

**National Science Foundation
Geosciences Directorate
Division of Ocean Sciences
Arlington, Virginia**

**FINAL NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) ANALYSIS
PURSUANT TO
EXECUTIVE ORDER 12114**

**Marine Geophysical Survey by the R/V *Melville*
in the Pacific Ocean off Central and South America,
October–November 2010**

FINDING OF NO SIGNIFICANT IMPACT

OCE# 0851056

Principal Investigators/Institution: Drs. Franco Marcantonio and Mitchell Lyle, Texas A&M University

Project Title: ^{230}Th dynamics in the Eastern Equatorial Pacific Ocean: testing the ^{230}Th - normalization method to estimate sediment fluxes

This constitutes a final environmental analysis prepared by the National Science Foundation (NSF) for a marine seismic survey proposed to be conducted in October - November 2010 on board the research vessel (R/V) *Melville* in the Pacific Ocean off Central and South America. This analysis is based, in part, on a revised Environmental Assessment report prepared by LGL Limited environmental research associates (LGL) on behalf of NSF, entitled, "Environmental Assessment of a Marine Geophysical Survey by the R/V *Melville* in the Pacific Ocean off Central and South America, October–November 2010" (Report #TA4902-1) (Attachment 1). The conclusions from the LGL report were used to inform the Division of Ocean Sciences (OCE) management of potential environmental impacts of the cruise. OCE has reviewed and concurs with the report's findings. Accordingly, the LGL report is incorporated into this analysis by reference as if fully set forth herein.

Through discussions with the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS), the original requests for one take each of sei and fin whales were withdrawn and some take requests were adjusted to account for reported mean group size. Comments received during the public comment period of the Incidental Harassment Authorization (IHA) application process were considered by NSF and NMFS. An error was identified in the density for the striped dolphin and an adjustment was made to the take request as a result. Clarifying language was also included regarding the amount of ensonified survey area estimated for contingency which is used in determining take estimates. In addition, a correction was made in the documentation regarding one of the streamers to clarify that a 16 channel streamer will be used versus a 12-channel streamer as erroneously noted in some places.

No impact is anticipated by this change as the hydrophone streamer is a passive system. Adjustments to the analysis were considered by NSF, and by NMFS in the IHA application and ESA consultation processes. No significant impacts on the environment are anticipated as a result of these changes.

Project Objectives and Context

The purpose of the survey will be to study sedimentation processes in the equatorial tropical Pacific through acquisition of sediment, water-column, and geophysical data. Knowledge of sedimentary fluxes is crucial to understanding the role of the ocean relative to historical climate conditions and understanding impacts of large-scale anthropogenic releases of greenhouse gases. Sediment transport and deposition is influenced by drivers such as wind, temperature, biological productivity, and upwelling. Through this study, scientists will evaluate the presence of ²³⁰Thorium (²³⁰Th), which is a constant-flux proxy used in sediment deposition models that are used to identify past climate conditions. A proxy is needed since there are no direct data for processes that occurred on time scales longer than the record of scientific observations (for the oceans, 50-100 years). Results from the survey will also resolve disagreements in the scientific community about the applicability of the use of ²³⁰Th as a proxy in sediment deposition models in the equatorial tropical Pacific.

The Panama Basin is a good test area for this study because there are defined potential sediment sources, and well understood water paths to study sediment movement and ²³⁰Th fractionation. Additional measurements on already existing sediment cores will complement the collection and analysis of new sediment, water column, and geophysical data.

The project will support scientists, technicians, graduate and undergraduate students, and others. The research and results from this project will be used by the Principal Investigators to teach advanced graduate classes.

Summary of Proposed Action and Alternatives

The procedures to be used for the survey will be similar to those used during previous seismic surveys and will involve conventional seismic methodology. The proposed survey will take place from October through November 2010 within international waters and the Exclusive Economic Zones (EEZs) of Costa Rica, Panama, Colombia, and Ecuador (See Attachment 1, Figure 1). The seismic survey will consist of approximately 5475 km of transect lines (including turns) in water depths ranging from approximately 1000 meters to 4800 meters. The survey will involve the R/V *Melville* as the source vessel which will deploy a pair of low-energy Sercel Generator-Injector (GI) airguns as an energy source (each with a discharge volume of 45 in³), plus either of two towed hydrophone streamers, one 725 meters long with 40 channels, and the other 350 meters long with 16 channels. As the airgun array is towed along the survey lines, the hydrophone streamer will receive the returning acoustic signals and transfer the data to the on-board processing system. The GI airguns will be operated on a small grid (see Attachment 1, Figure 1, inset) for approximately 45 hours at each of four sites (see Attachment 1, Figure 1, depicted black boxes), where the 40-channel streamer will be used. During transit to the first site, transits between the sites, and after the last site (see Attachment 1, Figure 1, depicted red seismic line), the 16-channel streamer will be used. In addition to the GI airguns, a multibeam echosounder (MBES) and a sub-bottom profiler (SBP) will be used throughout the cruise except

