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**DRAFT ENVIRONMENTAL ASSESSMENT  
PURSUANT TO THE NATIONAL ENVIRONMENTAL POLICY ACT (NEPA),  
42 U.S.C. 4321, *et seq.***

**Marine Seismic Survey in the Pacific Ocean off Central California, 2012**

This constitutes a draft environmental assessment (DEA) by the National Science Foundation (NSF) for marine seismic surveys proposed to be conducted September - December 2012 on board the research vessel (R/V) *Marcus G. Langseth* in the Pacific Ocean off the coast of California within the Exclusive Economic Zone of the U.S. and California state waters. This DEA is based, in part, on an Environmental Assessment report prepared by Padre Associates, Inc., entitled, “Environmental Assessment of Marine Geophysical Surveys by the R/V *Marcus G. Langseth* for the Central Coastal California Seismic Imaging Project” (Attachment 1).

The conclusions from the report prepared by Padre Associates, Inc. were used to inform the Division of Ocean Sciences (OCE) management of potential environmental impacts of the proposed marine geophysical surveys. OCE has reviewed and concurs with the report’s findings. Accordingly, the report prepared by Padre Associates, Inc., is incorporated into this DEA by reference as if fully set forth herein.

**Project Objectives and Context**

The California State Legislature has required Pacific Gas and Electric Company (PG&E) to re-assess the earthquake and tsunami hazards in the off-shore regions adjacent to Diablo Canyon Power Plant (DCPP) as a factor in the application for renewal of licenses which expire in 2014-2015. This Project is proposed in response to that requirement and would be a collaborative effort of Lamont-Doherty Earth Observatory (LDEO), a part of Columbia University, in cooperation with PG&E. It would consist of deploying seismic or sound sources and receivers at onshore and offshore locations to generate data that could be used to improve imaging of major geologic structures and fault zones in the vicinity of the DCNPP. These seismic studies would provide additional insights of any relationships or connection between the known faults as well as enhance knowledge of offshore faults in proximity to the Central California Coast and DCPP. The proposed deep (10 to 15 kilometers [km] or 6 to 9 miles [mi]), high energy seismic surveys (HESS) (energy >2 kilo joule) would complement a previously completed shallow (<1 km [<0.6 mi]), low energy (<2 kilo joule) 3D seismic reflection survey. Data sets collected would be “open access”.

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<sup>1</sup>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. Published June 2011. Available on the NSF Website: <http://www.nsf.gov/geo/oce/envcomp/index.jsp>. NSF Record of Decision anticipated Summer 2012.

The proposed seismic surveys would:

- Record high resolution wide 2D and 3D seismic reflection profiles of major geologic structures and fault zones in the vicinity of the Central California Coast and DCPD;
- Obtain improved deep (>1 km [>0.6 mi]) imaging of the Hosgri and Shoreline fault zones in the vicinity of the DCPD to constrain fault geometry;
- Obtain improved (>1km [>0.6 mi] depth) imaging of the intersection of the Hosgri and Shoreline fault zones near Point Buchon;
- Obtain improved (>1 km [>0.6 mi]) imaging of the intersection of the San Simeon and Hosgri fault zones near Point Estero; and
- Augment the current regional seismic database for subsequent use and analysis through the provision of all data to the broader scientific and safety community, and general public.

### **Summary of Proposed Action and Alternatives**

The procedures to be used for the surveys would be similar to those used during previous seismic surveys by LDEO and would use conventional seismic methodology. The proposed surveys would take place September through December 2012 in the Pacific Ocean off the coast of California in the Exclusive Economic Zone of the U.S. and California state waters (See Attachment 1, Figure 1). The project duration would be approximately 82 days, with seismic surveys comprising approximately 42 of those days and the remaining days occupied in project preparation (e.g. equipment calibration/deployments/mobilization/demobilization); vessel refueling/transit; anticipated weather and/or ship maintenance delays. The seismic surveys would consist of approximately 6217 km (3862 mi) of survey transect lines and a total survey area of 1237 km<sup>2</sup> (478 mi<sup>2</sup>) in water from 0 meters (m) to over 400 m (1300 feet) deep. The surveys would involve the R/V *Marcus G. Langseth* as the source vessel which would deploy an array of 18 airguns with a total discharge volume of ~3300 in<sup>3</sup>. The marine receiving systems would consist of a 6 km hydrophone streamer and approximately 600 geophones which would record the returning acoustic signals internally for later analysis. As the airgun array is towed along the survey lines, the hydrophone streamer would receive the returning acoustic signals and transfer the data to the on-board processing system. Geophones would be deployed by support vessels in the nearshore area to depths of about 91 meters and would be retrieved at the conclusion of the surveys (Attachment 1, Figure 2-7). Consistent with 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”<sup>1</sup> (PEIS), for HESS where take is anticipated, the full mitigation zone (or safety zone) and mitigation zone (exclusion zone) were modeled for the proposed surveys.

In addition to the offshore marine component, the project would include an onshore component. Two onshore sound sources would be used: Accelerated Weight Drop and Vibroseis. Geophones would be used as onshore receivers.

In addition to the operations of the airgun array, a multibeam echosounder (MBES) and a subbottom profiler (SBP) would also be operated from the R/V *Langseth* continuously throughout the surveys.

Timing of the surveys would depend on logistics, weather, and issuance of authorization and permits, but are proposed to occur between September and December.

In addition to the proposed action Alternative, four Alternatives to the proposed action, including the No Action Alternative were considered (See Table 1). Three additional Alternatives were considered but were eliminated from further analysis as they did not meet the purpose of and need for the proposed action.

