

RESPONSE PLANNING AND ENVIRONMENTAL RISK ANALYSIS, STATE OF ALASKA

*Erich R. Gundlach
Arthur D. Little, Inc.
Acorn Park
Cambridge, Massachusetts 02140*

*Geoff M. Harben
Alaska Department of Environmental Conservation
410 Willoughby Street
Juneau, Alaska 99801*

Under the sponsorship of the Alaska Department of Environmental Conservation (ADEC), a multitasked study was undertaken to determine the relative risk of noncrude oil transport (including marine and freshwater), the status of spill response capability in the state, and the need and most appropriate locations for siting spill response depots. The project used multidisciplinary transport and environmental data analyzed in a geographic information system (GIS) to enable various scenarios and data changes to be easily visualized.

Western regions have seen between 50,000 and 100,000 gallons lost, Bristol Bay and Kodiak less than 10,000 gallons, and the other regions no reported losses. The Wrangel Narrows in the Southeast is the single area in all of Alaska that has had the most incidents, including groundings and spill releases.

Spill causes and cleanup

Our review of spill events revealed that all but one spill occurred in coastal waters. Groundings caused more than half the spills, and weather conditions roughly 15 percent; one was caused by the sinking of a barge, and the remaining four were of unknown causes. More than 50 percent of the oil spilled was light diesel oils (mainly No. 2); automotive and aviation gasolines were involved in 20 to 25 percent of the incidents; kerosene, jet fuel, No. 5 fuel oil, and clarified oil made up the remainder; no spills were reported to have lost primarily No. 6 oil. The average spill for all of Alaska has historically been 157,000 gallons (123,000 gallons for tankships and 174,000 gallons for barges). Only four spills have been greater than 157,000 gallons. Approximately half the spills apparently had no cleanup performed, most likely due to product dissipation and/or sea and weather conditions; the other half resulted in some equipment deployed (primarily booms), but little or no product was recovered.

Environmental hazards

Analysis of the statistical and environmental data indicates that the only route identified as having a higher probable incidence of spills is along the Wrangel Narrows, where spills could potentially affect sensitive shoreline habitats, particularly wetlands, rocky shores, and productive tidal flat areas; all other spills are widely distributed without correlation to specific routes, so that specific wildlife or fish habitats at risk cannot be identified. Regionally, 10 noncrude spills greater than 1,000 gallons have occurred in the Southeast, and many additional groundings (mainly due to the natural hazards associated with narrow channels and bedrock shoals), the Aleutian region had 5 spills (due mainly to weather conditions and the large amount of noncrude transport in the region), Cook Inlet had 3 spills, influenced by the large transport volume in the region. The Kodiak, North Slope, and Western regions had only 1 spill each, while the Northwest Arctic, Prince William Sound, and Interior regions had no reported spills over 1,000 gallons. Figure 1 shows a typical summary map developed with the GIS to indicate vessel routes, volume transported, and land-based facilities (by size). Similar maps were made for each region and for environmental data.

Ranking of relative risk

Table 1 summarizes the analysis used to rank each Alaska region in terms of risk from noncrude spills, with brief descriptions of the risk