while at water/core stations to help verify seafloor conditions at possible coring sites and to collect additional seafloor bathymetric data. Seismic operations will be carried out for approximately 15 days, water and core samples will be collected for approximately 10 days, and approximately 2 days will be transit. Some minor deviation from proposed cruise dates may be required, depending on logistics, weather conditions, and the need to repeat some lines if data quality were substandard.

One alternative to the proposed action would be to issue an IHA at an alternative time and conduct the survey at that alternative time. Constraints for vessel operations and availability of equipment (including the vessel) and personnel would need to be considered for alternative cruise times. Limitations on scheduling the vessel include the additional research studies planned on the vessel for 2010 and beyond. Other research activities planned within the region also would need to be considered.

Another alternative to conducting the proposed activities would be the "No Action" alternative, i.e. do not issue an IHA and do not conduct the operations. If the planned research were not conducted, the "No Action" alternative would result in no disturbance to marine mammals attributable to the proposed activities, but paleo-oceanographic data of considerable scientific value and relevance increasing our understanding of sediment deposition and climate change processes would not be acquired and the project objectives as described above would not be met. The "No Action" alternative would result in a lost opportunity to obtain important scientific data and knowledge relevant to a number of research fields and to society in general. The collaboration, involving investigators, students, and technicians, would be lost along with the collection of new data, interpretation of these data, and introduction of new results into the greater scientific community and applicability of this data to other similar settings. Loss of NSF support often represents a significant negative impact to the academic infrastructure.

Summary of environmental consequences

The potential effects of sounds from airguns on marine species, mammals and turtles of particular concern, are described in detail in Attachment 1 (pages 44-77 and Appendices A-D) 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 project will result in any cases of temporary or especially permanent hearing impairment, or any significant nonauditory 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 proposed activity will include a mitigation program to further minimize potential impacts on marine mammals that may be present during the conduct of the research to a level of insignificance. As detailed in Attachment 1 (pages 7-12; and 58) monitoring and mitigation measures would include: ramp ups, minimum of one dedicated observer maintaining a visual watch during all daytime airgun operations, two observers for 30 min before and during ramp ups during the day and at night (and when possible at other times), and shut downs when mammals or turtles are detected in or about to enter designated exclusion zones. The fact that

the GI airgun, as a result of its design, directs the majority of the energy downward, and less energy laterally, will also be an inherent mitigation measure.

With the planned monitoring and mitigation measures, unavoidable impacts to each species of marine mammal and turtle that could be encountered would be expected to be 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 U.S. Marine Mammal Protection Act (MMPA) definition of "Level B Harassment" for those species managed by the National Marine Fisheries Service. No long-term or significant effects would be expected on individual marine mammals, sea turtles, or the populations to which they belong or on their habitats.

A survey at an alternative time would result in few net benefits. As described in Attachment 1, marine mammals and sea turtles are expected to be found throughout the equatorial tropical Pacific and throughout the time period during which the project may occur. A number of marine mammal species are year-round residents in the survey areas, so altering the timing of the proposed project likely would result in no net benefits for those species (see Attachment 1, Section III). The proposed survey is scheduled near the start of the peak nesting periods for the three sea turtles that nest in the area, so few hatchlings would be encountered at sea.

The "no action" alternative would remove the potential for disturbance to marine mammals or sea turtles attributable to the proposed activities as described. It would however preclude important scientific research from going forward that has distinct potential to address geological and climate processes of concern.

Conclusions

NSF has reviewed and concurs with the conclusions of the LGL report (Attachment 1) that implementation of the proposed activity will not have a significant impact on the environment. Consequently, implementation of the proposed activity does not have a significant impact on the environment within the meaning of the Executive Order 12114 or National Environmental Policy Act (NEPA). An environmental impact statement will not be prepared. No further action is required for NSF compliance with Executive Order 12114. On behalf of NSF, I authorize the issuance of a Finding of No Significant Impact for the marine seismic survey proposed to be conducted on board the research vessel *Melville* in the Pacific Ocean off Central and South America in October - November 2010.

David O. Conover
FOR David O. Conover, Director
Division of Ocean Sciences

10/5/10
Date