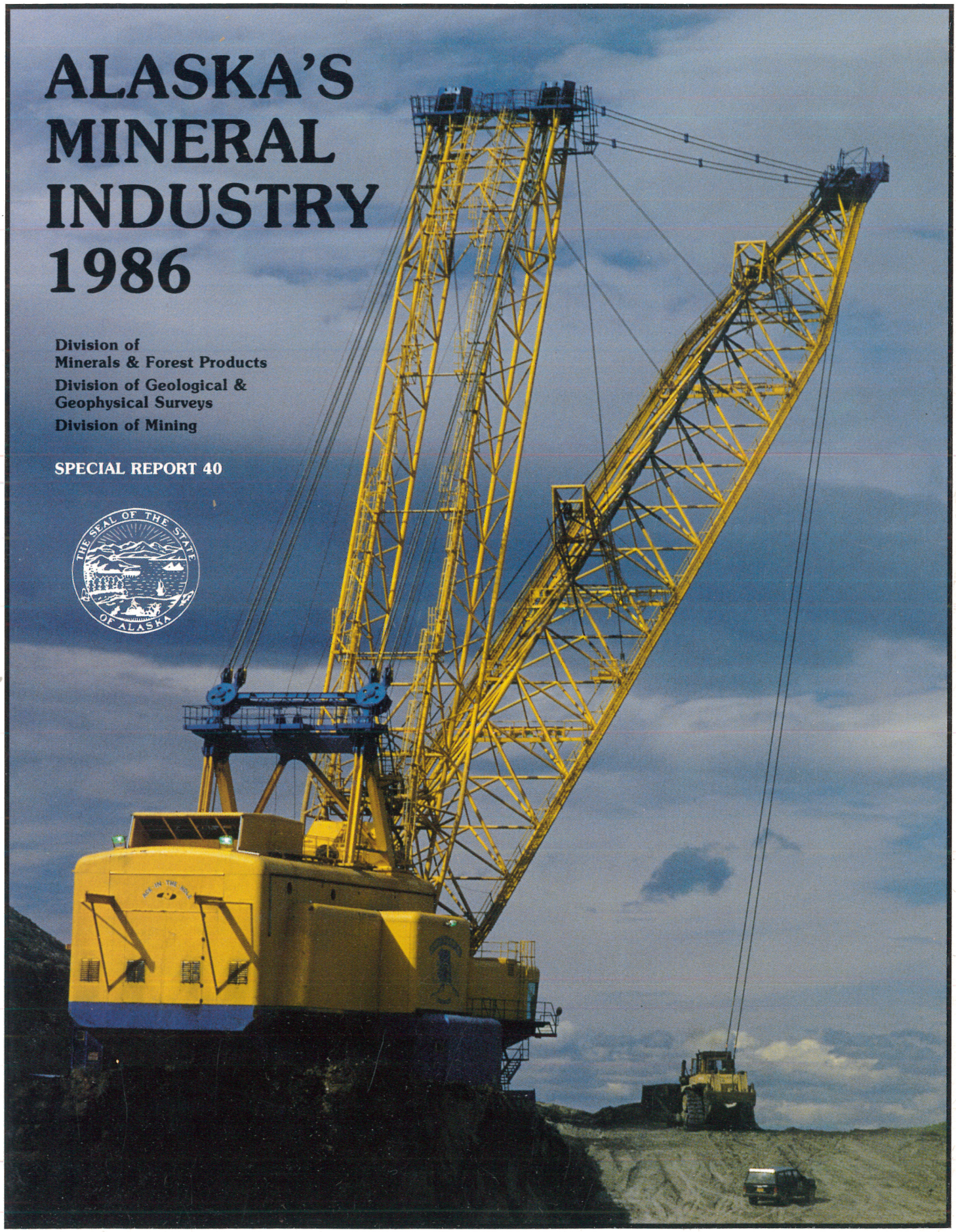
ALASKA'S MINERAL INDUSTRY 1986

Division of
Minerals & Forest Products
Division of Geological &
Geophysical Surveys
Division of Mining

SPECIAL REPORT 40



Front cover: *The 'Ace-In-The-Hole' 1300W Bucyrus-Erie dragline strips overburden with a 33-yd^3 bucket at Poker Flats, Usibelli Coal Mine, Healy, Alaska. Photograph by Robert Usibelli, 1986.*

ALASKA'S MINERAL INDUSTRY, 1986

By T.K. Bundtzen, C.B. Green, James Deagen, and C.L. Daniels

DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS
SPECIAL REPORT 40

STATE OF ALASKA
Steve Cowper, *Governor*

Fairbanks, Alaska
1987

STATE OF ALASKA

DEPARTMENT OF COMMERCE AND ECONOMIC DEVELOPMENT
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Office of Mineral Development
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DEPARTMENT OF NATURAL RESOURCES
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Gerald L. Gallagher, *Director*

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FOREWORD

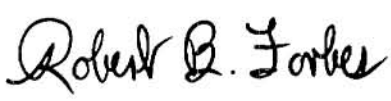
Special Report 40, 'Alaska's Mineral Industry - 1986,' is the sixth annual report produced by the Department of Commerce and Economic Development Division of Minerals and Forest Products and the Department of Natural Resources Division of Geological and Geophysical Surveys and Division of Mining.

The primary objective of this report is to provide current information on Alaska's mineral industry. The report is wholly dependent on the cooperation of government agencies, private industry, and individuals who voluntarily provide information on their projects and activities.

In 1986, the value of the mineral industry to Alaska's economy was $231.7 million, a decrease of 14 percent from 1985. With the exception of increased coal production, all other phases of mineral-industry activity declined: exploration expenditures by 2 percent, development expenditures by 29 percent, and sand-and-gravel production by 26 percent.

The volume of gold production decreased 16 percent, and the number of placer mines decreased 27 percent, despite a significant increase in gold prices from the previous year. Federal lawsuits related to mining activity on federal lands and uncertainties about water-quality regulations contributed significantly to the decrease in mining activity in Alaska. For the first time in 83 years, no gold was mined in the historic Kantishna mining district as a result of a lawsuit brought against the National Park Service.

Despite the overall decline in mining and exploration activity, several encouraging developments occurred in 1986. The decision was made by Cominco Alaska, Inc., to begin road and dock construction at the Red Dog zinc mine; action was taken by Amselco Minerals Company toward full development of the Greens Creek silver-gold mine; and Inspiration Gold, Inc., continued its exploration of offshore gold-placer deposits near Nome with the world's largest bucketline dredge.



Robert B. Forbes
Director and State Geologist
Division of Geological and Geophysical Surveys

Thyes Shaub
Director
Division of Minerals and Forest Products

Gerald L. Gallagher
Director
Division of Mining

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ALASKA'S MINERAL INDUSTRY, 1986

By T.K. Bundtzen[1], C.B. Green[2], James Deagen[3], and C.L. Daniels[1]

Executive summary

During 1986, mineral-industry activity in Alaska substantially declined from previous years. Expenditures for exploration, development, and production totaled $231.7 million, down from $269.9 million in 1985, a reduction of about 14 percent (fig. 1; table 1). The number of people employed in various aspects of the industry dropped from 3,650 in 1985 to 2,950 in 1986. Principal mineral commodities produced during 1986 were 20.9 million tons of sand and gravel valued at $75.8 million, 160,000 oz of gold valued at $60.8 million, and 1.49 million tons of coal valued at $40.1 million. Sand and gravel, gold, and coal account for 89 percent of the 1986 total production value of $198.5 million. Building stone, tin, silver, antimony, tungsten, mercury, jade, soapstone, and peat make up the remaining 11 percent. Sand-and-gravel production dropped 26 percent from the previous year because of the substantial reduction in oil-and-gas infrastructure developments on Alaska's North Slope and reduced construction in urban areas of southcentral and southeastern Alaska. Both declines were caused by the plunge in oil prices during 1986.

The volume of gold production decreased 16 percent, and the number of mechanized placer mines—the principal producers of gold bullion—decreased 27 percent. Reasons for this decline are complex. Two federal lawsuits related to mining on federal lands in Alaska, along with continued uncertainties about State water-quality regulations, contributed to the decreased production. The Sierra Club vs. National Park Service (NPS) lawsuit was settled in 1985. With few exceptions, it prohibits mining in three national conservation units until the NPS completes environmental assessments, which could take several years. In 1985, 30 mining companies were operating in Denali National Park and Preserve, Wrangell - St. Elias National Park and Preserve, and Yukon-Charley Rivers National Preserve, but in 1986 only one small mine was still in operation. The result has been a loss of 175 jobs and over 22,000 oz of gold production. The 'BLM' lawsuit (Sierra Club vs. Penfold) filed in federal district court in Alaska in February challenged the methods used by BLM to manage mining activity on federal lands. As a result of the lawsuit, BLM was required to make individual environmental assessments for every placer mine in Alaska and to enforce retroactive land reclamation. This lawsuit may be resolved in mid-1987.

Alaska's turbidity requirement for mine discharge water continued to be a source of concern for Alaska's miners. Although few miners have been prosecuted, most are not in compliance with state law and may face court action. The cumulative effect of these and

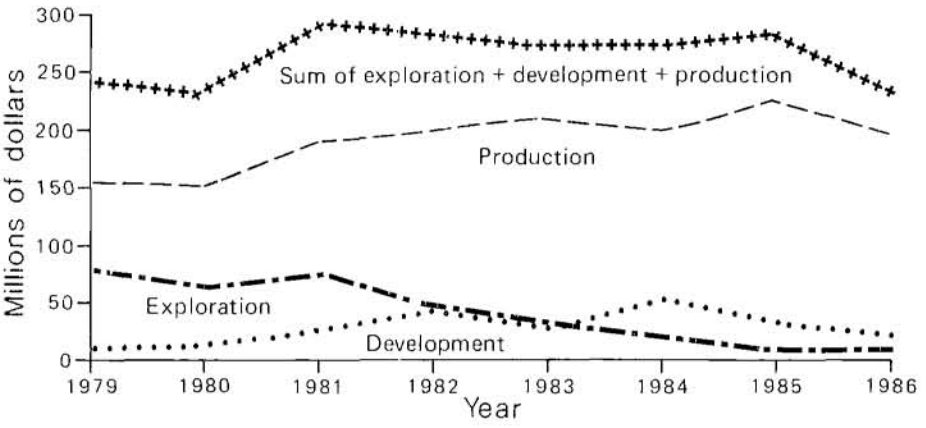

Figure 1. Value of mineral activity in Alaska, 1979-86.

