

ALASKA LEGISLATURE SPECIAL COMMITTEE / SUBJECT FILES 8672

113 SCOMM 9: HOUSE SPEC. COMM. ON PERMANENT FUND 1977-78

forest is commercial timber, representing 77% of all the sawtimber in Alaska, 70% of the nation's supply of Sitka spruce, and 40% of its western hemlock sawtimber. Average volumes per acre for sawtimber stands in Southeast Alaska compare favorably with similar stands in forest-rich Oregon and Washington.

Alaska currently utilizes only a small portion of its timber resources. On a statewide basis, and considering all timberlands, the present utilization is estimated at only about one-third of the allowable cut -- i.e., the amount of timber that can be cut during the interim period until "sustained yield" capacity is reached. Allowable cuts are subject to variation, depending upon the factors considered in their computation, especially the rotation cycle, or number of years estimated to produce a new harvestable forest stand.

Several federal agencies manage land in Alaska. The Bureau of Land Management (BLM) controls about 85% of the federally controlled lands in Alaska. The U.S. Forest Service controls about 6%, but that includes more than 5 million acres of commercial timber in national forests in coastal Alaska where most of the state's timber development has occurred. The fact that national forests supply almost 90% of Alaska's timber production illustrates the impact of U.S. Forest Service policies on Alaska's forest resource utilization.

Two large dissolving pulp mills account for most of the state's timber production volume and shipment value. Small sawmills exist throughout the state providing wood to meet local construction needs. However, Alaska imports most of its finished wood products from the lower 48; it does not have a large enough market to support the diversity and quality of wood products that consumers require. In addition, because of high labor costs, Alaskan-made products may cost more than imports. Even some commodity products such as plywood flooring are imported.

Almost 90% of the output from Alaska's forest products industry is shipped to Japan. Exports of forest products in 1976 included 315.8 mbf of logs, lumber, and cants; 182,400 short tons of pulp; and 107,700 2000-pound units of chips. Dissolving pulp, used in the production of rayon, acetate, cellophane, and cellulose chemicals, is Alaska's most important forest product export. Both of Alaska's mills can also make bleached paper pulp for tissue and printing papers. Most of it is shipped to Japan, with lesser amounts going to the lower 48.

The Japanese are heavily involved in the Alaskan timber industry. For example, the Alaskan Lumber and Pulp Company's mill at Sitka (one of the state's two major pulp mills) is Japanese-owned, with much of the initial capital for the company coming from 15 chemical fiber manufacturing companies including all of the major rayon-producing companies of Japan. The mill employs about 500 people -- mostly local. The firm's shipments to Japan travel mostly by carriers specially built for this route.

The Wrangell Lumber Company was originally incorporated as a subsidiary of Alaska Lumber and Pulp, and eventually became its parent company. It operates a mill at Wrangell which cuts Sitka spruce and hemlock into cants for shipment to Japan.

Southcentral Timber Development, Inc., is owned by Japan's largest lumber company, Iwakura-Gumi Lumber Limited, which receives most of the exported cants and lumber products.

3. Problems

Alaska has utilized only a small portion of its forest product resources. The reasons for the limited development of the Alaska forest products industry are economic and regulatory. The economic reasons are the same as those that constrain the development of other export industries in Alaska -- i.e., the high cost of operating in Alaska which limits the competitiveness of Alaskan products in export markets.

The principal disadvantage which Alaska faces in marketing forest products in the lower 48 and Canada is the relative high cost of Alaskan products because of the high cost of harvesting, transporting, processing, and distributing timber and wood products from a remote region. Labor rates in southeastern Alaska logging operations are about 25% higher than those prevailing in similar operations in the Pacific Northwest. Construction costs of forest access roads in Alaska are substantially higher than those of roads built in the Pacific Northwest. For pulp mills of comparable type and capacity, costs of construction in Alaska may be almost double those prevailing in the Northwest and Canada.

The markets which Alaska competes in are dominated by the highly integrated, well-established forest products industry in the Pacific Northwest and the South which has lower-cost operations. The Jones Act adds to Alaska's locational disadvantage by requiring that ocean shipments be made on relatively high-cost U.S. vessels.

One area where Alaska can compete economically is closed to it because of state/federal regulatory policy. Forest management agencies (U.S. Forest Service, BLM, and the State Division of Lands) restrict the export of unprocessed materials. Consequently, Alaska cannot export unprocessed logs. Instead it must process the logs into pulp, cants, or chips. This prevents the industry from minimizing the high costs of Alaskan labor and construction by forcing the location of costly processing facilities within the state (although this also enhances use of Alaskan labor and inhibits overuse of unprocessed resources).

The future of the timber products industry in Alaska will continue to depend on the economics of Alaskan production, but to an increasing extent will depend on the availability of land for timber development. Federal and state regulatory policy and political/institutional considerations make this availability uncertain. For example, a recent U.S. Forest Service regulation could seriously limit expansion of Alaska's forest products industry. The Forest Service imposed a two-year moratorium on timber sales in Alaska, pending completion of a land use plan for the Tongass National Forest. Also, future timber contracts will be limited to a maximum of 10 years rather than 55 years, which previously was the norm in Alaska. Consequently, firms considering the large investment required to establish a major wood processing operation would be unable to obtain an assured supply of logs to justify a major installation. Should this policy remain, expansion of the forest products industry in Alaska will be limited to relatively small mills.

The future utilization of the interior forests is uncertain. Coastal timber has a higher profit margin associated with larger sawlogs and denser forest stands, faster growth, and better accessibility. Many of the interior forests are inaccessible and would require construction of costly access roads and transportation facilities if they are to be developed. The interior forests are only partially inventoried, and prospective large developers lack information about specific areas to be sure of feasibility. In addition, the state, which manages much of the interior forests, has not as yet classified enough land as timber-producing land to assure a sustained supply for economic size forest product ventures.

The availability for development of lands that come under the Alaska Native Claims Settlement Act is also uncertain. BLM timber sales from lands which have been nominated for selection by the native village and regional corporations and from the d-2 lands selected by the Secretary of the Interior, as specified by the Act, have been almost entirely eliminated; timber sales from these lands must be approved by the appropriate native corporation or the federal agency which is expected to administer the d-2 lands.

The transfer of some Alaskan lands from federal to state jurisdiction may also affect timberland availability. The Alaska Statehood Act empowered the State of Alaska to select and receive title to approximately 104 million acres of land; the state has selected much of the commercial, accessible timberlands formally administered by the BLM, further diminishing the cut from BLM-administered lands.

Environmental restrictions may also limit both the availability of timberland and the operations of the forest products industry. The cancellation of the Champion International pulp mill complex because of delays in obtaining timberland lease clearances and beginning operations illustrates the difficulties companies face in obtaining timberland. The Champion International Company cancelled its plans for constructing a pulp mill complex for Berner's Bay near Juneau. The company sought and received a final cancellation of its 50-year timber sale on Admiralty Island. The sale had been involved for several years in litigation between the company, the Sierra Club, and the U.S. Forest Service. In releasing Champion from its contract, the Forest Service indicated a policy change which would no longer allow the long-term and wide-ranging timber sales experienced in Alaska in previous years.

The Ketchikan Pulp Company controversy illustrates the environmental restrictions on forest product company operations. During 1975 water pollution restrictions were imposed on the Ketchikan Pulp Company by the U.S. Environmental Protection Agency (EPA) similar to regulations it enforced throughout the dissolving pulp industry. The estimated \$30 million capital cost to meet the regulations, coupled with rapidly rising timber harvesting costs as the company began to use its interior lease-holdings, caused company officials to threaten to close the Ketchikan pulp mill by mid-1977. The closing would have severely impacted the Ketchikan area and much of Southeast Alaska. As the area's major employer, the mill closing

could have idled nearly 45% of the population in the Ketchikan/Prince of Wales area. The controversy was resolved by financing the company and extending its deadline for meeting EPA standards to 1980.

The most promising development for Alaska's timber industry was the passage, in October 1976, of the National Forest Management Act. This bill lifted a previous ban on clear-cutting which threatened to curtail the entire Alaskan forest products industry. Due to the extreme density of the forests, clear-cutting is the only economically feasible method to harvest timber in southeastern Alaska. With the clear-cutting ban at an end, existing sawmills can develop previously uneconomic areas.

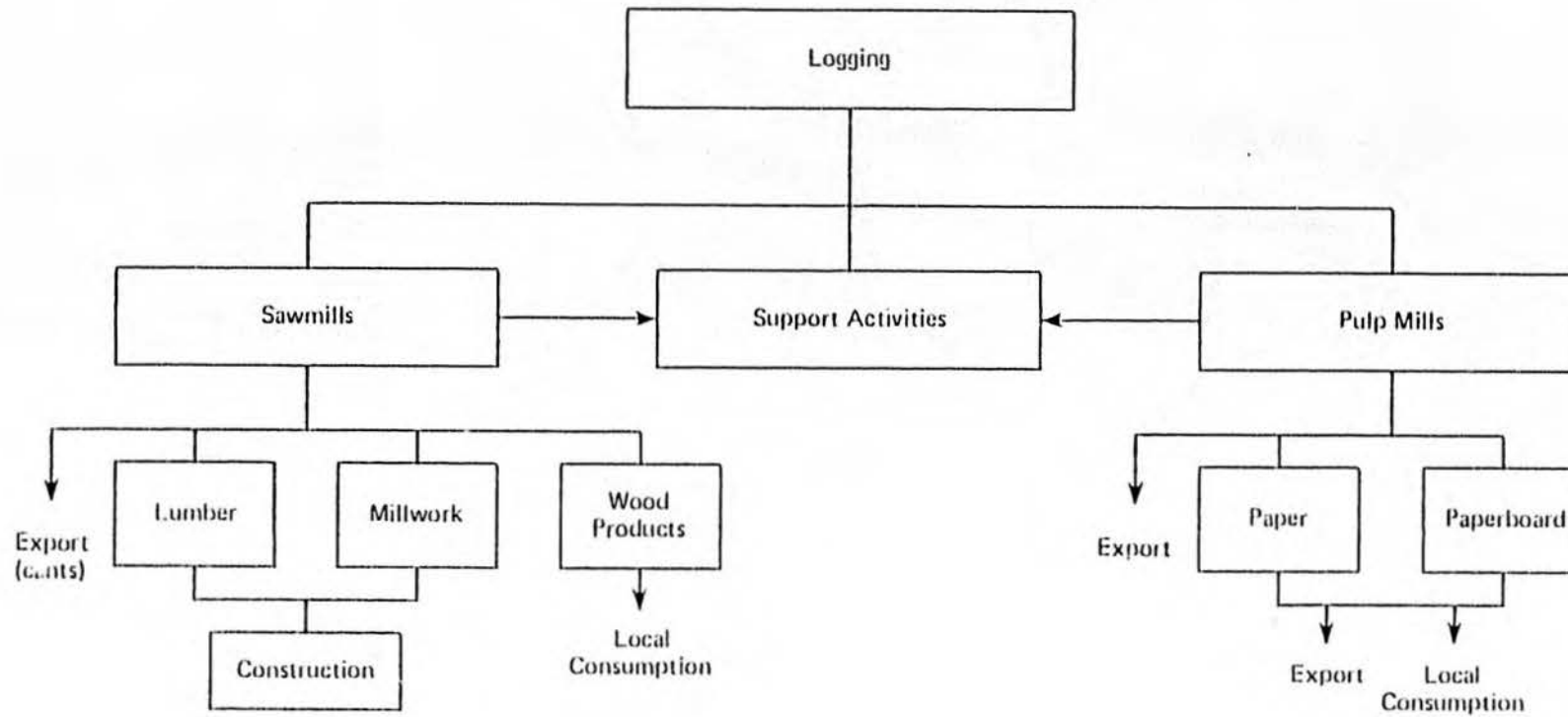
4. Outlook and Opportunities

Alaska's vast timberlands have huge development potential, as portrayed geographically in Figure III-5. The U.S. Forest Service estimates that 28 million of Alaska's 119 million acres of forest land can be developed commercially. The volume of Alaskan sawtimber that can be developed commercially from these lands is an estimated 215 billion board feet, which is equivalent to all the sawtimber in the New England, Middle Atlantic, and Central states combined. Nearly 80% of the marketable timber is located on the islands and coastal forest of the Tongass National Forest in Southeast Alaska.

The future of the Alaskan forest products industry and development of timber resources will depend on the economics of Alaskan production and the availability of timberland for development. The economics of Alaskan forest products development will probably limit expansion of the industry to the existing markets. Given the high operating costs of Alaskan production, it is unlikely that Alaska can produce processed wood products that are competitive with those produced in the lower 48. If the primary processing requirements are continued, expansion of the Japanese market for Alaskan forest products will depend on the Japanese construction industry and Japan's production of rayon and paper. The export of cants to Japan may increase to meet the needs of Japan's expanding housing construction program. Japanese demand for dissolving pulp for rayon production will be affected by the competition from petroleum-based fibers (mainly polyester and nylon). In the past this competition has weakened demand for Alaska's pulp. World dissolving pulp demand is expected to grow at an average rate of 1% per year for the next 5-10 years. The expansion of paper pulp production at Ketchikan Pulp will probably permit the mill to respond more quickly to changes in the market.

Land availability problems, as outlined earlier, will have to be resolved so that the industry can determine the amount and location of timberland that will be available and can then estimate economic feasibility and market potential.

RESOURCE: TIMBER



III-20

FIGURE III-5 DOWNSTREAM DEVELOPMENT POTENTIAL - TIMBER

Despite the limitations on available timberland, there will be room for some expansion of the industry. With the transfer of nearly 150 million acres of federal lands to the state and to native regional corporations, more land should become available. The potential native land selections under the provisions of the Alaska Native Claims Settlement Act will reclassify about 13 million acres of state and federal timber into private ownership. For example, villages in the Sealaska region may receive timber inventories exceeding five billion board feet and the regional corporation itself may receive over more than four billion board feet.

Additional sawmills and wood finishing plants can be expected to serve growing local and regional markets in Alaska. For example, the Anchorage market may eventually be large enough to support a mill of a size capable of producing first-class products.

Actions necessary for Alaska to expand its existing markets include:

- Classification of land and determination of its future use.
- Completion and update of forest inventories to determine the species, quantity, quality, potential productivity and economic feasibility of forest resources.
- Resolution of controversy over primary processing.

C. FISHERIES

1. Summary and Overview

Fishery products are second only to oil and gas as a contributor to Alaska's economy. In 1975, 442 million pounds of fish were caught in Alaskan waters, with a value of about \$125 million. About 8% of the total U.S. commercial catch is taken from Alaskan waters -- mostly from waters off the coast of central Alaska. About 5% of the edible seafood exported from the United States is shipped via the Alaska Customs District, primarily to Japan and Canada. In the last few years, shellfish have become the major target of Alaska fishermen. Fish processing activities in Alaska consist primarily of salmon canning, but freezing fish is becoming increasingly significant. Most canneries in Alaska are owned by out-of-state interests and operated, as they have been historically, by a seasonal labor force recruited from Washington, Oregon, and California.

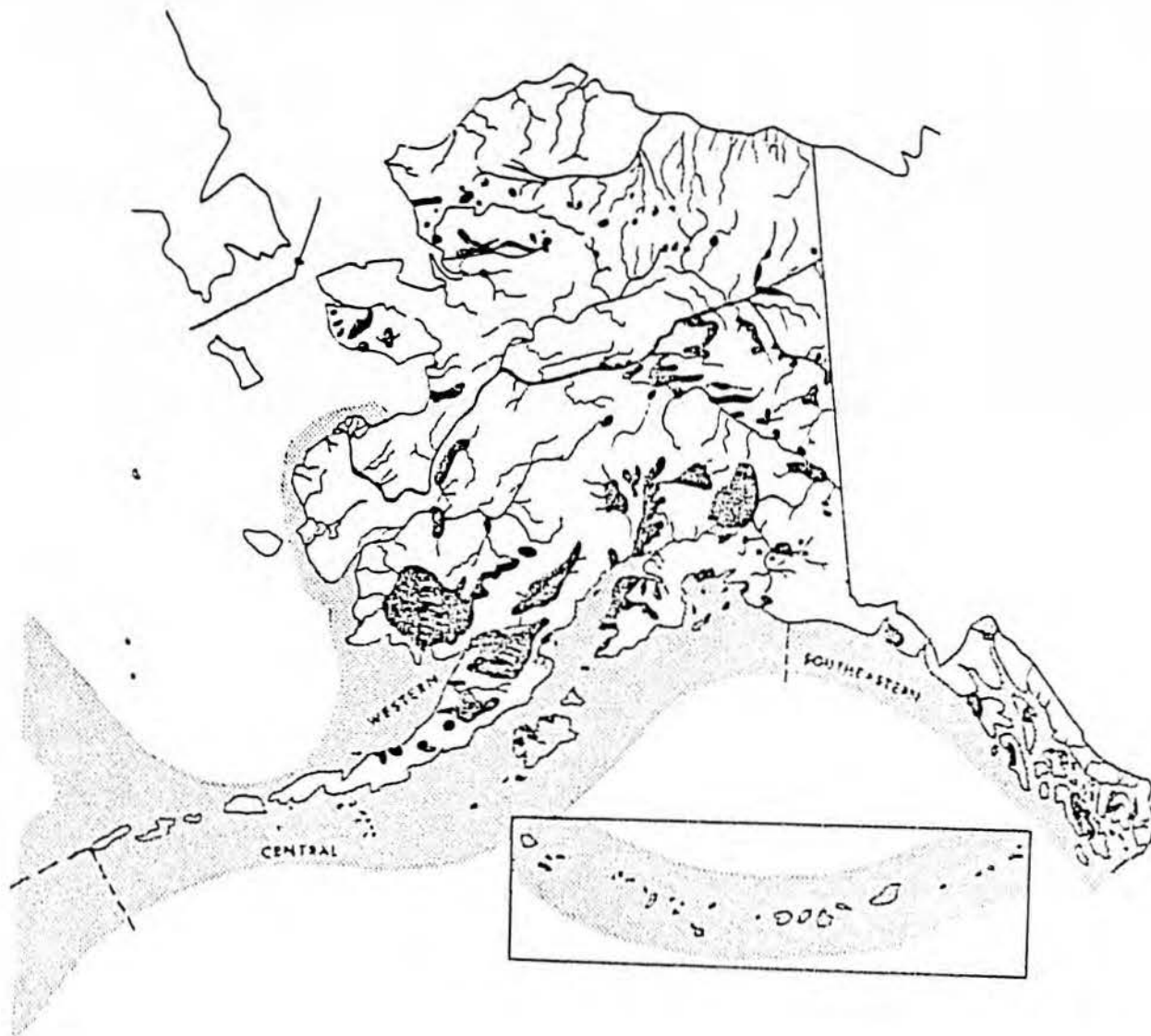
Aside from the high costs of operations for fishing and fish processing in Alaska, the major problem of the industry in the past, and one that will influence its development in the future, is the proper management of fishery resources. This includes the need for limitations on the size of the annual catch so as not to deplete resources, and the development of hatcheries and spawning areas.




The possible pollution of fishing waters from Outer Continental Shelf oil and gas development and other resource and processing activities is causing increasing concern among Alaska fishermen.

The best opportunity for future expansion of the Alaska fishing industry lies in bottomfishing. The extension of U.S. territorial waters to 200 miles will give Alaska fishermen access to a huge supply of bottomfish which have heretofore been taken by Japanese and Russian trawlers. A large market for Alaskan bottomfish would exist in Japan, and to a lesser extent in the United States, and possibly, South America. Alaska bottomfishing would also increase the opportunities for fish processing in Alaska. Bottomfishing would reduce the seasonality of Alaskan fishing because these fish can be taken during winter months.

