State of Hawai'i
DEPARTMENT OF LAND AND NATURAL RESOURCES
Division of Aquatic Resources
Honolulu, Hawai'i 96813

April 10, 2015

Board of Land and Natural Resources
Honolulu, Hawai'i

Request for Authorization and Approval to Issue a Papahānaumokuākea Marine National Monument Research Permit to Drs. Christopher Winn and Samuel Kahng, Hawai'i Pacific University, for Access to State Waters to Conduct Seawater Carbon Research Activities

The Division of Aquatic Resources (DAR) hereby submits a request for your authorization and approval for issuance of a Papahānaumokuākea Marine National Monument research permit to Drs. Christopher Winn and Samuel Kahng, Associate Professors, Hawai'i Pacific University, pursuant to § 187A-6, Hawai'i Revised Statutes (HRS), chapter13-60.5, Hawai'i Administrative Rules (HAR), and all other applicable laws and regulations.

The research permit, as described below, would allow entry and activities to occur in Papahānaumokuākea Marine National Monument including the NWHI State Marine Refuge and the waters (0-3 nautical miles) surrounding the following sites:

- Nīhoa Island
- Mokumanamana (Necker Is.)
- French Frigate Shoals
- Gardner Pinnacles
- Maro Reef
- Laysan Island
- Lisianski Island, Neva Shoal
- Pearl and Hermes Atoll
- Midway Atoll
- Kure Atoll

The activities covered under this permit would occur between May 1, 2015 and April 30, 2016.

The Applicants and the proposed seawater sampling activities are largely a renewal of work previously permitted and conducted in the Monument.

INTENDED ACTIVITIES

Dr. Christopher Winn and Dr. Samuel Kahng (Applicants) propose to conduct activities to study changes in coral reef metabolism in response to ocean acidification. Up to five (5) individuals

(including the Applicants) would conduct proposed activities and access the Monument via a separately permitted vessel (Applicants currently collaborating with NOAA Ship *Okeanos Explorer, PMNM-2015-025 in review*) during the 2015 summer field season. Proposed activity locations include marine areas (near shore and out to 15 kilometers) of Maro Reef and each island/atoll within Papahānaumokuākea (Nīhoa Island, Mokumanamana (Necker) Island, French Frigate Shoals, Gardner Pinnacles, Laysan Island, Lisianski Island, Pearl and Hermes Atoll, Midway Atoll and Kure Atoll). Activities would not involve land access (see Applicant responses to scientific review questions # 8 and #9).

The project would consist of the following activities: collecting no more than 14 gallons of seawater manually using a clean bucket in near-shore areas or via shipboard Conductivity-Temperature-Density (CTD) casts in deep water (each sub-sample would consist of 250 mL of seawater fixed with one drop (100 microliters) of a saturated mercuric chloride solution); taking salinity and temperature measurements of each sub-sample using a YSI hand-held instrument; conducting shipboard CTD casts; and measuring sea surface current direction and speed using either a drifter drogue, temporary deployment of an Acoustic Doppler Current Profiler (ADCP); or discharging a fluorescent dye (fluorescein disodium salt).

The drifter drogue consists of a surface buoy that is attached to a subsurface drogue with a thin rope (see Appendix 1 for diagram and photo). The subsurface drogue is made of a thin wire frame with a tarp material connecting the wires, designed similar to a kite to catch the subsurface current. The greater subsurface surface area allows the primary force moving the drifter drogue to be the subsurface water current. The drifter drogue would be deployed with a global positioning device (GPS) attached and followed from a tender vessel approximately 10 feet away for 30 - 60 minutes. The path would be tracked on the GPS unit which would be used to determine the average subsurface water current speed and direction. This measurement would be taken once each day to determine the residence time of water at the sampling site.

The ADCP is an oceanographic instrument with approximate dimensions of 0.25 m. x 0.25 m. x 0.25 m. and is used to measure small scale currents and the speed and direction water is moving across the entire water column. The ADCP would be set approximately 10 meters away from the nearshore sampling location and lowered manually from a tender vessel in approximately 5 – 20 meters depth. The ADCP would be mounted on a weighted tripod frame approximately 2.5 feet in diameter and 3 feet high and altogether would weigh approximately 40 lbs. At the base of each leg of the tripod, a circular metal "foot" about 4 inches in diameter would rest on the seafloor. The weighted frame would be connected by a line to a small surface marker buoy in order to relocate and retrieve. The ADCP would be deployed only on sandy bottom for no longer than 72 hours at a site.

The fluorescent tracer dye (fluorescein disodium salt) is less toxic than sodium chloride (common table salt that is regularly ingested) and will also be used to analyze the directionality and speed of the surface seawater current. A small amount of dye (10 grams) would be released on the surface of the seawater which will fluoresce at 494 nm and 521 nm which would be recorded with a camera capable of detecting ultraviolet light. No more than 300 grams total of fluorescein disodium salt would be used.

The proposed project would improve understanding of the seawater carbonate chemistry of the waters surrounding the islands and atolls of the Monument. The activity would study changes in coral reef metabolism in response to ocean acidification within the Monument and continue long-term ocean acidification monitoring. The activity would directly support the Monument Management Plan (MMP) Marine Conservation Science Action Plan Strategy MCS-1: Continue and enhance research, characterization and monitoring of marine ecosystems (PMNM MMP Vol. I, p. 122).

The proposed activities are in direct support of the Monument Management Plan's (MMP) priority management needs through 3.1.1 – Marine Conservation Science Action Plan (Strategy MCS-1: Continuing to enhance research, characterization and monitoring of marine ecosystems for the life of the plan). Strategy MCS-1 focuses on "continuing marine research, characterization, and monitoring designed to support an ecosystem-based approach to protection and management". The proposed project fits into this Strategy because it would improve the understanding of seawater carbonate chemistry of the water surrounding the islands and atolls of the Monument. This study would characterize the carbon system dynamics within the Monument and continue long-term ocean acidification monitoring.

The activities described above may require the following regulated activities to occur in State waters:

- ☒ Removing, moving, taking, harvesting, possessing, injuring, disturbing, or damaging any living or nonliving monument resource
- ☒ Drilling into, dredging, or otherwise altering the submerged lands other than by anchoring a vessel; or constructing, placing, or abandoning any structure, material, or other matter on the submerged lands
- ☒ Discharging or depositing any material or matter into the Monument
- ☒ Swimming, snorkeling, or closed or open circuit SCUBA diving within any Special Preservation Area or Midway Atoll Special Management Area

REVIEW PROCESS:

The permit application was sent out for review and comment to the following scientific and cultural entities: Hawai'i Division of Aquatic Resources, Hawai'i Division of Forestry and Wildlife, Papahānaumokuākea Marine National Monument (NOAA/NOS), NOAA Pacific Islands Regional Office (NOAA-PIRO), United States Fish and Wildlife Service Hawaiian and Pacific Islands National Wildlife Refuge Complex Office, and the Office of Hawaiian Affairs (OHA). In addition, the permit application has been posted on the Monument Web site since October 9, 2014, giving the public an opportunity to comment. The application was posted within 40 days of its receipt, in accordance with the Monument's Public Notification Policy.

Comments received from the scientific community are summarized as follows:

QUESTIONS:

1. *Is this the first time this study is being attempted in PMNM?*

The Applicant states: no, CTD and discrete water samples have been taken in the nearshore waters of the NWHI in past studies by HPU. This is the first time data will be collected using ADCP, drifter drogues, and fluorescein dye.

2. *Is the plan to repeat this activity in the future? How many times or at what time interval (annual, every 2 yrs, etc.)?*

   The Applicants anticipate continuing to make these measurements for the foreseeable future in order to monitor ocean acidification in the monument waters.

3. *How will the ADCP be deployed and retrieved (e.g. SCUBA diver, skin diver, and/or dropping off the side of a tender vessel)?*

   The Applicant responds that the ADCP will be deployed by lowering to the seafloor from a small boat. The method will likely be hand over hand by multiple people on the small boat.

4. *At what depths will the ADCP be deployed?*

   Deployment depths are anticipated to be between 5 and 20 meters.

