would follow procedures described in the *KOK* Safety Management Manual.

The *KOK* Safety Management Manual also addresses solid waste management. Degradable waste that is ground up into small pieces would be discharged overboard at a minimum distance of 3 nm from SPA boundaries, and degradable waste that is not ground would be discharged at a minimum distance of 12 nautical miles from SPA boundaries. Any degradable waste that may remain floating for some time, would be discharged at a minimum distance of 25 nm from SPA boundaries. Discharge of these wastes within PMNM are regulated activities, and therefore would be conducted pursuant to a valid PMNM permit. All plastics are retained on board until the vessel returns to port. Laboratory waste is also retained on board until it can be properly disposed of at home port.

The *KOK* is equipped with a SeaBeam 3012 multibeam sonar bathymetric system. The SeaBeam system uses active sonar to map the depth and contours of the sea floor (bathymetry). The system sends a focused pulse of sound (ping) straight down and listens for the reflected echo off 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. Power, amplitude, pulse width, and ping rate vary depending on the depths of the ocean in the area being mapped. The SeaBeam uses a frequency of 12 kilohertz and a maximum power of 30 kilowatts for deep ocean mapping pinging every 1-25 seconds. The source level on the maximum response axis is 231 decibels (dB) re 1 micropascal (uPa) at one meter. In practice, due to slight mismatches between the amplifier and the projectors, the power levels in actual systems are usually 1-2 dB lower than the specified number which is based on an ideal match. The beam pattern is a vertically focused narrow beam system with 2x2 degree beams. The mapping system would be turned on once the ship reaches the general location of the target survey sites to identify the appropriate location in which to launch the *Pisces IV* and *V* submersibles for no more than 30 dives that are planned for this project..

This type of sonar is different from Low-Frequency Active Sonar used by the U.S. Navy which uses a frequency range of 100-1,000 hertz (Federation of American Scientists, 2007).

Pisces IV & Pisces V

The *Pisces IV* and *V* submersibles can conduct a maximum of about 40 dives per year total. Up to 30 dives would be conducted to support Dr. Baco-Taylor's research activities. All of the proposed submersible work will occur in the aphotic zone beneath the photocline where light does not penetrate.

The submersibles would use steel washer punches for ballast. The punches are approximately 10mm thick, with a high surface area. The punches are made of uncoated low-carbon steel, and washed before use. To land on the seafloor, the submersible pilot drops one round of weights, and when the submersible is ready to return to the surface, the pilot drops a second round of weights. In total, each submersible would drop approximately 300-400 pounds (lbs) of washer punches per dive (150-200 lbs per drop). A 5-gallon bucket of washer punches weighs about 100 lbs. As a result of conducting up to 30 submersible dives, a maximum of 12,000 lbs of steel washer punches would be discharged. Submersible operators would survey their surroundings visually and have access to detailed maps and would avoid sensitive areas, such as coral colonies, when landing and dropping weights. All ballast would be dropped in the aphotic zone. When low-carbon steel ballast corrodes in seawater the process releases iron into the surrounding environment (Lenntech, 1998). The decay rate of steel in seawater varies depending on the type of steel. It would take approximately 5 years for a 10 millimeter-thick piece of steel to corrode in seawater. Actual corrosion rate depends on the salinity, oxygen availability, and temperature of the water (National Association of Corrosion Engineers, 1984).

Up to 100 pounds of seawater may be pumped out or flooded into the hard ballast tanks of the submersibles, depending on the ballasting needs encountered. Under certain conditions, high pressure air may be used in soft ballast tanks to increase the buoyancy of a submersible during the ascent at the end of a dive mission. The soft ballast tanks are open to the environment to avoid rupture due to rapidly expanding air near the surface. The surplus ballast air is released into the surrounding water.

The operator would perform pre-dive and post-dive maintenance checks on each submersible. During these checks, all hydraulic and pressure compensating systems are examined for leaks and potential problems. Any oil leak found on these systems must be addressed prior to the next dive mission to ensure proper operation of the vehicle and thus the safety of observers and crew. No solvents or fuels are used to operate the submersibles. Silicone-based lubricants are used to treat the seals within pressure proof systems on the submersible.

All electrical and hydraulic systems on the manned submersibles are sealed to the environment as intrusion of seawater into any part of these components must be avoided to ensure the safety of submersible observers and crew. All power generation is electrical. The battery systems emit a small amount of hydrogen gas which is released through check valves to avoid pressure build up inside the battery pods.

The submersibles would be launched in the morning in clean condition and remain immersed in seawater during the day. Every evening, each submersible is recovered and rinsed with fresh water to remove residual seawater, which causes corrosion and crystallization issues.

Table 1. UH and HURL Facility Specifications

Facility	Specifications	
Ka‘imikai O Kanaloa	Built: 1979 (Modified 1993) Ownership: State of Hawai‘i Length: 223 ft Beam: 38 ft Draft: 13 ft 6 in Gross Tonnage: 259 Displacement: 1,961 tons Speed: Cruising 10 knots; Full 11 knots; Minimum 1 knot Range: 15,000 nautical miles (nm) (60 days) Fuel Capacity: 101, 000 gallons* Endurance: 50 days (food and fresh water)	
Pisces IV	Length: 20 ft Width: 10 ft 6 in Height: 11 ft Weight: 13 tons Crew: 1 Pilot 2 Observers Life Support: 140 hours for 3 people Max. Operating Depth: 6,500 ft (1981 meters) Power: 2 lead-acid battery systems Duration: 7 - 10 hours Buoyancy Control: seawater, high-pressure air and droppable descent/ascent weights.	
Pisces V	Length: 20' Width: 10' 6" Height: 11' Weight: 13 tons Crew: 1 Pilot 2 Observers Life Support: 140 hours for 3 people Max. Operating Depth: 6,280 ft. (1914 meters) Power: 2 lead-acid battery systems Duration: 7 - 10 hours Buoyancy Control: seawater, high-pressure air and droppable descent/ascent weights.	

Source: HURL, 2007
*Note: The fuel capacity differs from the source specifications sheet because some of the fuel tanks have been converted to water tanks since the specifications were initially posted. S. Winslow, personal communication via email, School of Ocean and Earth Science and Technology (SOEST), 30 August 2009.

