

These airguns will be spaced in an approximate rectangle with dimensions of 35 m (115 ft) (across track) by 9 m (30 ft) (along track).

The ADWBC seismic survey will be high-resolution, consisting of two 105 in³ GI airguns with a total volume of approximately 210 in³, spaced 7.8 m (26 ft) apart, and towed 37 m (121 ft) behind the vessel at a depth of 2–3 m (7–10 ft). Towing airguns at this shallow depth is accomplished by suspending the guns from floats, and the resulting short-period free surface “ghosting” keeps the spectral content broad with usable signals up to 300–350 Hz. These airguns produce an unusually clean impulse with sufficient energy to penetrate many hundreds of meters of sediment. Airgun firing, timing, and synchronizing is handled by a LDEO-built controller, which is integrated with a SUN workstation-based DGPS navigation, data logging, and fire control system. The air is produced by a standalone Price Co. 2000 psi compressor, and the seismic signals are detected by a solid state ITI hydrophone “Stealtharray”, with 48 12.5-m (41 ft) long channels, and a total length of 600 m (1969 ft).

The dominant frequency components for both airgun arrays is 0 – 188 Hz. The 2-airgun array will have a peak sound source output level of 237 dB re 1 μ Pa or 243 dB peak-to-peak (P-P). The 20-airgun array will have a peak sound source output level of 255 dB re 1 μ Pa or 262 dB P-P. Because the actual source is a distributed sound source (2 or 20 airguns) rather than a single point source, the highest sound levels measurable at any location in the water will be less than the nominal source level. Also, because of the downward directional nature of the sound from these airgun arrays, the effective source level for sound propagating in near-horizontal directions will be substantially lower.

Along with the airgun operations, several additional acoustical data acquisition systems will be operated during most or all of the cruises. The ocean floor will be mapped with an Atlas Hydrosweep DS-2 multi-beam 15.5-kHz bathymetric sonar, and/or a 3.5-kHz sub-bottom profiler. These mid-frequency sound sources are commonly operated from research vessels simultaneous with airgun arrays as well as in the absence of airgun activity.

The Atlas Hydrosweep sonar will be used during cruises by the *R/V Maurice Ewing*, is mounted in the hull of the vessel, and operates in three modes depending on the water depth. The first is a shallow-water mode when water depth is <400 m (1312.3 ft); source output is 210 dB re 1 μ Pa-m rms and a

single 1-millisecond (ms) pulse or “ping” per second is transmitted, with a beamwidth of 2.67 degrees fore-aft and 90 degrees in athwartship. The beamwidth is measured to the 3 dB point, as is usually quoted for sonars. The other two modes are deep-water modes: The Omni mode is identical to the shallow-water mode except that the source output is 220 dB rms (normally used only during start up). The Rotational Directional Transmission (RDT) mode is normally used during deep-water operation and has a 237 dB rms source output. In the RDT mode, each “ping” consists of five successive transmissions, each ensonifying a beam that extends 2.67 degrees fore-aft and approximately 30 degrees in the cross-track direction. The five successive transmissions (segments) sweep from port to starboard with minor overlap, spanning an overall cross-track angular extent of about 140 degrees, with tiny (<1 millisecond) gaps between the pulses for successive 30-degree segments. The total duration of the “ping”, including all 5 successive segments, varies with water depth but is 1 ms in water depths <500 m (1640.4 ft) and 10 ms in the deepest water. For each segment, ping duration is 1/5th of these values or 2/5th for a receiver in the overlap area ensonified by two beam segments. The “ping” interval during RDT operations depends on water depth and varies from once per second in <500 m (1640.5 ft) water depth to once per 15 seconds in the deepest water.

For the ADWBC cruise, the SeaBeam 2100/12 multibeam 12 kHz bathymetric sonar system will be used, with a source output of 237 dB re 1 μ Pa-m. Operation of this system is similar to that of the Atlas Hydrosweep (described above). The SeaBeam 2100/12 system has a swath width of about 3 times the water depth, so it will provide data over swaths 10–15 km (5–8 n.mi.) wide during most of the survey.

The sub-bottom profiler is normally operated to provide information about the sedimentary features and bottom topography that is simultaneously being mapped by the Hydrosweep. The energy from the sub-bottom profiler is directed downward by a 3.5-kHz transducer mounted in the hull of the vessel. The output varies with water depth from 50 watts in shallow water to 800 watts in deep water. Pulse interval is 1 sec. but a common mode of operation is to broadcast five pulses at 1-sec. intervals followed by a 5-sec. pause. The beamwidth is approximately 30° and is directed downward. Maximum source output is 204 dB re 1 μ Pa, 800 watts, while nominal source output is 200 dB re 1 μ Pa, 500 watts. Pulse duration will

be 4, 2, or 1 ms, and the bandwidth of pulses will be 1.0 kHz, 0.5 kHz, or 0.25 kHz, respectively.

For the ADWBC cruise, the multibeam bathymetry and sub-bottom profiling will be used to define windows where erosion or non-deposition has exposed deeper sequences suitable for piston coring. Coring transects across these windows will provide biostratigraphic age determinations that can be used to constrain the age of reflections throughout the study area. There will be five days of piston coring following completion of the ADWBC seismic survey.

Additional information on the airgun arrays, bathymetric sonars, and sub-bottom profiler specifications is contained in the application, which is available upon request (*see ADDRESSES*).

Comments and Responses

A notice of receipt of LDEO's application for seismic work in the Mid-Atlantic Ocean and proposed IHA was published in the **Federal Register** on September 17, 2003 (68 FR 54421). That notice described in detail the proposed activity and the marine mammal species that may be affected by it. That information is not repeated here. During the 30-day public comment period, comments were received from the Marine Mammal Commission (Commission).

Comment 1: The Commission believes that NMFS' preliminary determinations are reasonable, provided NMFS is satisfied that the proposed mitigation and monitoring activities are adequate to detect marine mammals in the vicinity of the proposed operations and to ensure that marine mammals are not being taken in unanticipated ways or numbers. In this regard, NMFS' **Federal Register** notice and the application state that “[v]essel-based observers will monitor marine mammals near the seismic source vessel during all daylight airgun operations and during any nighttime startups of the airguns...” The probability of detecting marine mammals about to enter or already inside the presumed safety limits is probably close to zero at night. Observers will generally not be on duty, and bridge personnel will have limited time to search for marine mammals. The current **Federal Register** notice states that “[a]n image-intensifier night-vision device (NVD) will be available for use at night,” but previous **Federal Register** notices have stated that “past experience has shown that NVDs are of limited value for this purpose.” There is no discussion of why nighttime operations are considered necessary, why experienced marine mammal