

**Request by the University of Alaska to Allow the Incidental
Take of Marine Mammals During a Marine Geophysical
Survey across the Arctic Ocean,
August–September 2005**

submitted by

University of Alaska
Department of Geology and Geophysics
900 Yukon Dr., Fairbanks, AK 99775

to

National Marine Fisheries Service
Office of Protected Resources
1315 East–West Hwy, Silver Spring, MD 20910-3282

Application Prepared by

LGL Alaska Research Associates, Inc.
1101 East 76th Ave., Suite B; Anchorage, AK 99518

and

LGL Ltd., environmental research associates
22 Fisher St., POB 280, King City, Ont. L7B 1A6

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✓ **Multi-beam Echosounder (SeaBeam 2112)**

A SeaBeam 2112 multi-beam 12 kHz bathymetric sonar system will be used on the *Healy*, with a source output of 237 dB re 1 μ Pa at one meter. The transmit frequency is a very narrow band, less than 200 Hz, and centered at 12 kHz. Pulse lengths range from less than one millisecond to 12 milliseconds. The transmit interval ranges from 1.5 seconds to 20 seconds, depending on the water depth, and is longer in deeper water. The SeaBeam system consists of a set of underhull projectors and hydrophones. The transmitted beam is narrow ($\sim 2^\circ$) in the fore-aft direction but broad ($\sim 132^\circ$) in the cross-track direction. The system combines this transmitted beam with the input from an array of receiving hydrophones oriented perpendicular to the array of source transducers, and calculates bathymetric data (sea floor depth and some indications about the character of the seafloor) with an effective two-degree by two-degree foot print on the seafloor. The SeaBeam 2112 system on the *Healy* produces a useable swath width of slightly more than 2 times the water depth. This is narrower than normal because of the ice-protection features incorporated into the system on the *Healy*.

Sub-bottom Profiler (ODEC Bathy 2000)

The Ocean Data Equipment Corporation (ODEC) Bathy 2000 will provide information on sedimentary layering down to between 20 and 70 m, depending on bottom type and slope. It will be operated with the multi-beam bathymetric sonar system that will simultaneously map the bottom topography. The ODEC system has a maximum 7 kW transmit capacity into the underhull array. During normal operation, the operator adjusts the transmit level for optimum penetration into the seafloor. The energy from the sub-bottom profiler is directed downward from the transducer array mounted in the hull of the vessel. Pulse duration ranges from 0.5 to 25 milliseconds and the interval between pulses can range between 0.25 s and 10 s depending upon water depth. The swept (chirp) frequency ranges from 2.75 kHz to 6 kHz. The Bathy 2000 will be the primary unit used for seafloor sub-bottom mapping and the Knudsen 320BR (see below) will be used as back-up.

There is a single 12 kHz transducer and one 3.5 kHz, low frequency (sub-bottom) transducer array, consisting of 16 elements in a 4×4 array that will be used for either the ODEC Bathy 2000 or the Knudsen 320BR. The beamwidth propagated by the transducers will be the same for both sonar units. The 3.5 kHz transducer (TR109) emits a conical beam with a width of 26° and the 12 kHz transducer (TC-12/34) emits a conical beam with a width of 30° .

✓ **Hydrographic Echo Sounder (Knudsen 320BR)**

The 320BR echosounder is a dual-frequency system with operating frequencies of 3.5 and 12 kHz. Maximum output power at 3.5 kHz is 10 kW and at 12 kHz is 2 kW. Pulse lengths up to 24 ms and bandwidths to 5 kHz are available. Pulse intervals are typically 1/2 s to about 8 s depending upon water depth. The repetition rate is range-dependent with a maximum 1% duty cycle. See above for beamwidth information.

12-kHz Pinger (Benthos 2216)

The Benthos 12-kHz Pinger will be used only during coring operations, to monitor the depth of the corer relative to the sea floor. The pinger is a battery-powered acoustic beacon that is attached to the coring mechanism. The pinger produces an omnidirectional 12 kHz signal with a source output of ~ 192 dB re 1 μ Pa-m at a one pulse per second rate. The pinger produces a single pulse of 0.5, 2 or 10 ms duration (hardware selectable within the unit) every second.

✓ **Acoustic Doppler Current Profiler (150 kHz Broad Band)**

The 150 kHz Broad Band acoustic Doppler current profiler (ADCP™) operates at 150 kHz and has a minimum ping rate of 0.65 ms. There are four beam sectors and each beamwidth is 3°. The pointing angle for each beam is 30° off from vertical with one each to port, starboard, forward and aft. The four beams do not overlap. The 150 kHz Broad Band ADCP™'s maximum depth range is 300 m.

✓ **Acoustic Doppler Current Profiler (RD Instruments Ocean Surveyor 75)**

The Ocean Surveyor 75 is an ADCP™ operating at a frequency of 75 kHz, producing a ping every 1.4 s. The system is a four-beam phased array with a beam angle of 30°. Each beam has a width of 4° and there is no overlap. Maximum output power is 1 kW with a maximum depth range of 700 m.