Table 1. *Total value of mineral industry in Alaska, 1984-86.*

	1984	1985	1986
Exploration	$ 22,283,650	$ 9,150,000	$ 8,914,744
Development	53,348,055	34,120,775	24,331,972
Production	199,437,167	226,599,250	198,461,007
TOTAL	$275,068,872	$269,870,025	$231,707,723

[1]Alaska Division of Geological and Geophysical Surveys, 794 University Ave. (Basement), Fairbanks, Alaska 99709.
[2]Alaska Division of Minerals and Forest Products, 1001 Noble St., Ste. 420, Fairbanks, Alaska 99701.
[3]Alaska Division of Minerals and Forest Products, P.O. Box D, Juneau, Alaska 99811.

other issues contributed to a loss of 385 jobs in Alaska's placer-mining industry between 1985 and 1986. The most telling decline in mining activity took place in the eastern interior region, which saw a 49-percent drop in employment from the previous year. In marked contrast is the placer-gold industry in Canada's Yukon Territory, which saw a 5-percent increase in activity from the previous year (Debicki and Gilbert, 1986; Yukon Territory Northern Affairs Division, 1986). This growth is attributed to the nearly 23-percent increase in the average price of gold from 1985 to 1986.

Exploration expenditures in 1986 ($8.9 million) were comparable to those in 1985 ($9.1 million), but development expenditures dropped 29 percent ($24.3 million in 1986 vs. $34.1 million in 1985). In contrast, exploration expenditures in British Columbia increased from $79 million in 1985 to $100 million in 1986, and exploration expenditures in the Yukon Territory increased from $26 million in 1985 to $34 million in 1986.

Despite declines in Alaska's mineral activity, encouraging developments occurred in 1986, and there are several indications that 1987 will be a significantly better year. Important steps were taken to put the giant Red Dog zinc deposit in northwest Alaska into production. The initial construction phase of the port facility near Kivalina was completed, and contracts for design and construction of the facility were awarded to various contractors. On November 26, 1986, the COMINCO Board of Directors approved the full development of the zinc-lead-silver mine, which will result in about $400 million in construction expenditures over the next 4 yr. Initial production is scheduled for 1991.

A change in ownership and construction of a mine road highlighted 1986 developments at the Greens Creek gold-silver-base metals project on northern Admiralty Island in southeastern Alaska. AMSELCO MINERALS, INC. (a subsidiary of BRITISH PETROLEUM NORTH AMERICA), now owns 79 percent of the property after purchasing interests held by NORANDA MINING, INC., and ANACONDA MINERALS COMPANY. CSX OIL AND GAS and EXALAS RESOURCES CORPORATION own the remaining 21 percent. AMSELCO, the project operator, constructed nearly 7 mi of road and prepared the site for a 6,000-ft-long adit that will be the main haulageway for the mine. Construction of the adit is scheduled to begin in spring 1987. This action may indicate that full mine development will soon be approved by the board of directors of AMSELCO's parent company, BRITISH PETROLEUM NORTH AMERICA. The company plans to spend $80 million during a 2-yr development phase and expects to ship concentrates in late 1988. The operation will be designed to produce 1,000 tons of ore per day and may create up to 225 jobs in the Juneau area.

In 1986, INSPIRATION GOLD, INC. (formerly INSPIRATION MINES, INC.), initiated offshore mining operations in Norton Sound. Production tests were conducted from mid-August to October using the world's largest bucketline dredge, the 'Bima'; 86 people, including 42 Nome residents, were employed. Full-scale production may commence in 1987 when the Bima returns from Seattle, where it is undergoing technical modifications. The dredge, which is capable of processing 40,000 yd^3 of material per day, was formerly used to mine placer tin in Malaysia.

VALDEZ CREEK MINING COMPANY (formerly DENALI MINES, INC.) continued production and development of their properties in the Valdez Creek mining district east of Cantwell. An estimated 136 employees contributed to the production of 28,500 oz of placer gold. VALDEZ CREEK MINING COMPANY was Alaska's largest gold producer for the third consecutive year.

USIBELLI MINE, INC., produced 1.49 million tons of coal, over 700,000 tons of which were exported to the Korean Electric Power Company's power plant in Honam, Korea. The export contract was successfully renegotiated in the fall, and increased production is planned.

LOST RIVER MINING COMPANY continued placer-tin mining on the western Seward Peninsula. Tin production from their operation was the largest in the state in nearly 40 yr.

Other continuing significant mineral developments include the CHICHAGOF JOINT VENTURE gold project north of Sitka, the ECHO BAY MINES, LTD., evaluation of the Alaska Juneau Gold Mine, the Quartz Hill molybdenum project near Ketchikan, the efforts of the FAIRBANKS EXPLORATION COMPANY in the Fairbanks mining district, and several coal developments in the southcentral and eastern interior regions of the state.

The ALASKA MINERALS COMMISSION, which was created by the State Legislature in 1986, presented their findings to the Governor and Legislature in January 1987. The 11-member Commission is charged with making recommendations to mitigate the constraints on mineral development in Alaska.

Federal and state agencies conducted mineral-resource studies in Alaska under several cooperative programs. A 4-yr contract between the ALASKA DEPARTMENT OF NATURAL RESOURCES DIVISION OF GEOLOGICAL AND GEOPHYSICAL SURVEYS (DGGS) and the U.S. BUREAU OF MINES (USBM) calls for geologic and mineral studies in the Skagway and Haines area of southeastern Alaska. Under the agreement, DGGS conducts geologic mapping, and the USBM conducts detailed examinations of mineral prospects and mines. Several reports related to the studies were released in 1986 (Bundtzen, 1986; Bundtzen and Clautice, 1986; Hoekzema and others, 1986; Gilbert and others, 1987).

In 1985, the U.S. Congress appropriated funds to the U.S. GEOLOGICAL SURVEY (USGS) for geologic mapping and mineral evaluations of the Steese - White Mountains National Recreation area. DGGS, under contract to the USGS, completed detailed geologic mapping, collected geochemical samples, and examined mines and prospects in the study area (Smith, 1986). A final report will be available in September 1987.

The USGS and DGGS completed field work for a cooperative geologic and mineral-resource investigation in the

Iditarod Quadrangle, which includes the historic Innoko and Iditarod mining districts. The USGS also issued a bibliography that summarizes data releases and folio reports for the Alaska Mineral Resource Assessment Program (AMRAP). This program spans more than a decade of mineral research in Alaska by that agency (Winkler, 1986).

Several studies on Alaska's strategic-mineral resources were released by the USBM. Reports include the first documentation of an Alaskan niobium (columbium) resource near Manley Hot Springs and information on promising platinum resources north of Paxson and at Goodnews Bay (Barker and others, 1985; Southworth and Foley, 1986; Warner and others, 1986).

DGGS released Special Report 37, 'Map of Alaska's coal resources,' which illustrates coal resources in the state in a hierarchy from regional provinces to basins, fields, districts, and occurrences. The 1:2,500,000-scale color map is accompanied by a brief text and data tables (Merritt and Hawley, 1986).

In June 1986, the Board of Regents of the University of Alaska approved a 1-yr certificate program in Mining Technology at Tanana Valley Community College in Fairbanks. The objectives of the program are to provide entry-level training for technical and supervisory positions with exploration, mining, environmental, and consulting firms and to provide career development for those already active in the minerals community.

This report includes six appendixes that contain information about mineral-industry activities and issues. Appendix A lists active claims and new claims staked on state and federal land in 1984, 1985, and 1986. Appendix B lists the functions, key personnel, and mailing addresses of state, federal, and private agencies involved in mineral-development activities in 1986. Appendix C lists selected significant mineral deposits in Alaska. Mining licenses issued by the Alaska Department of Revenue in 1986 are listed in Appendix D. Appendix E lists production estimates for nine metals in Alaska from 1880 through 1986, and appendix F lists production estimates for industrial minerals and coal for the same period.

Acknowledgments

This report is designed, produced, and distributed by the Alaska Department of Natural Resources Division of Geological and Geophysical Surveys (DGGS) and Division of Mining (DOM) and the Department of Commerce and Economic Development Division of Minerals and Forest Products (DMFP). The success of this sixth annual report on Alaska's mineral industry continues to be dependent on information volunteered by the private sector. We thank Alaska's miners, industry explorationists, consultants, sand-and-gravel companies, Native corporations, petroleum corporations (using sand and gravel), and federal and state agencies for their cooperation.

T.K. Bundtzen and C.L. Daniels (DGGS) mailed 1,050 questionnaires on mineral activity in Alaska. C.H. Stevenson and M.E. Brown (DOM) compiled claim statistics shown in appendix A and figures 3 and 4. Bundtzen wrote the executive summary, exploration, production, and part of the development sections and compiled statistics used in these sections. C.B. Green (DMFP) provided information on the Red Dog, Greens Creek, and Quartz Hill developments. James Deagen (DMFP) compiled most of the material concerning mineral potential on lands owned by Native corporations. L.L. Lueck (DGGS) compiled appendixes A and B; Bundtzen, M.S. Robinson (DGGS), and Lueck compiled appendixes C and D; and Bundtzen compiled production estimates for appendixes E and F. Green designed the initial report format and wrote the drilling section. Deagen oversaw cover design and printing of the report. John F.M. Sims, G.R. Eakins, Bundtzen, Daniels, Green, Deagen, T.L. Pittman (U.S. Bureau of Mines), and K.E. Adams (DGGS) reviewed and edited the report.