<b>Alternatives Considered</b>	<b>Description/Analysis</b>
<b>Alternative 1 -- No Action Alternative</b>	Under this alternative, no seismic surveys would be conducted and PG&E would rely on existing information and additional desktop analyses. While this alternative would avoid impacts to marine resources, it would not meet the objectives of the project because it does not collect additional data associated with regionalized faulting as requested under California Assembly Bill 1632 or allow for public access to the data sets for scientific analysis and alternative theory testing. Geological data of considerable scientific value and relevance increasing our understanding of the seismic hazards along the California coast would not be collected. The collaboration, involving industry, academic scientists, 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.
<b>Alternative 2 -- Survey Boxes 1, 2 and 4 Only (Eliminate Survey Box 3)</b>	Under this alternative, data targeted (Hosgri-San Simeon step-over) would not be collected; otherwise data collection for the remaining survey boxes would remain the same. For this alternative, LDEO and PG&E would adjust the survey to avoid activities within White Rock-Cambria MPAs near Cambria as well as MBNMS. This alternative does not meet all of the Project objectives; however, the highest priority objectives would be achieved.
<b>Alternative 3 – Alternative Survey Timing</b>	Under this alternative, LDEO and PG&E would conduct survey operations at a different time of the year to reduce impacts on marine resources and users, and improve monitoring capabilities. However, the proposed Project was selected, in part, because it would have the least impact on marine resources including seasonal concentrations of marine mammals, avian breeding, and the timing of California gray whale southward migration to breeding lagoons. 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 2012 and beyond.
<b>Alternative 4 – Restrict Survey to Daytime Operations</b>	Under this alternative, LDEO and PG&E would only conduct seismic surveys during daylight hours when protected species would be easier to detect and, as such, accommodate the more expeditious initiation of the impact avoidance and minimization measures. However, restricting survey operations to daylight only would increase the actual number of days of surveys and could extend the duration of the Project into the period of the northward California gray whale migration in which cows and calves approach closer to the coastline and the area of seismic surveys.
<b>Alternatives Eliminated from Further Analysis:</b>	<b>Description/Analysis</b>
<b>Alternative E1 -- Alternative Location</b>	Because of the location of DCPD and attendant geological features under investigation, alternative locations would not address the issues related to regional faulting.
<b>Alternative E2 -- Different Survey Techniques</b>	Under this alternative, LDEO and PG&E would utilize alternative survey techniques, such as marine magnetotelluric or controlled source electromagnetic surveys that could reduce impacts on marine receptors. This alternative would not meet the objectives of the Project because it is experimental at this stage and, based on previous results from studies in the area, does not provide the necessary resolution to image the area faulting.
<b>Alternative E3 -- Survey Optimization</b>	Under this alternative, LDEO and PG&E would alter streamer configurations, source/receiver characteristics, or other parameters to reduce the time and/or intensity of the survey in the Project area. This alternative would not meet Project objectives because the proposed Project has been carefully designed and modifications to equipment and/or procedures could compromise results. Further, the proposed Project is consistent with other surveys conducted by the R/V Langseth and is, in fact, lower energy than other potential streamer source configurations considered.

**Table 1.** Alternatives considered, eliminated from further analysis, and descriptions/analysis.

### **Summary of environmental consequences**

The potential effects of the proposed action on marine and terrestrial species, including mammals and turtles of particular concern, are described in Attachment 1 (pages 94-143 and Appendices C-F). Potential impacts on marine species are consistent with those described in the PEIS, 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 proposed action, and Alternatives, would include a monitoring and mitigation plan, or “a Marine Wildlife Contingency Plan,” (MWCP) to further minimize potential impacts on species that may be present during the conduct of the research to a level of insignificance. The monitoring and mitigation plan would include standard measures for marine species identified in the PEIS for HESS, and due to the proposed location of the surveys and associated compliance with California state requirements, would include additional measures. These monitoring and mitigation measures for marine species, both the standard and additional measures, are detailed in Attachment 1, Table 2-6, and pages 27-40. Monitoring and mitigation measures for marine species would include such activities as: ramp ups; dedicated protected species observers (PSOs) for maintaining a visual watch, including during ramp-ups; passive acoustic monitoring (PAM); power downs and shut downs; and aerial surveys. Monitoring and mitigation measures for terrestrial species are described in Attachment 1, pages 41-42. LDEO and PG&E would prepare and implement the MWCP to reflect these monitoring and mitigation measures and any further ones resulting from federal and state requirements, such as those resulting from consultation with National Oceanic and Atmospheric Administration’s National Marine Fisheries Service (NOAA Fisheries) and US Fish and Wildlife Service pursuant to the Endangered Species Act and/or Marine Mammal Protection Act (MMPA), or the California State Lands Commission.

With the planned monitoring and mitigation measures, unavoidable impacts to each species of marine mammal and sea turtles 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 MMPA definition of “Level B Harassment” for those species managed by NOAA Fisheries. No long-term or significant effects would be expected on individual marine mammals, sea turtles, seabirds or the populations to which they belong or on their habitats.

Essential Fish Habitat (EFH) would be located within the survey area and Habitat Areas of Particular Concern (HAPC) could be influenced by project activities. Project activities would not result in any chronic or permanent negative effects to EFH. The seismic component of the proposed project would have little impact on fish resources, and the only effect on fish habitat would be short term disturbance that could lead to temporary relocation of pelagic fish species or their food. Significant effects on EFH or HAPC from deploying and placing geophones in the nearshore survey area would not be anticipated and any potential effects would be further mitigated by use of divers for equipment placement.

## **Conclusions**

NSF has reviewed and concurs with the conclusions of the Environmental Assessment report prepared by Padre Associates, Inc. (Attachment 1) that implementation of the proposed activity will not have a significant impact on the environment.