

COASTAL CONSISTENCY DETERMINATION
FOR A MARINE GEOPHYSICAL SURVEY

Prepared By
U. S. Geological Survey
Department of the Interior

April 13, 1999

1. AUTHORITY

This General Consistency Determination is being submitted in compliance with Section 930.34 et seq. of the National Oceanic and Atmospheric Administration (NOAA) Federal Consistency Regulations (15 CFR 930).

2. DETERMINATION

In accordance with the Federal Coastal Zone Management Act of 1972, as amended, Section 307(c)(1), the U. S. Geological Survey (USGS) has determined that this proposed General Consistency Determination is consistent to the maximum extent practicable with the California Coastal Act of 1976, Chapter 3, Coastal Resources Planning and Management Policies, as amended January 1998, for the reasons stated below.

3. PROJECT DESCRIPTION

Project Location and Dates

The area proposed for study is located within the marine environment of southern California, between Point Dume and the U.S.-Mexican border, extending from nearshore to a maximum of 20 miles offshore. The project is currently scheduled to be conducted for two weeks, starting no earlier than June 10, 1999. Vessel scheduling may require that the survey period be extended partially or entirely into July, but completion will be no later than July 20, 1999.

Purpose and Need

The USGS plans to collect high-resolution seismic -reflection data to investigate: 1) the hazards posed by landslides and potential earth-quake faults in the nearshore region from Santa Barbara to San Diego; and 2) the invasion of seawater into freshwater aquifers that

are critical to the water supply for people within the Los Angeles-San Pedro area. Both of these tasks are multiyear efforts that require the use of small acoustic sources, including electromechanical transducers and airguns.

Important geologic information that the USGS will derive from this project's seismic-reflection data concerns how earthquake deformation is distributed offshore - that is, where the active faults are and what the history of movement along them has been. This information is needed to improve our understanding of the shifting pattern of deformation that occurred over both the long term (approximately the last 100,000 years) and short term (the last few thousand years). We seek to identify actively deforming structures that may represent significant earthquake threats.

High-resolution seismic-reflection data will also help locate the sources and pathways of seawater that intrudes into freshwater aquifers below San Pedro. USGS scientists are working with the Los Angeles County Department of Public Works and the Southern California Water Replenishment District to develop a ground-water simulation model to predict fluid flow below San Pedro and nearby parts of the Los Angeles Basin. Eventually this model will be helpful in managing water resources. The accuracy of the present model is compromised by a paucity of information about aquifer geometry and about other geologic factors in the offshore area that might affect fluid flow within the coastal zone. Data we collect will be used to improve 3- dimensional, fluid-flow models to aid management of water resources.

Additional information regarding the scientific objectives and methods to be used in these studies can be found in the accompanying Request for an Incidental Harassment Authorization (Enclosure #2).

4. CONSISTENCY WITH PROVISION OF CALIFORNIA COASTAL ACT (DIVISION 20 PUBLIC RESOURCES CODE)

Since the project area is located within the coastal zone, a Consistency Determination is appropriate for this proposed geophysical survey. The following Determination of Consistency is prepared in compliance with the Federal Coastal Zone Management Act of 1972, Section 307 (Title 16, U.S.C. Section 1456(c)), which states that federal actions must be consistent with approved state coastal management programs to the maximum extent practicable. The USGS has determined that Article 4 -Marine Environment (Section 30230) of the California Coastal Act of 1976 is applicable to this project.

It is the opinion of the USGS that the proposed action is consistent with the California Coastal Act of 1976 to the maximum extent practicable. This Determination of

Consistency has been prepared with the following applicable section of the California Coastal Act of 1976 listed below.

Article 4 - Marine Environment (Section 30230) :

The proposed activity could have an effect on the marine environment because it includes the use of acoustic energy for seismic-reflection profiling. Seismic-reflection profiling is a remote-sensing technique that uses sound waves to image the strata beneath the seafloor. Seismic profiling techniques span a spectrum of frequencies between 10 Hz and 8 kHz. In general, higher frequencies result in better resolution, but poorer penetration within the seafloor. The instruments the USGS is proposing to use in this survey are commonly referred to as "high-resolution", meaning that they are intended to image seafloor strata in the upper 1000 meters of the seafloor, at a resolution of 1 m or better. Table 1 summarizes the acoustic characteristics of the systems to be used. These sources are towed from a survey vessel traveling at a speed of approximately 4 knots, and will be operated continuously for the duration of the survey, approximately 12 days (288 hours). During that time, the survey vessel will collect data along a series of sub-parallel lines, roughly perpendicular to the coastline, from north to south.