Exploration activity during 1986

INTRODUCTION

Mineral-exploration activity in Alaska in 1986 approximated the level established in 1985. Total reported exploration expenditures during 1986 were $8,914,744, compared to $9,150,000 in the previous year, a decline of 2 percent. Expenditures are listed by commodity and region in tables 2 and 3 and shown graphically in figure 2. The slight decline in exploration expenditures during 1986 is overshadowed by even larger declines in claim activity (figs. 3 and 4). The number of new claims staked declined 22 percent (5,315 in 1986 vs. 6,773 in 1985), and the number of active claims maintained on state and federal lands declined 14 percent (71,024 in 1986 vs. 81,782 in 1985).

Alaska's mineral-exploration industry is restructuring and stabilizing after the departure of major mineral firms during the last 2 to 3 yr, including ANACONDA MINERALS COMPANY (ANACONDA), AMERICAN SMELTING AND REFINING COMPANY (ASARCO), ENSERCH EXPLORATION (ENSERCH), EXXON MINERALS, NORANDA EXPLORATION, INC. (NORANDA), INSPIRATION DEVELOPMENT, HECLA MINING COMPANY, PHILLIPS MINERALS DIVISION, MOHAWK OIL AND GAS, INC., TETON EXPLORATION (TE-

Table 2. *Reported exploration expenditures in Alaska by commodity groupings, 1981-86.*

	1981	1982	1983	1984	1985	1986
Base metals	$28,262,200	$31,757,900	$ 9,758,760	$ 4,720,596	$2,397,600	$1,847,660
Precious metals	35,273,200	10,944,100	20,897,555	14,948,554	6,482,400	6,107,084
Industrial minerals	10,300,000	--	2,068,300	270,000	--	170,000
Coal and peat	2,341,000	2,900,000	1,338,454	2,065,000	270,000	790,000
Other[a]	127,000	15,300	70,000	279,500	--	--
TOTAL	$76,303,400	$45,617,300	$34,133,069	$22,283,650	$9,150,000	$8,914,744

[a]Includes jade, soapstone, uranium, and other unspecified commodities.

TON), and ST. JOE AMERICAN CORPORATION. Some of these firms were oil-company subsidiaries that were dissolved or redirected to programs outside Alaska.

KENNECOTT CORPORATION (KENNECOTT) closed their Anchorage office in February 1986, but directed exploration programs in Alaska from their home office in Salt Lake City, Utah. In late December, NERCO announced that they would move their corporate headquarters from Fairbanks to Vancouver, Washington, by midsummer 1987. This move will result in the loss of 150 jobs and $2 million in salaries in interior Alaska. However, NERCO'S exploration division, RESOURCE ASSOCIATES OF ALASKA, INC. (RAA), will maintain an office in Fairbanks and will conduct a large exploration program in 1987.

Exploration firms new to Alaska in recent years include ECHO BAY MINES, LTD., LONG LAC MINERALS, and EXVENCO RESOURCES (EXVENCO). These companies are evaluating prospects and mineral developments in the southeastern region of the state (fig. 5).

During the 1970s, about $254 million was expended on mineral exploration in Alaska (Conwell, 1979). Of this, about 5 percent ($13 million) was expended in exploration for nonmetallic minerals and coal and about 26 percent was directed towards exploration for precious metals [mainly gold ($66 million)]. About 69 percent ($175 million) was expended in exploration for tin, zinc, copper, tungsten, nickel, and molybdenum.

Since the early 1980s, mineral exploration has been focused primarily on precious metals. Of the $196 million spent from 1981 to 1986 (table 2), 48 percent was expended in exploration for precious metals ($94 million), 40 percent was directed toward exploration for base metals ($78 million), and the remaining 12 percent ($24 million) was expended in search for nonmetallic minerals and coal. In the last 2 yr, nearly 70 percent of the Alaska exploration dollar was spent in search of precious metals. Nationwide about 90 percent of exploration expenditures was directed at gold and silver deposits (Metals Economics Group, 1986). Selected mineral-exploration projects in Alaska are shown in figure 6 and summarized below.

NORTHERN REGION

The northern region covers the northern one-third of the state and includes the Brooks Range, De Long Mountains, and North Slope. Reported exploration expenditures in the region declined from $1,860,000 in 1985 to $601,000 in 1986. Limited assessment work was completed on various properties within the region, which includes the world-class Ambler mining district (Hitzman and others, 1982; 1986) and the Noatak zinc-lead-barite district (Moore and others, 1986). Access to the Ambler mining district is complicated by the distance to the nearest road, rail, or tidewater site. In addition, the district is surrounded by five national conservation units established in 1980 by the Alaska National Interest Lands Conservation Act (ANILCA).

METALS

NANA REGIONAL CORPORATION (NANA) explored for zinc, gold,

Table 3. *Reported exploration expenditures in Alaska by commodity and region, 1986.*

	Northern	Western	Eastern interior	Southwestern	Southcentral	Southeastern	Alaska Peninsula
Base metals	$475,000	$ 25,000	$ 800,000	$ 55,000	$ 75,000	$ 417,660	$ --
Precious metals							--
Placer	26,000	57,800	948,174	56,200	1,583,850	3,560	21,500
Lode	--	500,000	430,000	65,000	110,000	2,305,000	--
Coal and peat	--	--	200,000	--	590,000	--	--
Industrial minerals	100,000	--	--	--	50,000	20,000	--
TOTAL	$601,000	$582,800	$2,378,174	$176,200	$2,408,850	$2,746,220	$21,500
Employment (person-days)	1,643	1,596	7,779	592	6,274	3,864	68

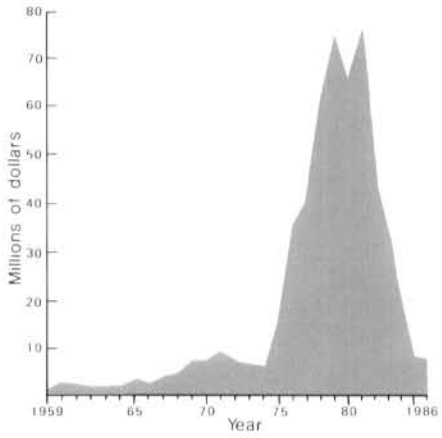

Figure 2. Mineral-exploration expenditures in Alaska, 1959-86.

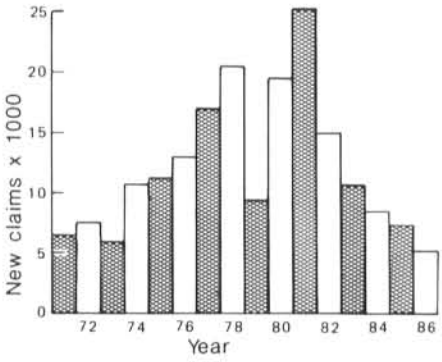

Figure 3. New claims filed in Alaska, 1971-86.

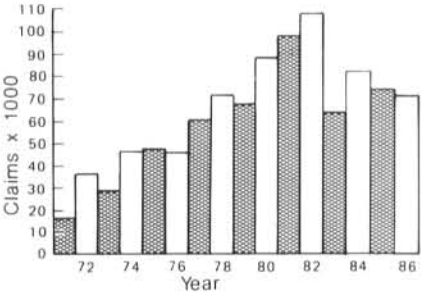

Figure 4. Assessment work filed in Alaska, 1971-86.

and silver in the Noatak mining district and initiated reconnaissance geologic studies and geochemical sampling. COMINCO ALASKA, INC. (COMINCO), conducted exploration drilling in the Wulik basin (loc. 2a, fig. 6) and Ambler mining district (loc. 2b, fig. 6) at the same level as in 1985 and also assessed over 2,000 mining claims in the Wulik basin. ARCTIC SLOPE CONSULTING ENGINEERS, in a joint venture with KAKTOVIK-INUPIAT CORPORATION, explored for base metals along the north flank of the Brooks Range from the Kukpowruk to Wulik Rivers (loc. 1a-b, fig. 6). The AMBLER MINING COMPANY, a subsidiary of SUNSHINE MINING COMPANY (SUNSHINE), ceased work on most of its claim-holdings, including the Cliff, Bud, Kogo, Cynbad, and Tom-Tom massive-sulfide prospects in the Ambler mining district. Most of SUNSHINE'S properties were sold to NANA. Likewise, KENNECOTT sold property in the Ambler mining district to NANA, namely the Ruby Creek copper deposit, but held other property such as the Arctic Camp deposit, which contains nearly 40 million tons of ore that grade 4 percent copper and 5½ percent zinc with credits of silver and gold (Schmidt, 1986).

WILD RIVER VENTURES (Wally and Bonnie Gordon) conducted geochemical analyses and test cuts on Lake Creek in the Wild Lake area and announced a gold-placer reserve of at least 10,000 oz with possibilities of further extensions of the paystreak (loc. 3, fig. 6; fig. 7). A lessee of LITTLE SQUAW GOLD MINING COMPANY conducted minor exploration work, including drill tests and rock and mineral analyses, on Little Squaw, Tobin, Big Squaw, and St. Mary's Creeks in the Chandalar mining district. DODIES DREAM COMPANY explored the south fork of 12 Mile Creek (Wiseman mining district) by hand-prospecting methods, and BILL NORDEEN explored for placer deposits and produced from his claims on Emma Creek in the Wiseman mining district.

