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

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

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. Nicole Raineault
Affiliation: Ocean Exploration Trust

Permit Category: Research
Proposed Activity Dates: 19 October 2021-19 December 2021
Proposed Method of Entry (Vessel/Plane): Vessel (E/V Nautilus)
Proposed Locations: Deep-water (>200 m) expanded area of the PMNM (Lili`uokalani Ridge seamount chain, Don Quixote Seamounts south of Pioneer Ridge and Lisianski Island) and Chautauqua Seamount chain

Estimated number of individuals (including Applicant) to be covered under this permit: 60 total over 3 legs (up to 31 science and operations, 17 ship's crew per leg)

Estimated number of days in the Monument: 45

Description of proposed activities: (complete these sentences):

a.) The proposed activity would…
Conduct high resolution seafloor mapping and seafloor characterization of seamounts within the PMNM. We would live-stream data and video from the remotely operated vehicles (ROVs) for scientific and outreach purposes on the NautilusLive.org website. All data and physical samples are open-access and planned with the community including the PMNM staff involvement. Our goal is to increase our knowledge of the deep areas of the monument, while informing the public and inspiring their awe and understanding of the ocean.

b.) To accomplish this activity we would ….
Use the Exploration Vessel (E/V) *Nautilus* and teams of scientists and engineers to explore these areas. The first expedition leg (20 Oct-12 Nov) would map the seamounts and other unmapped areas of seafloor with the ship's EM302 30 kHz multibeam echosounder and 3.5 kHz sub-bottom profiler in the northern expanded area of the PMNM (Lili`uokalani Ridge seamount chain). The goal of this expedition is to produce detailed seafloor maps of the previously unmapped seamounts including depth and derived products showing slope and rugosity, as well as seafloor backscatter, which relates to substrate type, and water column

anomalies. A secondary activity is the deployment of a National Geograpic Society deep ocean drop camera, which is deployed from the ship, sits on the seafloor, and films the benthic environment in a fixed location for a period of time before returning to the surface. Data would be used to plan an anticipated 2022 remotely operated vehicle (ROV) characterization expedition of these seamounts.

The second leg planned for 2021(15 Nov-06 Dec) would use two 4000 m-rated ROVs to explore the seamounts south of the Pioneer Ridge around Don Quixote seamount, located in the southern expanded area of the monument. The ROVs are equipped with high-definition video cameras, lights, a CTD and O2 sensor, and sampling devices. Representative biological and geological samples be taken with the ROV manipulator or suction (slurp) tool. Water samples (niskins) will be used for chemical and eDNA analyses.

The third leg planned for 2021 (08-19 Dec) would mostly focus ROV exploration and mapping of the Chautauqua Seamounts, which are outside of the PMNM boundary, with the exception of the northernmost seamount. We would like to conduct 1-2 ROV dives on the northernmost seamount to characterize this end-member of the seamount chain, in the same manner applied to the southern Wentworth area, with HD video, oceanographic sensor measurements, and select samples from the ROVs. This seamount is located within the 50 nm boundary of the PMNM.

The ROV cruises will likely provide tremendous education and outreach opportunities for PMNM. Due to high-speed ship-to-shore satellite communications, anyone with an internet connection will be able to watch the ROV video, listen to the scientific dialogue, and ask questions that the shipboard team will answer in real time. We staff the ship with communications experts to facilitate outreach with groups on shore.

c.) This activity would help the Monument by …
This project will provide critical information on deep-water areas within PMNM, which could help inform management. We will fill gaps in existing seafloor mapping data and characterize benthic ecosystems and potential resources, which is part of the National Ocean Mapping, Exploration, and Characterization (NOMEC) strategy. This project has applied science objectives that are consistent with a number of NOAA Mission priorities. NOAA's long-term Healthy Oceans goal requires studies that will improve our understanding of ocean ecosystems in order to develop management measures to ensure sustainability in the face of both human and climate change impacts. The ROV dives and mapping conducted during this project will take place within the poorly explored expansion area of the Papahānaumokuākea Marine National Monument (PMNM). he findings from the project will have direct and immediate benefit to monument staff in informing their efforts to protect deep-water habitats in the central Pacific. Furthermore, this study expands on the findings of the 3-year NOAA CAPSTONE project of the existence of large-scale high-density coral and sponge communities throughout the Central and Western Pacific and OET's 2018 expedition to the expanded area of the monument to conduct mapping and ROV dives on a chain of seamounts including Naifeh. The communities observed during those past dives show a unique composition of species and support a very large number of associated invertebrates. Even

though a modest number of these communities were discovered, how and where they form is still poorly understood. The discovery and characterization of more of these unique communities will address this priority NOAA Mission Priority to improve understanding of ecosystems to inform resource management decisions. Many of these communities are located in the Prime Crust Zone (PCZ) and on Mn-crusted substrate at depths that may be targeted by the deep-sea mining industry in locations outside of protected areas in the near future. It is imperative to gain a much better understanding of these communities in order to ensure well informed management decisions can be made. The discovery of more of these communities within PMNM provides valuable information on the resources the monument is protecting, and furthermore provide proxy data on unprotected and vulnerable Mn crust communities throughout the Pacific.

Finally, we plan to leverage our robust outreach program to share information about the National Marine Sanctuary and PMNM and Hawaiian culture. We are actively working with staff at PMNM to develop outreach and communications plans for these expeditions. We hope to bring many voices to this project to discuss different aspects of the ocean, traditional knowledge, oral traditions and mythology, and the monument. We understand that the timing of these expedition legs aligns with the 15th anniversary of the monument and will likely be undergoing the process to gain status as a National Marine Sanctuary and believe our efforts, particularly as they are live-streamed on a public website, can help connect people to this special, but remote place. OET also supports Hawaiian language revitalization efforts and plans to do so through expedition naming and any naming of places or organisms that result from this expedition.

Other information or background:
Ocean Exploration Trust, a non-profit organization, owns and operates the E/V *Nautilus*. We have been conducting scientific exploration of the world's oceans since 2009, while also focusing on using the latest technologies to enhance our exploration and communication efficiencies. A third part of our mission is to conduct extensive outreach and educational opportunities on each cruise through our NautilusLive.org website. These expedition legs are funded by the NOAA Office of Ocean Exploration and Research, Office of National Marine Sanctuaries, and a National Oceanographic Partnership Program grant between OER and ONMS.

Section A - Applicant Information

1. Applicant

Name (last, first, middle initial): Raineault, Nicole A.