5. *How will the ADCP be weighted or anchored so it will not be moved by swells, currents, etc.?*

   The ADCP will be mounted on a weighted frame. The tripod frame is about 2.5 feet in diameter and about 3 feet high. At the base of each tripod, a circular metal "foot" about 4 inches in diameter rests on the seafloor. With the ADCP attached, the out-of-water weight for the entire apparatus is about 40 pounds.

6. *How will the ADCP be relocated?*

   The ADCP will be placed on a sandy seafloor in areas where current velocity measurements are needed to interpret the chemical data we will collect. The GPS latitude and longitude will be recorded when the ADCP is deployed and there will be a line that connects the frame of the ADCP to a small buoy that will act as a surface marker. The ADCP will be retrieved using the buoy marker line to pull it back up onto the small boat.

7. *How long will the ADCP be left in place at each sampling location? Will the ADCP be retrieved at the end of sampling at each location?*

   The ADCP will always be removed following our sampling work. We do not anticipate leaving the ADCP on the seafloor for more than 72 hours. The ADCP is an expensive instrument and will be carefully lowered into place, generally on a sandy bottom. It will be carefully recovered following each deployment with minimal stress on the instrument.

The instrument will leave no permanent impact on the reef environment and we don't expect to see any imprints even on the sandy seafloor immediately after recovery.

8. *Would land access require staying on land overnight? If so, please provide more information on which islands; # of nights on land; # of people to stay overnight; and any initial logistical plans made with any partnering agencies (FWS, State, NOAA, etc.).*

   The Applicants state: No. The HPU carbonate chemistry group is not planning an independent trip to the NWHI. HPU's carbonate chemistry group is attempting to join another scientific research cruise to the NWHIs during the summer of 2015. HPU currently has an option to collaborate for research in the NWHI with the NOAA Ship *Okeanos Explorer* team (separate permit application to be submitted). The *Okeanos Explorer* team currently has no plans to access land while in the PMNM.

9. *Would land access require access above the intertidal zone? If so, please explain why.*

   No. The current plan is to enter the PMNM on and remain aboard the NOAA Ship *Okeanos Explorer* (separate permit application, PMNM-2015-025 in review) for the entire stay in PMNM.

COMMENTS / RECOMMENDATIONS:

1. *It is unclear how the totality of the procedures described in the application (nearshore water sampling and current analysis using drogues, ADCP, and/or dye, plus deep-water CTD/water sampling) combine to measure the levels of inorganic and organic metabolism over the coastal reefs to quantify their effects on the inorganic carbon system of coastal waters. Please clarify how the proposed activities will help to monitor coral reef metabolism.*

   The reef metabolism varies throughout the day with respect to normalized alkalinity and DIC (Suzuki et al. 1995; Shamberger et al. 2011; Lantz et al. 2013). The change throughout the day of nTA:nDIC is the slope of the reef metabolism. The slope of the reef metabolism is unique to the reef ecosystem (Suzuki and Kawahata 2002; Lantz et al. 2013). The change in TA to DIC is 2:1 for both precipitation and dissolution in contrast to the change in TA to DIC for photosynthesis and respiration which is 1:1 (Zeebe and Wolf-Gladrow 2001; Zeebe and Ridgwell 2011). The difference in the change the metabolic processes have on the TA: DIC ratio allows for determination of the contribution of each component to the measured reef metabolism (Gattuso et al. 1996; Zeebe and Wolf-Gladrow 2001; Shamberger et al. 2011; Lantz et al. 2013). The chemical changes that are driven by organic and inorganic metabolism are continually diluted by horizontal transport of water over the reef ecosystems. That is to say that the water above the reef ecosystems is constantly replaced by water from the surrounding ocean. In order to accurately measure the impact of the reef ecosystem on the chemical changes we observe, we must quantify the rate at which the water over the reefs is exchanged with the surrounding ocean. We need the current data from the ADCP, the drogues and the dye to measure water exchange with the surrounding ocean. We are requesting

permission to use all three of these approaches because none of these methods will be useful in every circumstance. For example, the ADPC is limited to waters greater than about 5 meters, and provides only eulerian current measurements (i.e., flow past a single location). The drogues are also of limited use in shallow water but provide lagrangian current measurements (i.e., flow patterns through space. The dye may be necessary to provide estimates of current velocity in shallow water or in locations where either the ADCP or drogues measurements are not possible.

2. *If the applicants are to join a cruise onboard a NOAA ship (Oscar Elton Sette or Hi'ialakai) they should be aware that small boats are only deployed and recovered within a regulated time frame (e.g., ~7:30 AM to 4:30 PM), which may impact their temporal proximity to sampling close to sunrise and sunset.*

   Noted

3. *On page 8 in the Procedures/Methods sections, it states, "If the researcher is stationed at an island, the sampler will wade into shallow water...". This is the first mention of a researcher stationed ashore, as well as keeping hazardous chemicals (mercuric chloride) in a storage box ashore. Please provide more information on who these shore-based personnel are, their training in handling mercuric chloride, and land-based chemical storage procedures.*

   The research plan is not yet fully defined. Much of the sampling that has been completed in the past in PMNM has been opportunistic; HPU's directive was not the only goal of the research voyages. The study that is being planned will also be opportunistically executed. If given the opportunity to spend time on an island instead of in a small boat in PMNM our group would like to complete a very similar experiment to the one described to be completed from the small boat but will likely be administered in a shallower reef environment that can be accessed directly from land. All of the personnel that will be collecting the samples have received laboratory chemical safety training and have experience handling mercuric chloride. The land-based chemical storage will be double containment of the mercuric chloride when it is not in use in an area away from any bodies of water that could permit spreading of the chemical if it were to spill accidentally.

4. *The applicants should locate a suitable sandy location for the deployment of the ADCP that is away from coral reefs. To prevent the ADCP from being carried by currents and/or waves during the deployment, the applicants should check the wave forecast for the duration the instrument will be in the water, and ensure that the instrument is properly weighted or secure it with sand spikes if the forecast is calling for rough conditions.*

   Noted

5. *Before each deployment of the drifter drogue, all lines and anchor points should be inspected for wear to ensure that they will hold during the time the drogue is in the water. If any lines or anchor points are frayed or torn these should be replaced before*

deployment. While the drifter drogue is deployed, the researchers should maintain constant surveillance on the instrument, if practicable.

Noted

Comments received from the Native Hawaiian community are summarized as follows:

Cultural reviews support the acceptance of this application. No concerns were raised.

Comments received from the public are summarized as follows:

No comments were received from the public on this application. No concerns were raised.

Additional reviews and permit history:

Are there other relevant/necessary permits or environmental reviews that have or will be issued with regard to this project? (e.g. MMPA, ESA, EA) Yes ☒ No ☐
If so, please list or explain:

- The proposed activities are in compliance with the National Environmental Policy Act.
- The Department has made an exemption determination for this permit in accordance chapter 343, HRS, and Chapter 11-200, HAR. See Attachment ("DECLARATION OF EXEMPTION FROM THE PREPARATION OF AN ENVIRONMENTAL ASSESSMENT UNDER THE AUTHORITY OF CHAPTER 343, HRS AND CHAPTER 11-200 HAR, FOR PAPAHĀNAUMOKUĀKEA MARINE NATIONAL MONUMENT RESEARCH PERMIT TO DRS. CHRISTOPHER WINN AND SAMUEL KAHNG, HAWAI'I PACIFIC UNIVERSITY, FOR ACCESS TO STATE WATERS TO CONDUCT SEAWATER CARBON RESEARCH ACTIVITIES UNDER PERMIT PMNM-2015-05")

Has Applicant been granted a permit from the State in the past? Yes ☒ No ☐
If so, please summarize past permits:

- The applicant was granted permit PMNM-2009-045 in 2009, PMNM-2010-039 in 2010, PMNM-2011-021 in 2011, PMNM-2012-041 in 2012, and PMNM-2013-025 in 2013 to conduct similar work.

Have there been any a) violations: Yes ☐ No ☒
b) Late/incomplete post-activity reports: Yes ☐ No ☒

Are there any other relevant concerns from previous permits? Yes ☐ No ☒

STAFF OPINION:

PMNM staff is of the opinion that Applicant has properly demonstrated valid justifications for his application and should be allowed to enter the NWHI State waters and to conduct the activities therein as specified in the application with certain special instructions and conditions, which are in addition to the Papahānaumokuākea Marine National Monument Research Permit General Conditions. All suggested special conditions have been vetted through the legal counsel of the Co-Trustee agencies (see Recommendation section).