INDUSTRIAL MINERALS

ARCTIC SLOPE REGIONAL CORPORATION drilled a gravel deposit at the Kaktovik pit on Barter Island and proved up 3.5 million tons of aggregate in anticipation of future oil-and-gas development.

MRS. ORO STEWART located additional high-quality jade boulders on her Dahl Creek jade property and conducted routine assessment on claims formerly held by her husband, HERBERT IVAN STEWART, who passed away in June 1986.

COAL

ARCTIC SLOPE REGIONAL CORPORATION and ARCTIC SLOPE CONSULTING ENGINEERS (1986) completed feasibility studies for development of one or several open-pit coal mines in the Deadfall syncline area, northwest Alaska. The general findings of the 3-yr analysis are listed below:

1. Coal reserves, mainly located in the Deadfall syncline, are in a structurally simple area that allows conventional open-pit mining with a 4:1 stripping ratio.
2. At an annual production level of 100,000 tons, the Deadfall syncline deposit can supply coal to meet local needs for 400 yr.
3. Coal quality is high-volatile 'B' bituminous with an average (as-received) heating value of 12,000 Btu, ash content of 10 percent, moisture content of 5 percent, and sulfur content of 0.1 to 0.3 percent.
4. A 4-yr development schedule will require 24 permits, 5.4 mi of haul road, a 4,000-ft-long airstrip, and a dredged port facility. Total development costs are estimated at $16 million.
5. Coal could be produced and sold (in Kotzebue) for $91/ton compared to the present cost of $108/ton ($4.50/million Btu).
6. There are no major environmental constraints to mining.

The commercial viability of the proposed development may depend on whether the Red Dog project and future resource-development projects in the area select coal as their power source.

WESTERN REGION

The western region of Alaska includes the Seward Peninsula, the lower Yukon River (including the

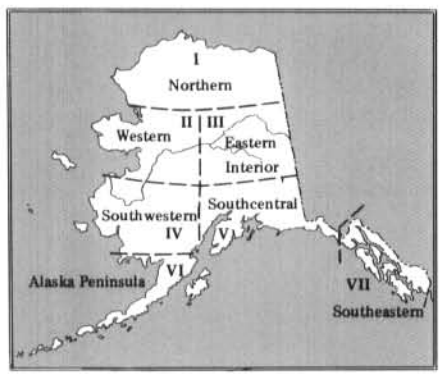

Figure 5. Regions of mineral activity in Alaska, 1986.

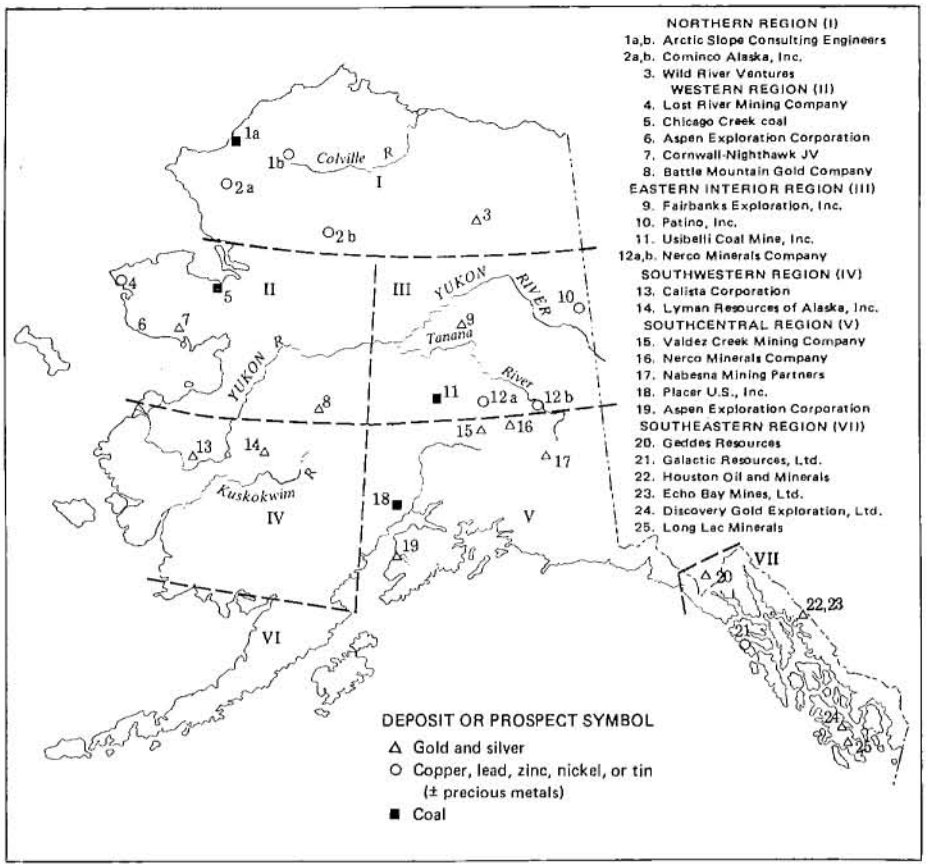

Figure 6. Selected mineral-exploration projects in Alaska, 1986.

Ruby-Poorman and Koyukuk-Hogatza mining districts), and the upper Kuskokwim-Innoko Rivers (including the Nixon Fork, Innoko, and Tolstoi mining districts). In 1986, expenditures in the western region totaled $582,800, down from $650,000 spent in 1985.

METALS

BATTLE MOUNTAIN GOLD COMPANY, formerly DUVAL CORPORATION, conducted the largest exploration project in the western region. The company employed 10 people for a 70-day field season to continue evaluating the Nixon Fork gold-copper-bismuth skarn deposits north of Medfra on the Kuskokwim River (loc. 8, fig. 6). ALSINCO, INC. (Fairbanks), completed 10,000 ft of rotary drilling for the project.

Using a crew of six, LOST RIVER MINING COMPANY mapped, sampled, and processed mineral deposits at the Cape Creek tin mine on the western tip of the Seward Peninsula (loc. 4, fig. 6).

ASPEN EXPLORATION CORPORATION (ASPEN; Denver) announced that it acquired a lode mining lease on the Nome coastal plain, south-central Seward Peninsula (loc. 6, fig. 6), from ALASKA GOLD COMPANY (Nome). The lease includes a 17,500-acre tract of mining claims, most of which were patented in the early 1900s. ASPEN President R.V. Bailey stated that the tract contains some of the most promising and accessible lode mineralization in Alaska. The lode targets may underlie rich placer-gold deposits mined by ALASKA GOLD COMPANY and its predecessor, USSR&M COMPANY (Nome, Fairbanks). ASPEN is assuming that the 'mother lode' of the 4 million oz of placer gold is in bedrock of the coastal plain near Nome. Late in the season, ASPEN announced that it had discovered veins of up to 1.24 oz/ton gold during mineral evaluations of the lease tract.

CORNWALL PACIFIC ALASKA, INC., in a joint venture with NIGHTHAWK RESOURCES, LTD., continued work on the Big Hurrah gold-tungsten-quartz vein deposit near Solomon, Seward Peninsula (loc. 7, fig. 6). Metallurgical studies of bulk samples collected in previous years were conducted, and preliminary estimates of total mineral reserves were compiled. The Big Hurrah deposit was mined from 1903 to 1907 and again from 1944 to 1952. At least 27,000 oz of gold were produced, making it the largest producer of lode gold on the Seward Peninsula (Read and Meinert, 1986).

The BERG-WETLESEN PARTNERSHIP, in joint venture with AU MINING COMPANY and PARDNERS MINING, drilled placer-gold and lode silver-lead-zinc deposits on Independence, Candle, and Mud Creeks, central Seward Peninsula.

YUKON MINING COMPANY (Anchorage) drilled and sampled mineralized zones on Golden Creek, a tributary to Illinois Creek, on the flank of the Kaiyuh Hills, western Alaska. The principal prospects on Golden Creek are gold placers derived from nearby lode sources. FLAT CREEK MINING (Pete Haggland) drilled gold-placer prospects in the Ruby-Poorman mining district south of the Yukon River. TOLSTOI MINING (Doug and Gail Sherrer) explored for tin, gold, and platinum on a tributary of the Innoko River (Boob Creek) that has been mined for gold and byproduct platinum since the early 20th century.

INDUSTRIAL MINERALS

Exploration drilling for riprap and leach stone to construct a seawall for Nome was conducted north of the city by KIEWIT CONSTRUCTION COMPANY.

COAL

Retherford and others (1986) completed a State-supported assessment of a proposed coal mine at Chicago Creek, northcentral Seward Peninsula (loc. 5, fig. 6). On the basis of 7,700 ft of rotary drilling, the reserve at Chicago Creek contains 4.7 million tons of coal of which 1.5 million tons can be mined at a stripping ratio of 1.7:1. The heating value of mined coal will probably average 7,500 Btu/lb, and ash and sulfur contents should be low. The researchers assumed two basic scenarios for developing the coal resource: 1) developing the coal at a rate of 50,000 ton/yr to supply the electric-power needs of Kotzebue, and 2) developing the coal at a rate of 150,000 ton/yr to supply the electric-power

needs of Kotzebue and the proposed Red Dog Mine. Preliminary results indicate that annual mining rates of 50,000 tons or less may not be competitive with imported coal or fuel oil. However, annual rates of 150,000 tons could be competitively delivered to Red Dog and Kotzebue power plants at $42/short ton ($2.80/million Btu).

EASTERN INTERIOR REGION

The eastern interior region, the source of half of all historical gold production in Alaska, covers 16 quadrangles, including mineralized areas in the Alaska Range and Yukon-Tanana Upland. Exploration expenditures in the region rose to $2,378,174 in 1986 from $1,749,000 in 1985, an increase of 36 percent.