Principal questions addressed

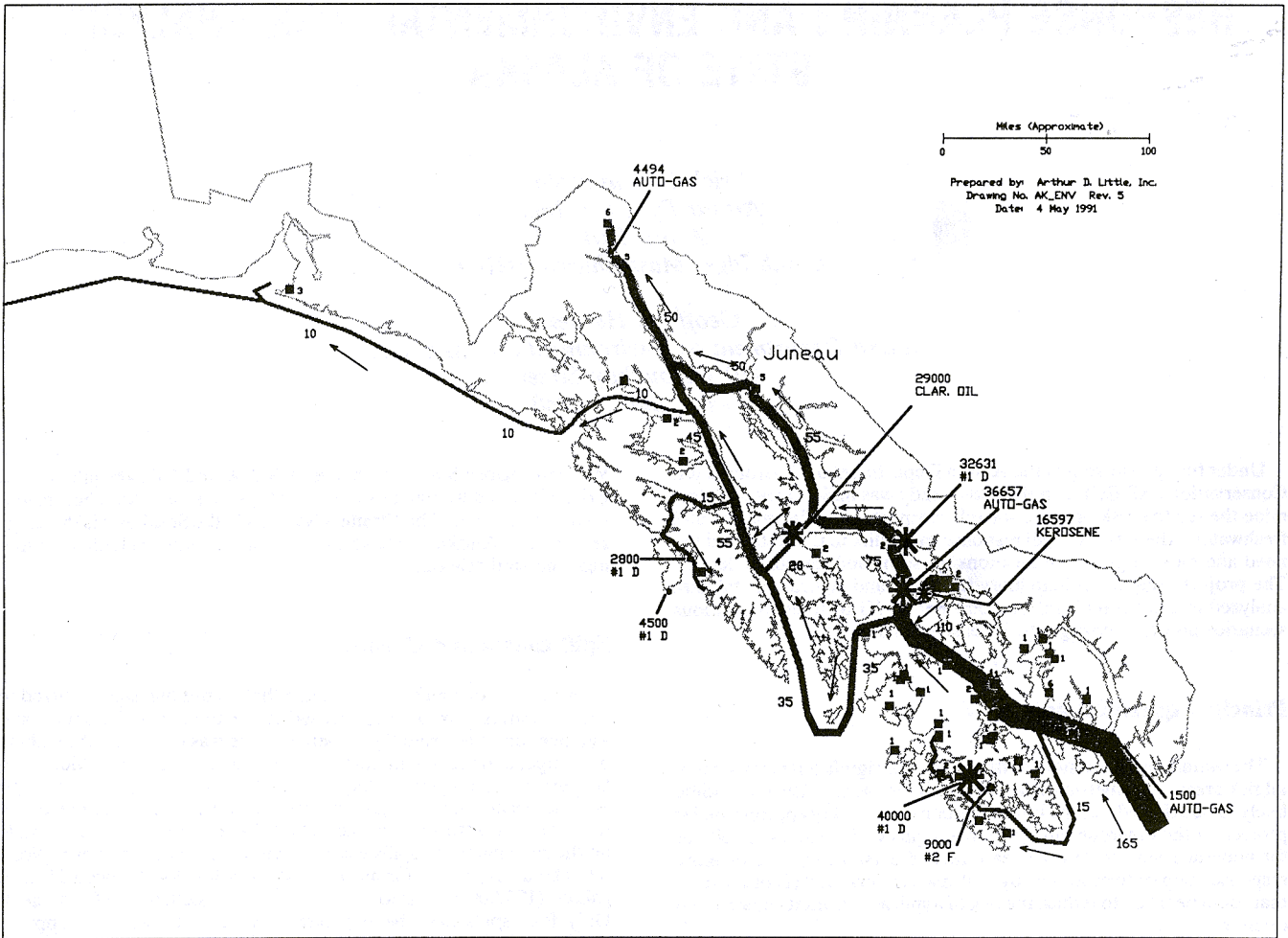
The evaluation concerned (a) designation of significant environmental risk areas, (b) environmentally sensitive areas and fish and wildlife likely to be affected, (c) the level of response capability appropriate for protecting the environment, (d) the adequacy of current capabilities for noncrude vessels, (e) the feasibility of establishing one or more response cooperatives for use by multiple carriers, and (f) other steps that could be taken to reduce the risk of a spill and facilitate control and cleanup.

Noncrude vessel traffic

The evaluation revealed that total noncrude transport in Alaska is approximately 1.2 billion gallons annually. The type of fuel carried varies, but is generally light (e.g., kerosene, diesel, gasoline, and jet fuel) for all but the Cook Inlet-Japan route, which accounts for more than half of all transport, mainly No. 6 oil. The number of noncrude spills greater than 1,000 gallons has been very small (fewer than 22 or 23 over the 18 years up to 1991). The total lost in noncrude spill incidents greater than 1,000 gallons since 1973 is approximately 3.3 million gallons. The average spill size is roughly 160,000 gallons, but most are smaller. Most of the oil spilled, being light in nature, dissipated before it could be collected or removed.