2. Present Status

Fish products are second only to petroleum as a contributor to Alaska's economy in terms of value of production. In 1975, 442 million pounds of fish were caught in Alaskan waters, with a value of about \$125 million. About 58% of the catch, and nearly half the fish value, consisted of fish caught off the coast of central Alaska (Figure III-6 and Table III-3). About 8% of the total U.S. commercial catch comes from Alaskan waters. For several years, Alaska was one of the leading states in terms of value of fish landed, and Kodiak was one of the leading ports in the nation for value paid to fishermen. About 5% of the edible seafood exported from the United States is exported through the Alaska Customs District and is shipped mostly to Japan and Canada.



-  Fresh water fish areas
-  Anadromous fish areas
-  Primary commercial marine fisheries area

Source: Compiled in 1971 by the Federal Field Committee for Development Planning in Alaska from authoritative sources.

FIGURE III-6 DISTRIBUTION AND RELATIVE IMPORTANCE OF ALASKA FISHERIES

TABLE III-3

CATCH AND GROSS VALUE TO FISHERMEN
 OF FISH LANDINGS IN ALASKA BY REGION, 1960-75
 (catch in millions of pounds, value in thousands of dollars)

	Catch				Value			
	<u>Southeast</u>	<u>Central</u>	<u>Western</u>	<u>Total</u>	<u>Southeast</u>	<u>Central</u>	<u>Western</u>	<u>Total</u>
1960	142.8	126.3	89.4	358.5	\$10,240	\$15,126	\$15,567	\$40,933
1965	140.2	195.2	155.1	490.5	19,896	22,252	27,934	70,082
1970	100.2	269.3	164.0	533.5	19,998	40,681	36,818	97,497
1975	62.4	256.8	123.0	442.2	25,313	60,971	42,947	124,931

Sources: Alaska Department of Fish and Game, and the Department of Commerce and Economic Development.

Shellfish have become the principal type of fish caught by Alaskan fishermen (Table III-4). Until the early 1970s, salmon accounted for the largest portion of the total catch. Since then the salmon catch has been declining because of the abnormally high mortality rates for juvenile salmon spawned or reared during the severe winters of 1970-71 and 1971-72. This short-term decline compounds the impact of a long-term decline in the salmon catch for the past 30 years, which resulted from overfishing between 1920 and 1940. In 1976 and 1977, there was a significant increase in the salmon catch. In 1976, the shellfish catch included 106 million pounds of king crab, 81 million pounds of snow crab, and 129 million pounds of shrimp. Other important species of fish caught in Alaska include halibut, with 27 million pounds caught in 1976.

Fish processing is becoming increasingly important in Alaska. More than one-third of Alaska's manufacturing employment is in fish processing. Canning salmon and shellfish is the major processing activity, but freezing is gaining in importance. Most canneries in Alaska are owned by out-of-state interests and are operated, as has been the case historically, by a seasonal labor force, recruited primarily in Washington, Oregon, and California. Thus, the processing of salmon in Alaska is essentially a nonresident activity, while most shellfish is processed in-state by Alaskans.

In 1975, the wholesale value of canned Alaskan fish products was an estimated \$108.9 million -- about 88% of which was canned salmon. The wholesale values fluctuate from year to year. The highest value was \$139 million in 1970 (Table III-5). The wholesale value of fresh frozen fish in 1975 was approximately \$173 million. The largest value was for crab (\$99 million) followed by salmon (\$32 million). In 1975 an estimated 1.2 million cases (48 one-pound cans) of canned salmon products were produced.

Until statehood, Alaska's commercial fisheries were managed by the Bureau of Commercial Fisheries in the Department of the Interior. Thereafter, management responsibilities were transferred to the State Department of Fish and Game.

3. Problems

The fishing industry in Alaska is affected by economic uncertainties resulting from a limited fishing season, the uncertainty of the size of the annual catch, and fluctuations in the market price for landed fish. The 1972-75 decline in the salmon catch significantly affected employment among fishermen and in fish processing. The high costs of operation in Alaska in the face of low market prices that barely cover operating costs have limited the profitability of fishing activities. The fish processing industry in Alaska is faced with the problem of high operating costs compared with other producers serving export markets. High labor and construction costs limit the competitiveness of certain Alaskan fish products in export markets.

TABLE III-4

TOTAL ALASKA FISHERIES CATCH
AND VALUE TO FISHERMEN, 1960-76
(catch in millions of pounds, value in thousands of dollars)

	Salmon		Shellfish		Other Fish		Total	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
1960	207.1	\$ 33,574	42.1	\$ 3,138	109.3	\$ 4,222	358.5	\$ 40,934
1965	274.8	48,274	157.5	14,509	58.2	7,299	490.5	70,082
1970	346.5	67,975	152.1	20,525	35.0	8,997	533.6	97,497
1975	137.6	55,302	246.9	55,272	52.8	14,357	437.3	124,931
1976	243.7	103,769	317.3	n.a.	n.a.	n.a.	n.a.	n.a.

n.a. = not available

Sources: Alaska Department of Fish and Game and the Department of Commerce and Economic Development.

TABLE III-5

WHOLESALE VALUE OF ALASKA FISHERY PRODUCTS - 1960-75
(in thousands of dollars)

	<u>Canned</u>	<u>Fresh Frozen</u>	<u>Cured</u>	<u>Other</u>	<u>Total</u>
1960	\$ 81,302	\$ 12,185	\$ 1,973	\$1,229	\$ 96,689
1965	120,476	42,402	3,207	487	166,572
1970	139,345	61,833	12,748	5	213,931
1975	108,876	172,893	11,411	18	293,198

Sources: Alaska Department of Fish and Game and the Department of Commerce and Economic Development

A major problem affecting the past and potential development of the Alaskan fish products industry is the management of fish resources. Effective management of fishery resources requires policies that limit the size of the annual catch so that the resource is not depleted, and that achieve a sustained yield. It also requires development and maintenance of hatcheries and spawning areas.

In an effort to keep salmon stocks from being further depleted, the state enacted a limited entry law in 1973 to limit the number of fishermen permitted in the Alaskan salmon fisheries to the 1972 level. The rationale for this law was that between 1961 and 1973, the number of people harvesting the dwindling stocks had more than doubled. This program probably was of minimal help in solving the problem, because it did not limit the amount of fish that could be caught by each fisherman.

The lack of sufficient information and research on fish resources has hampered effective resource management. For example, king crab and Pacific perch resources were damaged before research information for use in their management could be made available. Federal and state budgetary limitations have hampered such research in the past.

One potential problem facing the industry and one which is increasingly being discussed by Alaska fishermen is the potential effects of pollution from mineral exploration and development on Alaska's fish resources. Increased oil exploration, and eventual production of oil in OCS areas presents a growing risk to fishing areas. This risk includes the potential pollution from pipeline terminals and near-shore petrochemical facilities as well as the risks of large-size oil spills in the earthquake-prone OCS areas. Pollution potential for freshwater fish is also present from activities such as coal mining, canning, logging and pulp operations, and metal extracting and reduction. Little is known about the specific effects of pollutants on fishery resources under the cold environmental conditions that characterize Alaska.

One factor that has heretofore limited the development of Alaska's fishing industry has been the limitation of the U.S. territorial sea, and thereby, the proprietary fishing interests of the State of Alaska, to a three-mile limit. Before enactment of the 200-mile limit, foreign shipping fleets, especially the Japanese and Russian, have caught more than 4 billion pounds of fish annually from Alaskan waters, compared to 800 million pounds caught by U.S. fishermen in the same waters.

4. Outlook and Opportunities

Three recent developments will contribute to the expansion of the Alaskan fishing and fish processing industry:

- Legislation providing for the construction of fish hatcheries,
- Establishment of the Alaska Fisheries Council, and
- Extension of the U.S. territorial sea to 200 miles.

Legislation enacted in 1974 provided for the construction of private nonprofit salmon hatcheries. Guidelines have also been established for the organization of regional associations to institute and coordinate private hatchery development at the local level. The concept of regional organization is patterned after the Prince William Sound Aquaculture Corporation which represents fishermen, processors, native groups, and other resource users in the Cordova area. This organization has undertaken a substantial hatchery development on Evan's Island. In 1976 the state legislature established a \$200 million loan fund to support hatchery operators. In January 1977 the state sold \$29 million bonds to build additional state hatcheries.

Permits have already been issued to construct private hatcheries and applications are being made by a number of different organizations. Should "proprietary" fisheries created by private hatcheries prove to be financially successful, a salmon farming industry may emerge over the next several years. Such a proprietary fishery conceivably could attain economic importance in its own right, while at the same time contributing substantial numbers of salmon to the common property fishery.

In early 1976 the state established a permanent commission, the Alaska Fisheries Council, to set goals for hatchery production and to direct state assistance to affected individuals and businesses in the event of fishery failures such as the 1975 sharp decline in the pink salmon harvest in the Southeast.

The passage of the U.S. Fishery Conservation and Management Act of 1976 established an exclusive fisheries conservation and management zone 200 nautical miles offshore. Enforcement of this law began March 1, 1977. One purpose of the law is to develop the underutilized bottomfish resources off the Alaskan coast. Under U.S. jurisdiction, foreign ships will continue bottomfishing in Alaskan waters; but under a new licensing system, when U.S. industry is able to undertake production, U.S. producers will receive preferential harvesting allocations. Currently, a number of Alaskan fishermen are investigating the possibility of delivering fish directly to foreign (i.e., Japanese) mother-ships for processing.

The consequences to Alaskans of the passage of this Act are several:

- Through the regional council mechanism, Alaskans will have direct input into the decision-making process regarding the management of fishery stocks,
- The supply of fishery stocks should be increased through proper management in cooperation with state authorities,
- An increasing proportion of the stocks harvested in the North Pacific should be harvested by the domestic fleet, and
- Alaska's fishery plants and operations will be more attractive to foreign investment.

The North Pacific Fishery Management Council has jurisdiction over fisheries from three miles to two hundred miles offshore in the Arctic Ocean, the Bering Sea, and the Pacific Ocean. The council was created by the Fishery Conservation and Management Act of 1976. The areas of the North Pacific accommodate more than 80% of the foreign fishing activity off the U.S. coast. Interested foreign fleets have been allocated portions of the resources within these fisheries only when the stocks are determined to be surplus to U.S. needs.

The greatest opportunity for future expansion of the Alaska fishing industry lies in bottomfishing. The new 200-mile limit will limit the amount of bottomfish available to foreign ships, giving Alaskan fishermen a vast new source of fish supply. Only about 1% of landings by Alaska fishermen have been bottomfish. In 1976, before the new limit became effective, the Russians and Japanese, as noted above, harvested about 4 billion pounds of bottomfish with an estimated value of \$400 million.

Bottomfish production has not been undertaken because of economic risk in the face of competition from good quality, low-cost imports from Japan, Iceland, Denmark, Canada, and Norway. However, many plants and vessels working in the Alaska crab, shrimp, and purse seine fisheries are, with the addition of some new gear and equipment, capable of bottomfish production.

Japan would be the most likely market for Alaskan bottomfish. In recent years, Japan has obtained about one-fifth of its food supply from Alaskan waters. Some of the harvest will probably be reduced to prevent further depletion, but the demand should remain. The lower 48 will be another potential market, but probably a more limited one because of low U.S. demand for bottomfish. In general, the increasing Japanese demand, improving marketing acceptance for bottomfish in the United States, and rising market prices will result in increased harvesting of bottomfish. Alaska's native corporations are a potential source of investment in bottomfish harvesting and processing. Their involvement could help keep the value added from fishing-related industries within the state.

The state has recognized the huge potential for Alaska bottomfishing. The Alaskan Department of Commerce and Economic Development has undertaken a program to stimulate bottomfishing. Under this program, the state will select two firms to negotiate a contract whereby they will be reimbursed up to \$150,000 each for bottomfish products sold at less than cost. Detailed production and sales records will be maintained by the contractors and publicly reported in order to provide other potential bottomfishing contractors with adequate information with which to start similar operations.

Expanded bottomfish fishing offers the potential for further development of fish processing in Alaska. Traditional activities such as fish freezing would expand to process the new catch, but additional products such as frozen fish sticks and fish balls are also possible. One question raised by U.S. bottomfishing is whether foreign processors should be allowed to handle U.S.-caught fish in the absence (or even with the availability) of American processing capabilities. One possibility is to sell

the catch to the Japanese for processing on ships off the Alaskan coast. Such an arrangement could adversely affect the potential employment in fish processing activities in Alaska. The existing processing facilities in Alaska for bottomfish are inadequate.

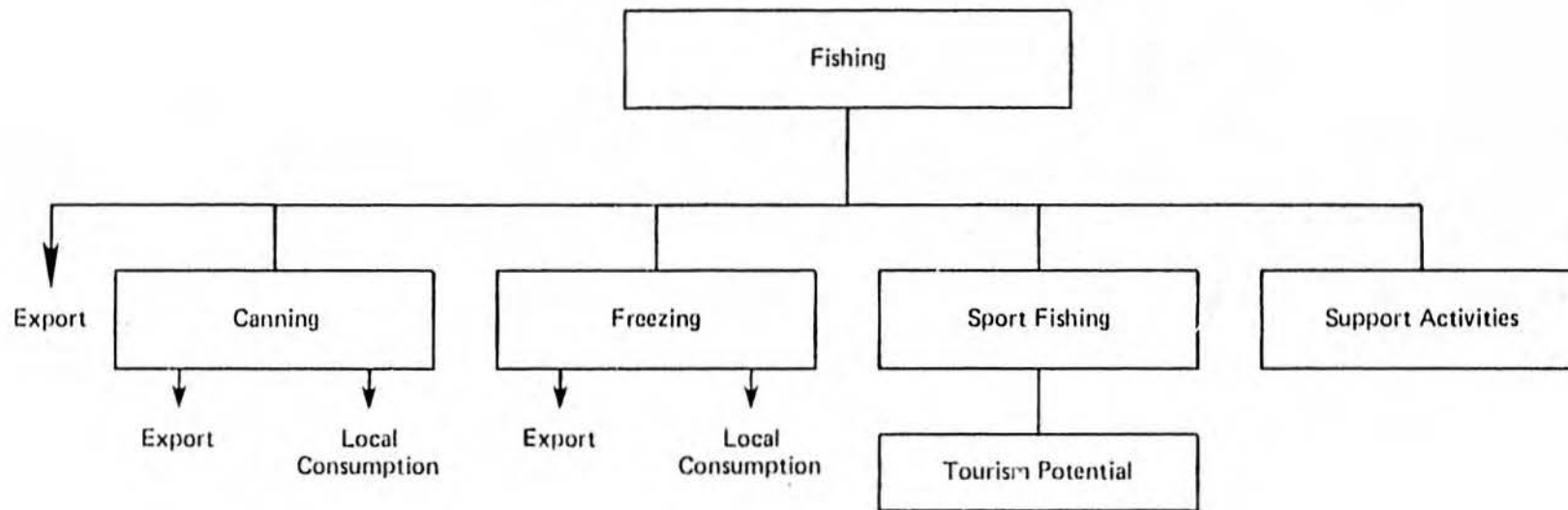
If processing and marketing components of the fishing industry continue to be dominated by the Japanese and by Washington-, Oregon-, and California-based firms, the State of Alaska and its residents will only receive limited benefits from expansion of the industry. Cooperative processing establishments and processing by Alaska's native corporations could alter this trend.

Alaska's freshwater resources should not be overlooked in an appraisal of Alaska's fish potential. Whitefish and other species appear sufficiently abundant to allow for regular carefully controlled harvest, but problems of transportation and marketing have not been analyzed. It will also be necessary to resolve conflicts between the commercial harvest of freshwater fisheries and increasing demands on this resource for sport fishing. The potential of converting the present subsistence use of the fisheries resource by rural Alaska natives to commercial harvesting should also not be overlooked.

The value to the state's economy of Alaska sports fisheries is estimated at \$81 million in 1971 by the Alaska Department of Fish and Game. This was measured by receipts from the sale of more than 93,000 licenses and, in addition, the estimated expenditures of the some 79,000 persons who fished for sport in the state, for such things as transportation, food, lodging, boats, motors, and tackle.

Figure III-7 graphically shows development potential for the state's fishery resources.

RESOURCE: FISHERIES



III-32

FIGURE III-7 DOWNSTREAM DEVELOPMENT POTENTIAL - FISHERIES

D. OIL AND GAS

1. Summary and Overview

With the recent completion of the trans-Alaska pipeline and the shipment of oil from Alaska's Prudhoe Bay region to the lower 48, oil and gas production is becoming the principal contributor to the Alaskan economy. Oil and gas development is not significant because of its direct employment impact -- the industry is very capital-intensive -- but rather in the revenues it brings to the state and in the potential for oil- and gas-related secondary development in Alaska.

Before the production of oil at Prudhoe Bay, the oil and gas industry was concentrated in the Kenai Peninsula/Cook Inlet area. Since the beginning of oil and gas production in the area in the 1960s, petroleum production ranged from 66-84 million barrels per year. In 1975 Alaska ranked seventh among the oil-producing states, accounting for less than 2.5% of total U.S. crude oil production.

With the beginning of production of Prudhoe Bay oil in 1977, Alaska is assuming a dominant role as an energy supplier to the United States. Prudhoe Bay production is expected to average nearly two million barrels per day by 1980.

Most of the oil and gas produced in Alaska has been exported to the lower 48 or other countries. The low sulfur content of the oil from the Kenai/Cook Inlet fields has been particularly desirable on the U.S. West Coast for the production of low-sulfur fuel oils. Much of Alaska's natural gas has been exported to Japan via a liquefied natural gas terminal on the Kenai Peninsula. Alaska has only about 98,000 barrels per day of refinery capacity.

The greatest uncertainty about future oil and gas development in Alaska is availability of land and offshore areas for future oil and gas development. An estimated 83% of speculative recoverable oil reserves and 86% of speculative recoverable gas reserves are owned by the federal government, with most of these reserves located offshore. Availability of these areas for future development will depend on federal government leasing policies and environmental regulations.

Alaskan oil production may also be affected by the resolution of regulatory issues surrounding the movement of Alaskan oil from the U.S. West Coast to the East and Midwest and to Japan. The high costs of labor, construction, and operation in Alaska may limit the competitiveness of future oil and gas products manufactured in Alaska.

Alaska's huge potential for oil and gas development lies in its vast reserves. It has been estimated that Alaska contains 27 billion barrels of undiscovered recoverable oil reserves and 76 billion cubic feet of undiscovered recoverable gas. The Cook Inlet area is the location for much of these reserves and has been a center of substantial new oil and gas

exploration. The federal leasing policy with respect to the OCS areas in Cook Inlet and Prudhoe Bay will determine the rate at which Alaskan oil reserves will be developed.

In the near term, the development of gas supplies from the Prudhoe Bay field and from South Alaska could constitute the largest investment programs in the U.S. oil and gas industry. The most immediate project is the proposed 4700-mile gas pipeline which will permit movement of gas from Prudhoe Bay to the lower 48.

The state can expect significant direct and indirect economic benefits from expanded oil and natural gas production. It can expect vast revenues from oil and gas royalties. Construction would increase because of the need for pipelines, access roads, storage facilities, and port facilities. The development of a petrochemical industry using royalty oil and gas is also a possibility. The state is currently considering four proposals for the construction and operation of a refinery and petrochemical complex.

Expansion of petroleum-based chemical production in Alaska would produce downstream economic benefits. Supplies which have heretofore been imported -- fertilizers and pesticides for agriculture and asphalt for construction, as examples -- could then be supplied by in-state sources, at a lower cost.

2. Present Status

With the recent completion of the trans-Alaska pipeline and the shipment of oil from Alaska's Prudhoe Bay region to the lower 48, oil and gas production is becoming the principal contributor to the Alaskan economy.

Alaskan oil and gas development has not been significant in its direct employment impact -- the industry is very capital-intensive -- but rather in the revenues it brings to the state and in the potential for oil- and gas-related secondary development in Alaska. Employment in the oil and gas industry was about 3600 in 1976, about 2% of the state's total employment. This amount is only slightly higher than the 3200 employees in 1969 (2.5% of total employment). The number of employees for 1977 and subsequent years will undoubtedly be somewhat higher because the employees who operate and maintain the pipeline will then be included.