Title: Chief Scientist

1a. Intended field Principal Investigator (See instructions for more information):
Dr. Emil Petruncio (Lili`uokalani Seamount mapping leg);
Dr. Christopher Kelley (Wentworth Seamount leg);
Dr. Adam Soule (Chautauqua Seamount leg)

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

Phone: [redacted]

Fax: N/A

Email:
[redacted]

For students, major professor's name, telephone and email address:

3. Affiliation (institution/agency/organization directly related to the proposed project):
Emil: Ocean Exploration Trust (contractor);
Chris: University of Hawaii, emeritus;
Adam: University of Rhode Island Graduate School of Oceanography

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):

#	Name	Role	Affiliation	Email	Leg 1	Leg 2	Leg 3
1	Allison Fundis	Expedition Leader	Ocean Exploration Trust	allison@oet.org			X
2	Erin Heffron	Navigator/mapper	Ocean Exploration Trust	ejheffron@gmail.com	X	X	X
3	Renato Kane	Navigator/mapper	Ocean Exploration Trust	renato r.kane@gmail.com		X	X
4	Kate Von Krusenstiern	Navigator/mapper	Ocean Exploration	kvonkrus@gmail.com		X	X

			Trust				
5	Neah Baechler	Navigator/mapper	Ocean Exploration Trust	[redacted]	X		
6	Samantha Wishnak	Navigator/mapper	Ocean Exploration Trust	[redacted]	X		
7	Ed Mc Nichol	Lead video engineer	Ocean Exploration Trust	[redacted]	X	X	X
8	Stephen Matter	Video Engineer	Ocean Exploration Trust	[redacted]		X	X
9	Jessica Kaelblein	Video Engineer	Ocean Exploration Trust	[redacted]		X	X
10	Trevor Shepherd	ROV pilot/engineer	Ocean Exploration Trust	[redacted]		X	X
11	Daniel Cormany	ROV pilot/engineer	Ocean Exploration Trust	[redacted]		X	
12	Jessica Sandoval	ROV pilot/engineer	Ocean Exploration Trust	[redacted]		X	X
13	Joshua Chernov	Lead ROV pilot/engineer	Ocean Exploration Trust	[redacted]			X
14	Jacob Bonney	ROV pilot/engineer	Ocean Exploration Trust	[redacted]		X	X
15	Gabrielle Inglis	ROV pilot/engineer	Ocean Exploration Trust	[redacted]		X	X
16	Antonella Wilby	ROV pilot/engineer	Ocean Exploration Trust	[redacted]		X	X
17	Mark Deroche	Deck Chief	Ocean Exploration Trust	[redacted]		X	X
18	Ben Craik	Data Engineer	Ocean Exploration Trust	[redacted]	X	X	
19	Tim Burbank	Data Engineer	Ocean Exploration Trust	[redacted]			X
20	Madison Dapcevich	Communications Lead	Ocean Exploration Trust	[redacted]	X		
21	Kelly Moran	Communications Lead	Ocean Exploration Trust	[redacted]		X	X
22	Robert Ballard	Science Guest	Ocean Exploration Trust	[redacted]			X
23	Beth Orcutt	Science Guest	Bigelow Laboratory for Ocean Sciences	[redacted]		X	
24	Barbara Smit	Science Guest	Ocean Exploration Trust	[redacted]			X
24	Kornelis Smit	Science Guest	Ocean Exploration Trust	[redacted]			X
26	TBD	Science Guest	Ocean Exploration Trust				X
27	Mark Mahaffey	Science Guest	Ocean Exploration Trust	[redacted]			X
28	Steve Auscavitch	Science Management/Data Logger	Ocean Exploration Trust	[redacted]		X	X
29	Sarah Bremmer	Science Management/Data Logger	Ocean Exploration Trust	[redacted]		X	X
30	Meagan Putts	Science Management/Data Logger	Ocean Exploration Trust	[redacted]			X
31	TBD Science	Science Management/Data Logger	Ocean Exploration Trust			X	
32	John Smith	Mapping coordinator	Ocean Exploration Trust	[redacted]		X	
33	TBD Watch lead	Science Guest					X
34	TBD PMNM	Science Guest				X	
34	TBD PMNM	Science Guest					X
36	Pavel Chubar	Captain	Maritime Management	[redacted]	X	X	X

37	Vitalii Verbysky	2nd Officer	Maritime Management	[redacted]	X	X	X
38	George Bucur	2nd Officer	Maritime Management	[redacted]	X	X	X
39	Martyna Graban	Chief Officer	Maritime Management	[redacted]	X	X	X
40	Sherhii Semenov	Chief Engineer	Maritime Management		X	X	X
41	Fedir Uzun	2nd Engineer	Maritime Management		X	X	X
42	Igor Sergiienko	3rd Engineer	Maritime Management		X	X	X
43	Sergii Tsyganenko	Able Seaman	Maritime Management		X	X	X
44	Fedir Chepov	Able Seaman	Maritime Management		X	X	X
45	Segiy Mazur	ETO	Maritime Management		X	X	X
46	Macdara Sean Curran	Assistant ETO	Maritime Management		X	X	X
47	Mykhailo Kostiuk	Fitter	Maritime Management		X	X	X
48	Oleksandr Voytenko	Motorman	Maritime Management		X	X	X
49	Oleksandr Ashykhmin	Motorman	Maritime Management		X	X	X
50	Anatoliy Choma	Chief Cook	Maritime Management		X	X	X
51	Maksym Kuzmenko	2nd Cook	Maritime Management		X	X	X
52	Marlene Castillo Diaz	Stewardess	Maritime Management		X	X	X

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
☒ Monument Expansion Area			
☒ Other			

NOTE: Shallow water is defined by water less than 100 meters in depth.

☐ Remaining ashore on any island or atoll (with the exception of Sand Island, at Midway Atoll and field camp staff on other islands/atolls) between sunset and sunrise.

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

Location Description:

The legs will visit deep-water sites in the Papahānaumokuākea Marine National Monument as follows:

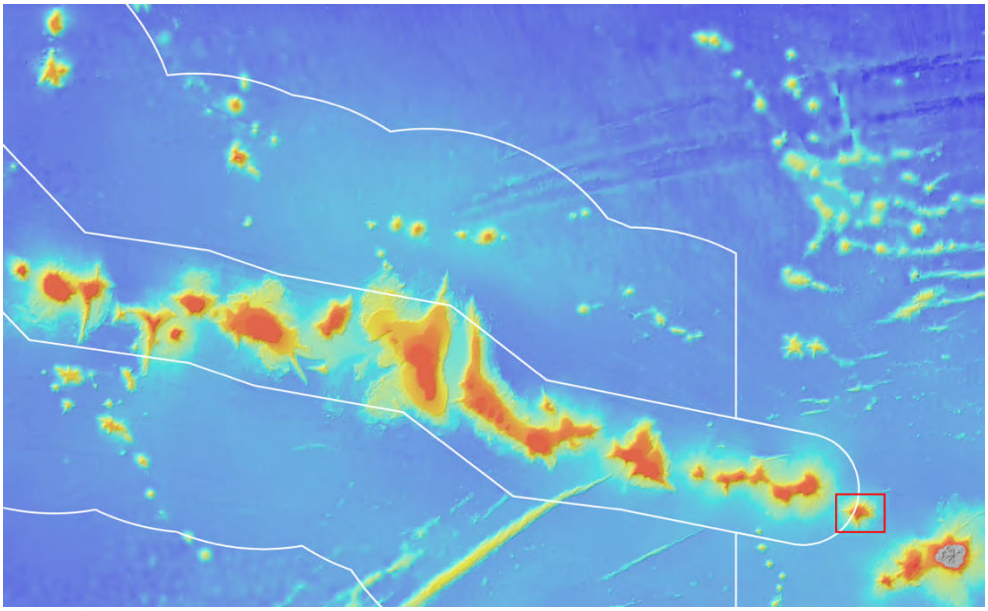
Liliuokalani Seamount Mapping Expedition NA134 (mapping only):

