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**DRAFT ENVIRONMENTAL ASSESSMENT
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Marine Seismic Survey in the Northwest Atlantic Ocean, August 2009

OCE/ODP# 0824368

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Project Title: Collaborative Research: Stratigraphic Controls on Freshwater Beneath the Continental Shelf

This constitutes a draft environmental assessment (DEA) by the National Science Foundation (NSF) for a marine seismic survey proposed to be conducted on board the research vessel (R/V) *Endeavor* in the Northwest Atlantic Ocean in August 2009. This DEA is based, in part, on an Environmental Assessment prepared by LGL Limited environmental research associates (LGL) on behalf of NSF, entitled, "Environmental Assessment of a Marine Geophysical Survey by the R/V *Endeavor* in the Northwest Atlantic Ocean, August 2009" (Report #TA4760-1) (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 2009 cruise. After the LGL report was fully and independently reviewed by OCE management, OCE management concurred with the report's findings. Accordingly, the LGL report is incorporated into this DEA by reference and fully adopted as if fully set forth herein.

Project Objectives and Context

The research project seeks to understand how stratigraphic evolution and various driving forces control the emplacement of non-equilibrium freshwater aquifers beneath continental shelves. This phenomenon is proposed to have widespread and global influence on ocean nutrient fluxes over geological time scales, and affects geochemical, diagenetic and microbial processes of deep shelf sediments. The proposed seismic survey would collect data to examine the distribution and amounts of freshwater sequestered within the continental shelf off the U.S. northeast coast (see Attachment 1, Figure 1). The program would provide data integral to improve models to estimate the abundance of sequestered freshwater and would provide site specific survey data for an Integrated Ocean Drilling Program (IODP) proposal to drill these freshwater resources for hydrogeochemical, biological, and climate studies.

Combined seismic and drilling data could help identify undeveloped freshwater resources that may represent a resource to urban coastal centers, if accurately characterized and managed. On a global scale, vast quantities of freshwater have been sequestered in the continental shelf and may represent an increasingly valuable resource to humans. This survey would help constrain

process-based mathematical models for more precise estimations of the abundance and distribution of freshwater wells on the continental shelf.

Summary of Proposed Action and Alternatives

The proposed action is a seismic survey to be conducted in Nantucket Sound and south of Nantucket and Martha's Vineyard, within the territorial waters and Exclusive Economic Zone of the United States (see Attachment 1, Figure 1). The survey would involve one source vessel, the R/V *Endeavor*. The R/V *Endeavor* would deploy two GI guns as an energy source, although only a single GI gun or 15 in³ watergun would be used in shallow water areas of the survey. The receiving system for the returning acoustic signals would consist of one 600-m, digital, high-resolution streamer towed at a depth of ~3 m. As the GI guns (or watergun) are towed along the survey lines, the hydrophone streamer would receive the returning acoustic signals and transfer the data to the on-board processing system. Water depths in the study area range from ~20 to ~125 m, but are typically <100 m. The proposed seismic survey would consist of ~1757 km of survey lines and turns.

One alternative to the proposed action would be to conduct the survey at an 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 2009 and beyond. Other national and international research activities planned within the region also would need to be considered. Alternative survey times offer minimal advantages or disadvantages in this location.

Another alternative to conducting the proposed activities would be the "No Action" alternative, i.e., 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, and no environmental impacts of other types. The seismic data from the proposed survey to determine the distribution and abundance of freshwater sequestered in the continental shelf within the area would not be available for use, nor the site specific survey data for a future IODP drilling program; and therefore, the project objectives as described above would not be met. It is anticipated that the data collected from a survey such as that proposed would affect a broad range of proposed and on-going hydrogeochemical, biological, and climate studies in the region and could lead to new, undeveloped freshwater resources for several large regional urban centers that have extensive freshwater needs.

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 institutions, investigators, students, and technicians involved would lose collection of new data, thus halting support of the greater effort to process and interpret these data, and introduce new results into the greater scientific community. 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 are described in detail in Attachment 1 (pages 53-84 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 would result in any cases of temporary or especially permanent hearing impairment, or any significant nonauditory physical or physiological effects. Some behavioral disturbance is expected, but this would be localized and short-term.

The proposed activity would include a mitigation program to minimize 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 6-11; and 68), mitigation measures that would be adopted include: ramp ups, a minimum of one dedicated observer maintaining a visual watch during all daytime GI gun operations, 30 minutes of observations before and during ramp ups during the day and at night, shut downs when marine mammals or sea turtles are detected in or about to enter designated exclusion zones, power downs during turns, shut downs if North Atlantic right whales are sighted at any distance from the source vessel (given their special status), and avoidance of concentrations of sperm, humpback, sei, blue, or fin whales.

With the planned monitoring and mitigation measures, unavoidable impacts to each species of marine mammal and turtle that could be encountered are 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 NMFS. No long-term or significant effects are expected on individual marine mammals, sea turtles, or the populations to which they belong, or on their habitats.

The proposed project would have little impact on fish resources. Any effects on essential fish habitat (EFH) would consist of short-term disturbance that could lead to temporary relocation of EFH species or their food. Impacts of seismic sounds on birds are possible, although none are expected to be significant to their populations.

As marine mammals are expected to be found throughout the proposed study area and throughout the time period during which the project may occur, no significant benefits would be gained from the alternative to conduct the survey at a different time (see Attachment 1, page 84). Even though rescheduling the proposed project to a different time of the year may reduce or avoid some marine mammal species, numbers of other marine mammal species in the area would increase.

The "no action" alternative would not have any environmental consequences; although it would preclude important scientific research from going forward.

Conclusions

NSF has reviewed and concurs with the conclusions of the LGL Environmental Assessment (Attachment 1) that implementation of the proposed activity would not have a significant impact on the environment.