Table 1
Acoustic Source Characteristics

System	Small airgun	Huntec (boomer)
Power	35 cu. in. @ 3000 psi; 2.0 bar-m Pk-Pk 220 dB	217 dB
Frequency range	20-500 Hz	0.5 to 8 kHz
Repetition rate	8 to 12 sec	0.75 to 1.25 sec
Towing depth	1 to 2 meters	10-100 meters
Pulse duration	2 msec typical	0.34 msec typical

Note: power dB units referenced to 1 micropascal @ 1 meter

The effect of these acoustic sources has been analyzed for their effect on marine mammals, fish and fisheries, threatened or endangered species, and fishing and recreation.

Marine Mammals

The impact of the proposed acoustic sources on marine mammals and the corresponding mitigation are addressed in the accompanying Request for an Incidental Harassment Authorization to National Marine Fisheries Service (Enclosure #2). In brief, measures that will be taken to mitigate possible effects on marine mammals include:

1. Professional mammal observers to be on watch at all times, with authority to order the shutdown of the acoustic sources if mammals are observed with safety zones.
2. For pinnipeds and odontocetes (toothed cetaceans), a safety zone of 50 m. to be observed.
3. For mysticetes (baleen whales), a safety zone of 100 m. to be observed.

Recently, the High Energy Seismic Survey (HESS) Team, convened by Mineral Management Service to develop a permit process for seismic surveys in Southern California waters, issued Interim Operational Guidelines. At the outset, the HESS report defines high energy seismic as:

High energy seismic is defined as acoustic data acquisition for the purposes of mineral resources exploration and/or development. It is considered to be the use of airgun arrays for the geophysical data acquisition commonly referred to as 2D and 3D seismic, but excludes seafloor investigative processes such as side scan sonar and shallow hazards surveys."

It is the opinion of the USGS that since the proposed survey is specifically a "*shallow hazards survey*", and is not in any way intended or expected to be used for "*mineral resources exploration and/or development*", it is therefore excluded from the HESS guidelines. Nonetheless, the mitigation measures proposed in the IHA application (Enclosure #2) for this survey are entirely consistent with the HESS Team recommendations regarding sound pressure levels, safety zones, and shipboard monitoring.

In 1998, the USGS conducted a survey in Southern California with the same acoustic equipment planned for the proposed 1999 survey. The above mitigation procedures were observed. Monitoring of that survey was done by the Cascadia Research Collective.. Their Final Report of December, 1998, indicated no adverse environmental impact (Enclosure #4).

Fish and fisheries

Extensive research has been conducted into the effects of airguns, especially large airgun arrays used for petroleum exploration and development, on fish and fisheries. These "high energy seismic survey" arrays are significantly more powerful than the acoustic sources to be used in the proposed survey.

While the potential effect on marine life, particularly in the zone proximal to the seismic source (within 3 meters), cannot be conclusively precluded, the potential impact even very near the proposed sources is deemed to be small. Studies conducted on fish (adult and eggs) and crustacean larvae consistently report either no effect from airgun sources or statistically insignificant effects even at distances as small as 2 m from an airgun. Recent summaries of the biological and environmental effect of airguns include Marsh (1993) and Chambers Group (1994).

There is no evidence of injury or mortality occurring under field conditions. Several recent environmental assessments and monitoring programs associated with large airgun surveys (summarized below) have reported no adverse environmental effects of airgun surveys.