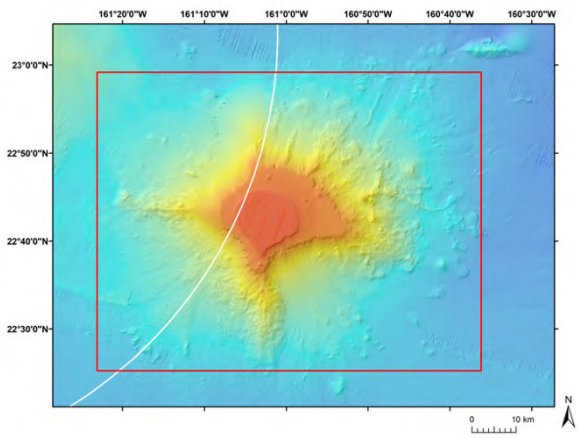
Site Name	Lat d Lat m m	Long d Long m m
King George Seamount	27° 53.937'N	170° 59.254'W
Nootka Seamount	28° 36.630'N	171° 3.579'W
Argonaut Seamount	28° 59.798'N	170° 55.178'W
Loudon Seamount	29° 6.006'N	173° 56.174'W
Mercury Seamount	29° 50.153'N	173° 58.959'W
Pittenger Seamount	30° 42.011'N	173° 3.589'W
Solide Seamount	30° 41.787'N	174° 31.687'W
Hope Seamount	31° 47.277'N	174° 21.577'W
Unnamed Feature	32° 34.804'N	175° 7.152'W

Southern Wentworth Seamounts Expedition NA135 (ROV dives & mapping):

Location	Lat deg	Lat min	Long deg	Long min
Tamana Seamount	24	1.3705336	172	58.8880658
Sovereign Seamount	24	19.9237774	173	6.99723852
Haaheo Seamount	24	49.6728555	172	45.0328713
Haaheo Seamount	24	31.9722297	172	45.5510225
Don Quixote Seamount SE	24	33.1835935	173	19.5529292
Don Quixote Seamount	24	51.5089616	173	45.3763557
Don Quixote Seamount	24	49.1777894	173	53.7683275
W Don Quixote Seamount	24	34.8985508	173	58.430394
Euphemia Seamount	24	19.3485073	173	46.8792817
S Tamana Seamount	23	49.6079263	172	49.1715835
Paul Seamount	23	28.2818008	172	33.7798304
Starling Seamount	22	58.9064772	172	26.2118953
Hooikaika Seamount	22	19.5715974	171	48.9398152
No Name Seamount	22	3.8906225	171	32.8579532
Middle Bank	22	40.0000000	161	0.00000000

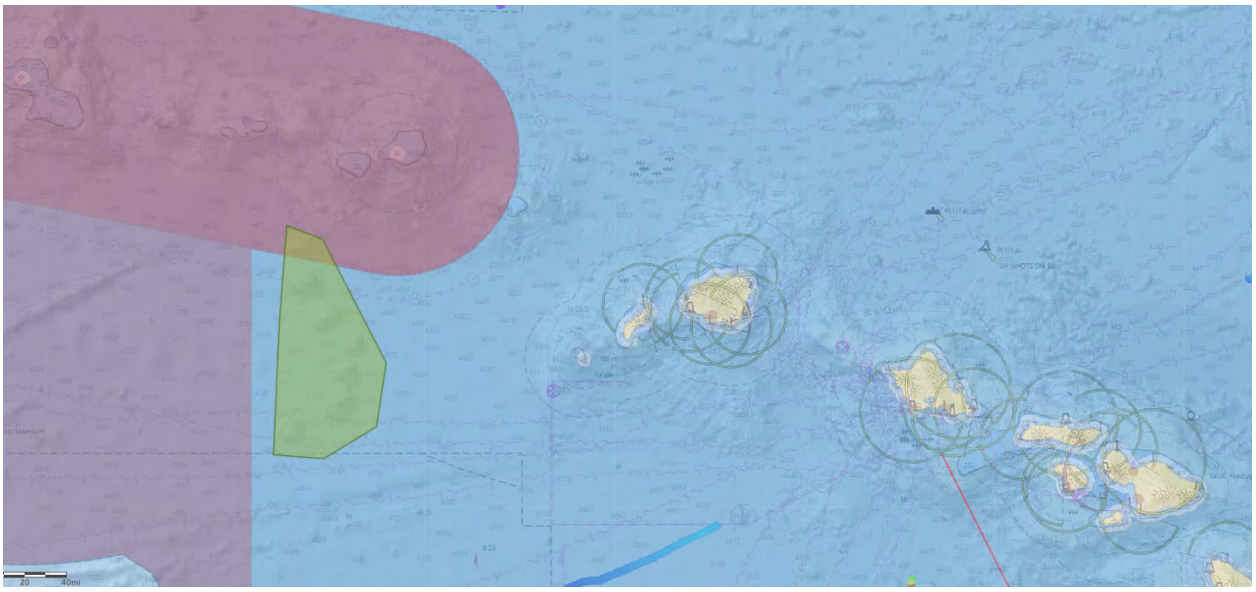
The Southern Wentworth and Don Quixote Seamount ROV targets (stars) and possible mapping locations (polygon).





Proposed backup dive sites will be on Middle Bank, which is located on the boundary of the PMNM.

Chautauqua Expedition NA136 (ROV dives & mapping):
Northern Chautauqua Seamount: N 22° 24.484, W 162° 38.528



The northernmost Chautauqua Seamount falls within the 50 nm boundary of PMNM and is the proposed target for 1-2 ROV dives on NA136.