Except for a small oil production and refining operation from 1911 to 1931 in the Katalla field on the Gulf of Alaska east of Cordova, there was no significant commercial development of Alaskan oil reserves until the 1960s. The oil industry had directed its attention to the exploration of oil in Texas and Louisiana, where production costs were lower and the climate was less harsh. Technological advances in the industry and the need to develop new sources of domestic oil led to the discovery of oil by Richfield Oil Corporation on the Kenai Peninsula.

TABLE III-6
 HISTORICAL ALASKAN OIL
 AND NATURAL GAS PRODUCTION

	<u>Production Amount</u>		<u>Production Value</u>	
	<u>Oil</u> (1,000)	<u>Natural Gas</u> (MM cu ft)	<u>Oil</u> (\$000s)	<u>Natural Gas</u> (\$000)
1960	558	246	1,228	30
1965	11,128	7,255	34,073	1,799
1968	66,204	17,343	186,695	4,388
1969	73,953	50,864	214,464	12,665
1970	83,616	111,576	251,684	27,448
1971	79,494	121,618	257,562	17,878
1972	72,893	125,596	235,444	18,463
1973	72,323	131,007	261,877	19,483
1974	70,603	128,935	347,408	21,919
1975	69,834	160,270	364,630	48,402
1976	65,675	153,499	352,675	53,725

Source: U.S. Department of the Interior, Bureau of Mines, Minerals Yearbook

Before the production of Prudhoe Bay oil and the construction of the trans-Alaska pipeline, the oil and gas industry was concentrated in the Kenai Peninsula/Cook Inlet area (Figure III-3).

Since the beginning of oil and gas production in the Cook Inlet/Kenai Peninsula area in the late 1960s, petroleum production has ranged from 66-84 million barrels per year. Oil production reached a high point in 1970 when 83.6 million barrels were produced. Gas has been produced concurrently with oil. Gas production has increased rapidly since the 1960s reaching a peak of 160 billion cubic feet (cu.ft.) in 1975 (Table III-6). For the past two years annual production has averaged more than 65 million barrels of oil. In 1975, Alaska ranked seventh among the oil-producing states, accounting for less than 2.5% of total U.S. crude oil production.

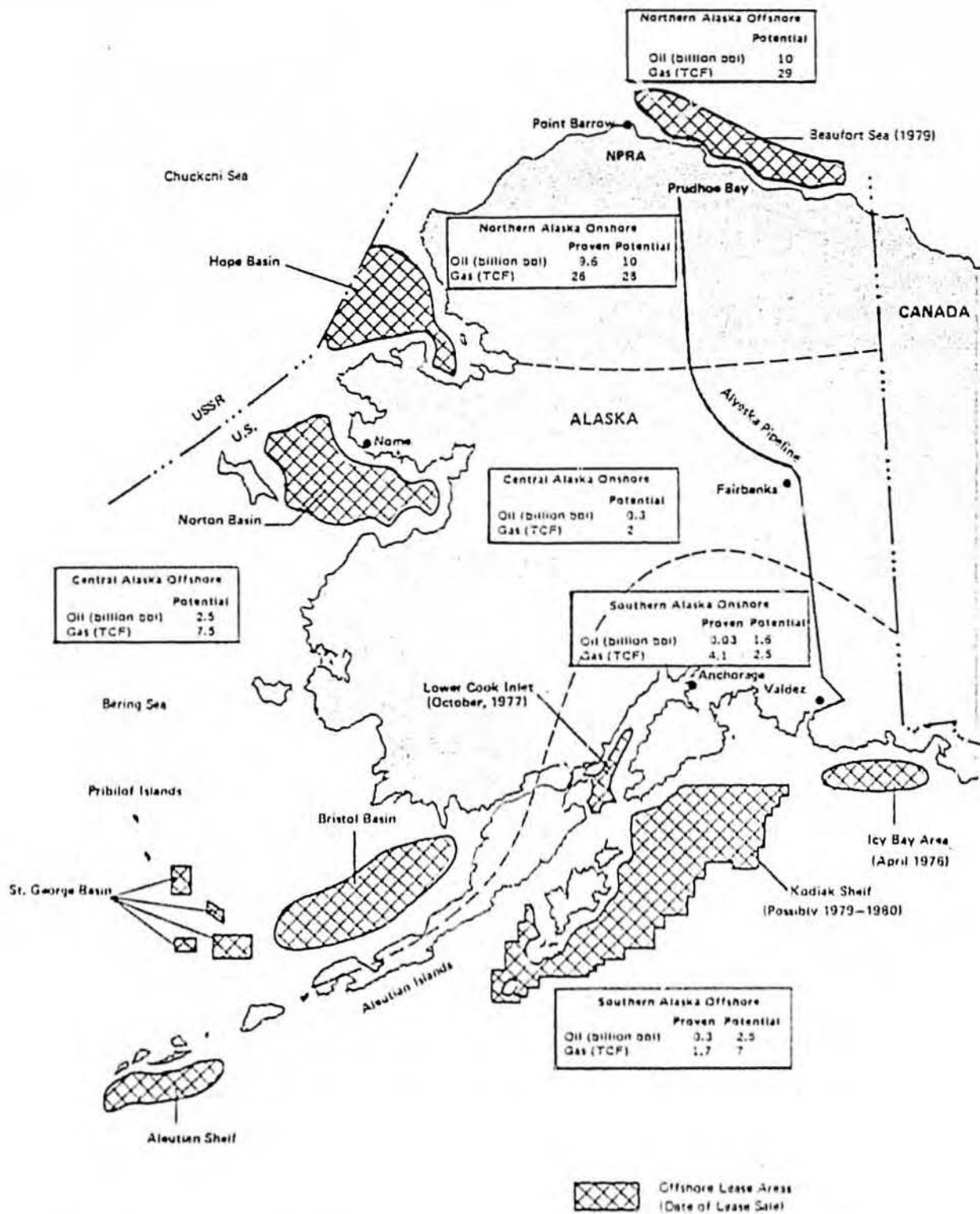
With the beginning of production of Prudhoe Bay oil in 1977, Alaska will assume an increasingly important role as an energy supplier to the United States. Production is estimated to be about 1.2 million barrels per day (bbl/day) by 1978, the first year of the estimated 20-30 year life of the field. Production is expected to increase to about 2 million bbl/day by 1980. By 1978, Alaska will be the third largest oil-producing state in the nation.

Most of the oil and gas produced in Alaska has been exported. The in-state market for oil and gas amounts to only 23 million barrels of oil per year and 72 billion cu.ft. of gas per year. The low sulfur content of the oil from the Kenai/Cook Inlet fields has been particularly desirable on the U.S. West Coast for the production of low-sulfur fuel oils.

Gas has been exported to Japan via a liquefied natural gas terminal on the Kenai Peninsula. In 1975 LNG exports amounted to 65 billion cu.ft. or 25% of total Alaskan gas production. About 9% of Alaskan gas production is used to make ammonia and urea at plants co-located with the LNG terminal. Table III-7 shows that the major use of gas (37%) is to maximize oil production by reinjection.

The development of oil and gas reserves has provided the state with a major source of revenues (Table III-8). The \$936.9 million shown for 1970 represents lease payments by the oil companies for drilling rights in the Prudhoe Bay area.

Alaska has about 98,000 bbl/day of refinery capacity. Until recently, the state's refining capacity has been located on the Kenai Peninsula. A new 25,000 bbl/day refinery has just been completed at North Pole near Fairbanks to serve Interior markets. ARCO has built a 13,000 bbl/day refinery at Prudhoe Bay to support exploration and production operations on the North Slope. Because the limited in-state market has precluded the inclusion of all types of refined product production, Alaska has had to import a portion of its consumption of refined products. Excess production of crude gasoline has been exported as a blending stock to West Coast refineries.



Sources: United States Geological Survey; Bureau of Land Management; *Oil and Gas Journal*, June 27, 1977, and State of Alaska Division of Oil and Gas.

FIGURE III-8 ALASKAN OIL AND GAS PROVEN RECOVERABLE RESERVES, POTENTIAL RECOVERABLE RESOURCES, AND ANTICIPATED LEASE SALE DATES

TABLE III-7

ALASKAN CONSUMPTION AND USE OF GAS
(millions of cubic feet per year)

	<u>Volume</u>	<u>Percent</u>
Utility Sales	12.6	5%
Electric Power Generation	25.4	10
Unclassified	3.3	1
Petroleum Related	<u>31.0</u>	<u>12</u>
Subtotal-in-state	72.3	28
LNG Exports	64.8	25
Amonia/Urea Exports	23.9	10
Oil Field Reinjection	<u>95.2</u>	<u>37</u>
Total	256.2	100%

Source: Kent Miller and Oliver Goldsmith, Energy Consumption in Alaska, prepared for the Alaska Department of Commerce and Economic Development, January 1977.

TABLE III-8

STATE REVENUES FROM PETROLEUM INDUSTRY - 1961-75

<u>Year</u>	<u>Petroleum Revenues</u> (in millions of current \$)	<u>Percent of Total</u> <u>Revenues</u>	<u>Percent Excluding</u> <u>Bonuses</u>
1961	\$ 4.2	6.0%	3.9%
1962	26.0	28.7	8.1
1963	27.9	26.6	11.5
1964	15.0	11.4	8.1
1965	16.6	11.0	7.4
1966	21.7	14.2	7.7
1967	21.6	12.8	8.1
1968	43.9	24.2	13.7
1969	34.7	18.5	18.1
1970	936.9	81.7	15.0
1971	47.5	13.3	13.2
1972	49.3	12.9	12.5
1973	50.3	12.7	10.9
1974	90.8	20.9	16.1
1975	80.1	13.4	12.9

Source: State of Alaska, Annual Financial Reports, 1961-1975.

The Collier Chemical Company has established a chemical plant based on methane. Using methane gas received from the Cook Inlet oil field, its facility in Kenai has been producing ammonia and urea for export primarily to the states in the Pacific Northwest. The recent doubling of capacity in both products has had a very positive economic impact in the Kenai area. With the new facility in operation, more than 250 people will be directly employed. This project has stimulated a new cycle of growth in the peninsula city.

3. Problems

The future of oil and gas development in Alaska will depend on (a) the availability of Alaskan land and offshore areas for oil and gas exploration and development, (b) the resolution of regulatory issues concerning movement of Alaskan oil to the U.S. Midwest and East Coast and Japan, and (c) the establishment of a market in the lower 48 or abroad for petrochemicals. Additional factors will include the acceptability of high-sulfur North Slope oil for U.S. refineries and Alaskan and world crude oil prices.

The greatest uncertainty about future oil and gas development in Alaska is the availability of land and offshore areas for oil and gas exploration and production. Most oil and gas reserves are under federal control. The State Division of Geological and Geophysical Survey estimated in 1975 that nearly 83% of speculative recoverable oil reserves and 86% of speculative recoverable gas reserves were owned by the Federal Government. Availability of these areas for future development will depend on governmental leasing policies and environmental regulations.

While most (90%) oil production (including that in Prudhoe Bay) is occurring on state lands, much of the state's richest reserves are on federal lands. One such area is Naval Petroleum Reserve Number 4 (now National Petroleum Reserve). A 26-well exploratory program is now underway at Naval Petroleum Reserve Number 4, known as PET-4, located just west of the North Slope field. The Federal Government has signed a five-year contract with the Husky Oil Company to conduct exploration on PET-4.

In June 1977, the U.S. Department of the Interior assumed jurisdiction over PET-4 with the charge to recommend a development plan to Congress by 1980.

Potentially greater reserves are to be found on the Alaskan Outer Continental Shelf. The nation's official commitment to pursuing greater energy self-sufficiency has placed a high priority on lease sales on the OCS. More than 60% of the U.S. OCS lies off Alaska. The Gulf of Alaska is regarded by the petroleum industry as among those U.S. offshore areas with good potential. The latest offshore oil lease sale in the Gulf of Alaska was held in October 1977 when seven lower Cook Inlet tracts were

won in federal lease sale for almost \$400 million. No production is expected from these areas until the 1980s. The rights to OCS oil and gas are held by the Department of the Interior. The department's policies in leasing these areas for exploration and development will help determine the pace of future development. The potential adverse environmental effects of OCS oil exploration and development in Alaska's fishing waters may constrain or delay future OCS lease sales.

The existence of a market for Alaskan oil will also determine the extent of future production. Most of Alaska's current production is being shipped to the U.S. West Coast, although some (about 150,000 bbl/day) is going to the Gulf Coast via the Panama Canal. There is concern among public and private officials that there may be a surplus of about 500,000 bbl/day on the West Coast as North Slope output rises. Unless some means is determined for moving this oil elsewhere, Alaskan production may be affected. Various proposals have been offered for moving Alaskan oil to other sections of the lower 48.

The development of a refinery and petrochemical complex that takes as its feedstock the royalty share of North Slope production is under consideration. The lack of a downstream chemical industry and a limited home market means that most of the new plant's output will have to be exported to foreign markets or the lower 48. The delivered cost of the products to the customer must be competitive with that of other producers. However, Alaskan produced chemicals must bear higher capital, labor, and transportation costs. The attractiveness of creating additional value-added processes from oil and gas will depend on factors largely outside the control of Alaskans, including world petrochemical capacity and prices.

4. Outlook and Opportunities

Alaska's huge potential for oil and gas development lies in its vast reserves. Alaska is and will continue to be one of the preferred areas for oil and gas development.

a. Oil and Gas Reserves

The mean value of U.S. Geological Survey (USGS) estimates of undiscovered recoverable oil and gas resources are some 27 billion barrels of oil: 12 billion onshore and 15 billion offshore. Gas resources are estimated to be 76 trillion cubic feet: 32 trillion cu.ft. onshore and 44 trillion cu.ft. offshore. As shown in Table III-9, there is considerable uncertainty in the estimates, but based on the mean values, Alaskan undiscovered resources of oil and gas might comprise one-third of all U.S. undiscovered oil resources and one-sixth of all gas resources.

TABLE III-9

ESTIMATED ALASKAN UNDISCOVERED RECOVERABLE
RESOURCES AS A PROPORTION OF U.S. UNDISCOVERED
RECOVERABLE RESOURCES - 1975

	<u>Billions of Barrels of Oil</u>			<u>Trillions of Cubic Feet of Gas</u>		
	<u>Low</u>	<u>Mean</u>	<u>High</u>	<u>Low</u>	<u>Mean</u>	<u>High</u>
<u>Onshore</u>						
United States	37	56	81	264	377	506
Alaska	6	12	19	16	32	57
Alaska Percentage	16%	21%	23%	6%	8%	11%
<u>Offshore</u>						
United States	10	26	49	42	107	181
Alaska	3	15	31	8	44	80
Alaska Percentage	30%	58%	63%	19%	41%	44%
<u>Totals*</u>						
United States	50	82	127	322	484	655
Alaska	12	27	49	29	76	132
Alaska Percentage	24%	33%	39%	9%	16%	20%

*Statistical means are additive; high-low range values are not. Therefore, some distortion is involved in deriving Alaska high-low percentages.

Source: U.S. Geological Survey, Geological Estimates of Undiscovered Recoverable Oil and Gas Resources in the United States, Geological Survey Circular 725, Washington, D.C., June 1975, Tables 4 and 5, pp. 28-31.

b. Oil Developments

When looking to the future of the petroleum industry in Alaska, it should be kept in mind that the Prudhoe Bay project on the North Slope, which holds one-fourth of U.S. proved crude oil reserves and nearly 10% of the nation's proved natural gas reserves, is simply one reservoir in one of Alaska's 15 sedimentary basins. That is, development on the North Slope represents only the beginning as far as potential oil development in Alaska is concerned.

Much of Alaska's undiscovered reserves lie offshore in federal OCS waters adjacent to the known oil reserves of the North Slope and Kenai/Cook Inlet region. Because exploration and development may span five to seven years, timely approval of lease sales is important to maintain and control production from South Alaska. Before announced lease sales dates, the Department of the Interior receives "nominations," or indications of interest in particular areas from oil companies; these nominations are reviewed by the USGS, which recommends which areas should be leased. Following this review, the Department of the Interior determines the total lease sales acreage and offers it in tracts (mostly in 5760-acre tracts) for bids. The USGS then evaluates the bids and recommends whether or not they should be accepted. The Department of the Interior may reject bids if they are considered too low.

In April 1976, the Gulf of Alaska's Icy Bay area was the subject of the first Alaskan OCS federal lease sale. Twenty companies participated in bidding a total of \$382 million on the 10 tracts receiving the highest bids in the sale, out of a total of \$572 million bid on 81 tracts. Shell (with 26% of the acreage), Atlantic Richfield (18%), Texaco (14%), and Gulf (13%) have the largest participation in the top 10 tracts. Exploration drilling is underway on several tracts.

Earlier in August 1977, Interior Secretary Cecil Andrus had announced the new OCS leasing schedule for 1979-81. This new schedule dropped three of the industry's top five choices as preferred hunting grounds. All three are in Alaska: the Beaufort Sea beyond the barrier islands; Bristol Bay; and the St. George Basin of the Bering Sea. Also dropped from the schedule were the Aleutian Islands sale, Hope Basin, and Chukchi Sea. Table III-10 shows the schedule for Alaskan areas.

The Federal Government controls approximately two-thirds of the state's onshore oil and gas reserves and 90% of the state's offshore oil and gas reserves. The state's native corporations control about 20% of onshore oil and gas reserves (Table III-11).

One of the greatest potential sources of oil and gas revenues remaining on state lands is the shallow Beaufort Sea area immediately north of the Prudhoe Bay field. This is one of Alaska's major oil basins, and studies indicate production can be both economically and environmentally feasible.

TABLE III-10

ALASKA OCS LEASING-SALE PLANNING SCHEDULE 1978-81

	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
Federal/State Beaufort (near shore)	T	EIS, S		
Gulf of Alaska	C, T	EIS	S	
Kodiak	C	T	EIS, S	
Cook Inlet		T		
Bering Norton		C	T	EIS, S

- C - Call for Nominations
T - Announcement of Tracts for Bidding
EIS - Final Environmental Impact Statement
S - Sale

Source: Oil and Gas Journal, August 19, 1977

TABLE III-11

ESTIMATED STATE, NATIVE, AND FEDERAL
SHARES OF SPECULATIVE RECOVERABLE OIL
AND GAS RESOURCES
(percent)

<u>Ownership</u>	<u>Oil</u>			<u>Gas</u>		
	<u>Onshore</u>	<u>Offshore</u>	<u>Total</u>	<u>Onshore</u>	<u>Offshore</u>	<u>Total</u>
State	16.0%	8.0%	10.7%	14.1%	8.1%	9.5%
Native	20.0	-	6.7	18.8	-	4.2
Federal	<u>64.0</u>	<u>92.0</u>	<u>82.6</u>	<u>67.1</u>	<u>91.9</u>	<u>86.3</u>
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: State of Alaska, Department of Natural Resources, Division of Geological and Geophysical Surveys.

c. Gas Developments

In the near term the development of gas supplies from the Prudhoe Bay field and from South Alaska could constitute the largest investment programs in the oil and gas industry. Current gas production from Cook Inlet is liquefied and sold only to Japan because of the historically low regulated price of gas in interstate commerce in the lower 48. Dwindling domestic gas reserves have forced the search for and purchase of higher priced gas and proposals by the Carter Administration, the Congress, and industry for at least an increase in the well-head price of domestically produced gas and a trend to permit rolled-in pricing of gas. Gas supplies from Alaska will be far more costly than existing interstate supplies of natural gas because of the much greater production and transportation expense. Two areas of Alaska constitute the areas of most probable development. One is proven -- the gas supplies of the Prudhoe Bay field of 26 trillion cu. ft. -- and the other is unproven, but believed to have large potential -- the 9.5 trillion cu.ft. in additions to South Alaska's onshore and offshore reserves.