In addition to the 1998 USGS Southern California survey (Enclosure #4), other recent seismic surveys that have been monitored for environmental impact include:

BASIX, 1991: In 1991, the USGS and other cooperating groups used a large airgun array (10 guns, 5828 cu.in.) in a study of the Bay area fault systems from the continental margin to well inland on the Sacramento River. During that experiment, the USGS contracted Brezina and Associates as biological consultants to investigate the area in which the airgun profiling had been conducted during the previous night (operation hours were between 6:00 pm and 6:00 am) and inspect the waters for signs of impact to fish and other marine life. The report provided by Brezina & Associates concluded that the airgun operation was not responsible for the death of any of the fish carcasses observed. Moreover, they noted that the airgun profiling did not appear to alter the feeding behavior

of sea lions, seals, or pelicans, all of which were observed feeding in parts of the study area

BARGE, 1993: In 1993, an environmental assessment for Project BARGE, a seismic survey of Lake Mead, Nevada, (Paulson and others, 1993), included a test on the effects of a single 700 cu.in. airgun suspended 3.5 meters above a school of threadfin shad in the lake. The airgun was "fired" three successive times at a 30-second interval. Neither surface inspection nor observations by divers of the water column and bottom revealed any sign of dead fish. No changes in the behavior of shad or striped bass (feeding on the shad) were observed by nearby fishermen.

THUMS, 1995: In January, 1995, the THUMS Long Beach Company conducted a 3-D seismic survey in the Long Beach Harbor and vicinity with a large airgun array. (A 12-gun, 1,500 cu.in. array was proposed in the environmental analysis. The Report of Biological Observation Program did not include reference to the actual array used.) The environmental analysis (Chambers Group, 1994) concluded that the project was "unlikely to have significant effects on fish or invertebrate populations in the in the harbor area", and that "long term effects on fish populations would be unlikely". The subsequent report (Chambers Group, 1995) reported no adverse effects to marine life.

SHIPS, 1998: In March, 1998, the USGS and cooperators conducted a large airgun survey in Puget Sound using a 16-gun, 5,300 cu.in. array (Fisher and others, 1999). The operation was monitored extensively, both with on-board observers and by small boat. No adverse effects to marine life or the environment were reported.

Threatened and Endangered Species

The southern California ESU of the westcoast steelhead has been listed as endangered. This fish typically spends 2-3 years in marine waters (ADS Ocean Tests EA, 1998). While this steelhead may be encountered in the survey area, impacts are judged to be very low, since steelhead are highly dispersed, solitary species in the open ocean. Similarly, the potential for encounter with any of the four federally listed species of sea turtle is judged to be very low. Effects of airguns on sea turtles are poorly known. However, in the unlikely event of a sea turtle sighting, seismic operations will be suspended while the turtle is visible from the vessel.

Fishing and Recreation

Concerns for equipment safety and data quality dictate standard survey practice that avoids fishing and recreational vessels to the greatest extent possible. The impacts on

either commercial or recreational fishing are considered very low. The survey objectives include collecting data as close to the beach as possible, but similarly, vessel and equipment safety and data quality preclude operations in water depths less than 25 meters or within 1 km of the shore. Harbor fisheries such as bait fish, lobster and crab will be unaffected.

References

ADS Ocean Tests EA, 1998, Coastal Consistency Determination for the Advanced Deployable System Ocean Tests (unpublished)

Paulson and others, 1993, Environmental Assessment for National Park Service for "Understanding the Rifting of Continents: A Marine Reflection Survey of the Lake Meade Fault System (Project BARGE), Las Vegas, NV (unpublished)

Chambers Group, 1995, Report of Biological Observation Program for THUMS DEEPVIEW Subsurface Mapping Project in Long Beach Harbor, Irvine, CA (unpublished)

Chambers Group, 1995, Final Environmental Analysis of the THUMS "DEEPVIEW" Subsurface Mapping Project in Long Beach Harbor, Irvine, CA (unpublished)

Marsh , P. C., 1993, Draft Biological Assessment on the Impact of the Basin and Range Geoscientific Experiment (BARGE) on Federally Listed Species in Lake Mead, Arizona and Nevada, Tempe, AZ (unpublished)

Fisher, M. A. and others, 1999, Seismic Survey Probes Urban Earthquake Hazards in Pacific Northwest, EOS, Transactions, American Geophysical Union, v. 80, no. 2, pp 13-17, January 12, 1999