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:***

Leg 1: Lili`uokalani Seamount Mapping (19 October-13 November 2021)

This expedition will involve multibeam and sub-bottom profiler mapping on the unmapped and unexplored Lili‘uokalani seamounts located in a poorly explored expansion area of the Papahānaumokuākea Marine National Monument (PMNM). Mapping is a prerequisite form of seamount exploration preceding ROV dives since it provides detailed visualization of the targeted features. Maps are critical for determining the optimal sites for geological and biological surveys and collections that are scheduled for a subsequent cruise. Furthermore, high-resolution bathymetry and backscatter alone can reveal a great deal about the geologic history of seamounts. Data from satellite altimetry and a single sounding from the NOAA nautical chart of this area suggest that at least two of these seamounts reach surprisingly shallow depths given their assumed Cretaceous origin. In particular, the summit of King George seamount appears to be at a depth between 150-329 meters, which if true, could support several deep-water fisheries. The Gloria sidescan sonar surveys conducted decades ago suggest that some of these seamounts could be large guyots, which if true, indicate that these broke the surface prior to the cessation of their volcanic activity. In addition, there was a 2007 JAMSTEC expedition that partially mapped the summit of the King George and Solide seamounts. The objectives of this cruise are therefore to 1) map these seamounts in preparation for ROV dives, 2) determine their summit depths, 3) determine which, if any, are guyots, and 4) obtain sub-bottom profiles of any seamounts revealed to be guyots for the purpose of gaining a better understanding of their geologic history. We plan to create mapping products (bathymetry, backscatter, slope and rugosity) to aid in the selection of dive sites on a 2022 ROV expedition.

Leg 2: Southern Wentworth Seamount Characterization and Mapping (14 November-06 December 2021)

This expedition will involve mapping of and ROV dives on unexplored seamounts south of Pioneer Bank and Lisianski Island located in a poorly explored "expansion" area of the PMNM. The lineation of these seamounts suggests that they could represent a previously unrecognized southernmost extent of the Wentworth seamounts, a small chain of Cretaceous "hotspot" or "mid-plate" volcanoes that originate from the Hess Rise located north of PMNM. The objectives of this cruise are to 1) survey these seamounts, mapping those that have not been previously mapped; 2) collect rock samples from as many of these seamounts as possible to determine their ages and whether they did indeed form from the same mantle plume as the more northern Wentworth Seamounts; 3) document the biological communities that presently live on these seamounts, looking in particular for high density coral and sponge communities similar to those previously discovered in the Musicians Seamounts and on a number of banks within PMNM; 4) collect macro-biological specimens that are potential new species or new records of species for PMNM; 5) determine microbial ecosystem services and mineral content of the rocks to examine microbe-mineral interactions in ferromanganese crust formation; and 6) collect water samples to support an environmental DNA (eDNA) study in the monument that began in 2018 during *Nautilus* expedition NA101. This cruise is scheduled for November-December when there is an increased possibility of winter storms disrupting ROV dive operations. For this reason, a contingency plan has been

developed in the event the sea conditions preclude dives on the targeted seamounts. This plan targets Middle Bank at the southernmost extent of PMNM. Additional surveys on the bank will provide informative data on the extent of the deep-sea coral and sponge communities and help guide management decisions. Therefore, ROV survey sites on Middle Bank are being selected in the event that sea conditions prevent exploration of the seamounts currently targeted for this cruise.

Leg 3: Chautauqua Seamount Characterization and Mapping (07-20 December 2021)

The Chautauqua Seamount chain represents a marine habitat that has significance to multiple scientific and social questions. Seamounts are generally viewed as potential oases of benthic life due to the availability of hard substrate for attachment of sessile fauna and their impacts on oceanographic mixing and hence nutrient delivery. Seamounts and volcanic ridges in the Central Pacific have been investigated to understand their role in genetic flow across the ocean basins. The Chautauqua Seamount chain is proximal to ridges that are viewed as genetic conduits (e.g., Necker Ridge), but their isolation and greater depth may make them less viable for genetic flow. Identifying the benthic organisms along this seamount chain will provide important insight into the physical controls on evolutionary biology in the deep ocean. In addition, the origin of the seamounts themselves remains a question. Early geophysical studies, primarily magnetic orientation, suggest a Cretaceous age and a location of origin more than 2000 n.m. to the southeast (Schimke and Bufe, 1968). That age is significantly older than the adjacent Hawaiian Islands. Alternatively, the seamounts may have formed from the Hawaiian mantle plume. Their position is consistent with the Hawaiian Arch that forms a volcanic 'halo' around the Hawaiian chain. As seamount chains provide important markers to paleo-tectonic reconstructions, understanding the origin of the Chautauqua chain through geochemical analyses will have significant implications. Further, the age of the seamounts presents important context for the abundance and grade of rare metals contained in Fe-Mn crusts. As metal composition and concentration reflects ambient oceanic conditions, knowing the position of the seamount through time is important. Further, an age of 114 million years vs. ~5 million years, depending on the favored model of formation, would have implications for the thickness of Fe-Mn crusts. The objectives are to: 1.) Generate high-quality bathymetric maps of the Chautauqua Seamount chain to identify dive targets at distinct depth ranges and benthic habitats at multiple seamounts. 2.) Conduct ROV dives to identify benthic fauna, characterize ecosystems as a function of position on the seamounts, and collect voucher samples within distinct benthic habitats including seamount summits and flanks. 3.) Collect rock samples along the seamount chain for later geochemical analysis of lava composition, radiogenic dating, and FeMn crust composition.

The information and data generated by these expeditions will directly contribute to a better understanding of the deep-water habitats, ecosystems, and geologic history of the NWHI by providing PMNM basic information about the about the rich and unique biological resources and habitats of this region. Improved knowledge will help generate continuous support for the monument and its protection of these resources.

*Considering the purpose of the proposed activities, do you intend to film / photograph federally protected species beyond the protocols provided in PMNM Best Management Practices (https://www.papahanaumokuakea.gov/permit/bestmanagement.html)? Yes ☐ No ☒

If so, please list the species you specifically intend to target.

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?

ROV Dives - All of the dive sites are located on deep seamounts, well away from the core emergent and shallow water features. Although some seafloor mapping has been conducted in the Southern Wentworth and Chautauqua Seamount regions, others are completely unmapped and to our knowledge are completely unexplored. Our goal is to discover how they formed and what type of biological communities they support.

This is a very low impact project that only involves collecting mapping, video, sensor data, and targeted rock or biological specimens via ROV. When specimen collecting is carried out, the ROV manipulator, suction sampler, or short tube core will be used for very selective sampling that minimally effects the nearby seafloor and fauna. We request permission to collect a maximum of fifteen rock samples per dive, which will have either no or a minimal amount of attached organisms. We request a maximum of five of any particular species per dive. Biological specimens suspected of being new species or new records for Hawaiian waters will be the main targets. We may need to discard steel ballast plates from the ROV to maintain proper buoyancy at the end of a dive. The steel plates weigh 20lbs in air, 16 lbs in water and have dimensions of 12x9x0.5 inches. We will minimize impacts by only discarding plates in areas where there is no visible macrofauna. On board the vessel, the biological samples will be preserved in ethanol, although bleach and formalin may be used for certain organisms for the best possible preservation. *Nautilus* has a wet lab with fume hood, chemical lockers, and established protocols to ensure samples are properly preserved and avoid any impact to the environment.