METALS

NERCO MINERALS COMPANY (NERCO) signed an agreement with MERIDIAN MINERALS COMPANY (MERIDIAN), a subsidiary of BURLINGTON NORTHERN, INC., to explore for gold and other minerals on NERCO'S property in the Alaska Range (loc. 12a-b, fig. 6). Under terms of the agreement, NERCO'S exploration arm, RESOURCE ASSOCIATES OF ALASKA (RAA), conducted field work from Healy to Tok; most of its efforts were concentrated on gold prospects in the Robertson and Tok River drainages, eastern Alaska. In total, RAA crews of 15 to 20 people drilled 7,000 ft of core, completed 100 mi^2 of geologic mapping, and ran 30,000 ft of magnetic and VLF geophysical lines during the 1986 field season.

PATINO, INC., the United States subsidiary of NORTHGATE EXPLORATION, LTD., investigated high-grade zinc-lead-silver deposits on land owned by DOYON, LTD. (Fairbanks), at Step Mountain north of the Yukon River (loc. 10, fig. 6).

Numerous placer-mining operators throughout the eastern interior region conducted mineral-exploration programs: C.W. CLEVELAND, INC., S AND H ENTERPRISES, DAE MINING, EASTMAN/GIBSON PARTNERSHIP, EARL H. BEISTLINE (fig. 8), RON WREDE, ROBERT COY, RAY WOLF, LYLE COLLEDGE, and BEACH RIVER CORPORATION in the Circle

Figure 7. Exploration-production drift-mining shaft operated by Wild River Ventures on Lake Creek, Wild Lake area, central Brooks Range, northern Alaska. Photograph by W.E. Gordon, 1986.

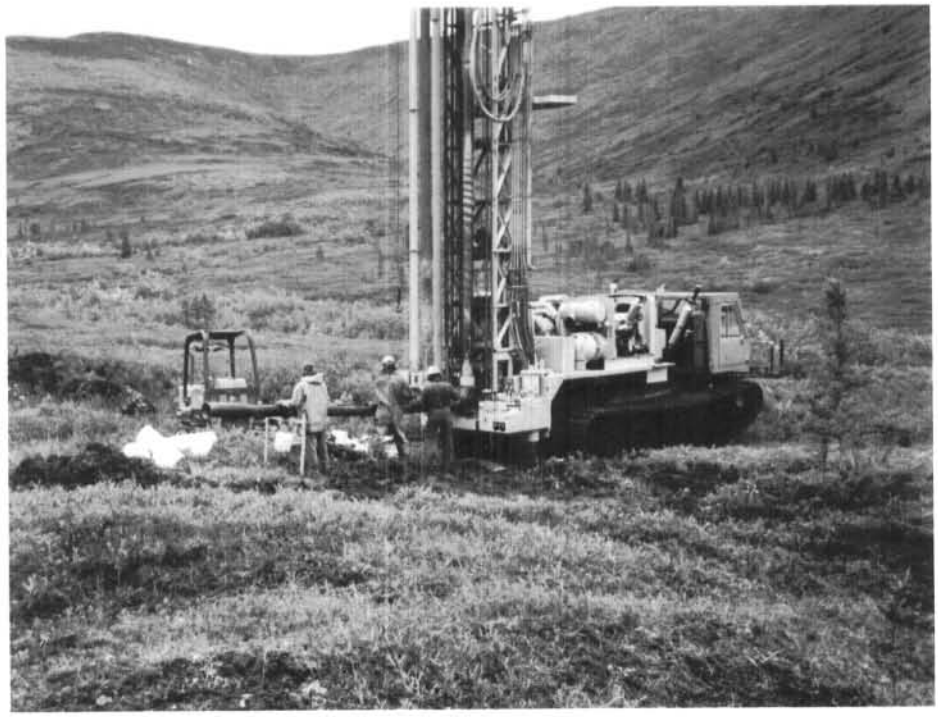

Figure 8. Skidmore drilling program on Mastadon Creek, Circle mining district, eastern interior Alaska. Photograph by E.H. Beistline, 1986.

mining district; HERNING EXPLORATION AND MINING, OSCAR TWEITEN, FOUR BROTHERS MINING, SMITH BROTHERS MINING, and WALTER ROMAN in the Fairbanks mining district; FAIRBANKS MINING COMPANY and BOULDER CREEK MINING COMPANY in the Manley-Tofty mining district; LESLIE MAXWELL, FRANK VANA, CHARLES HAMMOND, and KAVIC MINING COMPANY in the Fortymile mining district; and BILL SMITH, TOMMY VAN, INC., and D'LOG ENTERPRISES in the Bonnifield mining district. ROY FERRENBACH completed an exploratory shaft near Olnes in the Fairbanks mining district. Reported findings ranged from 'disappointing' prospects to placer reserves worth several million dollars.

FAIRBANKS EXPLORATION, INC., conducted aggressive claim acquisition and exploration and development programs in interior Alaska (loc. 9, fig. 6), including surface and underground work on its Vetter-McKibben, Newsboy Mine, and Any Creek gold-silver properties in the Fairbanks mining district and its Rainey Hollow gold-silver prospect in the Tolovana mining district. The corporation currently controls about 20,000 acres in the Fairbanks mining district and holds several past-producing lode-gold mines. In 1986, plans were implemented to obtain joint-venture and public-equity financing for development of the corporation's mineral holdings.

While searching for lode deposits of antimony, bismuth, and gold on Spruce Creek in the Fairbanks mining district, EXPLORATION GEO CONSULTANTS located a shaft that contained mineralized float. ROGER MCPHERSON, using a magnetometer, EM, geochemical analyses, and hand-dug test pits, evaluated the Grateful Dog lode claims near O'Connor Creek in the Fairbanks mining district. He encountered anomalous thorium, niobium, tantalum, and rare-earth elements in stockwork-like fissures in metaplutonic(?) rocks of the area.

MACK THOENNES reported encouraging results in his search for base- and precious-metal lodes in the Livengood Quadrangle.

COAL AND PEAT

USIBELLI COAL MINE, INC., conducted an exploration program on Two Bull Ridge that included a drilling program with E-log and core analyses. About 10,000 ft of rotary drilling was completed (loc. 11, fig. 6).

DIAMONDS

The recovery of three alluvial diamonds in 1982, 1984, and 1986 from widely separated placer-mining operations on Crooked Creek in the Circle mining district continued to attract interest in the lode- and placer-diamond potential of the Crooked Creek area. In 1985 and 1986, R.B. Forbes (under contract to DGGS), J.T. Kline (DGGS), and Al Clough (USBM) conducted reconnaissance studies of Crooked Creek gravels (fig. 9). Although tailings and pan-, sluice-, and jig-concentrate samples were examined for kimberlite indicator minerals and diamonds, none were found. These findings coincide with those of corporate geologists who also failed to find diamond indicator minerals during their studies on Crooked Creek.

Forbes and others (1987) reported that although primary sources of diamonds in the surrounding region have not been identified, the tectonic framework of both the Porcupine River region north of the Yukon River and of the Yukon-Tanana Upland schist terrane near its western edge may favor the occurrence(s) of kimberlitic rocks. The recent discovery of a carbonatite pluton near Tofty (Warner and others, 1986) suggests that diamond-bearing rocks could exist in the Yukon-Tanana Upland.

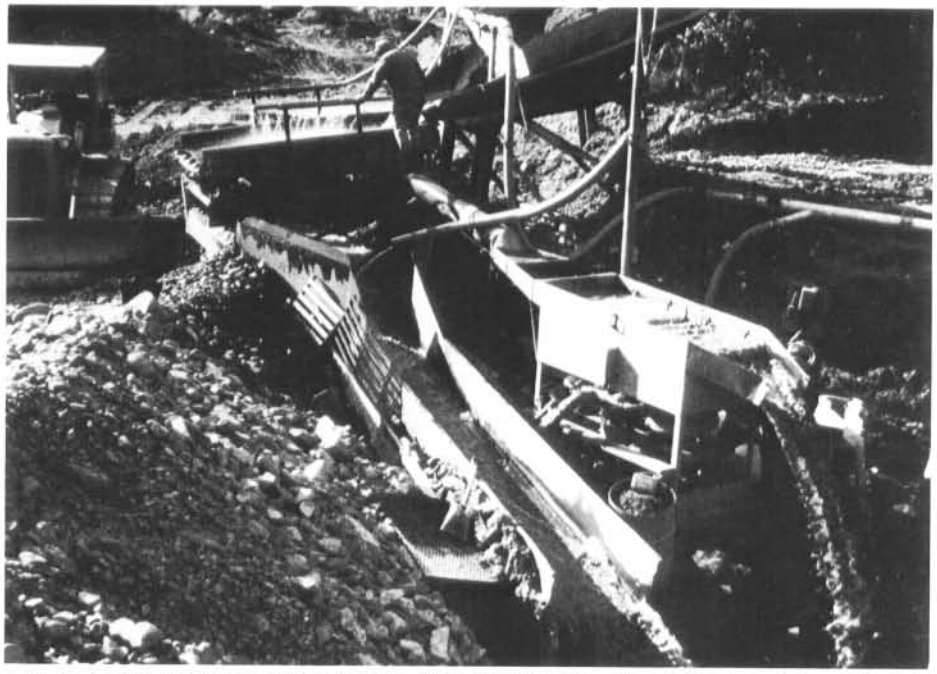

Figure 9. Diamond-jig plant in operation on Crooked Creek, Circle mining district, eastern interior Alaska. Photograph by Al Clough, U.S. Bureau of Mines, 1986.

SOUTHWESTERN AND ALASKA PENINSULA REGIONS

WILBUR AND ANN WILLIAMS reported exploration efforts at their Granite Creek property in the historic Iditarod mining district near Flat. CINNABAR CREEK, LTD., mapped and trenched placer and lode deposits of gold and mercury at their Taylor Mountains and Cinnabar Creek properties in the lower Kuskokwim River drainage.