MONUMENT MANAGEMENT BOARD OPINION:

The MMB is of the opinion that the Applicant has met the findings of Presidential Proclamation 8031 and this activity may be conducted subject to completion of all compliance requirements. The MMB concurs with the special conditions recommended by PMNM staff.

RECOMMENDATION:

Based on the attached proposed declaration of exemption prepared by the department after consultation with and advice of those having jurisdiction and expertise for the proposed permit actions:

1. That the Board declare that the actions which are anticipated to be undertaken under this permit will have little or no significant effect on the environment and is therefore exempt from the preparation of an environmental assessment.

2. Upon the finding and adoption of the department's analysis by the Board, that the Board delegate and authorize the Chairperson to sign the declaration of exemption for purposes of recordkeeping requirements of chapter 343, HRS, and chapter 11-200, HAR.

3. That the Board authorize and approve a Research Permit to Drs. Christopher Winn and Samuel Kahng, Hawai'i Pacific University, with the following special conditions:

    a. This permit is not to be used for nor does it authorize the sale of collected organisms. Under this permit, the authorized activities must be for noncommercial purposes not involving the use or sale of any organism, by-products, or materials collected within the Monument for obtaining patent or intellectual property rights.

    b. The permittee may not convey, transfer, or distribute, in any fashion (including, but not limited to, selling, trading, giving, or loaning) any coral, live rock, or organism collected under this permit without the express written permission of the Co-Trustees.

c. To prevent the introduction of disease or the unintended transport of live organisms, the permittee must comply with the disease and transport protocol attached to this permit.

d. Tenders and small vessels must be equipped with engines that meet EPA emissions requirements.

e. Refueling of tenders and all small vessels must be done at the support ships and outside the confines of lagoons or near-shore waters in the State Marine Refuge.

f. If there is any Hawaiian monk seal or any other protected species in the area when performing any permitted activity shall cease until the animal(s) depart the area, except as permitted for specific management of that species

g. No fishing is allowed in State Waters except as authorized under State law for subsistence, traditional, or customary practices by Native Hawaiians.

Respectfully submitted,

Maria Carnevale
State Co-Manager
Papahānaumokuāka Marine National Monument

APPROVED FOR SUBMITTAL

CARTY CHANG
Interim Chairperson

Papahānaumokuākea Marine National Monument

RESEARCH Permit Application

NOTE: ***This Permit Application (and associated Instructions) are to propose activities to be conducted in the Papahānaumokuākea Marine National Monument. The Co-Trustees are required to determine that issuing the requested permit is compatible with the findings of Presidential Proclamation 8031. Within this Application, provide all information that you believe will assist the Co-Trustees in determining how your proposed activities are compatible with the conservation and management of the natural, historic, and cultural resources of the Papahānaumokuākea Marine National Monument (Monument).***

ADDITIONAL IMPORTANT INFORMATION:

- Any or all of the information within this application may be posted to the Monument website informing the public on projects proposed to occur in the Monument.

- In addition to the permit application, the Applicant must either download the Monument Compliance Information Sheet from the Monument website OR request a hard copy from the Monument Permit Coordinator (contact information below). The Monument Compliance Information Sheet must be submitted to the Monument Permit Coordinator after initial application consultation.

- Issuance of a Monument permit is dependent upon the completion and review of the application and Compliance Information Sheet.

INCOMPLETE APPLICATIONS WILL NOT BE CONSIDERED

Send Permit Applications to:
NOAA/Inouye Regional Center
NOS/ONMS/PMNM/Attn: Permit Coordinator
1845 Wasp Blvd, Building 176
Honolulu, HI 96818
nwhipermit@noaa.gov
PHONE: (808) 725-5800 FAX: (808) 455-3093

SUBMITTAL VIA ELECTRONIC MAIL IS PREFERRED BUT NOT REQUIRED. FOR ADDITIONAL SUBMITTAL INSTRUCTIONS, SEE THE LAST PAGE.

Papahānaumokuākea Marine National Monument
Permit Application Cover Sheet

This Permit Application Cover Sheet is intended to provide summary information and status to the public on permit applications for activities proposed to be conducted in the Papahānaumokuākea Marine National Monument. While a permit application has been received, it has not been fully reviewed nor approved by the Monument Management Board to date. The Monument permit process also ensures that all environmental reviews are conducted prior to the issuance of a Monument permit.

Summary Information

Applicant Name: Dr. Christopher Winn and Dr. Samuel E. Kahng
Affiliation: Hawaii Pacific University

Permit Category: Research
Proposed Activity Dates: April 2015 to April 2016
Proposed Method of Entry (Vessel/Plane): Vessel or Plane
Proposed Locations: The details of the research trip are not yet planned, this research trip is opportunistic sampling joining another group's cruise. Potential to visit any of the Northwestern Hawaiian Islands: Kure Atoll, Midway Atoll, Pearl and Hermes Atoll, Lisianski Island, Laysan Island, Maro Reef, Gardner Pinnacles, French Frigate Shoals, Necker Island, and Nihoa Island.

Estimated number of individuals (including Applicant) to be covered under this permit: 5

Estimated number of days in the Monument: 30 days

Description of proposed activities: (complete these sentences):

a.) The proposed activity would…

help Monument managers assess and understand the impact of ocean acidification. We are working to develop a simple chemical method to assess changes in reef metabolism. This proposed research will collect preliminary observations using this new method to monitor coral reef metabolism. When implemented, this approach has the potential to provide managers with a simple and inexpensive procedure to assess the response of coral reef ecosystems to changes in ocean chemistry. A secondary aim of this effort is to measure the levels of inorganic and organic metabolism over the coastal reefs to quantify their effects on the inorganic carbon system of coastal waters. This project aims to examine the spatial gradient of carbonate parameters from the shallow fore-reef (~20 m depth) on the island shelves to the deep open ocean (~500 m depth) to investigate the effect of biological processes on the carbon system throughout the diel cycle. The latitudinal gradient of carbonate parameters along the NWHI island chain will also be assessed with respect to the island mass effect.

b.) To accomplish this activity we would ....
collect water samples at shallow depths (<10m) in the waters inside the atolls and nearshore to the island masses. The procedure involves the collection of water from the nearshore environment as close to sunrise as possible and as close to sunset as possible. Two or three replicate 250 mL subsamples will be collected into Pyrex glass bottles. 100 microliters (about one drop) of a saturated mercuric chloride solution will be added to each bottle and the bottles will be sealed with apeizon grease for transport to our laboratory in Waimanalo, Oahu. The temperature and salinity of the water sample will be measured with a simple hand-held conductivity and temperature meter called a YSI. This sampling method will be conducted in the morning and evening each day for the duration of our time in the PMNM. To better analyze the carbonate chemistry data set surface ocean current data will be measured using a drifter drogue each day of sampling and will be recorded continuously by an ADCP positioned on the sand seafloor adjacent to the sampling location for the duration of sampling. In tandem with the drifter drogue fluorescein disodium salt (fluorescing dye) may be used to determine directionality and speed of surface current. Continuous CTD measurements will be taken from the ship to assess the spatial and temporal gradients of carbonate chemistry parameters surrounding the islands. Discrete water samples will be taken at selected depths during the CTD casts to test in a laboratory setting to verify any trends seen in the CTD data.

c.) This activity would help the Monument by ...
developing a simple method to assess change in reef ecosystems in reponse to changing ocean chemistry. Assessing the island mass effect to determine the spatial gradients effect on the coral reef processes surrounding the coastal waters of the NWHI. Examining the gradients of carbonate parameters from the open ocean to coastal marine habitats is critical for forecasting any future impact of climate change on the coral reef ecosystems of the Papahānaumokuākea Marine National Monument. An additional objective of this project involves developing appropriate standard operating procedures (SOPs) for conducting field sampling and performing analytical laboratory measurements.

Other information or background:

Section A - Applicant Information

1. Applicant

Name (last, first, middle initial): Dr. Christoper D. Winn and Dr. Samuel E. Kahng

Title: Associate Professor of Oceanography

1a. Intended field Principal Investigator (See instructions for more information):
Dr. Christopher D. Winn and Dr. Samuel E. Kahng

2. Mailing address (street/P.O. box, city, state, country, zip): Oceanic Institute
[redacted]

For students, major professor's name, telephone and email address: Not applicable.