Ocean Exploration Trust has a long history of scientific exploration that is sensitive to cultural or historic resources. We do not touch or disturb any historic sites without proper permission and permitting. We will not disturb any historic sites that may be encountered on this cruise. Given the relatively short durations of potential impact during ROV dives, we expect ROV operations

will have no significant effect on the cultural, natural, and historic resources and ecological integrity of the monument.

Mapping - Mapping information will be collected with a sub-bottom profiler and EM 302 multibeam echosounder (the same system as on R/V *Falkor* and NOAA's ship *Okeanos Explorer*). We expect that mapping operations will have no effect on the cultural, natural, and historic resources and ecological integrity of the monument. Multibeam mapping has already taken place in the Monument with no detected effects on the Monument resources. We expect all mapping will take place in deep water and at considerable distance from emergent land. *Nautilus* has two scientific sonars that are configured to operate simultaneously without interference: a 30 kHz multibeam system, and 3.5 kHz chirp sub-bottom profiler sonar. The multibeam is used to map broad swaths for bathymetry and water column feature detection (e.g. gaseous seeps) and the sub-bottom profiler provides data useful for interpreting sub-seafloor geology. Both systems are routinely used by this exploration vessel and have provided invaluable scientific data for marine researchers and managers, including numerous National Marine Sanctuaries. Each of these sonar systems is described separately in the sections below. An assessment of potential impacts on marine mammals using best available information is then provided along with proposed safeguards to reduce any potential impacts. OET has a Marine Mammals and Sea Turtle standard operating procedure for navigator/mapper and mates to follow based on NOAA's National Marine Fisheries Service and Office of National Marine Sanctuaries vessel operating guidelines.

Multibeam systems are focused sonar arrays that use "selective angular directivity" and transmit "very short pulses at limited ping rates" (Lurton & DeRuiter 2011). These two characteristics of this type of sonar decrease the potential sound exposure level as well as decrease the probability of the animals being subjected to temporary threshold shift (TTS) intensity levels.

The National Science Foundation's 2011 document "Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey" provides a detailed analysis of potential impacts of seismic, multibeam, and sub-bottom sonars on sea turtles and marine mammals. Seismic surveys have the most potential impact and are not proposed in this permit application. The document evaluates deep water multibeam systems ranging from 12-95 kHz. The EM302 operates at 30 kHz so falls within the frequency, source levels, pulse lengths and beam widths evaluated by this report. The SBP on the *Nautilus* is of the same type evaluated in the report. With respect to multibeam echosounders (MBES) and sub-bottom profilers (SBP), the following direct excerpts are conclusions of this document regarding the potential impact on sea turtles, mysticetes, odontocetes, and pinnepeds:

Sea Turtles:
"Operation of the MBES, SBP, or pingers is not expected to affect sea turtles, because the associated frequency ranges are above the known hearing range of sea turtles. The SBP operates at 3.5 kHz with a maximum source output of 222 dB re 1 μPa-m. Thus, the frequency range of the SBP is outside the known detection range of sea turtles based on available data. As a result, sea turtles are not expected to be capable of hearing the higher frequency sounds produced by

SBPs. Furthermore, the intermittent and narrow downward-directed nature of the MBES and SBP as emitted from the transiting seismic vessel would result in no more than one or two brief ping exposures."

Mysticetes
"During the proposed marine seismic surveys, the pings from the MBES, SBP, and pingers would be very short (<1-64 ms). Thus, a given mammal would not receive many of the downward-directed MBES or SBP pings as the vessel passes by. In the case of the MBESs that operate at 30 kHz or higher, their operating frequencies are too high to have any effects on mysticete behavior. Source levels of the SBPs, another type of echosounder, are lower (maximum source level 222 dB re 1 microPa [rms]) than those of the MBES discussed above. Thus, there is even less likelihood of TTS occurring through exposure to SBP sounds, even in an animal that is briefly near the source. The SBP is usually operated simultaneously with other higher-power acoustic sources. Many marine mammals, particularly mysticetes, move away in response to the approaching higher-power sources or the vessel itself before the mammals are close enough for there to be any possibility of effects from the SBP's less-intense sounds. The possibility of PTS through exposure to MBES or SBP sounds is considered negligible and PTS is not expected to occur. Burkhardt et al. (2008) concluded that immediate direct injury was possible only if a cetacean dived under the vessel into the immediate vicinity of the transducer. Furthermore, PTS (or any injury or pathological effect) has never been demonstrated for any marine mammal exposed to echosounders such as the proposed MBESs and SBPs."

Odontocetes
"In summary, sounds from all the MBESs would be readily audible to most and possibly all odontocetes when animals are within the narrow angular extent of the intermittent sound beam. As with baleen whales, odontocete communications will not be masked appreciably by MBES, SBP, or pinger signals given their low duty cycles, the brief period (i.e., seconds) when an individual mammal would potentially be within the downward-directed MBES or SBP beam from a transiting vessel, and the relatively low source level of a pinger. Operation of MBESs, SBPs, and pingers is not likely to impact odontocetes. The project MBESs, SBPs, and pingers are not expected to induce TTS. The possibility of PTS through exposure to MBES or SBP sounds is considered negligible."

Pinnipeds
"The SBPs associated with the proposed marine seismic activities operate in the MF range of approximately 3.5 kHz with a maximum source output of 222 dB re 1 μPa-m (rms). The frequency range of the SBPs is within the frequency band audible to pinnipeds. Masking effects due to MBES, SBP, or pinger signals are expected to be minimal or non-existent. Thus, brief exposure of pinnipeds to small numbers of signals from the MBES or SBP would not result in a —take by harassment as defined by NMFS and the ESA. The project MBESs, SBPs, and pingers are not expected to induce TTS. Although the MBESs, SBPs, and pingers can presumably be heard by pinnipeds, their operation is not likely to affect pinnipeds. The intermittent and narrow downward-directed nature of the MBESs and SPBs would result in no more than one or two brief ping exposures of any individual pinniped given the movement and speed of the vessel and

animal; such brief exposure to this sound is not expected to cause injury or PTS based on results of limited studies of some pinniped species."

Nautilus sonars will be turned on before the ship enters into the Monument and will only be turned off during ROV dives. We will minimize turning the system on and off as a precautionary measure to avoid possible startling of the animals. When the multibeam system is turned off in the Monument, the flexible "soft start" mode will be used to restart the multibeam. The soft start mode is a delay function, starting the sonar transmissions at a low output level and then gradually increasing to the level required for optimal bathymetry data collection. The soft start modes can either be set at -10 or -20 decibels with a 0 to 15 minute ramp up time to the desired power. We can select -10 dB, -20 dB or maximum transmit power. Maximum transmit power is recommended by Kongsberg for maximizing the mapping swath coverage. In the deepest operating mode the EM302 is 243 dB re 1 microPa. When operating in shallow modes the decibels are 238 dB re 1 microPa.