CALISTA CORPORATION explored deposits in the Red Devil and Goodnews Bay areas and released data on promising lode-gold potential in the Marshall mining district (loc. 13, fig. 6; Turner, 1986). The WILMARTH BROTHERS searched for additional placer reserves at their Julian Creek Mine in the Iditarod-George River mining district and also sampled lode-gold mineralization at the head of Julian Creek. Radioactive minerals and mercury are commonly found in heavy-mineral concentrates from this area.

HOWARD BOWMAN followed up on magnetometer work conducted by ARCTIC TESTING LABS on his placer claims at Portage Creek on the north shore of Lake Clark.

LYMAN RESOURCES OF ALASKA, INC., drilled their Snow and Quartz Gulch properties in the Donlin Creek area north of Crooked Creek and produced gold from Quartz Gulch Mine (loc. 14, fig. 6). They will continue exploring for additional minable bench ground on property leased from CALISTA CORPORATION.

MAGNUSON MINING COMPANY drilled lower Ganes Creek in the Innoko mining district in hopes of finding additional gold reserves.

ALASKA APOLLO GOLD MINES, LTD. (Phoenix, Arizona), drilled test holes and completed minor roadwork on their Unga Island properties in the Aleutian Islands. Drilling results indicate 1,400,000 tons of mineralized rock. AMAX EXPLORATION also worked gold properties in the Aleutian Islands.

SOUTHCENTRAL REGION

The southcentral region covers much of the southern flank of the Alaska Range, the Talkeetna, Wrangell, and Chugach Mountains, and coastal areas that include Cook Inlet and Prince William Sound. Nelchina, Willow Creek, Nizina (Kennecott-McCarthy areas), Sunrise, Yakutat, and Seldovia are historic mining districts in the region where mining activities, mainly for placer gold and industrial minerals, are widespread. Exploration expenditures rose to $2,408,850 in 1986, compared to $1,281,000 in 1985, an increase of 88 percent. The growth is attributed to increased exploration for placer deposits and to continued evaluation of important coal resources.

METALS

NABESNA MINING PARTNERS (Wayne Bolt) continued to evaluate the Rambler and Nabesna gold deposits in the Chisana mining district near the White Mountain Mine, north flank of the Wrangell Mountains (loc. 17, fig. 6). Recent work on the Rambler deposit consisted of drilling seven test holes; indicated reserves are 18,283 tons of ore that grade 0.90 oz/ton gold and 1.16 oz/ton silver. From 1930 to 1941, Nabesna Gold Mine, a classic gold-iron skarn, yielded 66,000 oz of gold from 88,000 tons of ore mined from the eastern rim of a diorite body (Wayland, 1943). Nearly 20,000 ft of diamond drilling conducted in 1985-86 near the old Nabesna Gold Mine uncovered a previously unknown ore system on the west side of the diorite body. More exploration is planned for 1987. Recent federal court actions may guarantee access from the Tok 'Cutoff' Highway to the mine property along Nabesna Road through the Wrangell - St. Elias National Park and Preserve.

HAWLEY RESOURCE GROUP and GOLDEN ZONE DEVELOPMENTS, LTD. (GOLDEN ZONE), conducted a limited drilling program at Golden Zone Mine in the Chulitna mineral belt. Located about 9 mi from the Alaska Railroad, the mineral deposit is well situated and contains inferred reserves of 5 million tons of 0.1 oz/ton gold with credits of copper, arsenic, and silver.

FINNBEAR MINING AND EXPLORATION, INC. (Arne W. Murto), continued work on property in the Skwentna River drainage west of the Cache Creek - Collinsville mining district. The company continued to evaluate promising lode and placer deposits of gold, silver, platinum, copper, and manganese and is planning small-scale development of placers on Owl Creek.

GOLD CORD DEVELOPMENT CORPORATION (Dan Renshaw) conducted 400 ft of diamond drilling on the Sheared Claims and Gold Cord Mine in the historic Willow Creek mining district.

The previously active VAN ZELST GROUP did not conduct exploration on 'Kennecott-type' copper-silver-gold deposits in the Nizina mining district, southern Wrangell Mountains, pending resolution of various economic and political complications. The claims were included in Wrangell - St. Elias National Park and Preserve in 1980.

HENDRICKSON EXPLORATION AND MINING reported exploratory work at the Crown Point, Black Butte, Skeen-Lechner, and Falls Creek gold mines in the Seward mining district, Kenai Peninsula. In addition to channel sampling and geologic mapping, the company upgraded access roads and considered whether milled ores would be more marketable than sorted ores.

NORTHERN LIGHTS EXPLORATION COMPANY trenched for copper and gold in the Chulitna mining district.

FRED NELIUS worked on a high-grade antimony (stibnite) lode in the Chunilna mining district near Talkeetna. NELIUS is selectively hand-cobbing high-grade ore while waiting for a more favorable stibnite market.

NERCO conducted a limited drilling and assessment program on the 'Zackly' gold skarn west of Paxson (loc. 16, fig. 6). Indicated reserves are 1.25 million tons of 0.17 oz/ton gold with credits of copper and silver.

A three-man crew worked most of the year for BLACK SANDS MINING COMPANY (Philip Strange). They drove a crosscut, drilled two holes, and retimbered old drifts on the Arch property in the Willow Creek mining district, Hatcher Pass area. The company is preparing the property for development and production in 1987 or 1988.

LENA FLEN MINERALS, INC. (Dan Berkshire), worked on the Lucky Strike, New Hope, and Sixmile gold prospects in the Sunrise mining district, Kenai Peninsula. Bulk sampling, geologic mapping, and magnetometer surveys constituted most of their efforts.

The largest exploration effort in the region was that of the VALDEZ CREEK MINING COMPANY, formerly DENALI MINES, INC., which contracted WGM, INC. (Anchorage), to drill 20,000 ft (reverse circulation) on the Tammany and adjacent paleochannels east of Cantwell (loc. 15, fig. 6). This property continues to produce more gold than any other site in Alaska.

Other companies that reported exploration on placer properties include MIKE CONNER and J.T. STUBBLEFIELD in the Talkeetna-Chunilna mining district; CLIFFORD DINGMAN, GAME CREEK MINING COMPANY, FREDERICK HAAS, and GOODROCK PLACER ASSOCIATION in the Kenai Peninsula mining districts; NORTH CREEK MINING in the Nizina mining district; the MATTHISEN-HUNT PARTNERSHIP on Theodore River;

H&H CONTRACTORS in the Cache Creek-Collinsville mining district; and MURRAY JONES in the Valdez Creek mining district.

Several years ago ASPEN EXPLORATION CORPORATION (ASPEN) applied for State offshore-prospecting permits to evaluate a 238,000-acre site in Cook Inlet near Anchorage for possible economic concentrations of placer gold (loc. 19, fig. 6). After the application was denied by the State, ASPEN president R.V. Bailey filed a lawsuit to reverse the decision. In November 1986, the State announced that it would reconsider the denial.

ASPEN is also interested in a 38,000-acre tract between Ninilchik and Anchor Point on lower Cook Inlet. Issuance of a prospecting permit for this area is opposed by some residents and local fisherman who expressed concern for salmon and halibut fisheries in the area. However, Kenai Peninsula Borough Mayor Stan Thompson, a 30-yr commercial fisherman, supports the project because he believes the economic benefits would be substantial and the environmental impacts minimal. ASPEN estimates that a large offshore dredging facility could employ 100 to 200 people and produce 50,000 to 100,000 oz of gold annually. The company has spent over $1 million during a 5-yr period, primarily in magnetometer surveys, and has contracted DAMES AND MOORE, INC., to conduct biological studies of benthic (bottom-dwelling) organisms in Cook Inlet. Bailey emphasized that ASPEN is presently seeking permits for prospecting only, and that they will not seek a mining permit until they document an economic reserve(s) in the Inlet. The State is expected to make a final decision on the permits in 1987.

VERN GRIFFEN reported that his mining claims had been condemned by the State and BLM to facilitate creation of a new entrance to the south side of Denali National Park and Preserve; hence his longtime exploration and mining activity ceased. BOBNIK MINING (Kenai Peninsula) conducted only assessment-level exploration last season due to regulatory problems.

COAL AND PEAT

PLACER, U.S., INC., completed 7,960 ft of exploratory drilling on their Center Ridge lease in the Beluga coal field near Anchorage (loc. 18, fig. 6). Announced reserves exceed 150 million tons of export-quality coal.

HAWLEY RESOURCE GROUP and ROCKY MOUNTAIN ENERGY completed bulk sampling and detailed geologic mapping at their Wishbone Hill properties near Palmer. Their activities are described in the Development section.

INDUSTRIAL MINERALS

HAWLEY RESOURCE GROUP completed road work to their 'Don Group' industrial-grade limestone deposits in the Chulitna mining district. These deposits could be important raw-material sources for concrete and fiberglass if demand justifies in-state manufacturing of these products.

ENERGY PACIFIC CORPORATION (Anchorage) was contracted to find raw materials for the manufacture of fiberglass at a proposed plant in Anchorage. Lime, high-silica sand, quartzite, and diatomaceous-earth deposits will be examined.

SOUTHEASTERN REGION

The largest exploration expenditures in the state again took place in the southeastern region, which includes numerous mining districts along the mainland and on islands of the Alexander Archipelago. About 38 percent of the region—which contains high-quality deposits of base and precious metals—is open to mineral entry (Bottge, 1986). Proximity to tidewater provides excellent access to the properties. Total 1986 expenditures were $2,746,220, compared to $2,534,000 in 1985.