3. Affiliation (institution/agency/organization directly related to the proposed project):
Hawaii Pacific University
[redacted]

4. Additional persons to be covered by permit. List all personnel roles and names (if known at time of application) here (e.g. John Doe, Research Diver; Jane Doe, Field Technician):
Ms. Crystal Coughlin, HPU Graduate Student
Mr. Roman Battisti, HPU Graduate Student
HPU Graduate Student to be determined

Section B: Project Information

5a. Project location(s):

		Ocean Based	
☒ Nihoa Island	☒ Land-based	☒ Shallow water	☒ Deep water
☒ Necker Island (Mokumanamana)	☒ Land-based	☒ Shallow water	☒ Deep water
☒ French Frigate Shoals	☒ Land-based	☒ Shallow water	☒ Deep water
☒ Gardner Pinnacles	☒ Land-based	☒ Shallow water	☒ Deep water
☒ Maro Reef			
☒ Laysan Island	☒ Land-based	☒ Shallow water	☒ Deep water
☒ Lisianski Island, Neva Shoal	☒ Land-based	☒ Shallow water	☒ Deep water
☒ Pearl and Hermes Atoll	☒ Land-based	☒ Shallow water	☒ Deep water
☒ Midway Atoll	☒ Land-based	☒ Shallow water	☒ Deep water
☒ Kure Atoll	☒ Land-based	☒ Shallow water	☒ Deep water
☐ Other			

NOTE: There is a fee schedule for people visiting Midway Atoll National Wildlife Refuge via vessel and aircraft.

Location Description:
Sampling will be restricted to shallow surface and subsurface water. We will not be collecting live animals or any other samples except water samples within PMNM.

5b. Check all applicable regulated activities proposed to be conducted in the Monument:

☒ Removing, moving, taking, harvesting, possessing, injuring, disturbing, or damaging any living or nonliving Monument resource

☒ Drilling into, dredging, or otherwise altering the submerged lands other than by anchoring a vessel; or constructing, placing, or abandoning any structure, material, or other matter on the submerged lands

☐ Anchoring a vessel

☐ Deserting a vessel aground, at anchor, or adrift

☒ Discharging or depositing any material or matter into the Monument

☐ Touching coral, living or dead

☐ Possessing fishing gear except when stowed and not available for immediate use during passage without interruption through the Monument

☐ Attracting any living Monument resource

☐ Sustenance fishing (Federal waters only, outside of Special Preservation Areas, Ecological Reserves and Special Management Areas)

☐ Subsistence fishing (State waters only)

☒ Swimming, snorkeling, or closed or open circuit SCUBA diving within any Special Preservation Area or Midway Atoll Special Management Area

6. Purpose/Need/Scope ***State purpose of proposed activities:***
Our research is designed to evaluate a newer non-invasive method to assess change in coral reef ecosystem metabolism in the NWHI. It is important that we collect water this is uncontaminated by engine exhaust or other impacts from activities on the small boats. We are not certain of the number of people on the small boat and the activities that will be taking place over the side of the boat. We are therefore requesting that we be allowed to swim a short distance away from the boat if neede to ensure that we will be able to collect samples uncontaminated by boat engine exhaust without interfering with other small boat operations.

*Considering the purpose of the proposed activities, do you intend to film / photograph federally protected species? Yes ☐ No ☒

For a list of terrestrial species protected under the Endangered Species Act visit:
http://www.fws.gov/endangered/
For a list of marine species protected under the Endangered Species Act visit:
http://www.nmfs.noaa.gov/pr/species/esa/
For information about species protected under the Marine Mammal Protection Act visit:
http://www.nmfs.noaa.gov/pr/laws/mmpa/

7. Answer the Findings below by providing information that you believe will assist the Co-Trustees in determining how your proposed activities are compatible with the conservation and management of the natural, historic, and cultural resources of the Monument:

The Findings are as follows:

a. How can the activity be conducted with adequate safeguards for the cultural, natural and historic resources and ecological integrity of the Monument?
Our collection of small volumes (less than 14 gallons) of surface and subsurface seawater from shallow water regions will not impact the emergent islands or submerged reefs in any way. No macroscopic animals will be collected as part of our work. Mercuric Chloride is used to preserve water samples for analysis in a carbonate chemistry laboratory in Waimanlo, Oahu. One tenth of one milliliter of Mercuric Chloride will be added to each sample bottle after the sample is collected and no Mercuric Chloride will be released into monument waters. The collection of surface water samples in 250 mL aliquots should not impart on any cultural or historic resources within PMNM.

b. How will the activity be conducted in a manner compatible with the management direction of this proclamation, considering the extent to which the conduct of the activity may diminish or enhance Monument cultural, natural and historic resources, qualities, and ecological integrity, any indirect, secondary, or cumulative effects of the activity, and the duration of such effects?

We have all attended the cultural briefing in the past and appreciate the cultural significance of the Northwestern Hawaiian Islands to Native Hawaiians as a sacred place. Native Hawaiians have depended on the ocean as a resource for sustenance and cultural activities and we will respect this during our trip to the PMNM. We look forward to expanding our knowledge of this topic as we plan our trip and meet with PMNM staff. Coral reefs and the ecosystem surrounding the Hawaiian Archipelago are an important natural resource as well as a cultural asset for Native Hawaiians and all U. S. citizens. These massive calcium carbonate structures may be severely damaged by the slowly declining pH in the global ocean. The effects of ocean acidification on the subtropical shallow water coral reef ecosystem is largely unknown. Our research is designed to develop and test a simple procedure that managers can use to assess changes in coral reef ecosystems.
Our sampling work will be compatible with PMNM management practices and should not impact any cultural, historic, or natural resources. Water samples will be collected from the surface of the water column and will not impact any biological, physical, or cultural features of PMNM.

c. Is there a practicable alternative to conducting the activity within the Monument? If not, explain why your activities must be conducted in the Monument.
Our samples must be collected from PMNM waters in order to complete an assessment of the overall coral reef metabolism in PMNM.

d. How does the end value of the activity outweigh its adverse impacts on Monument cultural, natural and historic resources, qualities, and ecological integrity?
One of the most fundmental processes within PMNM is the precipitation of calcium carbonate by reef building organisms. Calcium carbonate is precipitated by a variety of reef organisms and will dissolve via biotic and abiotic processes. Currently, the rate of precipitation is generally greater than the rate of dissolution throughout PMNM. However, as the open ocean carbonate chemistry changes the rate of calcification is anticipated to decrease and the rate of dissolution is anticipated to increase. The open ocean pH is anticipated to continue to decrease due to the rise of carbon dioxide in the atmosphere from the burning of fossil fuels, cement production, and deforestation. Lower open ocean pH is anticipated to make calcification more energetically expensive and dissolution more energetically favorable. Our research will develop a method that PMNM managers can use to monitor changes in reef metabolism from ocean acidification in a future high carbon dioxide world.

e. Explain how the duration of the activity is no longer than necessary to achieve its stated purpose.
One week of sampling is the minimum requirement to ensure the diel cycle captured from the sunrise and sunset samples accurately reflects the reef ecosystem metabolism being sampled.

f. Provide information demonstrating that you are qualified to conduct and complete the activity and mitigate any potential impacts resulting from its conduct.
Dr. Winn and Dr. Kahng have many years of experience researching carbonate chemistry. Dr. Winn has participated in research programs focusing on oceanic carbon chemistry for decades. Relevant experience includes participation as principle investigator on the Department of

Energy's Global Carbon Survey as part of the International World Ocean Circulation Experiment (WOCE) and the National Science Foundation's Joint Global Ocean Flux (JGOFS) program. These large scale research programs have included similar work on research cruises in virtually all of the world's oceans. Dr. Winn was a founding member of the Hawaii Ocean Time-Series program which is the longest running time series of water chemistry data in the Pacific Ocean. Dr. Kahng has been working in Hawaii's coral reef environment for many years. He has worked on mesopelagic coral species and has extensive experience and expertise in coral reef biology and ecology. In addition, Dr. Kahng supervised a graduate student conduting a one year time-series carbon system measurement program in the near-shore waters at Kaiona Point, Oahu. The data collected provided some of the first data on carbon system dynamics on exposed coral reef environments in Hawaii.

g. Provide information demonstrating that you have adequate financial resources available to conduct and complete the activity and mitigate any potential impacts resulting from its conduct.
Dr. Winn and Dr. Kahng are working closely with the Papahānaumokuākea Marine National Monument to plan the next research trip to the PMNM. The research described here is part of a funding request to the Pacific Islands Climate Change Cooperative.

h. Explain how your methods and procedures are appropriate to achieve the proposed activity's goals in relation to their impacts to Monument cultural, natural and historic resources, qualities, and ecological integrity.
Our sample collection and analysis procedures have been developed over years of similar research throughout the global oceans. Our research will not involve the collection of any live animals or other materials from the monument and we will collect only shallow surface and subsurface seawater.

i. Has your vessel been outfitted with a mobile transceiver unit approved by OLE and complies with the requirements of Presidential Proclamation 8031?
Not applicable.

j. Demonstrate that there are no other factors that would make the issuance of a permit for the activity inappropriate.
We cannot forsee any conditions that would make issuance of this permit inappropriate.