Underway CTD - Accurate measurements of sound speed as a function of depth down to approximately 500 meters are needed every 3-6 hours during multibeam sonar mapping operations. These sound speed measurements are essential for ray-tracing calculations used by the EM302 multibeam sonar system in order to collect accurate bathymetry and backscatter data. To obtain these essential data, the *Nautilus* can either use an XBT or the underway CTD (UCTD) equipped with a sound velocity probe. The *Nautilus* uses the UCTD as much as possible rather than conducting XBTs, since UCTD does not leave anything in the ocean after gathering the measurements. This is limited to daylight hours and favorable weather conditions.

The UCTD (http://www.oceanscience.com/Products/UnderwayCTD/Underway-CTD.aspx) manufactured by Teledyne Ocean science is a piece of equipment used to gather conductivity/temperature/depth (CTD) measurements or sound velocity measurements while the ship is moving. A brochure from the manufacturer with pictures and specifications is included as appendix B. This instrument is mounted on the stern railing and has a reusable probe that is dropped through the water column then retrieved by rewinding the line onto a motorized spool. The unit would not touch the seafloor. The unit is equipped with a CTD probe. The UCTD can obtain water column profiles down to over 500 meters while the ship is moving at 8 knots. 8-10 knots is the ship's normal ocean mapping survey speed, so the UCTD can sample the water column while continuously mapping. The ship also obtains sound velocity profiles using expendable probes (XBTs). XBTs are expensive consumable supplies and leave behind zinc and copper waste in the ocean due to the one-time use of each probe. OET has installed the UCTD in order to minimize the use of XBTs while still gathering essential sound velocity profile data needed every 3-6 hours while mapping in order to accurately collect high quality multibeam sonar data.

XBTs are deployed to obtain sound velocity profiles to calibrate the multibeam system and ensure accurate bathymetric mapping when we cannot conduct a UCTD. The XBT type is the Deep Blue probe produced by Lockheed Martin Sippican. A single Deep Blue XBT is 8.5 in. length x 2 in. width and weighs 2.53 lbs. It consists of a plastic spool, hair thin copper wire (< 1mm width), zinc weight, thermistor (comprised of two short wires (< 8.5 in. length)) and is contained in a plastic housing. The Deep Blue XBT contains no chemical solutions. The very fine wire connecting the XBT probe to the ship is extremely easy to break by hand once the

probe reaches maximum depth. The minimal tensile strength of the wire should represent a minimal entanglement risk for species of concern. The potential for XBT deployments to impact ESA-listed species was the topic of an informal consultation request from the Monument to NMFS during the permit review for the past expeditions. The Monument's determination was that the *Falkor*'s use of XBTs may affect, but is not likely to adversely affect, Hawaiian monk seals, green sea turtles, hawksbill sea turtles, leatherback sea turtles, olive ridley sea turtles, North Pacific loggerhead sea turtles, MHI Insular false killer whales, humpback whales, sperm whales, fin whales, blue whales, sei whales, and north pacific right whales. We expect the same determination would be made with respect to the deployment of XBTs by the *Nautilus*. We expect to use a maximum of 50 XBTs during the three expeditions (45 days). This number will likely be greatly reduced by using Underway CTD casts instead.

National Geographic Drop Cameras- The National Geographic Society Deep Ocean Dropcam, developed by National Geographic Exploration Technology Lab, is an efficient way to capture video of the sea floor (Turchik et al., 2015). It is a high-definition camera encased in a pressure housing rated to go to the deepest part of the ocean, with onboard lights to illuminate the scene. The camera is weighted with ~25lbs of sand and free falls to the sea floor, where it is programmed to record for a number of hours. When recording is complete, the burnwire connecting it to the weight dissolves, and it freely floats to the surface for recovery by the ship. The ballast consists of sand in a biodegradable cotton pillowcase and line. We plan to periodically deploy these during seafloor mapping surveys.

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 are aware of the significance and cultural importance of the NWHI to Native Hawaiians. As a sacred place, and especially in the realm of Po (beyond Mokumanamana), our plan is to tread lightly and leave no footprint from our activities. Recognizing that natural resources are, in fact, cultural resources for Native Hawaiians, the information and data generated by this project will assist PMNM by providing basic information about the about the rich and unique biological resources and habitats of this region. This knowledge will contribute directly to the documentation of these natural/cultural resources, and it is this understanding that allows for enhanced protection of these resources. Only selective specimen collections with the ROV that have the potential to contribute significant scientific discoveries (detailed in section 7a) are requested under this permit, and would be collected in a way that minimally effects the nearby seafloor and fauna. Given the minor and short-term durations of potential impact, we expect ROV operations will have no significant effect on the cultural, natural, and historic resources and ecological integrity of the monument. We believe this proposed activity is consistent with the spirit of Proclamation 8031, and specifically with Finding 1.b. Additionally, this project will facilitate the Monument's effort to "bring the place to the people, rather than the people to the place" through telepresence and other outreach and education efforts that will share PMNM resources with a broad audience online in real-time. We are working with PMNM staff to develop protocols and communications guides to raise awareness about the cultural, as well as

natural significance of the monument. We are also discussing ways to incorporate the Hawaiian language revitalization effort into our outreach. Outreach will occur through live broadcasts on NautilusLive.org and in live interactions from the ship to classrooms, visitor's centers, aquariums or other public forums.

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.

The activities proposed here are specifically aimed to help scientists, managers, and others better understand the formation and ecology of seamounts in the NWHI. Direct mapping and ROV dives are the only ways acquire high resolution bathymetry data and obtain close up video data. A major objective of the project is to benefit the management of the monument by revealing the nature of the seafloor and associated habitats within its boundaries. The vast majority of existing HD video information is from depths shallower than 2000 m.

d. How does the end value of the activity outweigh its adverse impacts on Monument cultural, natural and historic resources, qualities, and ecological integrity?

The information gathered will directly contribute to a better understanding of the formation of these seamounts and locations and types of deep-water habitats and ecosystems in the NWHI. High resolution maps and baseline oceanographic data including temperature, salinity, dissolved oxygen, and imagery is highly valuable to managers and researchers. As noted in 7.b. (above), there are no significant anticipated impacts to PMNM cultural, natural, or historic resources. No shore access is required and if project gear touches or rests on the seafloor, it will be minimal and for short duration. In our estimation, the end value of this activity far outweighs any potential impacts, thus meeting the criteria noted under Finding 1.d. in Proclamation 8031.

e. Explain how the duration of the activity is no longer than necessary to achieve its stated purpose.

