FWLB-1045 ENVIRONMENTAL SETTING OF THE PROPOSED TRANS-ALASKA PIPELINE, NATURAL PHYSICAL SYSTEMS, BEAUFORT SEA .

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ENVIRONMENTAL SETTING OF THE PROPOSED TRANS-ALASKA PIPELINE

NATURAL PHYSICAL SYSTEMS

Beaufort Sea

That part of the Arctic Ocean north of Alaska and Canada between Point Barrow on the west and Banks Island and Prince Patrick Island on the east is designated the Beaufort Sea. While deep beyond the relatively narrow Continental Shelf, the Beaufort Sea is very shallow near the coast. The 10-fathom coutour is generally 20 to 40 miles offshore; it is about 25 miles offshore north of Prudhoe Bay. Tidal changes are minor, less than a foot, although strong winds periodically may cause inshore water levels to fluctuate several feet during ice free periods. A current typically moves from east to west along the Alaska coast throughout the year, although it may be temporarily reversed close inshore in response to westerly winds during ice free periods (Kinney, et. al., 1971:34). This current is part of a large clockwise surface water system, termed the Pacific Gyral, that dominates the entire Beaufort Sea (Dunbar & Wittman 1962:91-95; Sater 1969:20). Ice floes caught in this gyral may remain in it for years. On a smaller scale, a cyclonic circulation may periodically exist in the extreme southeast portion of the Beaufort Sea with a movement of surface water eastward into Amundsen Gulf.

Surface water temperatures range from approximately 2 degrees C. to

-2 degrees C. between summer and winter. Shallow coastal waters often carry suspended detritus which originates from thermal erosion of the entire coast from Barrow to the Mackenzie River (Lewellen, 1970:4), river effluent and scour of the substrate by moving ice (Mohr and Tibbs, 1962:247).

Pack ice may totally cover the Beaufort Sea at any season, although an ice free margin extending from 3 to 30 miles offshore typically exists between early July and late September. Seasonal ice which forms in open water areas, particularly over shallow coastal areas will usually achieve a thickness of about 60 inches before thawing commences in the spring. Multi-year ice which constitutes most of the permanent pack ice may be much thicker, often in excess of 20 feet. Ice islands, from calving of glacial shelves, may be more than 100 feet thick. While these ice islands are of regular occurrence in the Beaufort Sea, they are not abundant (Sater, 1969:26-67).

The following characteristics of the Beaufort Sea would influence the course of fate of oil spills in generally predictable ways: (1) currents would move oil along the coast, usually in a westerly direction; (2) low water temperatures would retard bacterial degradation and cause certain fractions to congeal; (3) an ice edge would tend to trap and contain spills and aid cleanup procedures; (4) oil trapped in or under ice floes could remain in the Pacific Gyral for years; (5) bottom scour by ice floes and ice islands would threaten the integrity of pipelines buried in the sea floor.

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