8. Procedures/Methods:
Our procedure involves the collection of water from the nearshore environment in the early afternoon and the late evening. If the researcher is stationed at an island, the sampler will wade into shallow water (approximately 1 meter in depth) and collect surface seawater in a clean bucket. The bucket will be carried to the beach to collect water samples. Alternatively if the researcher is operating from a small boat then a bucket will be lowered into the water over the side of the small boat to retreive water for sampling. Two or three replicate 250 mL subsamples will be collected from the bucket into Pyrex glass bottles. The extra water in the bucket once the sample bottles are full will be returned to the ocean. 100 microliters (about one drop) of a saturated mercuric chloride solution will be added to each bottle and the bottles will be sealed with apeizon grease for transport to our laboratory in Waimanalo, HI. The temperature and

salinity of the bucket sample will be measured with a simple hand-held conductivity and temperature meter called a YSI. The YSI is roughly the size of a large flashlight with a cable attached. The water remaining in the bucket will be returned to shallow water. This sampling method will be conducted in the morning and evening each day for the duration of our time in the PMNM.

The trip is not yet planned, but if possible it would be ideal to get nearshore samples from the shallow waters off all/ any land masses possible that are accessible by wading into the water to roughly 1 meter depth or easily accessible with a small two person kayak. The sample bottles and all chemicals would be kept on land contained in a storage box. When wading out or kayaking to the sampling location only the clean sampling bucket and the YSI (conductivity and temperature measurement tool) will be brought out into the water. The sample preservation technique is described in first paragraph of this section. The greater the duration of sampling at a single location, the greater the confidence in the analysis of the carbonate chemistry measurements. A more complex understanding of how currents and environmental conditions affect the magnitude of the diel signal is more likely with a longer sampling duration. The longest anticipated sampling duration on any one island is 30 days.

A suite of standard hydrographic measurements will be taken from the ship if it is equipped with the needed equipment. Standard hydrographic measurements typically include deploying a CTD (Conductivity, Temperature, and Depth measuring instrument) on a hydrowire attached to a winch onboard the ship. As the CTD is lowered through the water, continuous measurements are made by electronic sensors. No chemicals are released to the water column as the measurements are taken and recorded. The output from the CTD sensors is transmitted to a computer on the ship. Onboard the ship, the output voltages are converted to physical and chemical measurement values via a calibration algorithm. Most CTD assemblies will include a rosette around the electronic sensors that supports niskin water sampling bottles. The Niskin water sampling bottles can be closed at desired depths to collect water for further analysis in a laboratory setting. The water collected from the Niskin water sampling bottles follows the same sampling method as the surface water sampling described above. No waste of any kind will be introduced into monument waters.

A drifter drogue is proposed to be used in tandem with a bottom mounted acoustic doppler current profiler to measure the local currents at the sampling location. The current direction and speed indicate the origin of the water entering the sampling location which hints at the history of the water parcel. The residence time of the water parcel at the sampling location can also be determined by the current speed and direction. Residence time is a critical piece of information needed to interpret the carbonate chemistry measurements completely.

A drifter drogue consists of a surface buoy that is attached to a subsurface drogue with a thin rope. The surface buoy is designed to have minimal surface area above sea level relative to the surface area of the subsurface drogue. The subsurface drogue is generally built from a thin wire frame with a tarp material connecting the wires. The subsurface drogue is designed similar to a kite to catch the subsurface current. The greater subsurface surface area allows the primary force moving the drifter drogue to be the subsurface water current. The surface wind and current can

be a different direction and speed than the subsurface water current. In practice, a drifter drogue is deployed with a global positioning device (GPS) attached and the drifter drogue is followed from roughly 10 feet away for 30 to 60 minutes. The path is tracked on the GPS unit which is used to give the average subsurface water current speed and direction for the day. Each day this measurement will be taken once to determine the residence time of water at the sampling site and magnitude of the coral reef metabolic signal that should be measured that day.

An acoustic doppler current profiler (ADCP) is proposed to be set roughly 10 meters away from the shallow-water nearshore sampling location on the ocean bottom. The ADCP is proposed to be set in an area with a sand bottom at the start of sampling in the PMNM and will be retrieved at the conclusion of sampling in PMNM. An ADCP can measure small scale currents and how fast and what direction water is moving across the entire water column.

The carbonate chemistry group at HPU does not own an ADCP, but may have the ability to borrow an ADCP from another HPU department or organization outside HPU for the duration of the trip. Generally, an ADCP is roughly 0.25 meters x 0.25 meters x 0.25 meters. Generally, the ping frequency for ADCPs ranges from 300 to 1200 kHz. The ADCP unit will be mounted on a weighted frame and the frame will be placed on a section of sand bottom seafloor. The frame will be lowered down to the seafloor from a small boat and will be retrieved at the conclusion of the trip. Nothing will be left behind, all materials used with the ADCP will be removed from the seafloor at the conclusion of the trip.

Fluorescent tracer dye (fluorescein disodium salt) will also be used to analyze the directionality and speed of the surface seawater current. A small amount of dye (10 grams) is released onto the surface of the seawater which will fluoresce at 494 nm and 521 nm which can be recorded with a camera that picks up ultraviolet light. The MSDS for fluorescein disodium salt is included in this permit application along with the MSDS for sodium chloride (table salt that is regularly ingested) for comparison. A maximum of 300 grams total of fluorescein disodium salt will be used for the duration of the research trip.

NOTE: If land or marine archeological activities are involved, contact the Monument Permit Coordinator at the address on the general application form before proceeding, as a customized application will be needed. For more information, contact the Monument office on the first page of this application.

9a. Collection of specimens - collecting activities (would apply to any activity): organisms or objects (List of species, if applicable, attach additional sheets if necessary):

Common name:
We will not collect any living specimens but we will be collecting seawater samples from the shallow near-shore environment at several collection points in PMNM.

Scientific name:
Not applicable.

& size of specimens:
Not applicable.

Collection location:
Not applicable.

☐ Whole Organism ☐ Partial Organism

9b. What will be done with the specimens after the project has ended?
Not applicable.

9c. Will the organisms be kept alive after collection? ☐ **Yes** ☐ **No**
Not applicable.

• General site/location for collections:
Shallow near-shore waters near island masses and backreef coral systems. Water column above the substrate from the surface to 1000 meters within roughly 15 kilometers of any emergent reef.

• Is it an open or closed system? ☒ Open ☐ Closed
All of our water samples will be drawn from the water column, preserved and returned to Waimanalo, Oahu for analysis. After measurement of the sample is complete the sample is poured into an open disposable container and the water is allowed to evaporate.

• Is there an outfall? ☐ Yes ☒ No
Not applicable.

• Will these organisms be housed with other organisms? If so, what are the other organisms?
Not applicable.

• Will organisms be released?
Not applicable.

10. If applicable, how will the collected samples or specimens be transported out of the Monument?
Samples will be returned to Waimanalo, Oahu by research vessel or airplane.