NOAA Deep-sea Coral Lander Redeployment

A NOAA deep-sea coral lander would be recovered near Pioneer Bank, have its data retrieved and batteries replaced at the surface, and redeployed at SE Hancock seamount (outside the regulated PMNM boundary) for a period of approximately one year (October 2016 – October 2017). The footprint of the lander would be 1 meter on each of the four sides. The lander would contain CTD, oxygen, chlorophyll, turbidity, current velocity and direction, a sediment trap, as well as settling plates to enable larval recruitment to occur during the one year deployment. A deep marker beacon would be attached to the lander to allow researchers to locate the lander upon recovery. Weights and floatation devices would also be attached to the lander to ensure the lander stays in place during the duration of its deployment as well as successful recovery. Prior to launch, researchers would review previously taken photos of the site to determine the appropriate site upon which to deploy the lander ensuring avoidance of deep sea coral colonies and maximum protection of the seafloor habitat. The lander would be deployed from the ship and placed on the seafloor using a weight tension release system and winch. During recovery of the lander the release system would be activated to free the lander unit from the weights allowing the unit to float to the surface. Recovery would be conducted during future operations, approximately a year from research permit and conservation and management permit issuance.

Each component of the lander and attached instruments are described below.

Lander & acoustic release

The lander would include approximately 9 glass spheres with plastic hardhats or syntactic foam used as a floatation device. The frame is constructed using aluminum piping and is square shaped and 1 m in length all sides. One steel plate, identical to the AUV *Sentry* ascent weight, which was previously analyzed in the EA for PMNM dated October 2014, would be used and ballasted on the seafloor upon ascent and recover of the lander.

The weight is composed of:

- 4x Alvin plates
- 1x galvanized steel eyebolt with shoulder and nut: 3.25” x ½” - 13 thread
- 1x stainless steel shackle: ¼”
- 1x galvanized steel washer: ½”
- 1x wire rope lanyard: 1/8” in diameter, 12” long, galvanized steel, looped and crimped at both ends

The Deep Marker Beacon Sonardyne Type 7835 is a positioning transponder allows subsea devices to be uniquely acoustically marked for up to 4.5 years. This unit passively listens and can respond to defined frequencies allowing for the determination of the units range and direction. The unit operates at a frequency of 35 to 55 kHz and source levels of 183-186 dB. The *Pisces IV* and *V* will be used to locate the current lander that was deployed in 2015. This device is powered by an Alkaline battery pack (7835-000-01) and the entire device is encased in stainless steel and long term galvanic corrosion is minimized by incorporated zinc anodes.

CTD, Oxygen, Current velocity & direction device

The Seaguard II Platform with a multi-group recorder including four analog and 20 AiCaP sensor inputs with 2 GB SD storage cards and a Lithium battery (7V/35Ah) would be attached to the lander. The four analog sensor inputs are: (1) conductivity and temperature sensor, (2)

Oxygen Optode MkII IW AiCaP smart sensor, (3) Depth AiCAP smart sensor, and (4) WET Labs Environmental Characterization Optics fluorometer (ECO FLNTU) would be plugged directly into Seaguard II Platform housing. This instrument serves as a data logger and power source for a series of smart sensors that are connected directly or by cable to the Seaguard II Platform housing, of which is connected directly to the lander.

A deepwater DCPS 600 kHz 3D Broadband acoustic doppler current profiler sensor would be part of the Seaguard II Platform. This acoustic profiler operates at a frequency of 600 kHz with ping rates of up to 10 Hz. Acoustic measurements would occur every 4-6 hours with short periods of pings lasting less than three minutes per occurrence. When the doppler recorder is not in use, it would be in sleep mode and no noise emission would occur. The entire system is encased in Titanium and stainless steel to minimize leakage and corrosion.

Larval Recruiting Panels

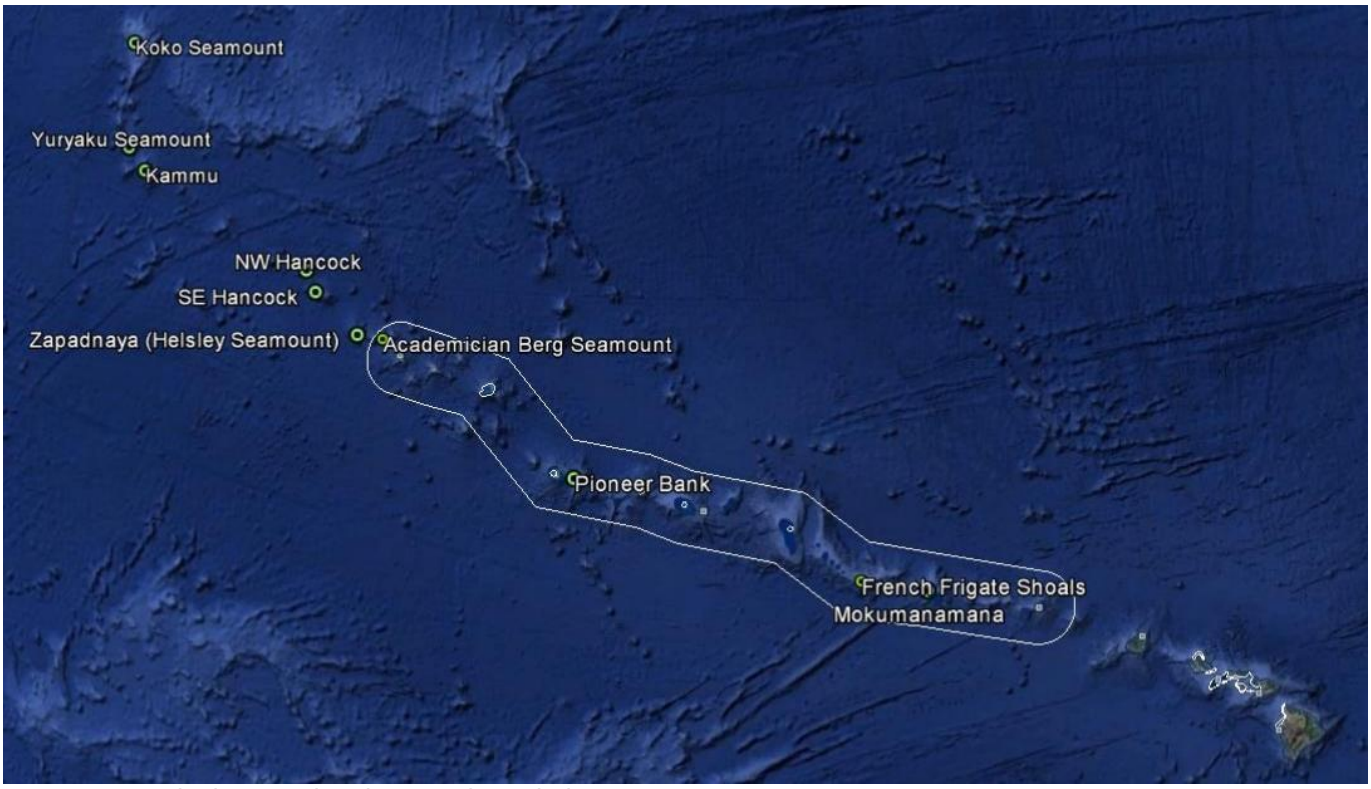
These settlement frames are composed of a frame (35 x 35 x 35 cm) made of plastic (3 cm diameter) with mild steel feet (to enable welding). Each frame has nine blocks made of 3 different materials (plastic, carbonate (stone) and green scrubby) and each block measures either 4 x 4 x 4 or 5.6 x 5.6 x 5.6 cm, secured to the frame using a nylon threaded rod and nylon nuts. A block of wood slats (5 x 3 x 20 cm) is attached lengthwise onto a side of the frame using a nylon rod. The different materials represent the different type of habitats (e.g., carbonate rocks) or structures (plastics) that larvae may recruit to.