METALS

HOUSTON OIL AND MINERALS drilled, sampled, and mapped gold prospects throughout the Juneau Gold Belt north of Juneau, but specific details of their program are not available (loc. 22, fig. 6). ECHO BAY MINES, LTD. (ECHO BAY), continued to explore the Alaska Juneau (AJ) Gold Mine at Juneau (loc. 23, fig. 6). The company assumed the leases from BARRICK RESOURCES in late 1985. In 1986, ECHO BAY accessed the southern part of the AJ ore zone, drilled high-grade ore shoots, and completed a road to the Sheep Creek adit from Thane. The company retained WGM, INC., to calculate reserve estimates and conduct reclamation studies at the mine.

With a crew of 20, GREENS CREEK MINING COMPANY drilled and mapped the Greens Creek deposit on Admiralty Island. Activity at this property is described in the Development section.

LONG LAC MINERALS (Reno) trenched mineralized zones, reconstructed a portal, improved trails, and maintained their camp and equipment at the Kaigani prospect on Dall Island. Similar work was conducted on their Ruby Tuesday polymetal deposit and Niblack base- and precious-metal deposits on Prince of Wales Island (loc. 25, fig. 6).

GALACTIC RESOURCES continued to evaluate important nickel-cobalt reserves on Yakobi Island and Mirror Harbor in the western Chichagof Island region (loc. 21, fig. 6). Open-pit reserves at the Yakobi Island property (Takannis orebody) are 16.2 million tons of 0.31 percent nickel, 0.18 percent copper, and 0.02 percent cobalt.

FREEPORT MINING COMPANY continued an aggressive exploration program in the Panhandle, but details of their efforts are not available.

DISCOVERY GOLD EXPLORATION, LTD. (Canada), continued to explore the Dawson Mine (loc. 24, fig. 6) and nearby prospects in the Hollis mining district on Prince of Wales Island (Herreid and Rose, 1966). The firm constructed a road to the site, collected channel samples for assay, and completed 19 rotary drill holes on the property. Inferred reserves reportedly grade 0.786 oz/ton gold. Additional drilling and reconditioning of underground workings are priorities for 1987.

GEDDES RESOURCES continued to explore the Windy Craggy copper-gold-cobalt deposit located in northern British Columbia 15 mi north of the confluence of the Alsek and Tatshenshini Rivers, about 20 mi east of the U.S.-Canada border (loc. 20, fig. 6). Indicated reserves of 90 million tons of ore grade 3 percent copper and 0.1 percent cobalt with significant credits of gold. Several hundred million tons of lower grade mineralized rock are also

present. Work in 1985 and 1986 included completing a 3,000-ft-long airstrip and designing a 2,800-ft-long exploration drift that will be used to fan drill and bulk sample the deposit from the subsurface. About 26,000 ft of drill core from the deposit was relogged by MINERAL EXPLORATION RESEARCH, INC. (Canada), to determine if gold-bearing intersections were properly identified. The reassessment is necessary because gold was found in areas of sparce sulfides. Access to the deposit will be through Alaska via the port of Haines or through Canada down the Alsek River.

Several placer properties in southeastern Alaska were explored. JO JURGELEIT assessed the gold potential of gravels at the mouth of Porcupine Creek in the Porcupine mining district near Haines. BIG NUGGET MINING COMPANY also proved up mining reserves in the Porcupine Creek drainage; this past producer has been in litigation for several years. CASEY OFFICER explored Dave's Dream in a remote part of the Wrangell mining district, but details of the work were not reported.

Mineral development in 1986

INTRODUCTION

Mineral-development expenditures in Alaska totaled $24.33 million in 1986, compared to $34.12 million in 1985, a decline of 29 percent from the previous year (table 4). Decreased activity on various coal-development projects and completion of preconstruction activities at Quartz Hill and at other base-metal projects were responsible for most of the decline. Development expenditures for precious metals ($16.42 million) approximated those of 1985.

A major new development project in 1986 was the 'Bima' offshore dredging project near Nome. In addition, LA TEKO RESOURCES completed Alaska's first 'heap-leach' precious-metal-extraction test in the Fairbanks mining district. The Grant Gold Mine, also in the Fairbanks mining district, discontinued operation in 1985. However, development activities at the Red Dog and Greens Creek projects are expected to accelerate in 1987, which should contribute to a substantial increase in overall mineral-development expenditures.

Most projects and activities described in this section fit the fairly narrow definition of development—that is, activities preparatory to the mining process. However, some companies combined development and exploration expenditures in questionnaire returns.

RED DOG PROJECT, COMINCO/NANA
Northern region
(loc. 1, fig. 10)

Owner NANA REGIONAL CORPORATION (NANA) and operator COMINCO continued to develop world-class, black-shale-hosted, zinc-lead-silver-barite deposits at Red Dog Creek in the Wulik River drainage, northwest Alaska. COMINCO geologists believe that Red Dog is a complex exhalative deposit that formed during the early development of a restricted sedimentary basin (Moore and others, 1986), whereas Lange and others (1985) believe the mineral deposit is the result of an evolving island arc adjacent to a late Paleozoic continental margin.

Drill tests indicate that the main Red Dog deposit has reserves of 85 million tons of ore that grade 17.1 percent zinc, 5.0 percent lead, and 2.4 oz/ton silver. It is the largest known unmined zinc reserve in the world, second only to the original Broken Hill deposit in New South Wales, Australia (Giegerich, 1986). Preliminary mine and mill design call for production of 580,000 ton/yr of zinc-lead-silver concentrates, with an eventual increase to 700,000 ton/yr. By the early 1990s, the mine will be the largest producer of zinc in the western world if production schedules are met. Concentrates will be refined at COMINCO'S facilities at Trail, British Columbia, and in Japan and Europe.

On November 26, 1986, the Board of Directors of COMINCO approved development of the zinc-lead-silver mine at Red Dog with production scheduled to begin in 1991. Development of the mine site will follow completion of the road and port facility (fig. 11). Total capital expenditures to bring the mine into production are estimated at $350 to $400 million over the 4-yr development phase.

Several important steps were taken in 1986 on the Red Dog project: A final agreement for financing the road and port facilities was signed by the State of Alaska, COMINCO, and NANA; a letter of credit from several international banks guaranteeing repayment of state revenue bonds was secured; and a contract for the construction of

Table 4. *Mineral-development expenditures in Alaska by commodity, 1981-86.*

	1981	1982	1983	1984	1985	1986
Base metals	$ 5,945,000	$10,270,000	$19,500,000	$10,710,500	$13,000,000	$ 7,260,800
Precious metals	11,400,000	19,320,000	7,112,500	15,058,555	16,890,755	16,417,172
Industrial and structural materials	7,000,000	4,251,000	1,000,000	579,000	1,830,000	124,000
Coal and peat	345,000	7,750,000	250,000	27,000,000	2,400,000	530,000
TOTAL	$24,690,000	$41,591,000	$27,862,500	$53,348,055	$34,120,775	$24,331,972

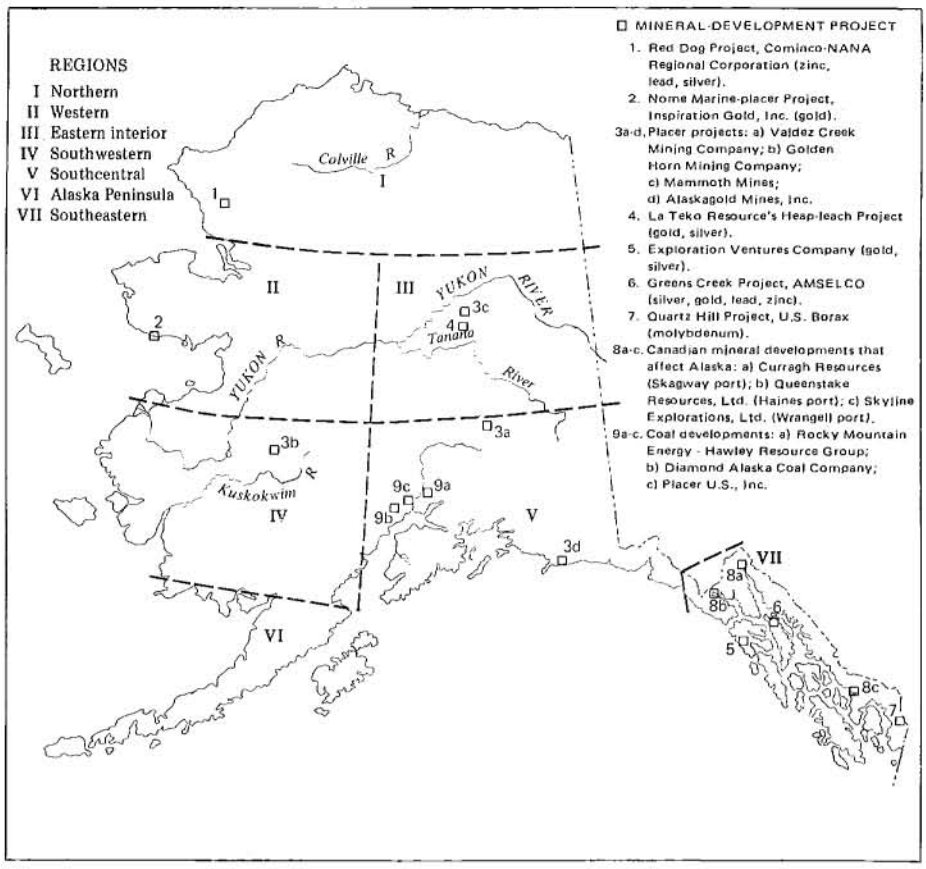

Figure 10. Selected mineral-development projects in Alaska, 1986.

dock and shoreside facilities sufficient to stage construction of the mine road and port was completed (figs. 12 and 13).

Terms for the repayment of revenue bonds issued by the Alaska Industrial Development Authority (AIDA) for construction of the 52-mi-long road and for port facilities to service the Red Dog Mine and other users were defined in the financing agreement signed by COMINCO and the State. The agreement assures the State of a repayment of principal and interest and a 6.5-percent return on investment. Repayment is based on toll fees that will be determined by both the development cost of the mine system and the payments required to amortize the State's investment over 50 yr, plus a 6.5-percent return. The repayment fees may be increased if the price of zinc increases above an index level.