11. Describe collaborative activities to share samples, reduce duplicative sampling, or duplicative research:
We anticipate exchanging a few water samples with other laboratories to ensure analytical accuracy and precision. Dr. Andrew Dickson's laboratory at Scripps Institution of Oceanography.
Contact Information:
Dr. Andrew Dickson
Marine Physical Laboratory
Scripps Instituion of Oceanography

University of California, San Diego
9500 Gilman Drive
[redacted]

In addition, we may share samples with Dr. Andreas Andersson, also at Scripps Institution of Oceanography.
Dr. Andreas Andersson
Scripps Institution of Oceanography
University of California, San Diego
[redacted]

12a. List all specialized gear and materials to be used in this activity:
A drifter drogue is proposed to be used in tandem with a bottom mounted acoustic doppler current profiler to measure the local currents at the sampling location. The current direction and speed indicate the origin of the water entering the sampling location which hints at the history of the water parcel. The residence time of the water parcel at the sampling location can also be determined by the current speed and direction. Residence time is a critical piece of information needed to interpret the carbonate chemistry completely.

A drifter drogue consists of a surface buoy that is attached to a subsurface drogue with a thin rope. The surface buoy is designed to have minimal surface area above sea level relative to the surface area of the subsurface drogue. The greater subsurface surface area allows the primary force moving the drifter drogue to be the subsurface water current. The surface wind and current can be a different direction and speed than the subsurface water current. In practice, a drifter drogue is deployed with a global positioning device (GPS) attached and the drifter drogue is followed from roughly 10 feet away for 30 to 60 minutes. The path is tracked on the GPS unit which is used to give the average subsurface water current speed and direction for the day. Each day this measurement will be taken once to determine the residence time of water at the sampling site and magnitude of the coral reef metabolic signal that should be measured that day.

An acoustic doppler current profiler (ADCP) is proposed to be set roughly 10 meters away from the shallow-water nearshore sampling location on the ocean bottom. The ADCP is proposed to be set in an area with a sand bottom at the start of sampling in the PMNM and will be retrieved at the conclusion of sampling in PMNM. An ADCP can measure small scale currents and how fast and what direction water is moving across the entire water column.

In tandem or in place of the drifter drogue and ADCP unit fluorescent dye tracer (fluorescein disodium salt) will be used to map the directionality and speed of the surface current.

The ship's CTD, rosette, winch, and hydrowire will be utilized to measure and record continuous CTD data as well as collect water samples at depth.

The temperature and salinity of the bucket sample will be measured with a simple hand-held conductivity and temperature meter called a YSI. The YSI is roughly the size of a large flashlight with a cable attached.

To ensure consistent sampling locations temporary marker buoys will be set in the shallow water sampling locations on a sand bottom.

12b. List all Hazardous Materials you propose to take to and use within the Monument:
Small amounts of Mercuric Chloride. This chemical will be used for sample preservation only and will not be released into monument waters. We add this chemical to our water samples into order to preserve them for analysis in shore-based laboratories. This chemical is also used sparingly, the amount used for 200 collection bottle samples is 0.02 Liters.

13. Describe any fixed installations and instrumentation proposed to be set in the Monument:
An acoustic doppler current profiler (ADCP) is proposed to be set roughly 10 meters away from the sampling location on the ocean bottom. The ADCP is proposed to be set in an area with a sand bottom at the start of sampling in the PMNM and will be retrieved at the conclusion of sampling in PMNM. An ADCP can measure small scale currents and how fast and what direction water is moving across the entire water column. An ADCP measures water currents with sound waves using the principle of the Doppler effect. An ADCP works by transmitting a 'ping' of sound at a constant frequency into the water column. The sound waves travel away from the ADCP and richochet off particles suspended in the water and are reflected back to the ADCP. The Doppler effect causes the sound waves traveling back to the ADCP to be at a slightly lowered frequency.
Particles moving toward the instrument send back a slightly higher frequency than particles moving away from the ADCP. The ADCP can calculate how fast each particle is moving and in what direction.
The pings emit are so highly pitched humans cannot hear them and it is believed they are also outside of the audible range for most marine mammals like dolphins. The ADCP uses piezoelectric oscillartors to transmit and receive sound signals. There are no moving parts to an ADCP. In the surface ocean the temperature and salinity of the water column is relatively constant which makes the ADCP one of the more effective measurements of current direction and speed.

14. Provide a time line for sample analysis, data analysis, write-up and publication of information:
Complete analysis and interpretation of carbonate chemistry measurement of all samples will require approximately six months following the completion of the sampling period. Our data will be compiled in a data report that will be submitted to the NOAA PMNM program and PICCC as required.

15. List all Applicants' publications directly related to the proposed project:

Lantz CA, Atkinson MJ, Winn CD, Kahng SE (2013) Dissolved inorganic carbon and total alkalinity of a Hawaiian fringing reef: chemical techniques for monitoring the effects of ocean acidification on coral reefs. Coral Reefs 10:1-11

Thompson RW, Dickson AG, Kahng SE, Winn CD (2014) Nearshore Carbonate Dissolution in the Hawaiian Archipelago. Aquatic Geochemistry

Please see the attached C.V. for a full list of credentials.

With knowledge of the penalties for false or incomplete statements, as provided by 18 U.S.C. 1001, and for perjury, as provided by 18 U.S.C. 1621, I hereby certify to the best of my abilities under penalty of perjury of that the information I have provided on this application form is true and correct. I agree that the Co-Trustees may post this application in its entirety on the Internet. I understand that the Co-Trustees will consider deleting all information that I have identified as "confidential" prior to posting the application.

Signature Date

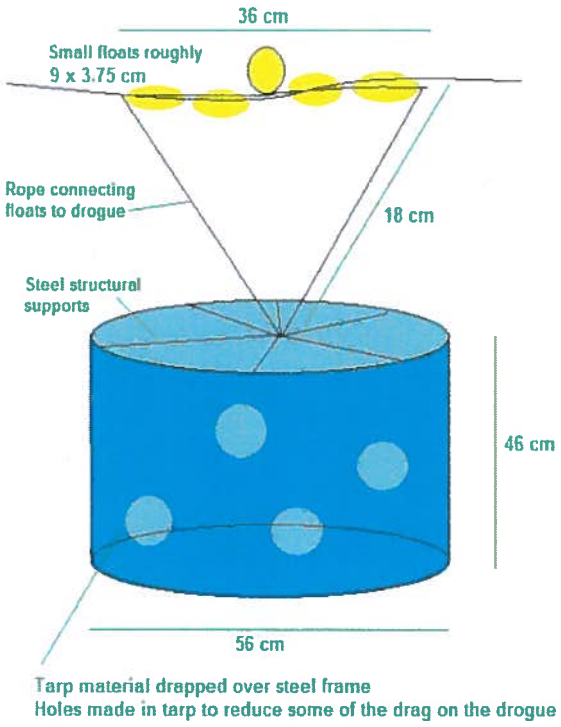
SEND ONE SIGNED APPLICATION VIA MAIL TO THE MONUMENT OFFICE BELOW:

NOAA/Inouye Regional Center
NOS/ONMS/PMNM/Attn: Permit Coordinator
1845 Wasp Blvd, Building 176
Honolulu, HI 96818
FAX: (808) 455-3093

DID YOU INCLUDE THESE?

☒ Applicant CV/Resume/Biography
☒ Intended field Principal Investigator CV/Resume/Biography
☒ Electronic and Hard Copy of Application with Signature
☐ Statement of information you wish to be kept confidential
☒ Material Safety Data Sheets for Hazardous Materials

APPENDIX 1: Diagram and photograph of drifter drogue configuration.



Papahānaumokuākea Marine National Monument
Compliance Information Sheet

1. Updated list of personnel to be covered by permit. List all personnel names and their roles here (e.g. John Doe, Diver; Jane Doe, Field Technician, Jerry Doe, Medical Assistant):
Dr. Christopher Winn, Scientist, Hawaii Pacific University, [redacted]
cwinn@hpu.edu;
Dr. Samuel Kahng, Scientist, Hawaii Pacific University, [redacted]
skahng@hpu.edu;
Crystal Coughlin, Scientist, Hawaii Pacific University, [redacted]
crystal.coughlin@gmail.com
TBD Graduate Student, Scientist, Hawaii Pacific University

2. Specific Site Location(s): (Attach copies of specific collection locations): Uknown at this time. Research plan is for sampling in the nearshore (<25km from island center) regions inside Papahānaumokuākea Marine National Monument.