Collection of Biological Specimens

Collections will be conducted using the manipulators/mechanical arm of the *Pisces IV* and *V* submersibles . The types of specimens and amounts to be collected were described and analyzed in the supplemental EA completed in August 2016 (pages 6 - 8; and pages 16 - 17). These impacts are not expected to change with the use of the *Pisces IV* and *V* submersibles in place of the ROV *Jason*, and therefore, are not further discussed in this document.

Project Locations

Figure 1: Project Locations Map*



*Map depicts regulated PMNM boundaries.

Table 2: Project Location Coordinates

Feature Name	Lat N	Long E/W	*Last Year Trawled	Coral Observations
Koko	35 15.0	171 35.0	Ong	Yes
Yuryaku	32 40.2	172 16.2	Ong	Yes
Kammu	32 10.0	173 00.0	Ong	Yes
NW Hancock	30 16.2	178 43.2	1986 - ong	Yes
SE Hancock	29 47.4	179 04.2	1986	Yes
Zapadnaya	28 54.0	-179 36.0	1977	Yes
Academician Berg	28 51.0	-178 52.0	Never	Yes
Pioneer Bank	26 00.0	-173 26.0	Never	Yes
Mokumanamana	23 12.9	-164 11.5	Never	Yes
French Frigate Shoals	23 41.3	-166 21.9	Never	Yes

*All positions from SBN earthref.org. *NOAA Report (2008), ong = ongoing.

2.2 Alternative 2 - No Action Alternative

Under the No Action alternative, the permits would not be issued and the project activities, including R/V *KOK* vessel operations, *Pisces IV* and *V* submersible operations, lander recovery and specimen collection would not occur. As a result, the lander would not be redeployed, and the analysis of the effects discussed in Chapter 4 are expected to remain the same as those analyzed as the August 2016 SEA no action alternative.

A conservation and management permit denial would be based on an applicant's inability to meet the Findings as defined in PMNM regulations 50 CFR Part 404.11, for the proposed action. Per PMNM regulations, to issue a permit, an applicant must provide information to demonstrate the following: (1) the activity can be conducted with adequate safeguards for the resources and ecological integrity of the Monument; (2) the activity will be conducted in a manner compatible with the purposes of the Proclamation, considering the extent to which the conduct of the activity may diminish or enhance Monument resources, qualities, and ecological integrity, any indirect, secondary or cumulative effects of the activity, and the duration of such effects; (3) there is no practicable alternative to conducting the activity within the Monument; (4) the end value of the activity outweighs its adverse impacts on Monument resources, qualities, and ecological integrity; (5) the duration of the activity is no longer than necessary to achieve its stated purpose; (6) the applicant is qualified to conduct and complete the activity and mitigate any potential impacts resulting from its conduct; (7) the applicant has adequate financial resources available to conduct and complete the activity and mitigate any potential impacts resulting from its conduct; (8) the methods and procedures proposed by the applicant are appropriate to achieve the proposed activity's goals in relation to their impacts to Monument resources, qualities, and ecological integrity; (9) the applicant's vessel has been outfitted with a mobile transceiver unit approved by NOAA's Office of Law Enforcement (OLE) and complies with the requirements of 50 CFR Part 404.5; and (10) there are no other factors that would make the issuance of a permit for the activity inappropriate.

Under this alternative, the activity described in this document would not be carried out within the regulated PMNM boundary or sites external to that boundary. As a result, no additional scientific information would be collected, no new and potentially beneficial knowledge on NWHI ecology would be gained, and the lander would remain on the seafloor.

3.0 AFFECTED ENVIRONMENT

3.1 Overview

The proposed activities have the potential to impact marine biological resources, cultural resources, physical conditions (water and air quality), solid waste, marine traffic, and hazardous and regulated materials. The affected environment sections of both the original EA of 2014 (pages 3-1 through 3-9),the SEA of 2015 (pages 3-1 through 3-5) and the SEA of August 2016 (pages 11-12) describe, in detail, resources that have the potential to be impacted as a result of the proposed conservation and management activities.