Future Alaskan gas will probably be transported by pipeline. Of three potential routes for the proposed gas pipeline, the Federal Power Commission has recommended and the President has approved the Northwest Pipeline Corporation's proposed route. The proposed pipeline would cover 731 miles in Alaska, 2000 miles in Canada, and about 2000 miles in other U.S. states. It would have a design capacity of 2.6 billion cu.ft./day. The pipeline will cost an estimated \$10.3 billion, excluding \$2-2.5 billion for gas-gathering facilities at Prudhoe Bay. Gas could begin flowing in 1983 although lack of commitments for investment in gas-gathering facilities may delay the startup.

In addition to the development of North Slope gas reserves, there is a proposal for transporting South Alaska gas to the lower 48. The gas would be produced and liquefied for transport to the proposed Point Conception, California, regasification terminal. However, such a project would depend on finding sufficient reserves to support the plant capacity and the resolution of environmental and safety concerns.

d. Other Industry Developments

The transfer of more than 40 million acres of land from the federal government to Alaska's native corporations may substantially affect oil production. Most of the native corporations which occupy potentially rich oil and gas basins have consummated exploration agreements with petroleum firms (see Table III-12).

The future development of oil and natural gas offers the potential for huge economic benefits to the state. The state will benefit directly from the royalty payment from oil and gas produced on state lands. For example, the 12½% royalty payments may produce annual revenues for the state that by 1980 may exceed the cumulative petroleum-related revenues received by the state during the first 15 years of statehood.

TABLE III-12

NATIVE CORPORATION DRILLING CONTRACTS

<u>Native Corporations</u>	<u>Contracting Companies</u>
Arctic Slope Regional Corporation	Standard Oil Union-Amoco Texaco
NANA Regional Corporation	Standard Oil
Calista Corporation	Shell
Bristol Bay Native Corporation	Phillips
Koniag, Inc	Standard Oil
Doyon, Ltd.	Louisiana Land and Exploration Champlin Asland
Ahtna, Inc.	Amoco
Chugach Natives, Inc.	Phillips

Source: Alaska Pacific Bank.

Other economic benefits will result from the construction of facilities and the development of infrastructure needed to serve the petroleum industry. These would include access roads, storage facilities, port facilities, etc. For example, further petroleum development in the Cook Inlet area can be expected to increase the secondary development that has already taken place. Before the construction of oil production facilities in the upper Cook Inlet in 1967, Kenai was a small fishing village. Today the City of Kenai is the largest community on the Kenai Peninsula, with a population of 6000.

The economic impacts associated with the construction of the Alaskan oil pipeline would also be experienced with the construction of a natural gas pipeline -- but probably to a lesser extent because part of the pipeline route would be in Canada.

Alaska can also be expected to receive extensive economic benefits from OCS oil and gas production. Rights to OCS oil are held by the Department of the Interior. While the State of Alaska does not derive direct revenues from lease sales, the state does benefit from increased economic activity stimulated by exploration and development of OCS oil. For example, the cities of Seward and Homer are expected to grow substantially as a result of oil-related activity in the Gulf of Alaska. Plans are currently being made by Dresser Industries to establish a barite plant, pipe storage area, and ship repair site in Seward. Exxon will construct a pipe storage yard north of Seward. Other Alaskan cities can be expected to experience a similar escalation in economic activity and growth in value of taxable property as more OCS leases are auctioned.

The value of oil and gas could prove to be even greater if petrochemical facilities are developed.

The State of Alaska owns the oil and gas at Prudhoe Bay and will be receiving a royalty of 12½%. The state is expected to accept its royalty in kind and sell it to firms that agree to process the oil in Alaska and thereby strongly influence expansion of a petrochemical industry in the state.

Four proposals for refinery and petrochemical projects have been submitted, each covering different sites and product mixes. The state Royalty Oil and Gas Advisory Board has selected the ALPETCO proposal for a basic petrochemical complex. Legislative approval will be required for the sale of royalty oil.

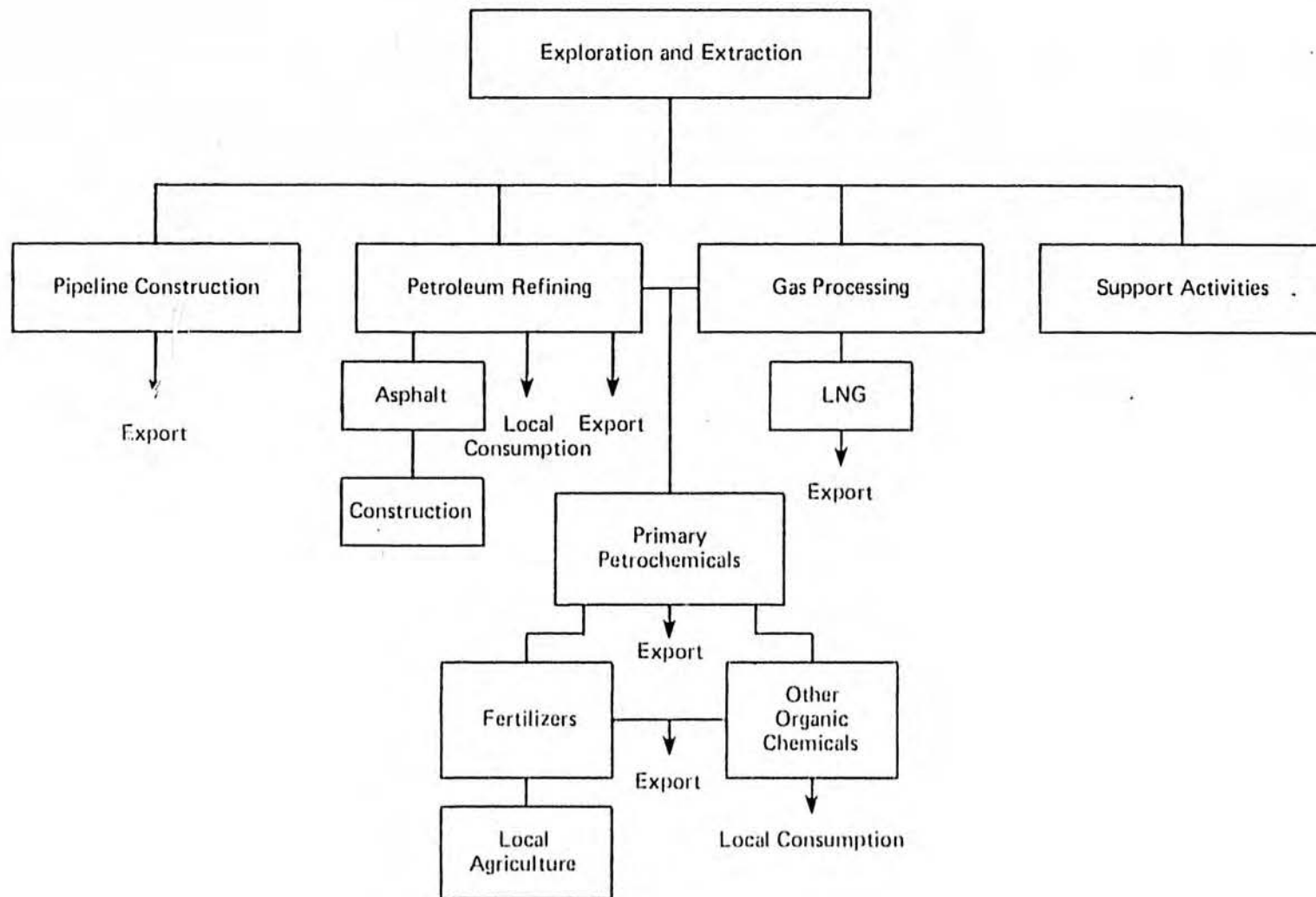
Expansion of petroleum-based chemical production in Alaska would produce downstream economic benefits (Figure III-9). Fertilizers and insecticides could become more easily available for use in local agriculture. Many of these supplies have heretofore been imported. Asphalt production could result in a source of supply for the construction industry.

The eventual production of petrochemicals in Alaska will depend on logistic and economic factors. The most obvious supply of the petrochemical feedstock is Prudhoe Bay -- an unlikely location for a petrochemical plant. The more desirable plant locations would be in southeastern Alaska where there would be year-round access to water-borne transport. Current proposals call for tanker transport of oil from Valdez to the plant site selected.

The most significant aspect of the economics of Alaskan petrochemical production is the fact that an Alaskan ethylene complex would have to compete with producers on the U.S. Gulf Coast and Japan where world-scale plants, nearby markets, and deepwater ports in a mild climate add up to an imposing economic advantage.

Increased production of Alaskan oil through 1985 is predicated on timely approval of offshore leases and their successful development, and approval of transcontinental pipeline capacity to deliver West Coast surpluses to the U.S. Gulf Coast and Midwest.

RESOURCE: OIL AND GAS



III-47

Arthur D Little Inc

FIGURE III-9 DOWNSTREAM DEVELOPMENT POTENTIAL -- OIL AND GAS

E. COAL

1. Summary and Overview

Coal production in Alaska has been very low. Despite the state's huge coal reserves, most coal produced in Alaska has been consumed in-state, primarily for electric power generation. The principal coal producing area is the Nanana coalfield south of Fairbanks, which produces most of Alaska's 700,000-750,000 short tons of production.

The principal obstacles to increased coal development have been the high cost of transporting coal to export markets and withdrawal by the federal government of potential coal producing lands from development.

Alaska has huge coal resources* -- an estimated 981 billion tons-- which comprise nearly two-thirds of the nation's total coal reserves. Most of these resources are located in the Northwest part of the state on land closed to mineral development and too remote to make development feasible. The greatest potential for future coal development is the Beluga field west of Anchorage. This field's access to Cook Inlet makes its development economically feasible because the coal can be exported by ship with minimal land transportation costs. Japan would be the most likely market for Beluga coal. Coal production could also expand to meet increased in-state needs for electric power generation, including mine-mouth generation of electric power.

2. Present Status

Coal production in Alaska has been low, and has changed little since the mid-1960s. Production has ranged from about 550,000-760,000 short tons; in 1976 it totaled 750,000 short tons. The two major producing coal fields in the state have been the Matanuska field, north of Anchorage, and the Nanana field, south of Fairbanks (Figure III - 10). Most of the state's coal production is now concentrated in the Nanana coalfield which produces 700,000-750,000 tons annually. Alaskan coal has a high moisture content, but a low sulfur content which makes it environmentally desirable. Alaskan coals are graded from lignite to bituminous.

Nearly all of the coal produced in Alaska is consumed in the state -- principally for electric power generation. Almost 90% of current consumption of coal occurs in and around Fairbanks (Table III-13). The bulk of that (61%) is used for the generation of electricity. In 1975 coal generated electricity provided 89% of the electricity generated for Fairbanks and 17% of all the electricity generated in Alaska (Table III-14).

* Resource = The estimated quantity of coal in the ground in such form that economic extraction is currently or potentially feasible.

Reserve = That portion of the identified coal resource that can be economically and legally mined at the time of determination.



Source: Miller, Stefano-Mesplay, and Nera.

FIGURE III-10 MAJOR ALASKAN COALFIELDS

TABLE III-13

ALASKAN COAL CONSUMPTION 1975
(tons per year)

	<u>All Uses</u>	<u>Electricity Generation</u>
Interior	75,000	75,000
Fairbanks	<u>677,200</u>	<u>414,200</u>
Total Alaska	752,200	489,200

Source: Kent Miller and Oliver Goldsmith, Energy Consumption in Alaska. Prepared for State of Alaska Department of Commerce and Economic Development, January 1977.

TABLE III-14

ALASKAN ELECTRICAL GENERATION BY FUEL SOURCE - 1975

<u>Fuel Source</u>	<u>Percent of Total Fuel</u>
Fuel Oil	22%
Natural Gas	53
Coal	17
Hydro	<u>8</u>
Total	100%

Source: Kent Miller and Oliver Goldsmith, Energy Consumption in Alaska.

3. Problems

Despite its huge coal resources, Alaska produces less than 1% of the 670 million tons of coal mined in the United States each year. The principal limitation on expanded coal production has heretofore been transportation costs. Because of the remoteness of much of Alaska's coal reserves, construction of high-cost land transportation facilities would be necessary to bring the coal to port facilities for shipment out of state. As noted elsewhere in this report, the Jones Act adds to the transportation costs of coal exported from Alaska to the lower 48 states because it limits the transport of Alaskan coal to the relatively high-cost ships built in the United States and manned by U.S. crews.

In addition to high transportation and labor costs, another factor inhibiting coal development has been the fact that more than three-fourths of lands on which coal resources are located cannot be leased for coal development. Some of the best coal lands are included in federal reserves that are closed to mineral development. The U.S. Department of the Interior has jurisdiction over the 23 million acre National Petroleum Reserve and could therefore withdraw up to 44% of the state's potential coal producing land from mineral development.

The uncertain status of some Alaska land areas may constrain future coal development at least in the short term. The resolution of native corporation land ownership issues could determine the future use of much of the land on which Alaska's coal resources are located. The withdrawal of the so-called d-2 lands from development by the Department of the Interior could also mean that certain potential coal producing areas would not be available for development.

The potential adverse environmental effects of strip mining could influence state and federal policy on the availability of lands for coal development. Underground mining is not suitable for most coal in Alaska because of its high cost and because steeply dipping coal beds make extraction difficult. Strip pits in areas underlain by permafrost are difficult to rehabilitate because of severe erosion that accompanies the massive degradation of permafrost.

4. Outlook and Opportunities

Alaska's total coal resources are huge. However, the demonstrated reserve base of 6.2 billion tons is only slightly more than 1% of the nation's total coal reserves. Nearly 90% of Alaska's resources are located in the northwestern part of the state, a vast and remote region near the Arctic Ocean (Figure III-10 and Table III-15). The potential for mining coal in this region is small because the area is closed to development by state and federal regulations, and because the high transportation costs

to move the coal to markets make it economically infeasible. Although use of the passage through the Chukchi Sea has increased, shipping costs will likely remain prohibitive.

TABLE III-15
ALASKAN COAL RESOURCES

<u>Region</u>	<u>Major Coalfields</u>	<u>Resources</u> (billion tons)
Anchorage and South- central	Matanuska Susitna Beluga	2.8
Fairbanks and Interior	Nanana Jarvis Creek	104.0
Northwest	Northern	874.0
Total		<u>980.8</u>

Source: Adapted from data of the Alaska Department of Natural Resources, Division of Geological and Geophysical Survey.

A more likely location for expanded coal development is the existing coal production areas in the Nanana coalfield near Fairbanks, and development of new fields in Southcentral Alaska. The fields in these areas are on state lands and are available for development. The most likely area for future development within the region is the Beluga coalfield west of Anchorage (Figure III-10). The Beluga coalfield lies some 45-60 miles west of Anchorage near the northwest shore of Cook Inlet. The area contains an estimated 2.1 billion tons of subbituminous low-sulfur coal. Potential production levels from the Beluga field are estimated to be about 6 million tons per year. The export of Beluga coal could be economically feasible because the closeness of the field to Cook Inlet minimizes land transportation costs and because the Cook Inlet location would permit water transportation to Japan (seven shipping days to Hokkaido) and the U.S. West Coast (four and one-half shipping days to San Francisco). Ice and high tide problems appear to be resolvable so that shipping could continue year round.

Development of the Beluga field would probably require the following infrastructure facilities:

- A 27-mile railroad or slurry pipeline from the coalfield to a coastal generating or shipping station on Cook Inlet,

- Transmission lines to provide power for the electrical mining equipment,
- Ship loading and storage terminals and port facilities on Cook Inlet,
- A washing plant to upgrade the coal and reduce transportation costs.

Placer Amex holds seven leases in the Beluga area. Future development of the Beluga field will probably have to await a strong commitment from a potential customer before full-scale feasibility studies, exploration, and testing can begin. It is expected that a small new town would develop in the vicinity of the proposed complex once production begins. The best quality coal would be exported with the lower quality used locally.

Expansion of Alaskan coal production will, in part, depend on the growth in demand within the state. This demand growth will depend on the degree of economic and population growth within the state as well as the economic competitiveness of coal with other energy sources such as gas and oil. Coal will still be needed to meet the expanded generating capacity of coal-fired electric utilities.

One alternative for expanded coal production to meet in-state needs is to construct mine-mouth electric power generating plants and distribute power to the growing population and industrial centers in the state. This may be more cost-effective than transporting coal to existing or new electric generating plants near developed areas. If federal limitations on the use of natural gas as a boiler fuel limit further use of natural gas as a fuel for the electric utilities in the Anchorage area, greater use of coal can be expected to meet the increasing power needs in that area.

In general, major development of Alaska's coal reserves will depend on the development of markets that will bear the transportation to an ice-free port in Alaska or the costs of year-round ice-breaking in a more northern location. The Japanese market offers the best potential because of the proximity of Alaska to Japan compared with other sources from which coal can be shipped to Japan. The Japanese have shown an interest in Alaskan coal by financing exploration. Development of the Beluga field with its access to Cook Inlet and resulting low transportation costs offers the greatest potential for capitalizing on the Japanese market for coal.

The potential for exporting coal to the lower 48 is small. The availability of sufficient coal reserves in the lower 48, and lower labor and transportation costs would limit the market for Alaskan coal.

Major spinoff industries resulting from expanded coal production would include increased construction activity to provide infrastructure facilities such as railroads, port facilities, and coal handling facilities. Overall development potential for coal is illustrated in Figure III-11.

RESOURCE: COAL

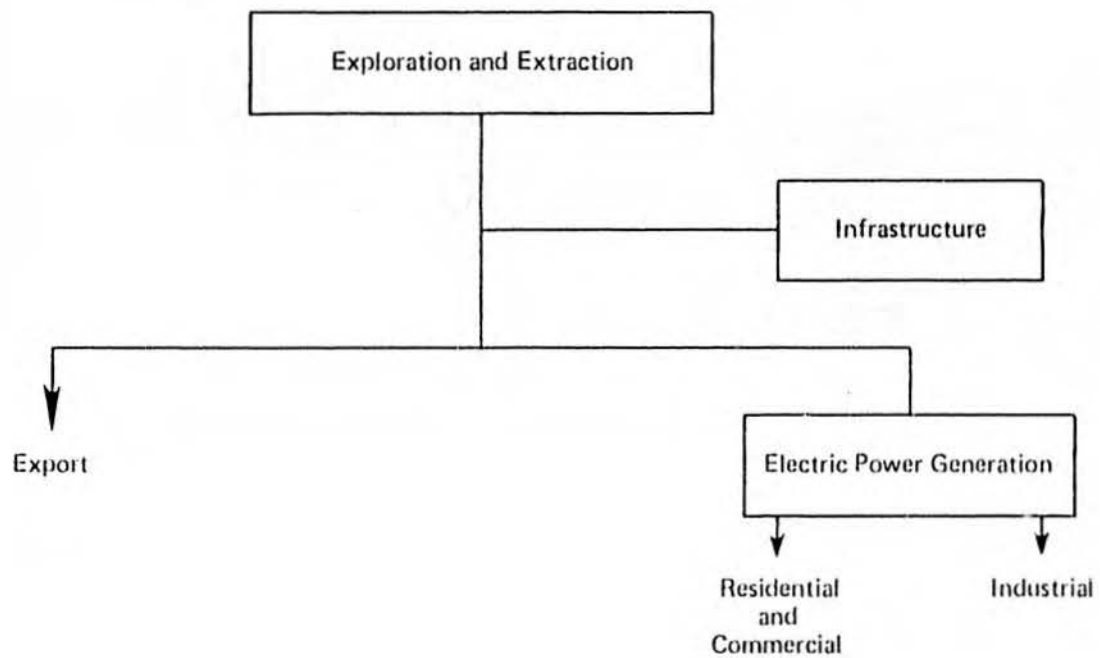


FIGURE III-11 DOWNSTREAM DEVELOPMENT POTENTIAL - COAL

F. HARDROCK MINERALS (excluding coal)

1. Summary and Overview

Mining is presently an insignificant activity in Alaska. Employment in the metal mining industry in Alaska in 1976 was only about 200 people, the same as in 1970. Most of Alaska's mining activity consists of mining for sand and gravel. Historically, Alaska's mining activities have been concentrated in gold and copper. Although mining in Alaska has a long history because of the size and diversity of the state's mineral resources, mineral production has declined over the last 25 years.

