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Revised Assessment of the Rate at Which Crude Oil Seeps Naturally into the Ocean

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Three times during the past 30 years, the U.S. National Academy of Sciences (NAS) has commissioned studies of the sources, fates, and effects of crude oil and crude-oil products in the marine environment. One component of these studies has been an assessment of the rate that crude oil reaches the ocean through natural seepage from geological sources.

In 1975, the estimated rate of natural seepage of oil into the marine environment ranged widely from 200,000 to 6,000,000 mt/a, with a 'best estimate' of 600,000 mt/a (1). These rates were based on a comprehensive global survey incorporating extensive geological considerations, but used extrapolations from only a few highly suspect seeps. In 1985, little new information had become available, and estimates of individual oil-seep rates had not changed significantly. Thus a revised estimate of the global seepage rate was calculated based on assumptions concerning the amount of crude oil known to be present that could seep over reasonable periods of geologic time. The new estimates ranged between 20,000 and 2,000,000 mt/a, with a 'best estimate' of 200,000 mt/a (2). This revised estimate did not imply that seep rates decreased during the intervening years, but rather reflected a difference in approaches to making the global estimates.

As part of a report in preparation for the NAS, we have now reassessed the global rate of natural seepage of crude oil. Although only a few new seeps have been identified and estimates of known crude-oil deposits throughout the world have not changed greatly from about 300,000 million mt, new technologies, particularly remote sensing techniques, have provided better means of natural seep detection and assessment. Studies in parts of the Gulf of Mexico (3), using these new technologies, have resulted in an estimated seepage rate for the entire Gulf of Mexico of 150,000 mt/a. For offshore southern California (4), a new estimate of annual rate of oil seepage is 20,000 mt. The annual rate of oil seepage for offshore Alaska (5) is also estimated to be about 20,000 mt. Thus the new North American estimate of 190,000 mt/a is only 10,000 mt less than the 1985 global

estimate of 200,000 mt/a, suggesting that the 1985 value was underestimated. To accommodate the new information now available, the 'best estimate' of the global crude oil seepage rate has been revised to 600,000 mt/a, with more restricted limits of 200,000 and 2,000,000 mt/a set by the amount of crude oil seepage estimated for North American waters and the amount of crude oil ultimately available for natural seepage.

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