As discussed above, of the ten site locations that would be affected by the proposed action, all locations were previously discussed and analyzed within the original EA for Deep-water research in the Northwestern Hawaiian Islands, dated October 2014 and the subsequent SEAs dated September 2015 and August 2016. Specifically, the 2014 document discussed multibeam mapping, acoustic impacts, AUV activities, and water sampling at the following site locations: Koko, Yurayaku, Kammu, NW Hancock, SE Hancock, Zapadnaya, Pioneer Bank, W Northampton, and E Northampton. The 2015 document discussed potential impacts of proposed research activities at the following site locations: Academician Berg and Mokumanamana. The August 2016 SEA discussed potential impacts of proposed activities within Federal waters around French Frigate Shoals.

The proposed vessel support operations using the R/V *KOK* and *Pisces IV* and *V* submersibles, and redeployment of the lander are newly proposed activities and are described below.

3.1.1 Marine Biological Resources

<u>Deep Water Corals and Sponges</u>

Submersible surveys at Pioneer Bank and two unnamed seamounts, one east of Laysan Island and the other east of Mokumanamana, established the presence of various substrate types, deposited when these geologic features were at sea level (Smith et al. 2004). Some areas displayed dense communities of corals and sponges at depths approaching 1,000 fathoms (6,000 feet, or 1.8 kilometers). Furthermore, tropical species, species with cold-temperature affinities, and species with disjunctive distributions make up the deep water marine ecosystem (McDermid and Abbott 2004).

The 10 sites for the proposed activities are comprised of soft bottom substrate. Large precious corals, such as gold, pink and black corals, are found within the target depth range of this research activity, however, are primarily found on rocky substrate such as submerged banks. Soft bottoms such as the areas targeted for deployment of the lander and its associated ballast discharge upon ascent do not have a suitable surface for the coral to attach to (NOAA, 2006; Drazen, personal communication, May 31, 2007). The bottom habitat surrounding the project drop areas are inhabited by invertebrate fauna, burrowing fish, and bottom-dwelling fish.

Other potentially affected marine biological resources, including banks and seamounts, coral reefs, bottomfish and seabirds, were previously discussed and analyzed for potential impacts in the original EA dated 2014 (pages 3-4 - 3-7). All of the above described species are highly migratory in nature and are known to exist throughout the Monument and beyond and therefore are not further analyzed in this document.

Marine Mammals & Endangered Species

Marine mammals and endangered species are found throughout the project area. The original EA completed in 2014 for Phase I of this research project analyzes in detail the marine mammals and endangered species that may, but are not likely to be significantly impacted by these proposed research activities and therefore are not further discussed throughout this document. For a detailed description of the affected environment for marine mammals and endangered species see pages 3-6 & 3-7 of the Environmental Assessment for Papahānaumokuākea Marine National Monument dated October 2014.

3.1.2 Cultural Resources

There are no known cultural or historical sites situated within the proposed locations described in Table 1 above. A complete analysis of the cultural resources potentially affected by this proposed research can be found in the Environmental Assessment for Papahānaumokuākea Marine National Monument dated October 2014 (pages 3-7 & 3-8).

3.1.3 Physical Conditions

Water & Air Quality

The Environmental Assessment for Papahānaumokuākea Marine National Monument dated October 2014 (pages 3-8) described the water and air resources potentially impacted by the proposed research activities.

3.1.4 Solid Waste

The Environmental Assessment for Papahānaumokuākea Marine National Monument dated October 2014 (pages 3-8) described the solid waste resources impacted as a result of the proposed research activities.

3.1.5 Marine Traffic

The Environmental Assessment for Papahānaumokuākea Marine National Monument dated October 2014 (pages 3-9) described the marine traffic potentially impacted as a result of the proposed research activities.

3.1.6 Hazardous and Regulated Materials

The Environmental Assessment for Papahānaumokuākea Marine National Monument dated October 2014 (pages 3-9) described the potential for hazardous and regulated materials to impacted the environment as a result of the proposed research activities.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Overview

This chapter evaluates and summarizes the potential environmental consequences to environmental resources associated with implementation of the Preferred Alternative (Alternative 1) and the No Action Alternatives (Alternative 2). Table 2 summarizes the anticipated environmental effects of the Preferred Alternative and the No Action Alternatives.

Table 2: Summary of Anticipated Environmental Effects of the Preferred Alternative and No Action Alternative

Resource Category	Preferred Alternative	No Action Alternative
Marine Biological Resources	No significant adverse impact to marine biological resources is expected, due to implementation of Best Management Practices (BMPs). If any endangered monk seals or sea turtles are observed, or enter the project area at any time, in-water work would be stopped until they leave the area.	Negligible beneficial effects on recruitment on the Lander that would be left.
Cultural Resources	No significant adverse impact is expected to cultural resources. If any indication of a culturally or historically significant site is found during project, work would be halted until the proper authorities are notified.	No impact.
Physical Conditions (Water Quality)	No significant impact to water quality as small quantities of steel washer punches (each puncher = 10mm thick) are dropped over an extremely large area, maximum 12,0000 lbs, over approximately 582,578 square miles.	No impact.
Physical Conditions (Air Quality)	No significant impact is expected to air quality by adding one additional research cruise per year. Other than incidental emissions from the R/V *KOK,* no other emission would occur.	No impact.
Solid Waste	No significant impact to solid waste is anticipated with the implementation of mitigations and operating practices as needed.	Lander would be left; corrosion would continue. Impacts would be below significant because of the small

		size and scale of device.
Marine Traffic	No significant impact is anticipated by adding one additional research cruise per year.	No impact.
Hazardous and Regulated Materials	No significant impact. In the event of an oil or toxic chemical spill, vessel crew would follow all established procedures detailed in the USCG approved Shipboard Oil Pollution Emergency Plan and Safety Management Manual. With these mitigation measures in place, no significant impact to resources are likely to occur as a result of the preferred alternative.	No impact

4.2 Preferred Alternative

4.2.1 Marine Biological Resources

Overview:

Impacts to marine biological resources would include the potential for direct contact with deep water corals during submersible operations or emergency anchoring, and impacts associated with potential alien and introduced species, mapping the seafloor prior to submersible launch, and redeployment of a lander. Specific protocols (explained in detail below) would be followed to reduce or eliminate the potential impact to these resources. In addition, proposed multi-beam mapping activities and R/V *KOK* vessel operations may temporarily disturb marine mammals and sea turtles, however, protocols are in place (i.e. continuous monitoring for protected species, vessel stop distance from protected species while conducting mapping operations, etc.) to reduce impacts. As discussed below, none of these potential impacts to affected marine biological resources are expected to be significant.

