National Science Foundation
Geosciences Directorate
Division of Ocean Sciences
Alexandria, Virginia

FINDING OF NO SIGNIFICANT IMPACT (FONSI) PURSUANT TO THE NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) AND EXECUTIVE ORDER 12114 AND DECISION DOCUMENT

Marine Geophysical Surveys in the North Pacific Ocean, 2018/2019

FINDING OF NO SIGNIFICANT IMPACT

OCE 1737245
Principal Investigator/Institution: Donna Shillington, Columbia University Lamont-Doherty Earth Observatory (L-DEO)
Co-Principal Investigator(s): Anthony Watts, Oxford University
Project Title: Collaborative Research: Seismic imaging of volcano construction, underplating and flexure along the Hawaiian-Emperor Seamount Chain

OCE 1737243
Principal Investigator/Institution: Robert Dunn, University of Hawaii
Co-Principal Investigator(s): Garrett Apuzen-Ito
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Final Environmental Assessment/Analysis (Final EA) was prepared for the proposed research projects funded by the National Science Foundation (NSF) entitled, "Collaborative Research: Collaborative Research: Seismic imaging of volcano construction, underplating and flexure along the Hawaiian-Emperor Seamount Chain" (Proposed Action). The Proposed Action would involve two marine geophysical surveys (or "seismic surveys") to be conducted on board Research Vessel *Marcus G. Langseth* (R/V *Langseth*) in the North Pacific Ocean. The Principal Investigators (PI) and Co- PIs associated with tthe Proposed Action are listed above. R/V *Langseth* is owned by NSF and operated on its behalf through a Cooperative Agreement entered in 2012 by Columbia University's Lamont-Doherty Earth Observatory (L-DEO).

The Final EA entitled, "Environmental Assessment/Analysis of a Marine Geophysical Surveys by the R/V *Marcus G. Langseth* in the North Pacific Ocean, 2018/2019" (Report #FA0143-01) (Attachment 1), was prepared by LGL Limited environmental research associates (LGL) on behalf of NSF and analyzed the potential impacts on the human and natural environment associated with the proposed research activities pursuant to National Environmental Policy Act (NEPA) and Executive Order 12114 – Environmental effects abroad of major Federal actions (Executive Order 12114). The Final EA tiers to the 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 (June 2011) and the Record of Decision (June 2012) (jointly referred to herein as PEIS). The Final EA also incorporates by reference the analyses and conclusions set forth in the Incidental Harassment Authorization (IHA) and the Biological Opinion (BiOp)/Incidental Take Statement (ITS) issued by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) for this Proposed Action. The conclusions from the Final EA were consistent with the conclusions of the PEIS and were used to inform the Division of Ocean Sciences (OCE) management of potential environmental impacts of the surveys. OCE has reviewed and concurs with the Final EA findings. The Final EA is incorporated into this Finding of No Significant Impact (FONSI) and Decision Document by reference as if fully set forth herein.

Project Objectives and Context

The main goal of the Proposed Action is to address questions about the fundamental earth processes that create the volcanoes of the Hawaii-Emperor Seamount chain and elsewhere. To achieve the project goals, the researchers propose to collect 2-Dimensional (2-D) deep-penetration seismic reflection and wide-angle seismic refraction data on a series of long transects across the Hawaii-Emperor Seamount Chain to constrain the thickness of new crust created by magmatism and the way that the oceanic plate bends and deforms because of the addition of new crust. Two seismic surveys were proposed to be conducted in support of the Proposed Action. The two surveys are illustrated in Attachment 1, Figure 1, and are referred to as the Hawaii survey and Emperor Seamounts survey.

Although not funded through NSF, collaborators Dr. I. Grevenmeyer (GEOMAR Helmholtz Centre for Ocean Research Kiel) would work with the PIs to achieve the research goals, providing assistance, such as through logistical support (e.g., Ocean Bottom Seismometers (OBSs)) and data acquisition and exchange. Likewise, personnel from the U.S. Geological Survey, Drs. U. Brink and N. Miller, would collaborate on the program without receiving NSF funding; U.S. Geological Survey personnel would participate in planning, acquiring and analyzing data and using the results to inform hazards for Hawaii. The Proposed Action would support a unique collaboration of U.S. and international, scientists, and graduate students.