Each leg of the expedition serves a specific purpose to map or characterize seamounts within the PMNM. The first leg is 24 days from Honolulu to Honolulu to the Lili`uokalani Ridge seamounts. We will have 17-18 days on site with a goal of mapping 9 seamounts, which should allow us to cover the summit and most of the flanks. The second leg to the southern Wentworth seamounts has dual goals of ROV characterization and seafloor mapping of any unmapped or poorly mapped areas. This 21-day expedition is also from Honolulu to Honolulu, resulting in 15 days on site. There are 10 total seamount dive targets (1 outside and one straddling the PMNM boundary), which should allow for 1 dive per day on each and some additional time for mapping. This will allow us to characterize a small portion of each of these seamounts. The third leg to the Chautauqua Seamount chain will likely only have 1 dive on the northernmost seamount, which falls within the PMNM boundary, due to time needed to characterize the chain during this two-week expedition.

f. Provide information demonstrating that you are qualified to conduct and complete the activity and mitigate any potential impacts resulting from its conduct.

Ocean Exploration Trust has been conducting scientific exploration of the deep sea and outreach since 2009 with its vessel E/V *Nautilus*. We have conducted seafloor mapping and remotely operated vehicle characterization in all of the west coast National Marine Sanctuaries, Thunder Bay NMS, the PMNM, and PRIMNM in the past. We work with highly trained science and operations team for all expeditions and involve partners from the Sanctuaries and Monument. Among those involved in the Monument work is Dr. Christopher Kelley, a researcher emeritus from the University of Hawaii, who has been working in the Hawaiian Archipelago for decades and was Chief Scientist on past *Falkor* mapping expeditions and *Okeanos Explorer* and *Nautilus* ROV cruises in the Monument. In addition, Randy Kosaki, research coordinator at PMNM, Dr. Beth Orcutt at Bigelow Laboratory for Ocean Sciences (Maine), and Dr. Adam Soule of University of Rhode Island are involved as science leaders for these expeditions. Joshua Chernov, the ROV Operations Manager, has decades of experience safely maintaining and operating remotely operated vehicles, many of which have been in areas of particular cultural and natural significance. Dr. Emil Petruncio, US Navy-retired, is leading the first two expeditions, and has sailed on E/V *Nautilus* expeditions for many years as a navigator, mapper, lead scientist, and expedition leader. He also taught at the US Naval Academy and is an adjunct professor at Anne Arundel Community College in Maryland.

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.

We are funded by NOAA's Office of National Marine Sanctuaries and the NOAA Office of Exploration and Research for these expeditions. The ship and operators are fully insured.

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.

Multibeam mapping is the best technique for mapping the seafloor deeper than 50m. The *Nautilus* multibeam system is capable of producing high resolution maps a depths 200 m and greater. The sub-bottom profiler is simultaneously gathering data to help geologists interpret the shallow geology of the seafloor. ROVs are the state of the best method to collect high resolution video information, oceanographic environmental data, and targeted samples.

i. Has your vessel been outfitted with a mobile transceiver unit approved by OLE and complies with the requirements of Presidential Proclamation 8031?

No—we have discussed borrowing one from PMNM/NOAA.

j. Demonstrate that there are no other factors that would make the issuance of a permit for the activity inappropriate.

There are no other factors that would make the issuance of the permit for the activity inappropriate.

8. Procedures/Methods:

During the Lili`uokalani Seamounts mapping expedition, seafloor mapping would be conducted continuously. Each day, weather and conditions will be evaluated for 1-2 deployments of the NGS Deep Ocean Dropcams.

During the Southern Wentworth and Chautauqua seamount expeditions, the general plan is to map and then conduct ROV dives. We work 24 hours per day at sea and do not have set ROV or mapping hours. In general, we will try to conduct 10-12 hour dives and then about 12 hours of mapping.

NOTE: If land or marine archeological activities are involved, contact the Monument Permit Coordinator at the address on the general application form before proceeding.

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:

Rock, sediment, coral, sponge, worm, crustacean, shrimp, bivalve, microbes

Scientific name:

N/A

& size of specimens:

Up to 15 rocks, 5 push cores, and 5 of an individual species per site. When possible, only small pieces of coral colonies will be taken. Rocks are typically softball-grapefruit sized. Up to 6x5L water samples per ROV dive.

Collection location:
Please see the information above for location information for specimen collection, which will occur on the two remotely operated vehicle legs in the southern Wentworth seamount chain and on the northernmost Chauatauqua seamount.

☒ Whole Organism ☒ Partial Organism

9b. What will be done with the specimens after the project has ended?
We are developing an in-depth specimen request list with the science community. This will include images (when available) to guide the specimen collections. We work with sample repositories to ensure the samples are available to any researcher post-expedition. However, we have partnered with scientists who will analyze many samples post-cruise. Rock samples are

split and air-dried or frozen. The basalt rocks will be sub-sampled for several analyses: 1. Argon-Argon age dating (Dr. Anthony Koppers, Oregon State University), 2: basalt geochemical composition (Dr. Jasper Konter, University of Hawaii and Dr. Dorsey Wanless, University of Idaho), 2. Crustal microbial analysis (Dr. Beth Orcutt, Bigelow Laboratory for Ocean Sciences), and 3. Crustal mineral content (Dr. Amy Gartman, USGS). The remaining geological samples are stored at the Marine Geological Samples Lab at the University of Rhode Island's Graduate School of Oceanography. The sediment cores are stored in a refrigerator and used for shallow (<10 inches) stratigraphic analysis. Specimens will be stored in public repositories for request. Geological samples are available to researchers at the University of Rhode Island Graduate School of Oceanography's Marine Geological Samples Lab. Biological samples are stored in ethanol and sub-sampled for DNA (also stored in ethanol) aboard the *Nautilus*. The biological samples are stored at the Museum of Comparative Zoology at Harvard University. Dr. Meredith Everett, NOAA NWFSC, who is an eDNA expert, will request subsamples of coral and sponge for her research, including building a DNA primer base for the eDNA methodologies. Researchers will use these samples to directly compare the DNA in water samples to what is seen and sampled in the environment. Dr. Christopher Kelley may subsample sponge specimens for ID.

9c. Will the organisms be kept alive after collection? ☐ **Yes** ☒ **No**

• General site/location for collections:
N/A

• Is it an open or closed system? ☐ Open ☒ Closed
N/A

• Is there an outfall? ☐ Yes ☒ No
N/A

• Will these organisms be housed with other organisms? If so, what are the other organisms?
N/A

• Will organisms be released?
No.