Mining activity has declined in Alaska for economic reasons. Costs in Alaska have been too high to make production economically feasible at the world price for the various minerals. Mining costs in Alaska exceed those in the lower 48, primarily because of the remote location of mine sites and because of the absence of infrastructure to support mining operations.

In addition to the need to improve the economics of Alaska mineral production, there is also a need to provide greater knowledge of Alaska's mineral resources. More data are needed on the location, size, and quality of mineral deposits so that potential producers can assess the economic feasibility of future production. Many mineral deposits are yet to be located, and the quality and quantity of a large percentage of identified deposits has yet to be determined.

One factor that may limit future mineral development in Alaska is the future availability of vast areas of potential mineral-producing land. State and federal land use regulations and resolution of issues surrounding the d-2 lands and the native corporation lands will determine future land availability.

Alaska's huge mineral resources offer the state a great potential for large-scale mineral development. The minerals with the greatest likelihood of future development include copper, iron ore, molybdenum, mercury, and limestone. Development of these resources will depend on the future economics of Alaskan production -- specifically the world price and availability of these minerals, and the availability of mineral-rich land for development.

The best opportunity for mineral development in Alaska is in supplying minerals to the lower 48 that are currently being imported from politically unstable areas and are expected to be in short supply in the future. Alaskan mineral development could be an alternative to increasing U.S. reliance on foreign sources of metals needed by industry. Future mineral shortages could lead to price increases which will increase the feasibility of Alaskan mineral production.

Alaska's mineral resources could be the basis for economic development in the state if mineral reduction and/or smelting activities are established. Possibilities include iron ore reduction or pelletizing plants and copper smelting. Natural gas or hydroelectric power could furnish the energy needed for metal reduction activities.

2. Present Status

Mining is presently an insignificant activity in Alaska. Employment in the metal mining industry in Alaska in 1976 was only about 200 people -- the same as in 1970. Minerals represent Alaska's least developed natural resource. Despite its vast resources, Alaska's mineral production has been less than 1/20th as great as that of the average western state. Mineral production in Alaska has declined substantially over the last 25 years. Most of Alaska's mining activity has been for sand and gravel; however, in 1976, sand and gravel production declined because of a reduction in its use for construction of the oil pipeline (Table III-16).

Mining has a long history in Alaska because of the size and diversity of the mineral deposits. Historically, Alaska's mineral production, excluding construction material (i.e., sand, gravel, and stone) has consisted mostly of gold and copper with silver mined as a by-product of gold. Uranium, tungsten, antimony, tin, and mercury production has been very small.

Gold was the first metal to be mined in quantity (in placer deposits and lodes) in the 1870s and 1880s. The gold rushes that occurred in the late 1800s and early 1900s throughout the interior of Alaska resulted in large production levels and the discovery and extraction of other minerals as well.

Copper mining began in the Southeast, but the largest discovery was in the Wrangell Mountains where production began in 1911. Silver, lead, and tin were also mined during this period.

World War I resulted in some production of strategic materials including tungsten, antimony, chromium, and mercury as well as in increased demands for other minerals. During the war years and the decade of the 1920s, the value of copper mined exceeded that of gold but world economic conditions resulted in the closure of the major copper mine. Gold production increased in the 1930s. Platinum production began in the 1930s.

World War II changed the composition of the mining industry as labor shortages, increasing costs, defense priorities, and finally an Executive Order closed all gold mines. Demand for strategic materials revived production of chromium, asbestos, tungsten, antimony, tin, and mercury. The war also brought the first significant demand for building materials, including sand and gravel.

TABLE III-16
VOLUME AND VALUE OF
ALASKA MINERAL PRODUCTION

	Gold		Sand and Gravel		Other*	
	Volume (troy ounces)	Value (\$000s)	Volume (000 short tons)	Value (\$000s)	Volume	Value (\$000s)
1950	289,272	\$10,124	3,050	\$ 2,377	N.A.	\$ 2,317
1960	168,197	5,887	6,013		N.A.	
1965	42,249	1,479	30,266	34,467	N.A.	5,542
1970	34,776	1,265	83,616	41,092	N.A.	12,723
1975	14,900	2,419	48,145	25,780	N.A.	39,514
1976	17,660	2,172	45,000	24,300	N.A.	37,115

N.A. = not applicable.

*Includes: Barite, bituminous coal, gemstones, lead, silver, copper, mercury, natural gas liquids, platinum group metals, and tin.

Sources: U.S. Department of the Interior, Bureau of Mines, and the Alaska Department of Commerce and Development.

The same pattern occurred during the Korean War, with declines in strategic metals production and expanded gold production in the intervening years of the late 1940s. Since the mid-1950s, production of strategic minerals and gold has declined and the increase in the price of gold has been the only significant positive factor in the Alaska mining industry.

Gold production has increased in the last year, both in volume and value, as a result of the renewed operation of the dredge of the Alaska Gold Company near Nome.

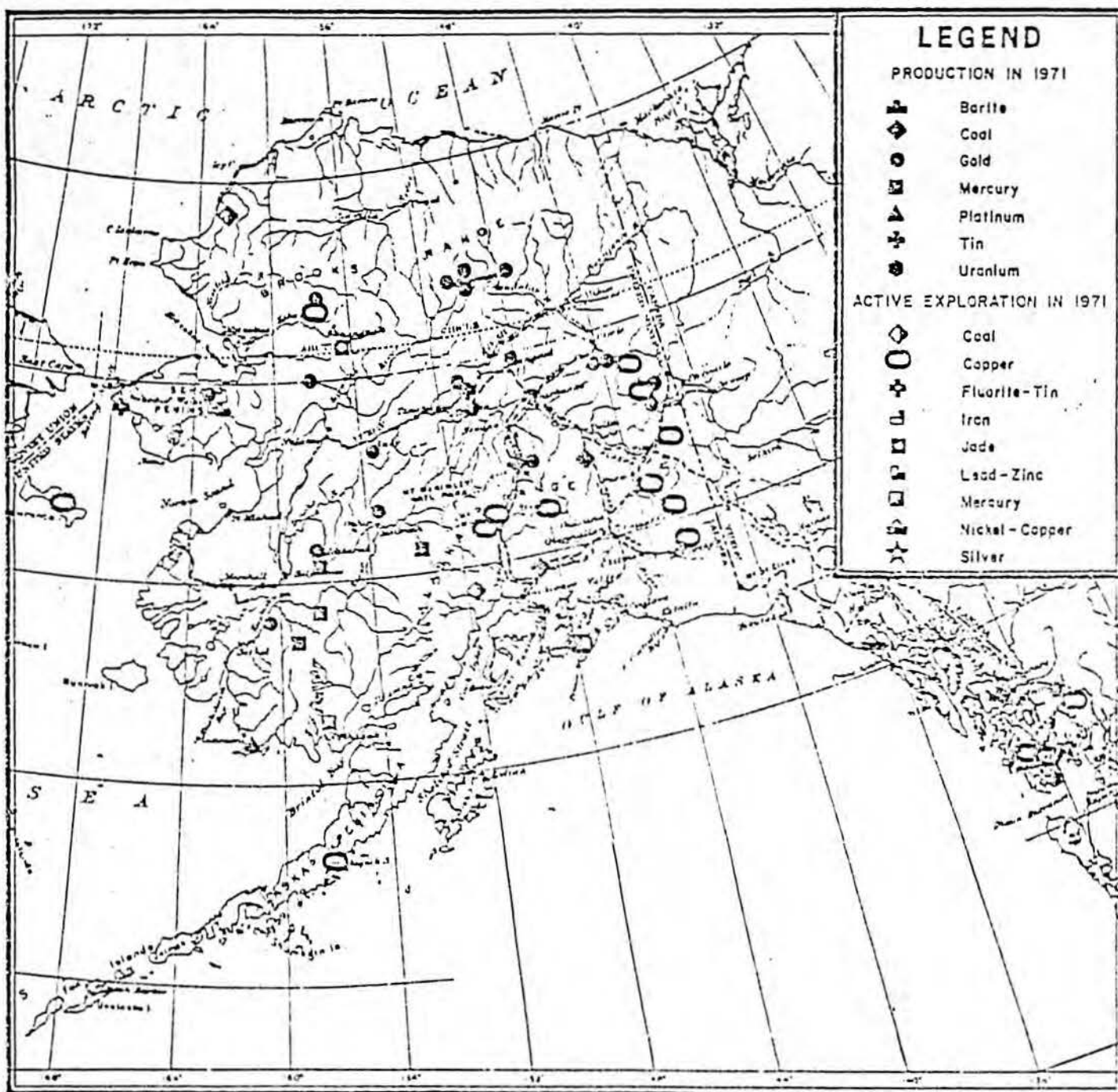
Alaska's mineral deposits are scattered throughout the state, with many located in remote areas (Figure III-12). Increasing attention is being focused on the Brooks Range of the Arctic north, the Alaska Range in the central area, and in the southeastern part of the state.

3. Problems

The reason that mining is at such a low level of development in Alaska is economic. High labor and transportation costs and the need for construction of costly transportation facilities (roads, rail lines, etc.) to provide access to remote mineral deposits have limited the utilization of Alaskan mineral resources. The availability of minerals from other sources at a lower cost has limited the competitiveness of Alaska metals in U.S. and world markets. Past fluctuations in the level of mineral production in Alaska show the sensitivity of Alaskan production to the world price for certain metals. Alaska's mining industry has been declining since World War II because in general, most minerals have not commanded a high enough price to pay the wages and other increases in operating costs that have been prevalent in Alaska for the last 25 years.

An interesting example of the disadvantages of an Alaskan location is presented in a recent study which estimates the cost of producing copper and silver from the Kennecott copper mine, assuming the deposits were newly discovered. In spite of the high grade of the copper ore, this operation, which was highly profitable in the early part of this century, would have required a subsidy to be profitable in 1973. This indicates that technological change and changes in relative costs of inputs can work against the mining operation at a distance from market even if the resource is of premium quality.

In addition to improving the economics of Alaskan production, there is a need for greater knowledge of Alaska's mineral resources. More data are needed on the location, size, and quality of mineral deposits so that potential producers can assess the economic feasibility of future production. Reliable examination reports are available on 5% or less of the identified mineral deposits. Parts of the state have not been geographically mapped and much of the state has not been examined by geologists.



Source: Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys.

FIGURE III-12 LOCATION OF ALASKAN MINERAL DEPOSITS

As a result, many mineral deposits are yet to be located, and the reserves and grade of a large percentage of identified deposits have yet to be determined.

Mineral production in Alaska has been deterred by the absence of privately owned land. In 1976, less than 30% of the land in the state was open to mining interests. One factor that may limit mineral development is the future availability of vast areas of state and federally owned potential mineral-producing land. The future pace of exploration and development of Alaska's minerals is heavily dependent upon state and federal land use regulations and, in particular, upon the selection of federal reserved lands under Section 17(d)(2) of the Alaska Native Claims Settlement Act of 1971. At issue in the d-2 lands question is the degree of access which will be allowed on federal lands in Alaska. At one extreme, all activities other than camping, hiking, and fishing could be banned on most federal land. At the other extreme, no restrictions would be placed on land use, other than normal regulatory restrictions on development. Congress has until December 18, 1978, to determine the location and size of any lands to be included in the national parks, national forests, national wildlife refuges, and national wild and scenic river systems.

Establishment of these 83 million acres as recreational lands, however, does not necessarily preclude their development. Wildlife refuges are subject to locatable mineral production "with exceptions," oil and gas development "with restrictions," and timber development "with permits." Petroleum and mineral development in national parks requires Congressional approval. Scenic rivers and national forests are subject to mineral development, oil and gas development, and timber development. Of course, environmental safeguards apply to all of these park classifications.

4. Outlook and Opportunities

Alaska's vast mineral resources offer the state a potential for large-scale mineral development. Alaska may have up to half the nation's uranium reserves, huge copper deposits, and perhaps the richest molybdenum and the largest nickel deposits in the world. Development of Alaska's mineral resources will depend on the future economics of Alaskan production, specifically, the world price and availability of certain metals, and the availability of mineral-rich lands for future development.

Mineral resources which are known or are expected to exist in Alaska in varying amounts and grades include:

- zinc
- lead
- limestone
- nickel
- phosphates
- platinum
- silver
- sulfur
- tin
- titanium
- tungsten
- uranium
- gold
- graphite

- gypsum
- iron
- manganese
- mercury
- molybdenum
- copper
- chromium
- fluorite
- garnet
- antimony
- asbestos
- barium
- beryllium

The resources most likely to be developed are copper, iron ore, molybdenum, mercury, and limestone.

Recent exploration has suggested the potential for Alaska's mineral resources. Inspiration Copper continues to mine copper-nickel deposits on Yakobi Island. The most important undertaking, however, is U.S. Borax's plans to develop a \$250 million open pit molybdenum mine in the Tongass Forest 45 miles southeast of Ketchikan. Company officials have confirmed reports of deposits in excess of 100 million tons of molybdenum. When constructed, the facility is expected to employ 500 workers and produce approximately 70,000 tons of ore per day. The company spent about \$2 million in 1977 on deep drilling tests. Future development of this ore body will depend in part on the outcome of proposed land withdrawals.

Recently there have been some new copper finds near Ambler River on the Koyukuk Peninsula; some exploration for zinc, copper, and lead at Roe Point near Ketchikan; some silver, lead, zinc, and copper claims staked on Admiralty Island; and major mineral finds near Kotzebue as well as in Mt. McKinley National Park. A barite mine near Haines may begin production late in 1978 to supply barite for drilling mud.

Copper exploration in the vicinity of the Kobuk and Wrangell mountains remains active, and exploration for copper-nickel mineralization on Yakobi Island is expected to continue. Increasing exploration activity is occurring around the long dormant Funter Bay nickel-copper mineralization and at several other locations on Admiralty Island where base metal and silver potential is reported. A high interest in radioactive mineral exploration is also continuing in the Seward Peninsula and in southeastern Alaska.

The foreseeable future suggests several mining possibilities. Officials of the Lost River Mining project, although hampered by a lack of city development, plan eventually to mine the vast deposits of fluorite (estimated at one-third of the world's reserves) and tungsten on the Seward Peninsula. Development studies of the Klukwan project carried out by U.S. Steel and Mitsubishi confirm the economic feasibility of mining the iron ore in this area. Officials suggest that construction of an iron ore mine may begin in 1978.

The best opportunity for expansion of mineral development in Alaska lies in supplying minerals that are currently being imported to the lower 48 states from politically unstable areas. Alaskan mineral development, although high in cost, could be an alternative to the increasing reliance of the U.S. and other industrialized nations on foreign imports of metals essential for industrial processing. U.S. industry already imports much of its supply of the basic minerals needed for industrial production (Table III-17).

TABLE III-17
NET IMPORT RELIANCE AS A PERCENT
OF U.S. DOMESTIC MINERAL CONSUMPTION
1973-77

	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>
Antimony	50%	44%	49%	54%	52%
Asbestos	83	88	82	85	85
Barite	37	38	32	42	40
Copper	8	20	0	12	17
Chromium	91	90	91	89	89
Gypsum	36	37	34	35	35
Iron Ore	35	37	30	29	33
Gold	48	63	52	76	60
Lead	29	19	11	15	14
Mercury	78	86	69	62	46
Manganese	98	98	98	98	98
Nickel	69	72	72	70	70
Peat	33	29	25	25	25
Platinum Group Metals	87	87	83	90	92
Potash	53	58	51	61	66
Silver	66	55	30	50	42
Tin	84	85	84	85	86
Tungsten	66	68	55	54	38
Uranium	0	0	0	0	0
Zinc	64	59	61	59	58

Source: U.S. Department of the Interior, Bureau of Mines Commodity Statement.

The United States is faced with a troublesome mineral situation stemming from three factors. The first is domestic shortages of certain raw materials required by industry including aluminum, chromium, manganese, nickel, tin, and zinc. Second, as the United States relies more heavily on the importance of these and other mineral resources, it will become increasingly vulnerable to the political instability of some foreign countries. Third, shortages will lead to price increases. Each of these factors will tend to increase the economic feasibility of Alaska mineral production.

Alaska has major copper reserves. Alaskan copper should be able to compete at world market prices if transportation costs can be reduced, legal barriers lifted, and if the mine owners feel that the time has come to develop their more politically secure domestic reserves. If the price of uranium rises, it may become economic to produce uranium in Alaska.

Alaska's mineral resources would be the basis for additional economic development in the state if mineral reduction and/or smelting activities are established. Such activities would increase employment in the mining industry as well as increasing employment in construction of reduction facilities and transportation facilities. Unless the raw materials are utilized in Alaska, the economic benefits to the state provided by the mining industry will be limited. Possibilities for further processing include iron ore reduction or pelletizing plants and copper smelting.

Mineral reduction activities require energy. Natural gas production in Alaska could provide the energy required for ore reduction and smelting. Several possible sites have the potential for such development.

Iron ore potential on the Alaskan Peninsula and at Klukwan and at Snettisham, in Southeast Alaska, has been extensively studied. Energy requirements are of major importance in the feasibility of pelletized production. A feasibility study of the Klukwan iron deposit conducted for Iron Ore Company of Alaska lists 105 megawatt power requirements among the necessary conditions for a facility to mine and produce five million tons of iron ore pellets per year.

Sufficient copper to support a smelting operation has been identified in the Kobuk-Shungnak region, with strong indications of additional copper mineralization along the southern flanks of the Brooks Range, in the Lake Clark-Lliamna vicinity and on the periphery of the Wrangell Mountains.

Other base metal potential is indicated in the Mt. McKinley Park vicinity at Mt. Eielson, in the Kantishna district, and in a belt of sediments south of the Alaska Range.

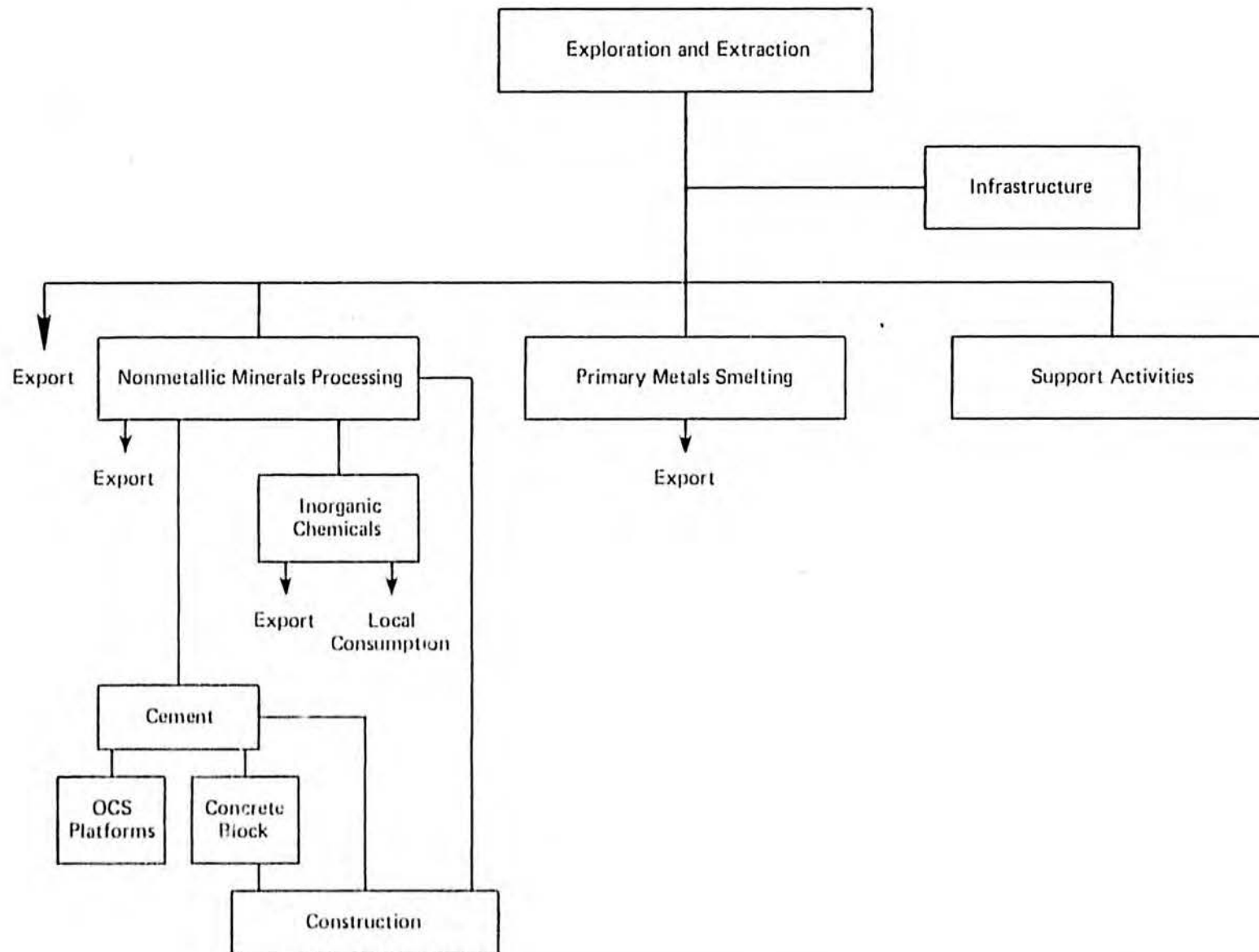
The nickel-copper mineralization at Brady Glacier and on Yakobi and Western Chichagof islands have been determined to hold excellent potential for important metallic raw materials.