Summary of Proposed Action and Alternatives

The procedures of the Proposed Action would be similar to those used during previous 2-D seismic surveys and would use conventional seismic methodology. The proposed seismic survey locations would be in the North Pacific Ocean (Attachment 1, Figure 1); the Hawaii survey would occur within the U.S. Exclusive Economic Zone (EEZ); the Emperor Seamounts survey would take place within International Waters. A total of approximately (~) 5657 kilometers (km) of transect lines would be surveyed in the North Pacific Ocean: ~3455 km during the Hawaii survey and ~2202 km during the Emperor Seamounts survey. There could be additional seismic operations associated with turns, airgun testing, and repeat coverage of any areas where initial data quality is sub-standard. In the calculations for all areas (see Attachment 1, Section 4.1.1.5), 25% has been added in the form of operational days which is equivalent to adding 25% to the proposed line km to be surveyed. Most of the Hawaiian survey would occur in deep (greater than (>)1000 meters (m)) water; only a small proportion (1.5%) would occur in intermediate water depths (100–1000 m). All of the Emperor Seamounts survey would take place in deep (>1000 m) water.

During the two 2-D surveys, R/V *Langseth* would tow the full array, consisting of four strings with 36 airguns (plus 4 spares) and a total volume of ~6600 cubic inches (in^3). The receiving system is proposed to consist of ocean bottom seismometers (OBSs) and/or a hydrophone streamer. As the airgun array is towed along the survey lines, the hydrophone streamers or OBSs would receive the returning acoustic signals; the hydrophone streamer would transfer the data to the on-board processing system while the OBSs would record the returning acoustic signals internally for later analysis. The 4-string array would be towed at a depth of 12 m, and the shot intervals would range from 50 m for multi-channel seismic (MCS) reflection lines and 150 m for OBS refraction lines. In addition to the operations of the airgun array, a multibeam echosounder (MBES) and sub-bottom profiler (SBP) are proposed to be operated from R/V *Langseth* continuously throughout the cruise.

The surveys are proposed for 2018/2019. The Hawaii survey would consist of ~36 days of seismic operations plus 11 days of equipment deployment/retrieval, ~3 days of operational contingency time (e.g., weather delays, etc.), and ~3 days of transit. R/V *Langseth* would leave out of and return to port in Honolulu during early fall 2018. The Emperor Seamounts survey would be expected to last 42 days, including ~13 days of seismic operations, ~11 days of equipment deployment/retrieval, ~5.5 days of operational contingency time, and 12.5 days of transit. R/V *Langseth* would leave Honolulu and return to port likely in Adak or Dutch Harbor. The most likely timing for this cruise would be late spring/early summer 2019. Some deviation in the length of the surveys, and ports of call, may be required, depending on logistics and weather; however, seismic operations would only occur during the timeframe allowable under the IHA. Seasonality of the proposed survey operations does not affect the ensuing analysis (including take estimates), because the best available species densities for any time of the year have been used. As higher densities of baleen whales would be encountered in the Emperor Seamounts survey area during the summer, the highest densities available for the area (i.e., July–September) were used to determine conservative take estimates for baleen whales for a potential survey at any time of the year. Humpback whales are known to occur in Hawaii during the winter (December–April); thus, more individuals would be encountered if the proposed survey would occur at that time.

Another alternative to conducting the Proposed Action would be the "No Action" alternative (i.e. the proposed research operations would not be conducted). The "No Action" alternative would result in no disturbance to marine species attributable to the Proposed Action, but geological data of considerable scientific value and relevance to increasing our understanding of geologic processes in the North Pacific Ocean would not be collected and the purpose and need for the proposed activity would not be met.