R/V *KOK* and *Pisces IV* and *V* Submersible Operations

Under the preferred alternative, submersible operators would implement operational practices to minimize any potential to adversely impact the environment or marine biological resources. Such mitigation measures would include avoiding deepwater corals when dropping ballast weights while performing underwater work. Submersible operators would select ballast drop sites where corals are not present. Operators would record Global Positioning System (GPS) coordinates at each drop site and ballast would not be dropped in the same location twice.

Vessel anchoring has the potential to impact the ecosystem depending on several factors, such as size of the ship or vessel, anchor system, weather conditions, and the location and vicinity of the anchorage relative to sensitive ecosystems (e.g. coral reefs). Anchors and chains can destroy coral and live rock affecting fishes, other benthic organisms and their habitat. The R/V *KOK* would not drop anchor within PMNM, except in emergency situations. In the unlikely event of an emergency situation requiring anchoring, efforts would be made to drop anchor in areas relatively free of coral.

Alien and introduced species are often spread through ballast water that has been discharged from ships as vessels transit ocean areas. In response to national concerns regarding invasive species, the National Invasive Species Act of 1996 was enacted which reauthorized and amended the Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990. In order to adhere to these policies and eliminate the introduction of any species via ballast water, the *R/V KOK* would use fresh potable water for ballast. In addition, a careful washing and disinfecting regimen for the *KOK* and *Pisces* submersibles would be followed to avoid the spread of invasive species. With proper attention to these guidelines, the preferred alternative would not be expected to introduce or contribute to the spread of alien species.

In addition, there is no research that indicates the type of multibeam system that R/V *KOK* operates is harmful to marine mammals. Similar, if not identical multibeam systems are utilized onboard many research vessels (e.g., *Falkor, Sikuliaq, Okeanos Explorer, Hi'ialakai, and Oscar Elton Sette)*, all of which have recently transited to the Monument in support of various research projects and activities. During each cruise on which multibeam systems are powered on and operational, observers were placed onboard each vessel prior to embarking for the NWHI to notify the ship captain and crew of the presence of marine mammals and cetaceans and document behavior during each siting.

The *KOK* is equipped with a SeaBeam 3012 multibeam sonar bathymetric system. The SeaBeam system uses active sonar to map the depth and contours of the sea floor (bathymetry). The system sends a focused pulse of sound (ping) straight down and listens for the reflected echo off 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. Power, amplitude, pulse width, and ping rate vary depending on the depths of the ocean in the area being mapped. The SeaBeam uses a frequency of 12 kilohertz and a maximum power of 30 kilowatts for deep ocean mapping pinging every 1-25 seconds. The source level on the maximum response axis is 231 decibels (dB) re 1 micropascal (uPa) at one meter. In practice, due to slight mismatches between the amplifier and the projectors, the power levels in actual systems are usually 1-2 dB lower than the specified number which is based on an ideal match. The beam pattern is a vertically focused narrow beam system with 2x2 degree beams.

The hearing range of baleen whales is within the operating frequency of the SeaBeam 3012. However, throughout the project and while R/V *KOK*'s multibeam system is turned on, active observers would be on watch for marine mammals, whales, dolphins and sea turtle encounters. If species are present within 200 meters of the ship, the vessel would stop until the animals depart the area but the mapping sonar would continue transmitting. The observers would document cetacean encounters using observer program data sheets and protocols. If the systems are shut down for any reason, such as turning off the multibeam system during an extensive area of shallow water mapping, the multibeam soft start mode – a delay function, starting sonar transmissions at a low output level and gradually increasing - would be used to minimize any impact on cetaceans. Therefore, the implementation of these BMPs are expected to reduce impacts to marine mammals. We anticipate that impacts would be below significant.

Endangered species including monk seals and sea turtles may be seen during vessel operation activities within PMNM and the surrounding areas. However, before any in-water work is to commence, personnel aboard R/V *KOK* would perform a visual scan of the adjacent areas to locate any endangered species. If an endangered species is observed, or if any such species enters the project area at any time, all in-water activities would be stopped until all endangered species leave the area. Activities that would take place as a result of the preferred alternative

would not occur within, near, or adjacent to any known breeding or nesting areas of endangered species.

Lander Redeployment

Under this preferred alternative, during the redeployment of the lander with additional instrumentation attached, operators would implement operational practices to minimize any potential to adversely impact the environment or marine biological resources. Implementation of these operational practices would be an explicit condition of the permit considered in this preferred alternative.

The lander would descend and be weighted to the seafloor and stay in place for a period of one year prior to recovery. During recovery, the lander would drop one set of steel plates, identical to those used by the AUV *Sentry* (all AUV *Sentry* weights have been previously described and analyzed for impacts in the Environmental Assessment dated October 2014). To avoid deepwater corals during deployment and recovery of the lander, to the extent possible, operators would select a drop site where corals are not present. R/V *KOK* would not drop anchor except in emergency situations. If an emergency occurs, efforts would be made to drop anchor in areas of sandy substrate.

4.2.2 Cultural Resources

There are no known cultural or historical sites situated within the proposed locations described in Table 1 above, and therefore, no impact to these resources is expected. However, if any indication of a culturally or historically significant site is found during project activities, work would stop in the surrounding area and coordinates would be recorded and reported to the proper Monument management authorities. In addition, the proposed activities are temporary in nature and would not significantly impact historic or cultural resources, nor interfere with traditional Hawaiian practices.