The Klukwan iron pelletization plant along with a nickel-copper smelter to handle ore from the inactive Brady Glacier, Yakobi Island, and West Chichagof deposits, could make possible a smelter-reduction complex located at Haines. Haines is the terminal of the discontinued military oil pipeline to Fairbanks. The pipeline route and operational support facilities could provide a base for a gas feeder line from the trans-Alaska gas line to a major resource-based market. There is also the possibility of processing ore from inactive Canadian mines in the Yukon Territory.

The native corporation lands represent a source of investment in the expansion of mining in Alaska. Much of the native corporation lands have mineral development potential. For example, ASARCO has formed a partnership with the Fairbanks-based native corporation, Doyon Limited, to investigate the potential for mining asbestos deposits located on Doyon lands. Phillips Petroleum has conducted surface geological and geophysical work in cooperation with the Bristol Bay Native Corporation in an effort to find copper near Perryville on the Alaska Peninsula in southern Alaska. Native corporation leaders are expected to pursue mineral development as a major activity.

Downstream development potential for hardrock minerals is described in Figure III-13.

RESOURCE: HARDROCK MINERALS



III-65

Arthur D Little Inc

FIGURE III-13 DOWNSTREAM DEVELOPMENT POTENTIAL - HARDROCK MINERALS

G. TOURISM

1. Summary and Overview

Tourism is in an early stage of development in Alaska, but is becoming increasingly important to the Alaskan economy. There has been a significant increase in the number of visitors to Alaska during the last decade because of rising disposable incomes, increases in leisure time, improvements in transportation which have shortened travel time to and from Alaska, and increased business travel. In the past 10 years the number of visitors to Alaska has more than doubled. In 1976 an estimated 270,000 people visited Alaska, the largest number ever. An estimated 8000 people are employed in tourism-related industries.

Alaska tourism relies on three modes of transportation: cruise ship, plane, and highway. The cruise ship market has grown rapidly in recent years.

The Japanese have accounted for a significant share of Alaskan tourism. Japan Air Lines operates 70 scheduled flights a week through Anchorage International Airport and has been actively promoting Alaskan tourism in Japan. The Japanese also own firms operating in the Alaska industry which employ about 250 Alaskans.

Several factors may inhibit the growth of tourism in Alaska. The foremost problem is the high cost of an Alaskan vacation. The high cost of getting to Alaska, especially by plane, and the high cost of accommodations make it difficult for Alaska to compete with other areas for tourist business. The distances between tourist attractions in Alaska, and the time needed to reach them by ferryboat or automobile, result in an extensive time requirement for an Alaska vacation. For the tourist with the time and money, there is a lack of sufficient accommodations and transportation access to remote areas. Alaskan tourism development is also inhibited by the lack of awareness of Alaska as a tourist destination among travel agents and the public. Insufficient state promotional activity has also inhibited tourism development.

The most immediate problem to overcome in increasing Alaska tourism is the high cost of flying to Alaska. The best opportunity for reducing this cost is through use of low-cost air charters or fly/drive tours. Charters, which have been very successful in reducing the cost of flying to Hawaii, could bring the cost of a trip to Alaska to within the reach of a greater number of tourists. Fly/drive tours, which have been extensively used to develop tourism in Europe, in addition to being reasonably priced, offer the tourist a means of getting to Alaska in a reasonable length of time, and an opportunity to visit recreational areas and attractions that are remote from the state's population centers. To make Alaska more attractive as a tourist destination will also require construction of additional tourist accommodations and access roads, and further development of recreation facilities in remote areas.

2. Present Status

Tourism is in its early stage of development in Alaska, but is increasing in importance to the Alaskan economy. There has been a general increase in the number of tourists visiting Alaska during the last decade because of rising disposable incomes, increases in leisure time, improvements in transportation which have shortened travel time to and from Alaska, and increased business travel.

In the past 10 years, the number of visitors to Alaska has more than doubled. In 1976 an estimated 270,000 travelers visited Alaska, the largest volume for a single year. The State Division of Tourism predicts that in 10 years, more than one million tourists per year will be visiting Alaska -- triple the current level. About two-thirds of the Alaskan tourist market is comprised of independent travelers who come to Alaska by ferryliner, highway, or air. There are an estimated 8000 people employed in tourism and visitor-related industries. Tourist expenditures in 1976 were an estimated \$100 million.

Alaska's tourism is generated from three modes of transportation: cruise ship, plane, and highway. The cruise ship market has grown rapidly in recent years: for example, there were an estimated 27,800 cruise ship tourists in 1973, 44,000 in 1974, and 48,000 in 1975 -- a 73% gain in visitors since 1972. This increase is due to the rapidly increasing availability of cruise ship space and the increasing interest and rising popularity, nationwide, of cruising to Alaska. Cruise ships operate primarily in the southeastern Alaska area.

The Southeast, Gulf of Alaska, Cook Inlet, Bristol Bay, Kodiak, Upper Yukon-Porcupine, Copper River, and Tanana regions of the state bear most of Alaska's recreational pressure. Within these regions the state transportation network is, although inadequate, more advanced than in the remaining regions. About 85% of the state's population and 98% of the developed tourist and recreation facilities exist in these areas.

National parks are an important tourist attraction in Alaska. The National Park Service manages three natural areas in Alaska -- Mt. McKinley National Park, Katmai National Monument, and Glacier Bay National Monument -- in addition to historically important Sitka National Monument. These areas are complemented by 18 sites in Alaska that are registered National Historic Landmarks, and 15 National Natural Landmarks that are federally, state, or privately owned or administered. Other potential natural landmarks are being studied. In 1970 approximately 49,800 visits were recorded to areas of the National Park System in Alaska. This figure increased by 1976 to 141,330 visits.

The Japanese have accounted for a significant proportion of the recent increase in tourism in Alaska. The inauguration of flights by Japan Air Lines (JAL) between Tokyo and Anchorage increased the flow of Japanese tourists to Alaska. While only one of several carriers flying from Alaska to Japan, JAL is carrying the bulk of the traffic and has spent the most

money in promoting Japanese tourism in Alaska. JAL operates 70 scheduled flights a week through Anchorage International Airport.

Japan also owns firms operating in Alaska's tourist industry which employ about 250 Alaskans. Perhaps the first Japanese investment in the Alaska tourism industry was Alaska Information Services, incorporated in October of 1970, now operating as American and Pacific Tours, Inc. Another Japanese tour company is Alaska-Japanese Enterprises, of Anchorage. It is estimated that this company provides travel assistance for approximately 600-700 Japanese annually.

International In-flight Catering Company, a subsidiary of Japan Air Lines, recently opened a \$1.4 million building at the Anchorage International Airport. This facility produces approximately 1500 meals per day and houses some JAL offices. The capacity of the kitchen is 5000 meals per day. The facility employs 90 Alaskans under the direction of a Japanese chef.

Another company operating in association with JAL is Pacific Creative Tours of Hawaii, a subsidiary of Japan Creative Tours, commonly known as JAL-PAK, with ownership equally divided between JAL and a group of large Japanese travel agencies in Japan. This company operates in conjunction with a local agency, Mt. McKinley Tours.

3. Problems

The limitations on past and potential growth in tourism in Alaska include the following:

- The high cost of an Alaska vacation,
- Extensive time requirements,
- The lack of tourism infrastructure facilities, and
- Lack of awareness of Alaska.

The Alaska Division of Tourism has estimated that the average daily cost (including travel) for a visitor to Alaska is \$150. Other travel centers competing with Alaska have an average daily cost of \$90-100. This high cost, combined with lower excursion fares to other vacation centers, makes it difficult for Alaska to compete with other areas for tourist business.

Most of Alaska's tourists use highway or ferry transportation which, because of the state's size, requires a large amount of time. The greatest inhibitor to increasing the number of highway and ferry visitors is the total trip time, which averages between 16 and 25 days for both modes. For most vacationers, this does not leave much time to travel within Alaska. Paving the Alaska Highway would at best cut only four days from this total

travel time. The long distances between the state's points of interest necessitates a long period for an Alaskan vacation. Since highway and ferry are the dominant modes of intrastate tourist travel, the expansion potential is limited. Short vacations must rely on air travel or on fly/drive combinations which have heretofore received little attention. Cruise tourists, while an expanding share of the tourist market, do not spend much money since their lodging is provided; and generally, they do not spend much time in Alaskan ports.

For the tourists who have the time and money to tour Alaska, the state lacks sufficient infrastructure to accommodate tourist needs. The main deficiency is the lack of private accommodations and transportation access in areas remote from population centers where Alaska's existing and potential recreation areas are located. The availability of first class accommodations is also limited.

In many recreational areas of the state, development of recreational opportunities is limited by lack of access. Private accommodations are scattered and limited. Outside of a few native centers, which receive tourists by regularly scheduled aircraft, the lakes, rivers, and hunting areas of the state are reached by charter or private aircraft. Visitors to these areas often live under primitive conditions with limited conveniences.

The state has done little to expand tourism in the winter season. It lacks a winter resort community, first class hotels (outside of Anchorage), and other amenities sought by many traveling vacationers. The state has only one ski area at Mt. Alyeska; another, Eagle Crest, is being developed with only one chair lift.

The weather will continue to have a significant impact on Alaska's tourist trade. The tourism business is highly seasonal with the peak expectedly in the May-September period. Outside of diversifying into a ski-oriented attraction there seems to be little that can affect the seasonality. Weather conditions outside the state may also play a role in the Alaska tourist business. Extreme winter weather conditions in primary tourist generating areas (Japan and the United States) could lessen the desirability of an Alaskan vacation.

Even the most rapidly growing segment of the tourist industry is limited by facility availability. Ferry line tourism has grown dramatically in recent years, but near-term growth will be limited by lack of sufficient ferry space in the peak season.

Even with the increase in Alaska tourism in recent years, travel agents and the traveling public appear to have little understanding of Alaska and awareness of Alaska as a vacation destination. This stems from a combination of factors including adverse publicity associated with the construction of the Alaska pipeline, incorrect perceptions about Alaska's weather, and inadequate state promotional efforts, especially in foreign markets. State efforts to overcome this lack of awareness have been limited.

State tourism promotion efforts have been small, but are beginning to increase. The Division of Tourism has a budget of about \$1.4 million which is too small to support the kind of promotion campaign that would be needed. About 30% of the budget represents salaries, \$200,000 is given to local communities to aid their promotional efforts, and about \$60,000 is used to help support local visitor information centers. The remainder is used for advertising and promotional efforts.

Future land use consideration will affect the availability of land for recreation and tourism in Alaska. The withdrawal of certain lands from development under section 17 (d)(2) of the Alaska Native Claims Settlement Act will probably preserve the wilderness status of these lands, but may also prevent access to them and the development of facilities for tourists. Some native corporation lands could become available for recreational use, although resource development and processing would probably take precedence for economic reasons. The native corporations can also aid tourism by investing in tourism facilities. The Federal Government owns much of the land on which existing and potential recreational facilities are located.

The Jones Act has a negative effect on tourism in Alaska. The Act prohibits foreign registered vessels from carrying passengers from one American city to another. Furthermore, the U.S. Bureau of Customs port equalization policy states that foreign bottom ships must spend less time in Alaskan ports than in foreign cities. This policy benefits Canada but results in a reduction in the number of Alaskan ports that foreign ships can stop at and the amount of time they spend there.

4. Opportunities and Outlook

The major obstacle to be overcome if the tourism industry in Alaska is to expand is the high cost of getting to Alaska. The best opportunity for reducing this cost is through low-cost air charters and fly/drive tours. If charters to Alaska become available to tourists in the lower 48, as they have to Hawaii, the state could substantially increase its number of visitors. The possibility of more extensive (ITX) tour-basing fares, particularly from gateway cities more distant from Alaska than Seattle, would also decrease the cost of flying to Alaska. The fly/drive arrangement, which can also be sold as a charter package, would provide tourists with a reasonable cost means of traveling to and within Alaska. Under such an arrangement, which has been used extensively in Europe, the visitor flies to the state and rents a car, camper, or motor home for intrastate touring. This type of arrangement in addition to being potentially reasonably priced, offers the tourist a means of getting to Alaska in a reasonable time and an opportunity to visit recreational and tourist attractions that are remote from the state's population centers. The fly/drive market has received little attention but is beginning to grow. It is potentially limited by the size of the camper and motor home rental fleet in Anchorage and the lack of camping facilities and other accommodations in the outlying areas.

The ferry liner market has the potential for continued growth. This growth, however, will be limited by the availability in summer of car, camper, and motor home deck space aboard the ferry liners serving Alaska from the gateways of Seattle and Port Rupert. This condition will continue to be a problem as the ferry liner capacity is anticipated to remain relatively constant for the next few years. Consideration should also be given to development of a hydrofoil ferry system. Such a system would probably be capable of transporting tourists more quickly than would be possible by expanding the existing ferry system.

To make Alaska more attractive as a tourist destination infrastructure facilities will have to be expanded. This would include construction of additional tourist accommodations, especially in outlying areas and construction of access roads and further development of recreation facilities in remote areas.

Expansion and improved maintenance of existing facilities is a paramount need if recreational demand is to be met but is not the answer in itself. Even though Alaska is large, use, in recreational terms, is restricted by access. The present highway system limits travel plans, acting like a funnel, and causing egress and ingress to become burdensome. Intensive use of accessible areas inundates the resource quality and may eventually decrease the desire of residents to participate in recreation and the desire of tourists to visit Alaska.

The qualities of Alaska that attract people are reduced as more people visit each year, crowd present campgrounds, overflow into gravel pits or roadside turn-offs, and stand elbow to elbow on favorite fishing streams. Present tourist and recreational facilities are wholly inadequate to support present demand, much less future requirements.

Development of parks and recreation areas would disperse tourist activities. The development of parks and recreation areas fills a twofold need in economic development: it provides a focus for tourism since just the fact that a national or state park, a refuge area, or recreational area exists, provides the traveler with a reason for visiting a locality; and secondly, the development of facilities, roads, and lodgings at or near these parks provides an economic stimulus that can be important in those years when private development is slow in an area.

Recent developments in Alaska point to further development of Alaska's tourist accommodations. In the spring of 1978, the Hotel Captain Cook will open its new 250-room addition in downtown Anchorage. The other new major Anchorage hotel which was to open also in 1978 may be delayed due to financing problems. The hotel, owned by the Calista Native Corporation, is to be managed by Sheraton. In Southeast Alaska, Shee Atika has begun work on a \$7 million, 107-room hotel in downtown Sitka to open in May 1978. Sheffield Enterprises intends to open a new Sitka hotel in January 1978, and plans to expand its Kodiak facility in 1978. In Ketchikan, Cape Fox Village Corporation plans to let a management contract bid soon for construction of a new hotel complex there.

These facilities are located primarily in the southeastern part of the state. To "open-up" Alaska's outlying areas will probably necessitate construction of tourist accommodations.

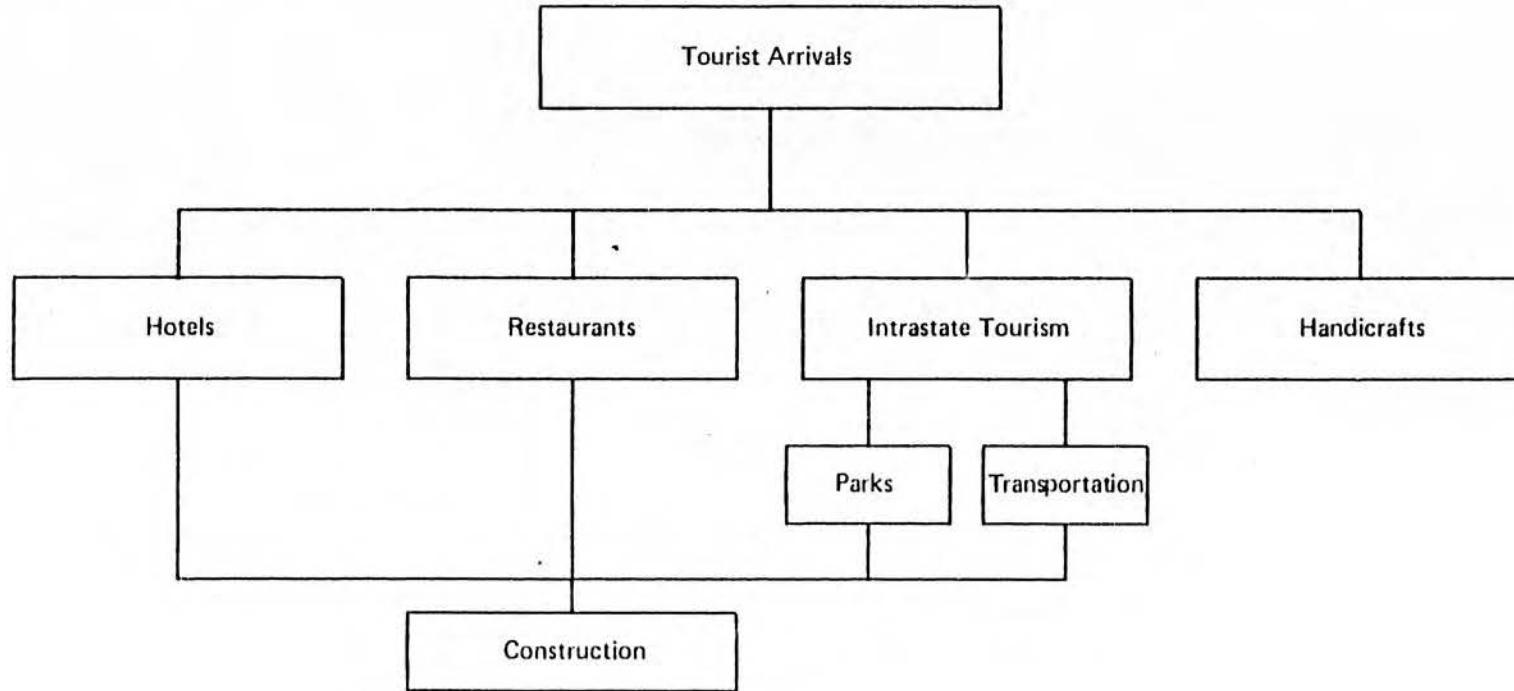
The state is actively working to encourage tourism in Alaska. It has recently undertaken a major multi-media million dollar tourism marketing campaign produced with both industry and state funding. The greatest need for promotion is in foreign markets such as Japan and Australia.