10. If applicable, how will the collected samples or specimens be transported out of the Monument?
Specimens will be transported aboard the *Nautilus* to Honolulu where lead scientists, Dr. Kelley and Dr. Orcutt will take sub-samples for local researchers back to the lab. The remainder will be shipped to the repositories listed above from Honolulu, HI.

11. Describe collaborative activities to share samples, reduce duplicative sampling, or duplicative research:
OET and the lead scientists have done research that shows no deep submergence ROV or AUV dives have been done in these areas. *Nautilus* will map areas complementary to mapping

accomplished during previous expeditions by consulting national databases prior to mapping an area to ensure we are not duplicating efforts. *Nautilus* has an open data policy so all data will be freely available after the expeditions. We make the data publicly discoverable on the Rolling Deck to Repository archive (https://www.rvdata.us/search/vessel/Nautilus). The mapping data is available in the NOAA NECI repository (https://www.ngdc.noaa.gov/multibeam-survey-search/#!/). In addition, the planning for these expeditions was formed with the input of the wider science community through our Scientist Ashore Program (https://nautiluslive.org/join/scientists-ashore-program). Over 100 scientists have expressed interest in these expeditions and participated in discussions of the initial plan. The early expedition meetings raised awareness of the plans and provided a pathway for input. Researchers can watch and participate in these expeditions from shore including viewing live videos and data, and a chat service to communicate with watchstanders on the vessel. The program is open to all interested researchers and scientists via the link above.

12a. List all specialized gear and materials to be used in this activity:
Kongsberg EM302 multibeam echosounder and sound velocity profiler

Underway CTD

Knudsen Chirp 3260 Sub-bottom profiler

Hercules and Argus remotely operated vehicles (ROVs)

Sonardyne Ranger2 Ultra Short Baseline system for tracking the location of the ROVs underwater

12b. List all Hazardous Materials you propose to take to and use within the Monument:
Most of the biological samples will be stored in EtOH (ethanol) on board the vessel in the ship's wet lab. A few will be preserved in 10% formalin for histological analysis. Small pieces of corals and sponges may also be placed in bleach for onboard microscopic examination of sclerites and spicules. We have provided MSDS sheets for these materials.

13. Describe any fixed installations and instrumentation proposed to be set in the Monument:
None

14. Provide a time line for sample analysis, data analysis, write-up and publication of information:
We will finalize multibeam mapping data products by the end of each expedition leg. All data and samples are available within a month of the expedition by request and provided to the data repositories within 60 days (time until available from repositories varies by institution). Video is also available post-cruise by request and is also available within a few days post-dive on the NautilusLive YouTube channel. The YouTube recordings are from the satellite data recorded at the Inner Space Center in Rhode Island, and therefore may be incomplete. Expedition summaries

that highlight all results will be published in an annual supplement to the Oceanography Society magazine by March 2022.

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

Brooke, S., C. Kelley, R. Kosaki, M. Parke, F. Parrish, A. Bowman, and J. Potter. 2017. CAPSTONE, Exploring the US Marine Protected Areas in the Central and Western Pacific. *Journal of Oceanography*. 30:1, p. 53-55.

Dohrmann, M., C. Kelley, M. Kelly, A. Pisera, J. Hooper, H. Reiswig. 2017. An integrative systematic framework helps to reconstruct skeletal evolution of glass sponges (Porifera, Hexactinellida). *Frontiers in Zoology*. 14:18. 31p.

Wagner, D. & C. Kelley. 2016. The largest sponge in the world? *Marine Biodiversity*. DOI 10.1007/s12526-016-0508-z.

Kelley, C., S. France, F. Parrish, D. Wagner, M. Gerringer, and M. Garcia. 2016. CAPSTONE's First Year: 2015 Hohonu Moana: Exploring Deep Waters off Hawai'i Expedition. *Oceanography*. vol. 29:1. Supplement. p. 68-73.

Kelley, C.D. T. Kerby, PM Sarradin, J. Sarazin, D. Lindsay. 2016. Chapter 13: Submersibles and ROVs. In: *Biological Sampling in the Deep Sea*. John Wiley & Sons, Ltd. 451 p.

Kelley, C., J. Smith, J. Tree, J. Miller, B. Boston, M. Garcia, G. Ito, J. Taylor, F. Lichowski, D. Wagner, J. Leonard, B. Dechnik, D. Luers. 2015. New Seafloor Mapping Surveys Are Rewriting the Geologic History of the Hawaiian Archipelago. *EOS* 96(11): 17-19.

Kelley, C., T. Hourigan, N.A. Raineault, A. Balbas, D. Wanless, L. Marsh, R. Wipfler, L. Ardor Bellucci, R. Kane, Enigmatic Seamounts: Exploring the Geologic Origins and Biological Communities in Papanaumokuakea Marine National Monument. in: Raineault, N.A., and J. Flanders, eds. 2019. New frontiers in ocean exploration: The E/V *Nautilus*, NOAA Ship *Okeanos Explorer*, and R/V *Falkor* 2018 field season. *Oceanography* 32(1), supplement, 150 pp., https://doi.org/10.5670/oceanog.2019.supplement.01.

Kelley, C.; R. Moffitt; & J.R. Smith. 2006. Description of bottomfish essential fish habitat on four banks in the Northwestern Hawaiian Islands. *Atoll Research Bulletin*. No. 543, 319-332.

Kelley, C. & W. Ikehara. 2006. The impacts of bottomfishing on Raita and West St. Rogatien Banks in the Northwestern Hawaiian Islands. *Atoll Research Bulletin*. No. 543, 305-318.

Orcutt, B.N., Bach, W., Becker, K., Fisher, A.T., Hentscher, M., Toner, B.M., et al. (2011a). Colonization of subsurface microbial observatories deployed in young ocean crust. *The ISME Journal* 5**,** 692-703. doi: 10.1038/ismej.2010.157.

Orcutt, B.N., and D'Angelo, T. (2020). "Synthesis of publicly-available sequence datasets of the 16S rRNA gene in environmental DNA extracted from seafloor and subseafloor samples from the Dorado Outcrop, Lō'ihi Seamount, North Pond, and Juan de Fuca Ridge flank.

Opresko, D.M., D. Wagner, 2020. New species of black corals (Cnidaria:Anthozoa: Antipatharia) from deep-sea seamounts and ridges in the North Pacific. Zootaxa, 4868(4): 543-559.

Parrish, F. A. Baco, C. Kelley, & H. Reiswig. 2015. Pacific Islands region deep sea coral and sponge report. In: *The state of deep coral ecosystems of the United States: 2015.*

Schlacher, T, A. Baco-Taylor, A. Rowden, T. O'Hara, M. Clark, C. Kelley, J. Dower. 2013. Seamount benthos in a Cobalt-rich crust region of the Central Pacific: implications for conservation challenges posed by future seabed mining. *Diversity and Distributions.* 1-12.

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.

Nicole A Raimondi 21 April 2021

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