4.2.3 Physical Conditions

Water Quality & Air Quality

Water Quality:

Under the preferred alternative, the submersibles would drop 300-400 lbs of steel as ballast per dive. With up to 30 dives to be conducted within and outside the Monument to support Dr. Baco-Taylor's research activities, the total amount of steel washer punches dropped as ballast would be 12,000 lbs. The steel punches would not be recovered and would slowly dissolve, adding iron to the water. The amount of iron in seawater varies strongly, and is different in the Atlantic and the Pacific oceans (Lenntech, 1998). According to the Hawaii Undersea Research Laboratory (HURL) Director, the environment where the ballast is likely to be dropped is iron-limited (J.C. Wiltshire, personal communication via email, SOEST, 10 September 2007). The submersibles would drop 150-200 lbs on the initial dive and another 150-200 lbs on the return ascent. Because the submersibles are submerged 7-10 hours, the drop sites for ballast weights would occur in different areas. Most of the submersible work would occur in deeper water below the photocline, and all ballast would be dropped in the aphotic zone. The steel ballast and added nutrients would be spread over a large area (approximately 1 mi^2). Due to the low-light environment, the ballast release would not cause localized phytoplankton blooms.

Marine vessels and their related activities can affect the water quality by discharging sewage or grey water effluent. Sewage discharge can contain bacteria, viruses, or medical wastes that can adversely impact the direct health of humans and wildlife or affect the ecosystem by increasing nutrient concentrations. Grey water is wastewater from sinks, showers, laundry and galleys. It can contain a number of pollutants such as suspended solids, ammonia, nitrogen, phosphates, heavy metals and detergents. All sewage aboard the *KOK* would be treated and the grey water retained until reaching a minimum of three nm from SPA boundaries, where it would then be discharged consistent with the terms of an PMNM permit. For the *Pisces IV* and *V* submersibles, besides the steel ballast discharge, normal operations do not cause any other discharge.

Bilge water collects in the bottom of the ship's hull, and as a result contains fuel, oil, and wastewater from engine and machine operations, including spills and leaks. Regulations for the PMNM, prohibit discharging or depositing any material into PMNM that could injure any resource. Exceptions were made to discharges incidental to vessel operations, such as deck wash, approved marine sanitation device effluent, cooling water, and engine exhaust (50 CFR 404.7(f)).

With these operational practices in place and regulations followed, the proposed action would not be expected to significantly degrade the water quality within PMNM; therefore, no significant impacts to water quality are anticipated as a result of the proposed action.

Under the preferred alternative, the lander would be deployed near Pioneer Bank within PMNM for a period of approximately one year. The footprint of the lander would be 1 meter on each of the four sides (forming a square shape). The lander would contain CTD, oxygen, chlorophyll, turbidity, current velocity and direction, a sediment trap, as well as settling plates to enable larval recruitment to occur during the one year deployment. A deep marker beacon would be attached to the lander to allow researchers to locate the lander for retrieval purposes. Weights and floatation devices would also be attached to the lander to ensure it stays in place for the duration of its deployment and support successful recovery. Upon retrieval, to enable successful ascent of the lander, one dive weight (~48-64 lbs) would be released and remain on the seafloor. The steel dive weight would not be recovered and would slowly dissolve, adding iron to the water. The environment where the weight is likely to be dropped is iron-limited (J. Wiltshire, personal communication via email, SOEST, September 10, 2007). The steel weights and added nutrients would be spread over a large area. Due to the low-light environment the ballast release is not expected cause localized phytoplankton blooms, and as such, significant impacts to water quality are not expected.

Air Quality:

The emissions from the *KOK* diesel engine would have no significant effect on existing air quality within the PMNM because the vessel would only be there temporarily and it is expected that emissions would dissipate quickly. The submersibles are battery-powered and there are no emissions under normal operating conditions. Therefore, no significant adverse impacts to air quality are expected as a result of the proposed action.

4.2.4 Solid Waste

Under the preferred alternative, degradable waste would be discharged at a minimum distance of 12 nm from shore. Degradable waste that might float would be discharged at least 25 nm from shore. All laboratory waste and plastics would be retained on board and properly disposed

of at home port. Adhering to these operational restrictions, the *KOK* would not discharge any non-biodegradable solid waste within PMNM and the surrounding areas.

Pisces IV and *V* Submersibles

Under the preferred alternative, the submersibles would drop 300-400 lbs of steel as ballast per dive. With up to 30 dives to be conducted within and outside PMNM, the maximum amount of steel washer punches dropped as ballast would be 12,000 lbs. The steel punches would not be recovered. The steel that would be used as ballast under the proposed action would have less adverse impact than the traditional lead shot ballast because it dissolves faster and does not release lead into the environment. The steel washer punches are relatively thin (10 mm) with a high surface area which minimizes the time it takes to corrode. During previous visits, anecdotal evidence is that the punches dissolve within 2 years (J.C. Wiltshire, personal communication via email, SOEST, 10 September 2007). The rapid corrosion rate of the ballast material, the small punch size and resultant increased surface area exposed to salt water, and anecdotal observations of researchers visiting areas of prior ballast releases suggest that the punches would not persist in the environment more than 2 years. Therefore, no significant impacts to solid waste are expected to occur as a result of the proposed action.

Lander

Under the preferred alternative, the lander would drop between 48 – 64 lbs of one steel weight upon ascent of the lander during retrieval in 2017. The steel weight would not be recovered. The use of steel ballast would have less adverse impact than the traditional lead ballast because it does not release lead into the environment. Individually, the steel plates are relatively thin (5/8”) with a high surface area which minimizes the time it takes to corrode.

One effort to model the corrosion of mild steel (same as used for the lander) experimentally manipulated five variables (salinity, sulfate, bicarbonates, pH, temperature and dissolved oxygen) whose effects are interrelated (Paul, 2011). The model predicted a corrosion rate of 0.435mm/year which compared very well to field measured corrosion rates of 0.471 mm/year for soft steel in seawater with an average composition of 29.8-34.9 g salinity, 2.4 g/L SO_4^{2-}, and pH 8 (Paul, 2011). A separate study on the corrosion of materials commonly used in constructing artificial reefs found a corrosion rate of 0.3625 mm/year for soft steel in seawater (Chen et al., 2011) while the corrosion rate in Peruvian surface waters was 0.231 mm/year (Farro et al., 2009). Thus a reasonable assumption given the lower oxygen content and temperatures in the affected waters is that corrosion rates of the soft steel plates would be even slower. Due to estimated slow corrosion rates and the size of the steel plates, all plates are expected to remain on the seafloor. The weights are comprised of ordinary carbon steel, which is less toxic than lead and the same type of steel used in vessels often used in shallow waters as artificial reef substrate. Given the vast area the project would survey and the comparatively small footprint of the dive weights, the value of the data obtained from such surveys would outweigh the potential impacts.