The Japanese market offers the best opportunity for expansion of Alaskan tourism and should be the target of much of the state's promotional activities. The promotion of Alaska in Japan is centered around the theme of an unspoiled environment and the vastness of recreational land available in Alaska, in contrast with Japan where environmental problems abound and there is a lack of recreational land.

An increase in the convention trade offers another opportunity for expansion of tourism in Alaska. The convention business is relatively new to Alaska. Convention business would reduce the seasonality of Alaskan tourism somewhat by increasing business in the spring and fall months. The likely convention market would be Japan and the West Coast of the United States. Additional convention space and accommodations will be needed if the convention business is to increase.

The development potential for tourism is described graphically in Figure III-14.

RESOURCE: TOURISM



III-73

FIGURE III-14 DOWNSTREAM DEVELOPMENT POTENTIAL – TOURISM

H. TRANSPORTATION

1. Summary and Overview

For a state of its size, Alaska has a very limited transportation network. The vast size of the state, the concentration of its small population in one section of the state, and the severe Alaskan weather have all contributed to a situation where the state lacks a strong transportation infrastructure that is necessary for economic development.

Alaska's lack of adequate transportation facilities is most evident in its highway network. Many of Alaska's communities are not served by year-round surface transportation. Current state transportation policy emphasizes upgrading the existing system before new roads are built.

The Alaska Marine Highway system serves the principal population centers of Southeast and Soutncentral Alaska that are not connected to the main highway network. Besides filling a transportation void for Alaska residents, it also serves tourists by offering an alternative route from the Alaska Highway.

Alaska has two railroads -- the federally owned Alaska Railroad and the White Pass and Yukon Railroad which is largely owned by Canadian interests and in Alaska, serves only the town of Skagway.

Air transportation has played an increasingly important role in Alaska. The increase in the number of passengers can be attributed to increased tourism as well as to increased business traffic.

About 30,000 Alaskans -- 90% of whom are natives living in western arctic Alaska -- are not regularly served by the above transportation modes. They are served by air carrier or air taxi once or twice a month, and one or two ships a year if on the seacoast. This lack of service is a consequence of the isolation of the native communities and the high cost of service based on low utilization.

The major reasons for the lack of a transportation infrastructure include the following:

- Arctic and sub-arctic environment,
- A small and scattered population,
- Physical access barriers including mountains and rivers,
- High operation and maintenance costs, and
- Limited state financial resources.

The most immediate improvement in the state's transportation system is expected to be the improvement of the existing highway system. The state's transportation plan does not have provision for the construction of new highway links that could become the basis for further economic development (e.g., tourism and resource extraction). The airport section of the state plan includes runway extension and reconstruction proposals and proposals for new airports in rural areas.

One important highway link around which considerable controversy has developed is the North Slope Haul Road that was built to allow movement of equipment and supplies for construction of the trans-Alaska oil pipeline. The state will be given the road but there is much opposition to opening the road for general use. The Governor's policy statement says that the road will be opened only for use by industrial and mining interests who will have to pay to use it.

The outlook for railroad transportation in Alaska depends in part on the future ownership of the Alaska Railroad and the development of a rail link with the lower 48. The Legislature has appropriated \$50,000 for a study of this potential rail link.

Further development of Alaska's oil, mineral, timber, fish, and other resources will depend to a great extent on adequate marine transportation and the provision of port facilities that will enable cargo to be transferred at minimum cost.

Extensive work is required at many of the state-owned airports in western Alaska before they will be suitable for jet operations. Eventually, all communities will be linked by road to a medium hub airport. This will make it possible to provide low-cost air freight service at frequent intervals to the bulk of the state's 223 communities.

2. Present Status

For a state of its size, Alaska has a very limited transportation network. The vast size of the state, the concentration of its small population in one section of the state, and the severe Alaskan weather have all contributed to a situation where the state lacks a strong transportation infrastructure that is necessary for economic development. The following transportation-related constraints to economic development have been identified elsewhere in the report:

- Limited movement of minerals from remote inland areas to coastal shipment or processing facilities,
- Limited movement of agricultural products to markets and supplies to farmers, and
- Limited movement of tourists into Alaska and to points of attraction that are remote from the principal population centers.

Transportation employment in Alaska in 1976 was nearly 8000 -- about 3000 more than in 1970. More than half of the total transportation employment is in air transportation.

Alaska's lack of adequate transportation facilities is most evident in its present highway network. Because of its vast size and modest amount of road and street mileage, many of Alaska's communities are not served by year-round surface transportation. Although some of these communities are located on islands and, therefore, are by technical necessity isolated because of their location, many others have been forced to remain in this condition simply because of inadequate financial resources. This situation is a sharp contrast to national standards under which all significant population centers have been connected by roads since about 1930.

Based on the past experience in transportation demands of the other states, the availability of other modes of transportation will not eliminate the desirability of providing highway routes to all significant traffic generators. Each mode has its own particular set of advantages but none can equal highway transport in flexibility of scheduling and function, economy for short-haul distances, providing land access, and affording opportunities for recreation. Highways, therefore, tend to complement rather than replace other transportation modes.

The state now has 4500 miles of highways and a total road mileage of 7110 miles, including local roads and city streets. Of this total, 3490 miles are federal aid primary and secondary systems. Many of the state's highways are substandard. It has been estimated that it would take more than \$1.5 billion just to upgrade the existing system. Current state transportation policy appears to emphasize upgrading the existing system before new roads are built.

The Alaska Marine Highway system serves the principal population centers of Southeast and Southcentral Alaska that are not connected to the main highway network. It also provides an alternate route from the Alaska Highway for auto travelers with service to Prince Rupert and Vancouver, British Columbia, and Seattle. (See Table III-18.)

The Marine Highway generated great controversy in Alaska before its inception, but it has proven to be a most successful innovative means of filling a difficult transportation requirement. Besides filling a transportation void for Alaska's residents, it provides a highly popular tourist attraction and makes it possible for the state to attract motorists who would otherwise not travel to Alaska on the 1300 miles of gravel road of the Alaska Highway.

TABLE III-18

POINTS SERVED BY ALASKA MARINE HIGHWAY SYSTEM

<u>Location</u>	<u>Scheduled Trips Per Week*</u>	
	(Summer)	(Winter)
Seattle	1	2
Vancouver	0	1
Prince Rupert	6	3
Ketchikan	7	4
Wrangell	7	4
Petersburg	7	4
Juneau	7	4
Haines	7	4
Skagway	7	4
Sitka	3	1
Valdez	5	2
Cordova	2	2
Seward	1	1
Homer	2	1
Seldovia	2	1
Kodiak	3	2
Anchorage	2	-
Whittier	4	0

*Trips are counted one way only. Seven trips is 7 northbound or 7 southbound, for example.

Source: State of Alaska Department of Public Works.

Alaska has two railroads -- the federally owned Alaska Railroad and the White Pass and Yukon Railroad (WP&YR), which is largely owned by Canadian interests. The Alaska Railroad serves Alaska's most populous area and gives it its common name -- the Railbelt. The railroad was completed in 1921 to serve as a link to the gold mining areas of Interior Alaska and to provide access to the coalfields of central Alaska. Little change occurred along the Railbelt for 20 years, except for the creation of Anchorage as a small railroad company town of 2500 population.

When World War II threatened, the major military bases were located near the railroad. These bases required large civilian workforces, and created the economic impetus that caused the population of Greater Anchorage to climb from 2500 to more than 120,000 in 30 years, and Fairbanks from 3000 to over 45,000 in the same time span.

The WP&YR serves only the town of Skagway in Alaska. Tonnages on this line have increased more than 300% in the past decade due to the mining boom in Canada's Yukon Territory. The tourists who leave the cruise ships at Skagway to ride the railroad to Whitehorse are an important impetus to the town's economy.

Air transportation has played an increasing role in Alaska. The increase in the number of passengers can be attributed to increased tourism as well as to increased business traffic.

The increased use of large jets for passengers and cargo generally has resulted in an increase in employment, cargo, and number of passengers. The continued preponderance of air transportation as an employer and common carrier of passengers clearly points out the inadequacy of other transportation modes.

Air transportation has played a significant role in the development of North Slope activity and has greatly stimulated the economies of the supporting communities, namely, Fairbanks and Anchorage. Numerous airstrips were constructed to support exploratory and production drilling. Most were temporary and have been abandoned.

Most of the airports in Alaska are publicly owned (mostly state with a few municipal) and it is these airports that need the greatest development. Airline service in Alaska varies from several times daily competitive schedules on modern jet aircraft to one weekly flight of single-engine planes.

About 30,000 Alaskans -- 90% of whom are natives living in Western arctic Alaska -- are not directly served by any of the above modes. They are served by air carrier or air taxi once or twice a month, and one or two ships a year if on the seacoast. This lack of service is a consequence of the isolation of the native communities and the high cost of providing service based on low utilization.

3. Problems

The major reasons for the lack of a transportation infrastructure in Alaska include the following:

- Arctic and sub-arctic environment,
- A small and scattered population,
- Physical access barriers to ground transportation including mountains and rivers,
- High operation and maintenance costs, and
- Limited state financial resources for transportation facilities.

These factors tend to limit the construction of new facilities and to make construction and operating costs of new facilities very high. In general, the development of transportation in Alaska has been made in response to the needs of existing communities (e.g., the main highway system and international airports at Anchorage and Fairbanks) rather than being based on an overall plan to use transportation facilities as a means of promoting additional economic development.

Alaska's climate presents several obvious problems with respect to transportation. The snow cover in much of the state precludes the development of an extensive highway network -- especially to the remote areas.

In several areas, sea ice forms a barrier to navigation for a substantial part of the year. The Bering and Chukchi Seas north of 58 degrees latitude in the Arctic Ocean and upper Cook Inlet are examples of such areas.

The small population in Alaska, scattered in a few small areas, often at great distances from each other, has heretofore limited the need for an extensive road transportation network. The high cost of constructing road links, the huge distances that highways would have to cover, the need to overcome physical obstacles such as rivers and mountains, and the limited seasonal use of roads has made the benefits of new highways seem small when viewed in light of the limited traffic they would carry.

The lack of funds has limited the development of a highway system in Alaska. Because of the state's sparse population and undeveloped economic base, all major highway construction must be financed with federal oil apportionments. Extremely modest in terms of total mileage, the existing system which was largely inherited from the Federal Government at the time of statehood was almost totally inadequate in 1960 by present-day standards. Although a substantial investment in highway improvements has been made, only approximately 460 miles of new highways have been added to the system since 1960. Compared with this amount, substantial improvements have been made to 1430 miles of existing roadway during the same period. Approximately 50% of existing mileage is still considered deficient. Other factors which tend to compound this problem include higher construction costs per mile caused by difficult terrain and higher price levels, and higher expenses for road maintenance due to harsh climates.

The main problem affecting Marine Highway transportation in Alaska is the same one that affects many other segments of Alaska's economy -- i.e., seasonality. The capacity of the ferries is strained during the summer, which imposes a limitation on tourism activity, but the system operates at only a small fraction of capacity in winter. Sixty percent of the annual passengers use the ferries over a four-month period from June through September. Only 20% use the system over the six-month period from October through March.

While use of the ferries has grown at an annual rate of 10% for passengers and 17% for vehicles, there has been no amelioration of the seasonal effects brought about by the increase in trade.

Another major problem is the lack of marine ways and shipyard facilities for large vessels. The nearest suitable facilities are in Seattle, which makes maintenance of Alaska-based vessels difficult and expensive. One of the difficulties in maintaining an icebreaker in Alaska is the lack of proper maintenance facilities. Ships operating in ice normally require more frequent visits to shipyards to repair damaged rudders, propellers, and hulls.

The lack of port facilities and the shallow coastal waters have made the Bering and Arctic coasts historically difficult to serve. Most locations require lightering cargo from ship to shore, which can increase costs 30% over what dockside handling would entail. The small volume of cargo for most ports has made it difficult to justify large investments for port facilities.

Responsibility for maintenance of the necessary infrastructure for waterborne commerce is diffused among several state and federal agencies. No one agency has direct responsibility for overall planning of a deep draft port system for the state, or the ancillary services necessary for the maintenance of a more effective shipping industry and fishing fleet.

The Jones Act affects the Marine Highway by preventing it from using low-cost foreign shipyards to meet its needs. The Merchant Marine Act of 1920 (the Jones Act) was passed to protect and stimulate the American Merchant Marine and U.S. shipbuilding by requiring that maritime trade between all states be transported in U.S.-made ships.

Historically, river (and canal) transport has provided the most economical means of moving bulk cargoes such as coal, mineral ores, and grain. The present tonnage moved over Alaska's rivers totals less than 50,000 tons annually, the bulk being deliveries of fuel and supplies to military installations on the Naknek, Kuskokwim, and Yukon Rivers. In Alaska, with its 15 major river systems, and over 3500 miles of navigable inland waters, the lack of backhaul cargoes and the paucity of population centers to demand or use large unit deliveries of non-bulk goods works against what, by logic, should be a low-cost transportation system. So little attention has been devoted to the full transportation potential of Alaskan rivers that little is even known of river characteristics beyond the approximate length, and in few cases, the annual flow. Even seasonal navigability is known only to the few pilots who ply the rivers, and at best, is unpredictable and undocumented.

Since petroleum, minerals, and timber comprise bulk cargoes of the type most apt to complement the economic advantages of river transport, the lack of development or even basic knowledge concerning the rivers presents an immediate problem in the field of transportation. Charting

of the rivers, collection of hydrologic data regarding river flows, training of river pilots, and employment of sophisticated river craft such as air cushion vehicles or hydrofoils for transport of people and cargo should be considered basic priorities in the comprehensive planning of an integrated transportation system for Alaska.

The bulk of Alaska's exports are petroleum, wood, and fish products. There is also substantial movement of ore from the Yukon Territory through Skagway. Unfortunately, exports and imports have not been compatible in their transportation requirements, and do not provide backhaul to a significant degree. As long as natural resources moving in bulk -- oil and ore -- comprise the majority of exports, this situation will prevail.

A final problem is that much of Alaska's trade is not certificated. Common carriers providing year-round service must publish tariffs and are regulated, while seasonal cargo is carried by companies which lease ships for a one-time operation and thus "skim the cream" from the total need for transportation, resulting in higher costs for the year-round shippers.

For the inland areas not served by the state highway system, transportation is limited to high-cost and infrequent air service. For cities such as Juneau, Anchorage, and Fairbanks, frequent jet service has resulted in keeping fares down. Most other communities rely on small aircraft that have high operating costs for service. High operating costs result from infrequent service, scattered population, and low use.

4. Outlook and Opportunities

a. Highways

The most immediate improvement in the state's transportation is expected to be the existing highway system. In 1977, the state published its annual six-year transportation plan. The plan includes proposals for construction and improvement of land and marine highways and airports. It outlines how the state proposes to allocate and spend funds for transportation facilities, and identifies projects and transportation facilities that can be provided with existing resources. The plan points out that the program will not completely meet all of the state's critical transportation needs because sufficient resources will probably not be available.

The priorities for highway construction were developed on the basis of first improving the existing roadway system, and removing safety hazards, and then performing major reconstruction or new construction where conditions are most critical. The main activities will be reconstruction, paving, and bridge replacement. The plan does not discuss priorities or have plans for the construction of new highway links that could become the basis for further economic development.

A recent study by the Department of Highways indicated an additional need for about \$300 million for highway reconditioning and preservation to keep the state's highways from deteriorating further due to oil pipeline related construction activity.

Early in 1970, in conjunction with the National Highway Needs and Classification Study, the Governor's Transportation Task Force established the goal of reaching all population centers of 1000 or more (1990 estimate) with highway connections wherever technically feasible by the year 1990. In addition, it was determined that the configuration of the resulting network should take maximum advantage of the state's natural resources and provide opportunities wherever possible for enjoying scenic panoramas.

One important highway link around which considerable controversy has developed is the North Slope Haul Road that was built to allow movement of equipment and supplies for construction of the trans-Alaska oil pipeline. The state will be given the road by the Alyeska Pipeline Company. The issues surrounding the question of opening the road for use by tourists and other industries include possible adverse environmental effects and the costs to the state of improving and maintaining the road.

The Governor's policy statement on the road says that the road will be opened only for use by industrial and mining interests, who will have to pay for the use of it. In 1976, Alyeska's road use charge was \$1.05 per mile and that covered only the maintenance cost. The statement indicates that the social, environmental, and fiscal costs of completely opening the road are too high. Residents near the road are against opening it and do not want it to become part of the state's public highway system. The Governor indicated that state policy concerning the road will be reviewed yearly.

Several potential highway links have been discussed that would greatly improve the state's transportation network.

If a highway to the Kobuk were constructed, a continuation to the lower Kobuk Valley and the Seward Peninsula would assume a high priority. This road would open up Eskimo inhabited areas to auto tourists for the first time. It would serve areas of high mineral potential and provide a surface transportation link for another 11,000 Alaskans.

A road from the west side of Cook Inlet to Bristol Bay is also given a high priority by the state among the total highway needs. A ferry link to Homer would connect to the main highway network. A main advantage of such a road would be the provision of year-round surface freight service to Bristol Bay through the ice-free ports on lower Cook Inlet. Unsurpassed sports fishing areas would be more readily accessible to residents and non-residents, and the area shows high potential for mineral development.

The U.S. Forest Service has long planned an Inter-Island Highway System for the Tongass National Forest. It would be designed to connect the main communities and also serve as a main spine road for the harvesting of the Tongass timber and mineral resources. Its greater value, however, would lie in the recreational opportunities it would open.

The highway would rely on small ferries for inter-island connections. It would not compete with the through service provided by the large ferries of the Marine Highway, but would complement it. Ultimate costs for the Inter-Island Highway are now estimated at \$314 million for 455 miles of road to connect from Haines to Ketchikan.

Congress has authorized the President to open negotiations with Canada for paving the Alaska Highway. The benefits to the State of Alaska from paving the highway would be quite significant and would include increased tourism, lower transportation costs for trucking, increased ease of access for Alaskans in travel to other states, and enhancement of the Marine Highway System. The Marine Highway has proven to be an extremely attractive method of travel to date, but many who would otherwise travel in one direction by water and the other by highway have been deterred because of surface conditions on the Alaska Highway. Highway-based visitors offer especially high potential for economic benefits since this type of traveler is more likely to spend significant periods in remote areas, provided access is available.

There is also a need for roads linking small communities with their airports. The role of development roads to aid in the harvesting of resources has been hotly debated in Alaska. The main argument is whether government or industry should bear the costs, or in what proportion they should be shared. Totally different programs are followed for timber, minerals, and oil.

The Forest Service has a long-range program for developing an access road and trail system that is aimed at areas of high timber potential and also those of recreational promise. Timber producers on state and other federal lands must build their own roads. The Forest Service prefers to control its road program as a prime method of limiting environmental damage for the lands under its control.

The oil industry has constructed roads to serve its needs, with no particular desire for government subsidy ever expressed. Extensive access road systems exist on the Kenai Peninsula, the west side of Cook Inlet, and the North Slope as a result of oil development. The state has taken some of these roads into the state system when a public need in addition to that of the oil industry became apparent.

The mining industry, which could be a significant factor in the state's economic development, has been in a general state of decline since World War II. The lack of adequate transportation facilities has been a major contributing factor. Not only does the lack of these facilities cause increased costs for equipment and ore shipments, but the isolation of bush areas causes high operating costs for any commercial or industrial activity. Although many minerals in high demand in the United States are found in abundant supply in Alaska, transportation costs have inhibited detailed and intensive exploration in many cases and have caused otherwise profitable proposed operations to become unattractive investment opportunities. The state, recognizing this problem, has from time to time conducted programs

for financing mineral development access roads, but funds available have been extremely small in quantity. Generally, these funds have been sufficient to only cover relatively short connections to the existing system and have not been of sufficient magnitude to develop significant highway corridors.