Summary of environmental consequences

The Final EA includes analysis on the affected environment (Chapter III) and the potential effects of the Proposed Action on the environment (Chapter IV). Potential impacts of the Proposed Action on the environment would be primarily a result of the operation of the airgun array. The potential effects of sounds from airguns on marine species, mammals, and sea turtles of particular concern, are described in detail in Attachment 1 (Chapter IV and PEIS Chapters 3 & 4) and might include one or more of the following: tolerance, masking of natural sounds, behavioral disturbance, and at least in theory, temporary or permanent hearing impairment, or non-auditory physical or physiological effects. It is unlikely that the Proposed Action would result in any cases of

temporary or especially permanent hearing impairment, or any significant non-auditory physical or physiological effects. Some behavioral disturbance is expected, if animals are in the general area during seismic operations, but this would be localized, short-term, and involve limited numbers of animals. The potential effects from the other proposed acoustic sources were also considered, however, they would not be likely to have a significant effect on the environment (Attachment 1, Chapter IV; and PEIS Chapter III).

The Proposed Action includes an extensive monitoring and mitigation program to further minimize potential impacts on the environment. Mitigation efforts include pre-cruise planning activities and operational activities (Attachment 1, Chapters II and IV; and PEIS 2.4.1.1). Pre-cruise planning mitigation activities included consideration of energy source optimization/minimization; survey timing (i.e., environmental conditions: seasonal presence of animals and weather); and calculation of mitigation zones. The operational mitigation program would further minimize potential impacts to marine species that may be present during the conduct of the proposed research to a level of insignificance.

As detailed in Attachment 1 (Chapters II and IV), the IHA and ITS issued by NMFS, and Letter of Concurrence (LOC) issued by USFWS, operational monitoring and mitigation measures would include: visual observations, acoustic monitoring, exclusion and buffer zones, pre-clearance and ramp ups, shutdowns and powerdowns, monitoring and reporting. The fact that the airgun array, as a result of its design, directs the majority of the energy downward, and less energy laterally, would also be an inherent mitigation measure. In addition, per the IHA, the acoustic source would be shutdown upon observation of an aggregation of large whales; large whale with calf; melon-headed whale or group of melon-headed whales observed in the range of the Kohala resident stock; and, spinner or bottlenose dolphin or group of dolphins observed approaching or within the Level B harassment zone (6.7 km) in the habitat of the specific main Hawaiian Island insular stock if the authorized takes have been met for any of these stocks. The shutdown requirement would be waived for small dolphins of the following genera: *Tursiops, Delphinus, Lagenodelphis, Lagenorhynchus, Lissodelphis, Stenella* and *Steno*. NMFS included vessel strike avoidance measures in the IHA; however, as noted in the Final EA, R/V *Langseth* (and other vessels in the U.S. Academic Research Fleet) have no history of marine mammal strikes. PSOs would also watch for any impacts the acoustic sources may have on marine species, including seabirds and fish. Although NSF calculated predicted distances to the Level A thresholds based on current NOAA Technical Acoustic Guidance[1], per the IHA, NMFS established a fixed 500 m exclusion zone and 1,000 m buffer zone for the surveys. The predicted distances for the Level B zones are based on the 160dB isopleth, per current NMFS policy for Level B harassment.

With the planned monitoring and mitigation measures, unavoidable impacts to marine species that could be encountered would be expected to be minimal, and limited to short-term, localized changes in behavior and distribution near the seismic vessel. At most, effects on marine mammals may be interpreted as falling within the federal Marine Mammal Protection Act (MMPA) definition of Level B Harassment for those species managed by NMFS, however, NMFS also issued small numbers of Level A take for some marine mammal species for the remote possibility of low-level physiological effects from the Proposed Action. Although considered unlikely, any

[1] NOAA Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing: underwater acoustic thresholds for onset of permanent and temporary threshold shifts. U.S. Dept. of Commerce. 2016.