A study looking at the environmental impacts of three decommissioned naval vessels used as artificial reefs in Australian waters found some metal (Aluminum (Al) and Iron (Fe)) enrichment of the sediments in the immediate vicinity of the ships but also concluded that the scuttling of the ships had no adverse environmental impacts on the sediments and that the small enrichments levels are unlikely to significantly impact marine life in the foreseeable future (MacLeod et al., 2004). Given these results for large ships and that this same type of ship steel is used to create numerous successful artificial reefs, a reasonable assumption is that the slow

corrosion of the soft steel plates would not have any adverse impact on the environment. Therefore, no significant impacts to solid waste are expected to occur as a result of the Proposed Action.

Comparing the two types of ballast between the submersibles and lander, the steel water punches used for *Pisces IV* and *V* would corrode at a faster rate than the steel plates used to secure the lander. Notwithstanding these different rates of corrosion, neither type of ballast, as noted above, is expected to have significant impacts to solid waste because of the relatively small amount of deposited material which is expected to dissolve over time.

4.2.5 Marine Traffic

Vessel operations and its impacts to marine traffic were previously analyzed in prior environmental assessment documents (original EA dated October 2014 (pages 4-4) and subsequent SEA dated September 2015 (pages 4-6) and in both instances the impacts were considered less than significant. On average, less than 10 vessels are permitted to operate annually in the Monument, resulting in very little marine traffic within the Monument. In addition, the site locations northwest of the Monument are further in distance and remoteness than the NWHIs from the Main Hawaiian Islands (1,961 nm distance) and over 3,000 nm from Japan. The site locations' remoteness helps to ensure that marine traffic remains limited in the action area and operations in support of the proposed research activities would not significantly impact the already limited marine traffic throughout the action area.

4.2.6 Hazardous and Regulated Materials

In the unlikely event of an oil or toxic chemical spill, vessel crew would follow all established procedures detailed in the USCG approved Shipboard Oil Pollution Emergency Plan and Safety Management System Manual. With these mitigation measures in place, no significant impact to resources are likely to occur as a result of the proposed action. In addition, impacts as a result of hazardous or regulated materials were previously analyzed in prior environmental assessment documents (original EA dated October 2014 (pages 4-4) and subsequent SEA dated September 2015 (pages 4-6).

4.3 No Action Alternative

The impacts as a result of employing the No Action Alternative were previously analyzed in the original EA dated October 2014 and subsequent EA dated September 2015. Because Phase I of this project has been completed in the action area, not issuing the requested permits would pose significant delays and possibly cancellation of the second half of this research project (e.g., Phase II).

4.4 Cumulative Impacts

Cumulative impacts to environmental resources result from incremental effects of the proposed activities evaluated in conjunction with the effects of other government and private past, present and reasonably foreseeable actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

Cumulative impacts were previously analyzed in the EA for PMNM dated October 2014 and subsequently in the accompanying SEAs dated September 2015 and August 2016. changed.

The following analysis is based on the vessel support operations using the R/V *KOK* and *Pisces* submersibles and redeployment of the lander..

Marine Biological Resources

On average, 17 research expeditions are conducted in the Northwestern Hawaiian Islands each year and no significant impact to biological resources have been found. Based on this previous data, no significant adverse marine biological impacts are anticipated because this is the only research cruise that has proposed to conduct deep sea research at the previously mentioned 10 seamount/underwater bank sites. From 2009 – 2016, 26 research expeditions targeted depths within the range of 200 - 700 m have occurred in PMNM. The majority of marine research activities occur at depths of <30 m. Therefore, the limited nature of deep sea research in the area, combined with the operational safeguards detailed above, indicate that the Proposed Action would not result in cumulative impacts.

In addition, submersible research and deep sea work have been permitted and conducted in the past within PMNM. These earlier proposed actions were permitted and conducted by HURL and UH Marine Center in 2007, 2009 and 2011 in separate locations, which resulted in no observable negative impacts to the environment. Therefore, it is anticipated that the proposed action would likewise not result in measurable cumulative effects to marine biological resources.

Finally, the proposed action to deploy a lander with specific instrumentation to collect data over the course of one year was previously permitted once (permit no. PMNM-2015-028) in PMNM. The steel weight proposed to be left on the seafloor as a result of the proposed action would be one steel plate ranging in weight from 48 – 64 lbs. Due to the weight and size of the steel weight under the proposed action and the vast scale of the Monument, the Proposed Action would not significantly impact marine biological resources.

Cultural Resources

Locations of underwater work would occur at depths ranging from 200 – 700 m. These underwater areas are not known to contain culturally or historically significant sites. In addition, the preferred alternative is temporary in nature and would not be expected to significantly impact historic or cultural resources, nor interfere with traditional Hawaiian practices. Therefore, no cumulative impacts to cultural resources are anticipated as a result of the preferred alternative.

5.0 ENVIRONMENTAL PERMITS, APPROVALS, AND COMPLIANCE

5.1 Permits

The University of Hawaii Marine Center and SOEST submitted a conservation and management permit application(PMNM-2016-021) to conduct vessel support operations using the R/V *KOK* and *Pisces* submersibles.

The Florida State University submitted a research permit application to conduct Phase II of its research project and conduct specimen collections and retrieval of the lander in the Monument. This research would be supported by the University of Hawai'i Marine Center pursuant to the conservation and management permit discussed above.

No other permits are required for these activities, as the activities contained herein are not expected to result in incidental disturbance or take of Hawaiian monk seals, cetaceans or other protected resources.