The Alaskan situation is in complete contradiction to that in Canada where an active program of building roads to develop northern resources is underway in the Yukon and Northwest territories. The Canadian Federal Government is making substantial investments in high-quality roads as a major incentive for resource-based industries.

b. Railroad Transportation

The outlook for railroad transportation in the state depends in part on the future ownership of the Alaska Railroad, and the development of a rail link with the lower 48. The Federal Government has offered the railroad for sale to either the state or a private buyer. There have been no offers from private sources.

The state has shown little interest in the line up to now. If it becomes possible to finance the northern extension by changing ownership to the state, it might be possible, but at present there is no evident benefit that would make the state want to pay \$100 million to obtain a service it is already receiving.

In Canada, there are active plans to extend the Pacific and Great Eastern Railroad northward from Prince George to Whitehorse in the Yukon Territory. This would provide a rail connection to the WP&YR and the continental rail network. Approximately 600 miles of track would be necessary to extend the Alaska Railroad to Whitehorse. Advantages would primarily accrue to eastern Alaska's mining industry by making possible direct shipment of ore to the smelters in the midwestern United States. Presently, Yukon ores are sent by truck to Whitehorse, by WP&YR to Skagway, by ship to Vancouver, and by rail to the smelter at Trail, B.C.

A proposed rail link connecting Alaska and Canada would connect Alaska by rail with the lower 48. In 1975, the Alaska legislature passed a resolution asking the Governor to call a conference to consider the connection of Alaska and Canada by an all-rail land route leading to the midwestern and eastern manufacturing centers. The conference held in April 1976 reached conclusions that (1) Alaska was far behind the Yukon Territory and Northern Canada in its research on the potential for a rail route, and (2) the concept of rail connection between Canada and Alaska looked promising and should be pursued at this time. The legislature appropriated \$50,000 for a study of this potential.

The new railroad would generally parallel the Alaska Highway from Tetlin into Fairbanks. The proposed route would require 297 miles of track in Alaska, 568 miles in the Yukon, and 100 miles in British Columbia. The land area for the entire route in Alaska may be selected through the eminent domain authority of the Alaska Railroad. Construction costs are estimated at about \$1.2 million per mile.

In attempting to estimate the future volume of such a rail route, potential shippers were contacted (131 in the United States and Canada). The responses indicated that the railroads could be an important factor contributing to further mineral development in Alaska.*

The report estimates that one million tons could flow across the route by 1985, given competitive service and no new development.

Proposals to improve railroad transportation in Alaska include the extension of the Alaska Railroad to the Kobuk copper deposits and to the oil fields at Prudhoe Bay.

c. Marine Transportation

The development of Alaska's resources has been largely dependent upon marine transportation, and this situation will probably continue in the foreseeable future. Fairbanks is the only major population center not located on the seacoast. The development of Alaska's oil, mineral, timber, fish, and other resources will depend to a great extent on adequate marine transportation and the provision of port facilities that will enable cargo to be transferred at minimum cost.

Besides port facilities for handling cargo ships, the state must support an extensive system of small boat harbors to serve the needs of its fishing fleets and its many citizens dwelling along its 33,904 miles of tidal shoreline that use the sea as a basic means of transportation or recreation.

The development of large icebreaking tankers and supply vessels that will be able to operate in the icebound seas with a minimum of icebreaker assistance appears to be essential to achieve year-round transportation of resources by sea from northern and western Alaska. The economic practicability of each proposed operation in the Arctic or in the ice of the near Arctic, however, must be considered and analyzed separately since the economic planning factors vary in each instance of use.

Year-round navigation to Anchorage, Alaska's leading general cargo port, and Drift River and Nikiski, the ports from which Cook Inlet petroleum products are shipped, is a recent development. There are indications that conventional deep-draft icebreakers are not suitable for the shallow waters and swift currents of Cook Inlet and that a specialized icebreaker should be developed.

*Alaska Department of Commerce and Economic Development, Division of Economic Enterprise, Alaska-Canada Transcontinental Rail Connection to Contiguous United States, January 1977.

Studies are underway by the State of Alaska and the Corps of Engineers to determine what ports should be developed to serve Alaska north of the Aleutian Chain. Regional ports are being evaluated at Bethel, St. Michael, and Port Clarence at present.

The upgrading of marine navigational aids along northern coasts and in the Valdez area is receiving high priority. Radar reflectors and radar transponders were installed during 1971.

A large increase in shipping, primarily in tankers operating from Valdez and other ports, will require more sophisticated navigation if schedules are to be maintained in bad weather, especially during periods of reduced visibility. The planned national navigation system, which is intended for use by aircraft or ships, could meet this need if it can be implemented before the tanker traffic begins to peak.

The economies of size will be difficult to achieve in the limited Alaskan market if there are too many participants. Up to this time competition in marine transportation has proven beneficial. As competition expands into areas of low cargo generation, it may have a deleterious effect on the industry, and make consolidation necessary as has occurred in the intra-Alaska air services during the past decade.

The Federal Maritime Commission in its 1968 Alaska Trade Study recommended the following courses of action to improve waterborne commerce in Alaska:

- Comparative freight rate studies,
- Containerization of cargo,
- Modernization of cargo vessels and handling facilities,
- Development of resources to provide backhaul cargo,
- Institution of developmental freight rates to encourage resource development and extractive industries,
- Rehabilitation and expansion of wharfing, warehousing, and drayage facilities,
- Establishment of centrally located redistribution ports, and
- Improvement of river and harbor facilities.

Some progress has been made in all areas but those dealing with rate studies. A comparative rate study which incorporated a comparison of rates that would be possible without the limitations imposed by the Jones Act would provide a substantive base from which to further modernize Alaska's maritime trade.

If major port facility improvements are to be made at the various ports throughout Alaska, it will be necessary for the Federal Government and the state to participate with the cities in providing the modern facilities required. It is doubtful if many of the seaport communities could "go it alone" on such an expansion program.

The question of obtaining enabling legislation to provide for the development of a port authority should be investigated. Previous studies of the problem have indicated that until Alaska's Constitution is amended allowing port authorities the right of taxation for the support of bond issues, a port authority would be quite helpless in attempts to finance programs. There is no doubt that improvements must be made to many of the ports of Alaska.

The state, in cooperation with the Federal Government, should assure that the land areas which will be required for port development in the future will be retained in public ownership for that purpose. Except in special cases, private ownership of port areas should be discouraged.

The cost advantages of the Marine Highway to the state were graphically shown in the 1969 report to the Alaska legislature, which showed capital costs of \$34 million for the present southeastern system versus \$410 million for land highways to serve the same area.

Future improvements to the Marine Highway envision the use of air cushion vehicles or hydrofoils as technological improvements make these high-speed systems cost competitive. Such improvements will probably be limited to new routes until the present fleet is amortized.

Air transportation will continue to grow in Alaska because of its advantage for an undeveloped, large, sparsely settled region. It can provide flexible, reliable transportation with a minimum capital investment. High fares and cargo rates will continue to be inhibiting factors in the upgrading of the economy in these areas relying on air transportation.

Air fares and freight rates between Alaska's main terminals and overlying areas are the most expensive parts of the system. The places most impacted by air transportation costs are those most in need of service. This problem cannot be solved by improving the infrastructure because the small, widely scattered communities will never be able to generate the cargo or passenger flows that will generate economies of scale.

Extensive work is required at many of the state-owned airports in western Alaska before they will be suitable for jet operations. Airport requirements for jet aircraft are costly and time consuming. It is imperative that an area or statewide plan be implemented to forecast and provide the necessary developments to permit the efficient utilization of equipment.

Eventually all communities will be linked by road to a medium hub airport. This will make it possible to provide low-cost air freight service at frequent intervals to the bulk of the state's 223 communities.

I. ELECTRIC UTILITIES

1. Summary and Overview

About 90% of Alaska's population has reasonably reliable electric power. Only about 10% of the state's retail electric power customers are served by private utilities. In all regions except the Southeast, electric power use has grown faster than the national average rate of 7% annually.

Electricity prices in Alaska are generally higher than the national average and show a large variation from community to community. Anchorage, the region of largest demand, has enjoyed the lowest electricity rates in the state because of the availability of low-cost gas from the Kenai Peninsula.

The Alaska regions vary in the composition of their generating capacity. The largest electric power generating capability is in the Anchorage and Southcentral region. More than two-thirds of the region's 394.6 megawatt (Mw) capability is gas turbine generated. In the Fairbanks area, coal-fired steam turbine plants account for about 60% of the region's 180.0 Mw capability. Hydroelectric power is significant only in the Anchorage-Southcentral region (11% of total capability) and the Southwest region (43%).

The major problem facing utilities in Alaska is the high cost of electric power. Operating costs are high because of high construction costs and because the construction of small scattered plants to serve low growth increments has prevented the utilities from realizing economies of scale.

Electric utility generating requirements in Alaska are expected to grow at a greater rate than in the lower 48. The greatest increase is expected to be in the Anchorage area and the smallest in the Northwest and Southwest regions.

Alaska has abundant fuels to meet future generating capacity requirements. Future fuel use and availability will depend on the outcome of certain regulatory and pricing issues including:

- The availability and pricing of residual fuel oil,
- Federal regulations on the use of natural gas by utilities, and the pricing of natural gas, and
- Coal mining and development costs.

Alaska has a huge untapped potential for hydroelectric development but the remoteness of the sites from load centers, and the high construction costs, may limit their development. The development of Alaska's hydroelectric power potential would make power available for electricity-intensive industries such as metal reduction, aluminum production, and cement manufacturing.

2. Present Status

Four basic sources supply Alaska's electrical power:

- Industry - 108 Mw
- Military - 218 Mw
- Private home generators (no figures)
- Utilities - 738 Mw

The first two of these, industrial and military electrical power, are insignificant since they are essentially independent of state population and income levels. And while privately generated power for home use is important because of incomplete utility coverage, its use is declining, and existing programs of rural electrification will continue this trend. Therefore, the largest component of electrical power in the state is that generated by utilities. And, because military requirements will not expand appreciably and population increases will be concentrated in urban areas, utilities in the future are expected to supply an even larger proportion of the state's electricity. In 1970, approximately 87% of Alaskan households were connected to electric utilities. Those not connected included villages, households with access to electricity but no desire to consume, and households isolated from any power source or community.

Alaska's electric power industry has traditionally been oriented toward mining operations, fish canneries, lumber mills, and trading posts. For many communities, industrial and commercial power installations were the only source of electricity. Some of Alaska's present utility systems are derivatives of these earlier commercial and industrial enterprises. In contrast to other states where substantial amounts of generating capacity are privately owned, in Alaska only about 10% of retail customers are served by private utilities. About 90% of Alaska's population has reasonably reliable electric power.

In all regions except the Southeast, growth in electric power sales has exceeded the long-run national average of 7%. Individual utilities have experienced much more rapid growth. Of the state's largest utilities, Golden Valley Electric Association in Fairbanks grew most rapidly -- more than 20% annually.

Differences in growth rates of electricity use are only partially explained by differences in the rates of population increase. In addition, percent of population served by electric utilities has also been increasing, and consumption per customer has been increasing at different rates in different regions. Table III-19 shows the number of customers and consumption per customer for the commercial and industrial sectors.

Residential prices for electricity, which are generally a decreasing function of the quantity consumed, show a large variation from community to community within the state. The 1974 cost of 500 kilowatt-hours (kwh) per month varied between \$13 in Anchorage and \$131.94 in Deadhorse (2.6

TABLE III-19

AVERAGE ANNUAL COMMERCIAL AND INDUSTRIAL
ELECTRICITY USE PER CUSTOMER

	1965		1970		1974	
	Number of Customers	Average Annual Mwh per Customer	Number of Customers	Average Annual Mwh per Customer	Number of Customers	Average Annual Mwh per Customer
Southeast Commercial	1,608	20,345	1,761	25,117	1,359	28,852
Southeast Industrial	-	-	57	457,912	13	1,401,385
Southcentral Commercial/ Industrial	1,575	35,594	2,447	49,412	2,839	53,583
Anchorage Commercial/ Industrial	3,035	46,997	4,093	63,260	5,132	85,395
Fairbanks Commercial/ Industrial	1,318	25,181	1,717	62,087	2,073	71,449

Source: University of Alaska, Institute of Social and Economic Research, Electric Power in Alaska, 1976-1995, August 1976.

cents versus 26.4 cents for one kwh). Anchorage, the region of largest demand, has enjoyed the lowest electricity rates in the state because of the availability of low-cost gas from the Kenai Peninsula.

Compared to prices nationally, the average for Alaska is high, but during the decade of the 1960s, it fell in real terms and also relatively. The Alaska average in 1960 was 4.32 cents/kwh, while nationally, it was 2.47 cents/kwh. By 1972, the Alaska average was 3.33 cents/kwh. To a large extent, this downward trend reflects the price of electricity in Anchorage, since more than half of the state's electrical consumption occurs in the Anchorage area. More recently, the downward trend in prices has reversed as a result of increasing costs of fuel, construction, and capital.

Prices for commercial and industrial consumers, when different from residential rates, are generally lower and trends have tended to follow those of the residential sector.

The Alaska regions vary in the composition of their generating capacity. The largest electric power generating capability is in the Anchorage and Southcentral region. The region has a total generating capability of 394.6 Mw of which 68% is gas turbine generated. In Anchorage gas turbines are used as baseload units (peaking units elsewhere) because of the availability of low cost gas. In the Fairbanks region, coal-fired steam turbine plants account for about 60% of the region's 180.0 Mw capability. Many of the coal-fired plants are located at the mine-mouth 108 miles from the city. In the Southeastern region and in rural Alaska diesel generation accounts for 57% and 93%, respectively, of total generation capability. Hydroelectric power is significant only in the Anchorage and Southcentral region (11%) and the Southeast region (43%) (see Table III-20).

3. Problems

Utility costs in Alaska are high compared with those in the lower 48. Although Alaska has plentiful amounts of fuel for use in electric power generation, operating costs are high because numerous small scattered plants have been built to serve low growth increments. Consequently, the utility plants have been unable to achieve economies of scale that would be possible for plants serving large populations. High costs make it difficult to bring electric power to remote areas. High construction costs and the isolation of demand centers will probably continue to contribute to the high cost of electric power in Alaska.

4. Outlook and Opportunities

Electric utility generating requirements in Alaska are expected to grow at a greater rate than in the lower 48. The greatest increase will be in the Anchorage area and the smallest in the Northwest and Southwest regions (see Table III-21).

TABLE III-20

ELECTRIC UTILITY GENERATION CAPABILITY BY REGION AND COMPOSITION

	<u>Anchorage and Southcentral Region</u>	<u>Fairbanks Region</u>	<u>Southeast Region</u>	<u>Rural Alaska</u>
Total Capability (Mw)	394.6	180.0	192.5	23.0
Largest Unit Type	269.5 (gas turbine)	108.8 (coal-fired steam turbine)	57.7 (hydro)	3.0 (diesel)
Composition (Mw)				
Steam Turbine	14.5	108.8	-	-
Gas Turbine	269.5	7.2	-	1.5
Hydro	45.0	-	82.3	
Diesel	65.6	64.0	110.3	21.5
Average Utility Size (Mw)				
Steam Turbine	14.5	108.8	-	-
Gas Turbine	269.5	7.2	-	1.5
Hydro	45.0	-	11.8	-
Diesel	6.6	9.1	3.1	0.5

Source: University of Alaska Institute of Social and Economic Research, Electric Power In Alaska, 1976-1995.

TABLE III-21

ELECTRICITY REQUIREMENTS IN ALASKA, CAPACITY ADDITIONS
(megawatts)

	<u>Low</u>	<u>High</u>
Anchorage and Southcentral Alaska		
1974-1985	506	1,133
1985-1995	938	2,768
Fairbanks		
1974-1985	79	221
1985-1995	122	380
Southeast Alaska		
1974-1985	48	48
1985-1995	45	72
Northwest and Southwest Region		
1974-1985	1	13
1985-1995	2	23

Source: University of Alaska Institute of Economic and Social Research,
Electric Power in Alaska, 1976-1995.

Alaska has resources in abundance to generate electric power to meet its future requirements (oil, gas, coal, or falling water). The availability of the resources to load centers, the thin transportation infrastructure, and the isolation of major centers has produced such anomalous situations as burning natural gas in gas turbines in Anchorage, burning low Btu coal in conventional steam electric plants in oil and gas-free Fairbanks, and shipping diesel fuel to villages near sites with enormous hydroelectric potential.

Any planning for future fuels availability will have to acknowledge considerable uncertainty and problems:

- Geologic fortune in regards to discovering more natural gas in South Alaska.
- The availability and pricing of residual fuel oil. To date residual fuel has not been burned to a significant extent. A federal ban on natural gas burning in utilities and natural gas pricing may change that.
- Federal regulations on the use of natural gas by the utilities and the pricing of natural gas. Gas use may be banned outright and the gas distributed to higher priority residential or industrial users. Even if utility gas burning is not banned outright, if the price of natural gas is greater than an alternative fuel source such as coal, natural gas may be diverted to better use. One use would be conversion to ammonia and urea for export.
- Coal mining and development costs. Coal would appear to show the greatest long-term price stability and is forecast to cost less than gas and oil on a cents per million Btu basis when available.

Uncertainty in the growth rates of Alaska's relatively small load centers and the diversity of the load centers accentuate the difficulty of meeting future electrical demand without serving as a brake on the economy. Only for Anchorage, and if intertied to Anchorage, Fairbanks, will it be possible to construct highly efficient conventional steam-electric plants. However, a slowdown in demand growth could reduce system reliability by placing too much reliance on a single large plant. Providing more capacity by gas turbines may prove to be a better match of capacity to demand at the price of less fuel efficiency and potentially higher cost over the life of the units. Development of large hydroelectric projects for the two regions is attractive because fossil fuel resources would not be burned to generate electricity, but the capital cost is very high and dependence on such a large single source via long distance high voltage lines may be unacceptable.

In the Southeast part of Alaska, small towns and villages are dispersed over a large and rugged region. New electrical demand would be best met by development of nearby hydroelectric sites and the installation of low-speed diesels or regenerative gas turbines.

The remaining areas of Alaska, the Northwest and Southwest, have a very low level of electricity demand are forecast to grow very slowly. The cost of financing electrical units has historically been a serious burden and will remain so because of the small units required. High-speed diesels provide virtually all the electricity for the region and probably continue to do so. Regenerative gas turbines fueled by diesel fuel would be competitive with long-life but higher-cost low-speed diesels.

Hydroelectric development has been limited to relatively small units serving nearby local centers. Alaska has 31 hydroelectric plants -- 2% of U.S. total. Installed hydroelectric capacity is 123,000 kw -- 0.2% of the U.S. total. Although Alaska has many undeveloped hydroelectric sites, the remoteness of the sites from load centers has constrained and may continue to constrain their development. Large hydroelectric projects may make long distance transmission of electricity feasible, but the project may incur unacceptable environmental damage. Large hydroelectric projects are very expensive and will take a long time to implement. The proposed 1,568 Mw Susitna Project is estimated to cost \$1.2 billion and take 6-11 years to complete. By comparison, a conventional steam electric plant or gas turbine would be only about one-half or one-third as expensive. The principal advantages of all hydroelectric plants are their simplicity in operation, very low operating costs, and reliability.

Alaska has the potential for vast hydroelectric development (see Figure III-15). Alaska contains over 40% of the hydroelectric power potential of the United States. The 89 undeveloped potential sites have a potential capacity of 33.3 million kw -- 29.3% of the U.S. total potential hydroelectric capacity. The development of this potential would make power available for electricity-intensive industries, including metal reduction, aluminum production, and cement manufacturing. The following five hydroelectric plants have been proposed, each having a long construction period:

- | | | |
|----|--------------------------------------|---------------|
| 1. | Thomas Bay Hydroelectric Project | Petersburg |
| 2. | Bradley Lake Hydroelectric Project | Homer |
| 3. | Watana Hydroelectric Project | Susitna River |
| 4. | Devil's Canyon Hydroelectric Project | Susitna River |
| 5. | Rampart Hydroelectric Project | Yukon River |