Level A harassment potentially incurred would be expected to be in the form of some smaller degree of permanent hearing loss due in part to the required monitoring measures for detecting marine mammals and required mitigation measures for power downs or shut downs of the airgun array if any animal is likely to enter the exclusion zones. Neither mortality nor complete deafness of marine mammals is expected to result from the surveys. No long-term or significant effects would be expected on individual marine mammals, sea turtles, seabirds, fish or the populations to which they belong or on their habitats.

The results of the cumulative impacts analysis in the PEIS indicated that there would not be any significant cumulative effects to marine resources from the proposed NSF-funded marine seismic research, including the combined use of airguns, MBES, SBP, and acoustic pingers. However, the PEIS also stated that, cruise-specific cumulative effects analysis would be conducted, "allowing for the identification of other potential activities in the area of the proposed seismic survey that may result in cumulative impacts to environmental resources." The potential cumulative effects of the Proposed Action were evaluated in Section 4.1.6 of the Final EA. Due to the locations of the Proposed Action and distance from shore, human activities in the area around the survey vessel would be anticipated to be limited to fishing, military (Navy) activities, and vessel traffic. Whale watching/tour boat operations could also occur around the Hawaii survey area, but not the Emperor Seamount survey area. Due to the deep-water survey location and brief periods of operations near areas of potential whale watching and tour boat operations at the Hawaii survey area, no impacts would be anticipated from the proposed activity to these industries. Similarly, due to the deep-water survey location, recreational diving would not be anticipated to occur in the Hawaii survey area or the Emperor Seamount survey area; therefore, no impacts would be anticipated from the proposed activity to recreational divers. Fisheries activities and vessel traffic within the region and potential impacts are described in further detail in the Final EA, Chapters III and IV. Fisheries activities would not be precluded in the survey areas; however, a safe distance would need to be kept to avoid possible entanglement with the towed airgun array. No fish kills or injuries were observed during any previous NSF-funded seismic survey activities. Given the brief duration of the proposed surveys and the temporary nature of potential environmental impacts, no cumulative effects, or economic impacts to fisheries, would be anticipated.

The "No Action" alternative would remove the potential of the limited direct and indirect environmental consequences as described. However, it would preclude important scientific research from going forward that would increase the understanding of Earth processes, including megathrust faults and subduction zones. The "No Action" alternative would result in a lost opportunity to obtain important scientific data and knowledge relevant to the geosciences and to society in general. The collaboration, involving PIs, international scientists, and students, would be lost along with the collection of new data, interpretation of these data, and introduction of new results into the greater scientific community. Loss of NSF support often represents a significant negative impact to the academic infrastructure, including the professional and academic careers of the researchers, students, ship technicians and crew who are part of the U.S. Academic Research Fleet. The "No Action" alternative would not meet the purpose and need of the Proposed Action.

As the Draft EA included information regarding marine mammals and threatened and endangered species in the proposed survey areas, it was used for consultations with other regulatory agencies. NSF reviewed and considered public comments received by NMFS during a 30-day public

comment period for the IHA process. After consideration of public comments received during the public comment period and discussions during MMPA and Endangered Species Act (ESA) consultations with NMFS, minor refinements to the information in the Draft EA were made, including special mitigation measures for melon headed whales and spinner and bottlenose dolphins, as previously noted. The new information included in the Final EA, however, did not alter the overall conclusions of the Draft EA and remained consistent with the PEIS.

Coordination with Other Agencies and Processes

Endangered Species Act (ESA)

NSF engaged in formal consultation with NMFS and informal consultation with U.S. Fish and Wildlife Service (USFWS), pursuant to Section 7 of the ESA. After submitting a request on 20 April 2018, NSF received confirmation from USFWS on 13 July 2018 that the proposed activity may affect but was not likely to adversely affect endangered species under their jurisdiction (Attachment 1, Appendix G). On 15 March 2018, NSF submitted a formal consultation request to NMFS under Section 7 of the ESA. NSF and NMFS staff held biweekly meetings to discuss the Proposed Action and matters related to the consultation. NMFS issued a Biological Opinion and an Incidental Take Statement for the Proposed Action on 24 August 2018, and consultation was concluded (Attachment 1, Appendix C).