Vessel type and spills

With regard to which vessel types, routes, or carriers present the greatest risks, the study found that roughly two-thirds of all noncrude spills by number have resulted from tank barges, and one-third from tankships. Three-fourths of all noncrude losses by volume over 1,000 gallons have resulted from tank barges (2.4 million gallons versus 0.8 million gallons for tankships). Tankships were responsible for approximately 25 percent of the volume spilled, whereas spills from barges comprise 75 percent of the total lost. Almost one-half (10) of all spills occurred in the Southeast region, 5 in the Aleutian region, 3 in Cook Inlet, 2 in Bristol Bay, and 1 each in the Kodiak, North Slope, and Western regions. By volume, noncrude losses were greatest in the Aleutian region (2.3 million gallons), followed by Cook Inlet (600,000 gallons) and the South East (177,000 gallons); the North Slope and



OIL-RELATED CONSIDERATIONS

■ Oil Terminals

- 1 1-100,000 Gallons
- 2 100,001-500,000 Gallons
- 3 500,001-1,000,000 Gallons
- 4 1,000,001-2,000,000 Gallons
- 5 2,000,001-5,000,000 Gallons

* Noncrude Spills 1973-1991 (>1000 gallons)*

- * 10,000 Gallons
- * 50,000 Gallons
- * 250,000 Gallons Spilled

#1 D	#1 Diesel	AV-GAS	Aviation Gasoline
#2 D	#2 Diesel	CLAR. OIL	Clarified Oil
#2 F	#2 Fuel	D	Diesel
#5 F	#5 Fuel	JET	Jet Fuel
AUTO-GAS	Automotive Gasoline	KERDSENE	Kerosene

*Spills over 200,000 gallons not indicated by symbol size.

Noncrude Carrier Routes (Annual Volume)

- 10 Million Gallons
- 100 Million Gallons
- > 800 Million Gallons

35 Millions of Gallons

Figure 1. Oil-related considerations for the southeast region of Alaska, with legend showing types of data that can be retrieved from the computer-based geographical information system—Similar maps were prepared for each Alaska Department of Environmental Conservation planning region.

Table 1. Relative risk rankings for noncrude oil spills, by ADEC region

Region	Environmental risk level, by risk factor ₁				Overall risk
	Environmentally sensitive habitats	Physical risk	Volume of noncrude transport	Spill history	
Southeast	H	H	H	H	High
Prince William Sound	M	L	M	L	Low to moderate
Cook Inlet	M	M	VH	H	Moderate to high
Kodiak	M	L	L	L	Low
Aleutian	L	M	H	H	Moderate to high
Bristol Bay	M	L	L	L	Low
Interior	M	L	L	L	Low
Western	M	L	L	L	Low
Northwest Arctic	L	L	L	L	Low
North Slope	M	M	L	L	Low to moderate

1. Environmental risk factors include (a) the proximity of environmentally sensitive habitats, (b) physical risk associated with hazards of weather, marine conditions, or channel configuration, (c) the annual volume of noncrude oil transported close to shore, and (d) the region's spill history (the number of spills there). For each risk factor, regions were ranked very high (VH), high (H), moderate (M), or low (L).

categories. The Southeast region, was found to be of highest risk, followed by the Cook Inlet and Aleutian regions. All others were found to be of lower risk.

Regional depots

The evaluation found that several Alaskan areas did not have adequate response equipment available within their regions, and that the establishment of regional depots would significantly enhance their

capability for all the largest spills. Based on the risk analysis summarized in Table 1, the most appropriate locations for establishment of response depots are in Ketchikan (Southeast region) and at Dutch Harbor. Other sites either have substantial capabilities now (e.g., Prince William Sound and Cook Inlet) or are of much lower risk categories and therefore of lower priority for development. In several areas, costs for the depot may be shared among terminal operators, fuel users, and fleet owners as well as the state, because noncrude carriers are responsible for only a portion of the spills entering Alaskan waters and should not be responsible for maintaining the depots alone.