5.2 Other Laws and Authorities Considered

Magnuson-Stevens Fishery Conservation and Management Act

Targeted coral and sponge species are found within the target depth range of this research activity and attach and grow on exposed, hard-bottom substrate (Tooker, et al 2005). Although the R/V *KOK and Pisces IV and V submersibles* will transit through other areas of the marine environment, the majority of any impacts from the proposed action would be expected at the bottom habitats of the research sites. Soft bottoms such as the areas targeted for deployment of the lander, and *Pisces* submersibles ballast discharge do not have a suitable surface for the target species to attach (NOAA, 2006; Drazen, personal communication, May 31, 2007). The bottom habitat surrounding the project drop areas, however, may be inhabited by invertebrate fauna, burrowing fish, and bottom-dwelling fish. The aspects of the proposed action with the potential to affect this bottom habitat are the vehicle ballast discharge of the *Pisces* submersibles.. To evaluate compliance with Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat (EFH) protections, on September 27, 2016, ONMS initiated informal consultation with NMFS to identify any potential impacts to EFH from the proposed action. On September 27, 2016, NMFS concurred with ONMS' conclusion that due to the limited scope of the proposed action, no adverse impacts to EFH are anticipated. Also, cumulative impacts are not expected as a result of the proposed activities because a vast amount of similar habitat lies within and outside of the regulated PMNM boundary.

Endangered Species Act

On July 25, 2016, PMNM initiated an informal consultation with NMFS Pacific Islands Regional Office (PIRO) on the operation of the ROV *Jason*, specimen collection, and conducting multibeam mapping operations aboard the R/V *Kilo Moana*.

The National Marine Fisheries Service (NMFS) has determined that these activities would not adversely affect Hawaiian Monk Seals (*Monachus schauinslandi*), green sea turtles (*Chelonia mydas*), hawksbill sea turtles (*Eretmochelys imbricata*), North Pacific distinct population segment of loggerhead sea turtles (*Caretta caretta*), olive ridley sea turtles (*Lepidochelys olivacea*), leatherback sea turtles (*Dermochelys coriacea*), Main Hawaiian Islands false killer whale distinct population segment (*Pseudorca crassidens*), humpback whales (*Megaptera novaeangliae*), sperm whales (*Physeter macrocephalus*), fin whales (*Balaenoptera physalus*), blue whales (*Balaenoptera musculus*), sei whales (*Balaenoptera borealis*), and north pacific right whales (*Eubalaena japonica*). The analyzed activities would take place greater than 3nm from shore at a depth range of 200 - 700m. As described in previous EA documents, staff aboard the R/V *Kilo Moana* would maintain a rotation of staff that would serve as observers aboard the vessel during research operations. In particular, observer staff would look for the presence of endangered or threatened marine species to ensure minimal to no disturbance or interaction with such species. Should a protected species be sited within 100 feet of the vessel during operations, to the extent practicable, the vessel would slow and stop if necessary until the animal left the area.

In the analysis, NMFS PIRO concurred with the determination by ONMS PMNM that the proposed activities may affect, but are not likely to adversely affect ESA-listed marine species or

designated critical habitat. NMFS' concurrence was received on August 12, 2016 and was based on the finding that the effects of the proposed activities are expected to be insignificant, discountable, or beneficial as defined in the joint USFWS-NMFS Endangered Species Consultation Handbook (NMFS & USFWS 1998).

The new proposed activities to use the R/V *KOK* and *Pisces* submersibles do not require a re-initiation of Section 7 consultation as these actions would not change any of the effects originally analyzed and would reduce impacts as a result of the *Pisces* submersibles being untethered vehicles which would eliminate the risk of entanglement.

National Historic Preservation Act (NHPA)

Under the provisions of Section 106 of the National Historic Preservation Act of 1966, the Secretary of the Interior has compiled a national register of sites and buildings of significant importance to America's history. Sites in the NWHI include cultural sites on Nihoa Island and Mokumanamana Island, and historic sites on Midway Atoll. The proposed activities would not be expected to cause any negative impacts to known historic properties, including registered sites or buildings on shore or any such submerged site, such as shipwrecks, because activities would not be conducted within the vicinity of known historic resources, therefore formal consultation with the State of Hawaii, Historic Preservation Office was not required.

Marine Mammal Protection Act

The Marine Mammal Protection Act authorizes NMFS to take measures to protect marine mammals that may involve setting aside habitat required by various life stages, although the chief provision is the prohibition of "taking" marine mammals directly or indirectly. None of the activities proposed herein should directly or indirectly result in interactions with monk seals or other protected marine mammals such as dolphins or whales. While there is a very remote chance of the vessel colliding with a marine species during operations, the vessel and research permittees are required to follow all applicable Monument Best Management Practices (such as BMP #4: BMP for Boat Operations and Diving Activities; included as part of Appendix C: PMNM Best Management Practices) and, in doing so, would further minimize the already remote chance of a collision with a marine mammal. Furthermore, during Phase I of the project, permittees were required to have someone on watch at all times during multi-beam operations to watch for marine mammals in the vicinity of the vessel. Should a marine mammal appear to be within 100 yards of the vessel, the vessel would be required to cease activities until the nearby marine mammal left the area, which would further less the likelihood of a marine mammal take. This mitigation measure would also be required as part of Phase II of the project. Because we do not expect adverse effects to marine mammals an MMPA authorization was not sought.

Executive Order 12898 on Environmental Justice

Consistent with the President's Executive Order on Environmental Justice (February 11, 1994) and the Department of Commerce's Environmental Justice Strategy, the proposed research activities would not have any disproportionately high and adverse human health or environmental effects on minority or low income populations, because of the remote location of the target research sites.

Executive Order 12866

Implementation of the activities herein described does not constitute a “significant regulatory action” as defined by Executive Order 12866 because (1) it would not have an annual effect on the economy of $100 million or more, or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities; (2) it would not create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; (3) it would not materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; and (4) it would not raise novel legal or policy issues arising out of legal mandates, the President’s priorities, or the principles set forth in the Executive Order.

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8.0 APPENDICES

Appendix A: Environmental Assessment for Papahānaumokuākea Marine National Monument dated October 2014

Appendix B: Supplemental Environmental Assessment for Deep Sea Research within the Northwestern Hawaiian Islands dated September 2015

Appendix C: Supplemental Environmental Assessment for Phase II of Deep Sea Research within the Northwestern Hawaiian Islands dated August 2016

Appendix D: PMNM Best Management Practices relevant to proposed research

Appendix F: FONSI

Appendix G: Decision Memo

Appendix H: Permits