

Description of the Marine Mammals Affected by the Activity

General information on marine mammal species found off the East Coast of the United States can be found in Waring et al. (2001, 2002). This report is available at the following location:

http://www.nmfs.noaa.gov/prot_res/PR2/Stock_Assessment_Program/sars.html.

The only marine mammal species likely to be found in the Turning Basin is the bottlenose dolphin. There is not currently a stock assessment available concerning the status of bottlenose dolphins in the inshore and nearshore waters off south Florida. Additionally, while neither a status review nor peer-reviewed reports of status of the Biscayne Bay bottlenose dolphins have been published, the Southeast Fisheries Science Center, NMFS, is currently working on this report. Preliminary information indicates a documented population of 159 bottlenose dolphins residing within the boundaries of the Biscayne Bay area. A total of 146 bottlenose dolphins have been resighted in the Port of Miami area at least one additional time. These animals were often sighted within or transiting through the Port of Miami. It is not known whether bottlenose dolphins inhabit the Turning Basin or whether they simply use the area as a transit to North Biscayne Bay or offshore via the main port channel. The defined stocks of bottlenose dolphins that reside closest to the project area, therefore, are the western North Atlantic coastal and offshore stocks of bottlenose dolphins with minimum populations estimated to be 2,482 for the coastal stock and 24,897 for the offshore stock. Additional assessment information for these two stocks is available at the previously mentioned URL.

Potential Effects on Marine Mammals

In general, potential impacts to marine mammals from explosive detonations could include both lethal and non-lethal injury, as well as Level B harassment. Marine mammals may be killed or injured as a result of an explosive detonation due to the response of air cavities in the body, such as the lungs and bubbles in the intestines. Effects are more likely to be most severe in near surface waters where the reflected shock wave creates a region of negative pressure called "cavitation."

A second criterion for mortality is the onset of extensive lung hemorrhage. Extensive lung hemorrhage is considered debilitating and potentially fatal. Suffocation caused by lung

hemorrhage is likely to be the major cause of marine mammal death from underwater shock waves. The estimated range for the onset of extensive lung hemorrhage to marine mammals varies depending upon the animal's weight, with the smallest mammals having the greatest potential hazard range.

NMFS has established dual criteria for determining non-lethal injury for explosives as the peak pressure that will result in: (1) the onset of slight lung hemorrhage, or (2) a 50-percent probability level for a rupture of the tympanic membrane. These are injuries from which animals would be expected to recover on their own. Finally, NMFS has established dual criteria for Level B acoustic harassment: (1) an energy-based TTS criterion of 182 dB re 1 $\mu\text{Pa}^2\text{-sec}$ cumulative energy flux in any 1/3 octave band above 100 Hz for odontocetes (and sea turtles) derived from experiments with bottlenose dolphins (Ridgway et al., 1997; Schlundt et al., 2000); and (2) 12 psi peak pressure cited by Ketten (1995) as associated with a safe outer limit for minimal, recoverable auditory trauma (i.e., TTS). The Level B Harassment zone therefore is the minimum distance at which neither criterion is exceeded.

To protect endangered, threatened and protected species (manatees, dolphins, sea turtles), the following equations have been proposed by the Corps for this project to determine zones for injury or mortality from an open water explosion and to assist the Corps in establishing mitigation to reduce impacts to the lowest level practicable. These equations are believed to be conservative since they are based on unconfined charges and the proposed blasts in the Turning Basin will be confined (stemmed) charges. The equations are:

Caution Zone radius = $260 (\text{lbs/delay})^{1/3}$

Safety Zone radius = $520 (\text{lbs/delay})^{1/3}$

The caution zone is the radius from the detonation where mortality (but not necessarily injury), would not occur in an open-water blast while the safety zone is the approximate distance where non-serious injury (Level A harassment) is unlikely from an open-water explosion. However, even though single event detonations do not result in behavioral response by marine mammals (see 66 FR 22450, May 3, 2001), there is a possibility that other Level B harassment (e.g., a temporary shift in hearing threshold) could occur at greater distances than provided by these safety zones. For that reason, an IHA is warranted.

In the Turning Basin or any area where explosives are required to obtain

channel design depth, marine mammal/sea turtle protection measures will be employed by the Corps. For each explosive charge, the Corps proposes that detonation will not occur if a marine mammal is sighted by a dedicated marine mammal/sea turtle observer within the caution zone, a circular area around the detonation site with the following radius: $R = 260(W)^{1/3}$ (260 times the cube root of the weight of the explosive charge in pounds) where: R = radius of the danger zone in ft; W = weight of the explosive charge in lbs). Although the area described by the above equation is considered to be an area for potential mortality, the Corps believes that because all explosive charges will be stemmed (placed in a drilled hole and tamped with rock), the areas for potential mortality and injury will be significantly smaller than this area and therefore it is unlikely that even non-serious injury would occur if monitoring this zone is effective. (Since bottlenose dolphins are commonly found on the surface of the water, implementation of a mitigation/monitoring program is expected by NMFS to be close to 100 percent effective).

According to the Corps, bottlenose dolphins and other marine mammals have not been documented as being directly affected by dredging activities and therefore the Corps does not anticipate any incidental harassment of bottlenose dolphins by dredging.

Potential Effects on Habitat

The Corps expects the effects on marine mammal habitat to be minimal. The bottom of the basin is rock and sand, and the walls of the Turning Basin are vertical rock. The Corps also believes that the area of the Turning Basin may not be suitable habitat for dolphins in Biscayne Bay, but it is more likely that the animals use the area to traverse to North Biscayne Bay or offshore via the main port channel. In addition, as a large number of fish are not expected to perish during the detonations, there will not be a significant effect on dolphins' food supply (T. Jordan, pers. comm, 2002).

Mitigation and Monitoring

The Corps proposes to implement mitigation measures and a monitoring program that will establish both danger- and caution-zone radii to ensure that bottlenose dolphins will not be injured during blasting and that impacts will be at the lowest level practicable. Mitigation measures include: (1) confining the explosives in a hole with drill patterns restricted to a minimum of 8 ft (2.44 m) separation from any other