3. Other permits (list and attach documentation of all other related Federal or State permits): None.

3a. For each of the permits listed, identify any permit violations or any permit that was suspended, amended, modified or revoked for cause. Explain the circumstances surrounding the violation or permit suspension, amendment, modification or revocation. None.

4. Funding sources (Attach copies of your budget, specific to proposed activities under this permit and include funding sources. See instructions for more information): Papahānaumokuākea Marine National Monument

5. Time frame:
Activity start: May 2015
Activity completion: May 2016
Timing of the research cruise is not set yet, the permit dates are entered above.

Dates actively inside the Monument:
From: Unknown.
To: Unknown.
At this time, we anticipate spending less than one month in the Monument during the permitted time period.

Describe any limiting factors in declaring specific dates of the proposed activity at the time of application: Time aboard the NOAA ship *Okeanos Explorer* for the HPU carbonate chemistry team has not yet been fully secured and timing of trip we will be joining is still tentative.

Personnel schedule in the Monument: Unknown.

6. Indicate (with attached documentation) what insurance policies, bonding coverage, and/or financial resources are in place to pay for or reimburse the Monument trustees for the necessary search and rescue, evacuation, and/or removal of any or all persons covered by the permit from the Monument: Hawaii Pacific University covers insurance for faculty and students participating in research activities.

7. Check the appropriate box to indicate how personnel will enter the Monument:

☒ Vessel
☐ Aircraft

Provide Vessel and Aircraft information: tentatively NOAA ship *Okeanos Explorer.*

8. The certifications/inspections (below) must be completed prior to departure for vessels (and associated tenders) entering the Monument. Fill in scheduled date (attach documentation):

☐ Rodent free, Date:
☐ Tender vessel, Date:
☐ Ballast water, Date:
☐ Gear/equipment, Date:
☐ Hull inspection, Date:

9. Vessel information (NOTE: if you are traveling aboard a National Oceanic and Atmospheric Administration vessel, skip this question): Not applicable, aboard NOAA vessel.
Vessel name:
Vessel owner:
Captain's name:
IMO#:
Vessel ID#:
Flag:
Vessel type:
Call sign:
Embarkation port:
Last port vessel will have been at prior to this embarkation:
Length:
Gross tonnage:

Total ballast water capacity volume (m3):
Total number of ballast water tanks on ship:
Total fuel capacity:
Total number of fuel tanks on ship:
Marine Sanitation Device:
Type:

Explain in detail how you will comply with the regulations regarding discharge in the Monument. Describe in detail. If applicable, attach schematics of the vessel's discharge and treatment systems:

Other fuel/hazardous materials to be carried on board and amounts:

Provide proof of a National Oceanic and Atmospheric Administration (NOAA) Office of Law Enforcement-approved Vessel Monitoring System (VMS). Provide the name and contact information of the contractor responsible for installing the VMS system. Also describe VMS unit name and type:

VMS Email:
Inmarsat ID#:

* Individuals MUST ENSURE that a type-approved VMS unit is installed and that its automatic position reports are being properly received by the NOAA OLE system prior to the issuance of a permit. To make sure your VMS is properly configured for the NOAA OLE system, please contact NOAA OLE at (808) 203-2503 or (808) 203-2500.

* PERMITS WILL NOT BE ISSUED TO INDIVIDUALS ENTERING THE MONUMENT VIA VESSEL UNTIL NOAA OLE HAS CONTACTED THE MONUMENT PERMIT COORDINATOR WITH A 'POSITIVE CHECK' READING.

10. Tender information:

On what workboats (tenders) will personnel, gear and materials be transported within the Monument? List the number of tenders/skiffs aboard and specific types of motors: Not applicable.

Additional Information for Land Based Operations

11. Proposed movement of personnel, gear, materials, and, if applicable, samples: Not applicable.

12. Room and board requirements on island: Not applicable.

13. Work space needs: Not applicable.

DID YOU INCLUDE THESE?

- ☐ Map(s) or GPS point(s) of Project Location(s), if applicable
- ☐ Funding Proposal(s)
- ☐ Funding and Award Documentation, if already received
- ☐ Documentation of Insurance, if already received
- ☐ Documentation of Inspections
- ☐ Documentation of all required Federal and State Permits or applications for permits

DAVID Y. IGE
GOVERNOR OF HAWAII

CARTY S. CHANG
INTERIM CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DANIEL S. QUINN
INTERIM FIRST DEPUTY

W. ROY HARDY
ACTING DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAI'I
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAI'I 96809

April 10, 2015

TO: Division of Aquatic Resources File

THROUGH: Carty S. Chang, Interim Chairperson

FROM: Maria Carnevale
State Co-Manager, Papahānaumokuākea Marine National Monument

SUBJECT:

DECLARATION OF EXEMPTION FROM THE PREPARATION OF AN ENVIRONMENTAL ASSESSMENT UNDER THE AUTHORITY OF CHAPTER 343, HRS AND CHAPTER 11-200 HAR, FOR PAPAHĀNAUMOKUĀKEA MARINE NATIONAL MONUMENT RESEARCH PERMIT TO DRS. CHRISTOPHER WINN AND SAMUEL KAHNG, ASSOCIATE PROFESSORS, HAWAI'I PACIFIC UNIVERSITY, FOR ACCESS TO STATE WATERS TO CONDUCT SEAWATER CARBON RESEARCH ACTIVITIES UNDER PERMIT PMNM-2015-05.

The following permitted activities are found to be exempted from preparation of an environmental assessment under the authority of Chapter 343, HRS and Chapter 11-200, HAR:

Project Title:
Papahānaumokuākea Marine National Monument Research Permit to Drs. Christopher Winn and Samuel Kahng, Hawai'i Pacific University, for Access to State Waters to Conduct Seawater Carbon Research Activities

Permit Number: PMNM-2015-05

Project Description:
The research permit application, as described below, would allow entry and activities to occur in Papahānaumokuākea Marine National Monument, including the NWHI State waters from May 1, 2015 through April 30, 2016.

Dr. Christopher Winn and Dr. Samuel Kahng (Applicants) propose to conduct activities to study changes in coral reef metabolism in response to ocean acidification. Up to five (5) individuals (including the Applicants) would conduct proposed activities and access the Monument via a separately permitted vessel (Applicants currently collaborating with NOAA Ship *Okeanos Explorer, PMNM-2015-025 in review*) during the 2015 summer field season. Proposed activity locations include marine areas (near shore and out to 15 kilometers) of Maro Reef and each

island/atoll within Papahānaumokuākea (Nīhoa Island, Mokumanamana (Necker) Island, French Frigate Shoals, Gardner Pinnacles, Laysan Island, Lisianski Island, Pearl and Hermes Atoll, Midway Atoll and Kure Atoll). Activities would not involve land access (see F-5, applicant responses to scientific review questions # 8 and #9)

The Applicants propose to perform the following activities:

1. Measure the levels of inorganic and organic metabolism over the coastal reefs to quantify their effects on the inorganic carbon system of coastal waters. This project aims to examine the spatial gradient of carbonate parameters from the shallow fore-reef (~20 m depth) on the island shelves to the deep open ocean (~500 m depth) to investigate the effect of biological processes on the carbon system throughout the diel cycle (nutrient cycle).
2. Collect two to three Pyrex glasses of bottles seawater (250 milliliter subsamples) from surface waters surrounding various Northwestern Hawaiian Islands including: Nīhoa, Mokumanamana, French Frigate Shoals, Gardner Pinnacles, Maro Reef, Laysan Island, Lisianski Island, Neva Shoal, Pearl and Hermes Atoll, Midway Atoll, and Kure Atoll, for assessing and documenting changing seawater carbonate chemistry and ocean acidification in the Monument. All water samples would be fixed (or preserved) on-board the vessel with mercuric chloride with no more than 100 microliters (about one drop) of mercuric chloride used in each bottle. No mercuric chloride will be introduced to the environment. A hand-held device will be used to measure surface seawater temperature and salinity. All sampling would be done at the surface (less than 10 m in depth).
3. If possible, collect nearshore samples of seawater at about 1 m depth to collect data regarding the carbonate chemistry measurements. This would involve wading or kayak to 1 m depth and all chemicals would be kept on land in a storage box. The greater the sampling duration at a given location, the more confident researchers will be in understanding how ocean currents and environmental conditions affect the magnitude of the diel signal (nutrient cycling). The longest anticipated duration on any one island is 30 days, but not likely that long due to ship logistical constraint.
4. Take hydrographic measurements from a hydrowire attached to the ship which deploys a CTD (Conductivity, Temperature, and Depth) instrument. Measurements are made by electronic sensors. Additionally, water samples will be taken from the vessel at various depths for analysis in a laboratory setting. The sampling bottles have the capability to close at desired depths.
5. Local ocean currents and will be measured with a drifter drogue (consisting of a surface buoy plus a subsurface drogue, see F-5a Attachment 1) in tandem with an acoustic doppler. This will provide the speed and direction of ocean currents which provide information on the history of the water parcel at a given location. Measurements will be taken from about ten feet away from the vessel for 30-60 minutes. A global positioning device (GPS) will also be used to give the average subsurface water current speed and direction for the day.
6. Researchers plan on using an acoustic doppler current profiler (ACDP) that will be set roughly 10 m away from the nearshore sampling location on the ocean bottom. It is proposed to be set at the beginning of sampling in PMNM and will be retrieved at the conclusion of sampling in PMNM. An ACDP measures speed and direction of water moving across the entire water column.
7. Directionality and speed of surface seawater currents will be measured using fluorescent tracer dye (fluorescein disodium salt). A maximum of 300 grams total would be used for

the duration of the trip. A camera that picks up ultraviolet light will be used to record the movement of the fluorescence given off by the dye. Fluorescein disodium salt is less toxic than common table salt.

All in all, no more than 14 gallons of seawater will be collected for the purposes detailed above.

The proposed activities are in direct support of the Monument Management Plan's (MMP) priority management needs through 3.1.1 – Marine Conservation Science Action Plan (Strategy MCS-1: Continuing to enhance research, characterization and monitoring of marine ecosystems for the life of the plan). Strategy MCS-1 focuses on "continuing marine research, characterization, and monitoring designed to support an ecosystem-based approach to protection and management". The proposed project fits into this Strategy because it would improve the understanding of seawater carbonate chemistry of the water surrounding the islands and atolls of the Monument. This study would characterize the carbon system dynamics within the Monument and continue long-term ocean acidification monitoring. Activities such as those to be carried out by the permittee, are also addressed in the Monument Management Plan Environmental Assessment (December 2008) which resulted in a FONSI (Finding of No Significant Impact).

Consulted Parties:
The permit application was sent out for review and comment to the following scientific and cultural entities: Hawai'i Division of Aquatic Resources, Hawai'i Division of Forestry and Wildlife, Papahānaumokuākea Marine National Monument (NOAA/NOS), NOAA Pacific Islands Regional Office (NOAA-PIRO), United States Fish and Wildlife Service Hawaiian and Pacific Islands National Wildlife Refuge Complex Office, and the Office of Hawaiian Affairs (OHA). In addition, the permit application has been posted on the Monument Web site since October 9, 2014, giving the public an opportunity to comment. The application was posted within 40 days of its receipt, in accordance with the Monument's Public Notification Policy.

Exemption Determination:
After reviewing HAR § 11-200-(8), including the criteria used to determine significance under HAR § 11-200-12, DLNR has concluded that the activities under this permit would have minimal or no significant effect on the environment and that issuance of the permit is categorically exempt from the requirement to prepare an environmental assessment based on the following analysis:

1. All activities associated with this permit, including activities associated with seawater carbon research and water collection, have been evaluated as a single action. As a preliminary matter, multiple or phased actions, such as when a group of actions are part of a larger undertaking, or when an individual project is precedent to or represents a commitment to a larger project, must be grouped together and evaluated as a single action. HAR § 11-200-7. Since this permit involves an activity that is precedent to a later planned activity, i.e. long-term monitoring of seawater, the categorical exemption determination here will treat all planned activities as a single action.

2. The Exemption Class for Scientific Research with no Serious or Major Environmental Disturbance Appears to Apply. Chapter 343, HRS, and section 11-200-8, HAR, provide for a list of classes of actions exempt from environmental assessment requirements. HAR §11-200-8.A.5. exempts the class of actions which involve "basic data collection, research, experimental

management, and resource evaluation activities, which do not result in a serious or major disturbance to an environmental resource." This exemption class includes sampling, collecting, and recording in the field. This exemption class has been interpreted to include seawater sample collection and temperature and salinity data collection. Additionally, Exemption Class #5, Exempt Item #2 includes sampling and recording in the field. DEPARTMENT OF LAND & NATURAL RESOURCES, EXEMPTION LIST FOR THE DIVISION OF FORESTRY AND WILDLIFE (June 12, 2008).

The proposed seawater carbon research activities here appear to fall squarely under the exemption class identified under HAR § 11-200-8.A.5., and are succinctly described under the former Fish and Game Division exemption list published in 2008. As discussed below, no significant disturbance to any environmental resource is anticipated in from seawater collection activities and temperature and salinity data collection. Thus, so long as the below considerations are met, an exemption class should include the action now contemplated.

3. Cumulative Impacts of Actions in the Same Place and Impacts with Respect to the Potentially Particularly Sensitive Environment Will Not be Significant. Even where a categorical exemption appears to include a proposed action, the action cannot be declared exempt if "the cumulative impact of planned successive actions in the same place, over time, is significant, or when an action that is normally insignificant in its impact on the environment may be significant in a particularly sensitive environment." HAR § 11-200-8.B. To gauge whether a significant impact or effect is probable, an exempting agency must consider every phase of a proposed action, any expected primary and secondary consequences, the long-term and short-term effects of the action, the overall and cumulative effect of the action, and the sum effects of an action on the quality of the environment. HAR § 11-200-12. Examples of actions which commonly have a significant effect on the environment are listed under HAR § 11-200-12.

This study involves the collection of seawater samples and temperature and salinity data collection from surface seawater (less than 10 m depth). No impact to the benthos is expected. With this in mind, significant cumulative impacts are not anticipated as a result of this activity, and numerous safeguards further ensure that the potentially sensitive environment of the project area will not be significantly affected. All activities will be conducted in a manner compatible with the management direction of the Monument Proclamation in that the activities do not diminish monument resources, qualities, and ecological integrity, or have any indirect, secondary, cultural, or cumulative effects. The joint permit review process did not reveal any anticipated indirect or cumulative impacts, nor did it raise any cultural concerns, that would occur as a result of these activities.

The activities would be conducted concurrently from the NOAA Ship *Okeanos Explorer, PMNM-2015-025 application in review*. There are currently no other proposed activities (PMNM permit applications) for PMNM locations which collect seawater for the purposes of long term understanding of carbonate chemistry in PMNM. If other activities are proposed and permitted in these same areas it is unlikely that negative cumulative interaction would occur, as the Applicants would collect seawater from small boats and not entering the water to swim, snorkel, or SCUBA dive. If newly proposed activities in the area do intend on collecting seawater in these areas, it would most likely be for purposes other than carbon chemistry. Cumulative impacts from all activities are not expected to be significant, and the importance of the purpose of this activity would far outweigh any potential overlap.

Since no significant cumulative impacts or significant impacts with respect to any particularly sensitive aspect of the project area are anticipated, the categorical exemptions identified above should remain applicable.

4. Overall Impacts will Probably be Minimal and Insignificant.

Again, any foreseeable impacts from the proposed activity will probably be minimal, and further mitigated by general and specific conditions attached to the permit. Specifically, all research activities covered by this permit will be carried out with strict safeguards for the natural, historic, and cultural resources of the Monument as required by Presidential Proclamation 8031, other applicable law and agency policies and standard operating procedures.

Conclusion. Upon consideration of the permit to be approved by the Board of Land and Natural Resources, the potential effects of the above listed project as provided by Chapter 343, HRS and Chapter 11-200 HAR, have been determined to be of probable minimal or no significant effect on the environment and exempt from the preparation of an environmental assessment.

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CARTY CHANG Date
Interim Chairperson, Board of Land and Natural Resources