Marine Mammal Protection Act (MMPA)

On 16 March 2018, L-DEO submitted on behalf of NSF, L-DEO, and the researchers and their institutions to NMFS an IHA application pursuant to the MMPA. NSF and NMFS staff held biweekly meetings to discuss the Proposed Action and matters related to the IHA application. Following a 30-day public comment period, NMFS considered public comments received and issued an IHA on 24 August 2018 (Attachment 2).

Coastal Zone Management Act (CZMA)

On 23 March 2018, NSF submitted a federal consistency application for the proposed activity pursuant to Part 930 Subpart C of the CZMA to the state of Hawaii Coastal Zone Management (CZM) Program. On 14 May 2018, the Hawaii CZM Program conditionally concurred with the NSF determination that the proposed activity was consistent to the maximum extent practicable with the enforceable policies of the Hawaii CZM Program (Attachment 1, Appendix H). The conditions for concurrence identified by the Hawaii CZM included conducting the proposed activity as represented in the consistency determination; fully implementing the monitoring and mitigation measures described in the consistency determination; and providing all of the protections to the State of Hawaii listed endangered, threatened, and indigenous species consistent with the provisions of Hawaii CZM Program enforceable policies HRS Chapter 195D, Conservation of Aquatic Life, Wildlife, and Land Plants, and Hawaii Administrative Rules (HAR) Chapter 13-124, Indigenous Wildlife, Endangered and Threatened Wildlife, and Introduced Wild Birds (Attachment 1, Appendix H). The consistency review process included a 15-day public comment period from 8-23 April 2018; no public comments were received during that process. NSF considered comments submitted to the Hawaii CZM Program as part of the CZM review process by the State Department of Land and Natural Resources, Division of Aquatic Resources (DAR).

Essential Fish Habitat (EFH)
Although NSF anticipated no significant impacts to EFH, as the proposed activities may affect EFH found in the water column, in accordance with the Magnuson-Stevens Fishery Conservation and Management Act NSF requested consultation with NMFS on 25 April 2018. In an email dated 3 May 2018, NMFS concurred with the NSF's determination that the proposed project may effect EFH, but that any adverse effects would be localized and transitory and therefore would not be significant. As such, NMFS did not provide additional conservation recommendations for the project, thus satisfying the requirements of both sections 305(b)(2)(A) and sections 305(b)(2)(B) of the Magnuson-Stevens Act. (Attachment 1, Appendix F).

Coordination with Navy
NSF, LDEO, and the PIs coordinated with the Navy on OBS use during the Hawaii survey to avoid/minimize space-use conflict.

Conclusion and Decision
NSF has reviewed and concurs with the conclusions of the Final EA (Attachment 1) that implementation of the Proposed Action will not have a significant impact on the environment. Consequently, implementation of the Proposed Action will not have a significant direct, indirect or cumulative impact on the environment within the meaning of NEPA and Executive Order 12114. Because no significant environmental impacts will result from implementing the Proposed Action, an environmental impact statement is not required and will not be prepared. Therefore, no further study under NEPA and Executive Order 12114 is required.

As described above, NSF's compliance with the MMPA, ESA, CZMA, and EFH is completed.

In sum, after full consideration of the Final EA, the PEIS, the IHA and ITS issued by NMFS, the concurrence from USFWS, and the entire environmental compliance record, NSF concludes that implementation of the Proposed Action will not result in significant impacts. Accordingly, on behalf of NSF, I authorize the issuance of a Finding of No Significant Impact for the Proposed Action, the marine seismic surveys proposed to be conducted on board the Research Vessel *Marcus G. Langseth* in the North Pacific Ocean during the effective time period of the IHA, and hereby approve the Proposed Action to commence.

Bauke (Bob) Houtman — Date
Integrative Programs Section Head
Division of Ocean Sciences

Attachment 1: Final Environmental Analysis of Marine Geophysical Survey by the R/V *Marcus G. Langseth* in the North Pacific Ocean, 2018/2019
Attachment 2: Incidental Harassment Authorization