To further assure that the bonds are repaid, the State required that COMINCO secure a letter of credit guaranteeing repayment of bonds. The letter of credit for approximately $120 million was secured by COMINCO from three international banks and delivered to AIDA in October 1986.

A contract for $1.6 million was awarded to ENSERCH ALASKA CONSTRUCTION, INC. (Anchorage), for construction of a gravel pad and steel sheet-pile loading dock that will be used as a staging area for road and port-facility constuction. Work began in July 1986, and construction was completed in September. Other contracts for development of the mine system have been awarded to the RALPH M. PARSONS COMPANY for mine planning, design, and construction and to FOSS MARITIME for the shuttle of concentrates from shore to ocean freighters in self-propelled lightering barges.

In September, COMINCO'S major stockholder, CANADIAN PACIFIC, LTD. (CANADIAN PACIFIC), entered into an agreement to sell its 52.5-percent interest in COMINCO. The largest part of CANADIAN PACIFIC'S holding in COMINCO--31 percent of its equity—was purchased by a holding company with three participants: TECK CORPORATION of Canada (50 percent); METALLGESELLCHAFT of West Germany (25 percent); and MIM HOLDINGS of Australia (25 percent).

NOME MARINE-PLACER PROJECT, INSPIRATION GOLD, INC.
Western region
(loc. 2, fig. 10)

In 1986, INSPIRATION GOLD, INC. (IGI; formerly INSPIRATION MINES, INC.), began an offshore gold-mining operation near Nome after several years of exploration and testing. Development of their offshore state mining leases moved a major step forward with the arrival of 'Bima,' the world's largest offshore mining vessel (fig. 14). The dredge reached Nome on July 5 after being transported from Singapore by ocean-going barge. Production tests commenced on August 5 and continued until October 1. During 1986, the project remained in the development stage.

The enormous offshore dredge, originally designed and used to mine placer tin, is 525 ft long and 150 ft wide with a displacement of nearly 15,000 metric tons. Five diesel generators produce several megawatts of power that approximate the total power requirements of Nome. Equipped with 137 buckets (4 ton, 33 ft^3), the dredge has a capacity to wash 40,000 yd^3 of gravel daily and work to water depths of 140 ft (fig. 15). Previous floating bucket-line dredges in Alaska had a maximum washing capacity of 10,000 yd^3/day. The vessel was purchased from P.T. RIAN MINING COMPANY in Indonesia for $33 million.

With some modifications, the Bima is suitable for offshore dredging in Norton Sound. Mechanical modifications include weatherization of the structure and various changes required by the U.S. Coast Guard. Because the dredge was originally designed to process the tin-ore mineral cassiterite (specific gravity 7), pyrite and other heavy minerals swamped the jig-recovery system. Thus the system is now being designed for placer-gold recovery (specific gravity 19). All modifications are currently being completed in Tacoma, and the dredge is scheduled to arrive in Nome on June 1.

The arrival and operation of the Bima provided a significant economic boost to the Nome community. Of the 86 people employed by IGI, 44 are Alaska hire, including 42 residents of Nome. The remaining 42 employees are specially trained personnel required to operate this complex mining machine. Nearly $70,000 per month was added to the local economy through salary and wages, and IGI provided vocational training in Nome. Approximately $7,500,000 was expended on development, and about 3,000 oz of gold were recovered in 1986 at a gross value of $1,200,000.

MISCELLANEOUS PLACER PROJECTS (loc. 3a-d, fig. 10)

Placer-gold expenditures reported by 40 mining companies during 1986 totaled $11,008,172 or $275,000 per operation, compared to $131,000 per operation during 1985, $85,000 per operation during 1984, and $55,000 per operation during 1983 (table 5). When expenditures for INSPIRATION GOLD, INC., are removed, the average is $116,000 per operation, down 11 percent from 1985 levels.

Most respondents to the DGGS survey indicated that expenditures were for water-recycling systems, mine layout, development drilling, and retroactive reclamation under requirements initiated by BLM during the 1986 season. Concurrent reclamation efforts are further described in the production section. Selected major placer-development projects are summarized below.

In the southcentral Alaska Range, VALDEZ CREEK MINING COMPANY (VCMC) continued development drilling of the Tammany-channel preglacial stream placers (loc. 3a, fig. 10). The previous reserve base of 105,000 oz was substantially increased after 20,300 ft of reverse-air, churn, and rotary drilling; 50,000 ft of resistivity lines; and 17,000 ft of magnetometer surveys. The 1986 development program included the design and implementation of a unique washing plant equipped for winter operation (fig. 16). The plant includes an insulated pumphouse that draws water from a settling pond, completely insulated primary and secondary washing facilities, and jig and wilfrey tables. Additional development

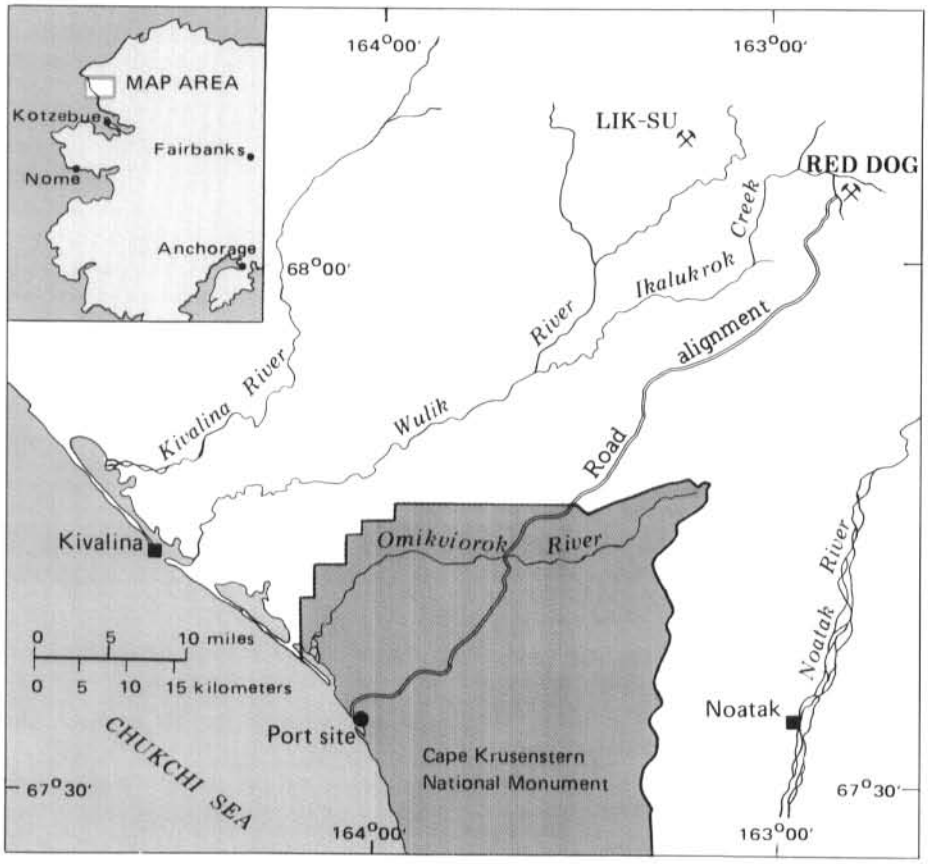

Figure 11. Location map showing Red Dog and Lik-Su zinc-lead deposits and Red Dog road alignment, Wulik River drainage, northwestern Alaska. Data from Geigerich (1986).

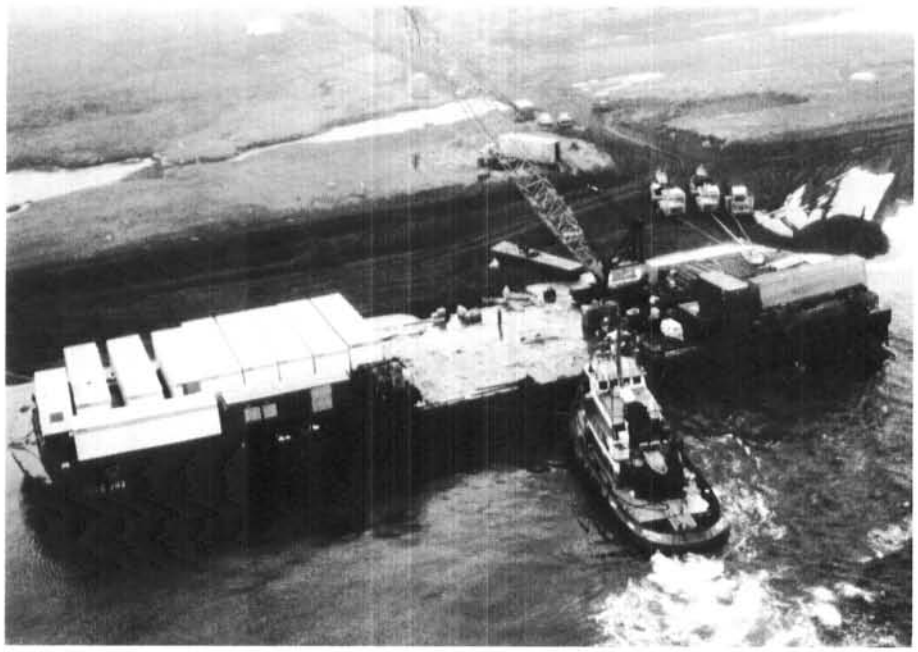

Figure 12. AIC-Martin J.V., Inc., unloading barge laden with construction equipment and materials at Red Dog port on Chukchi Sea, northwestern Alaska. Photograph courtesy of Cominco Alaska, 1986.

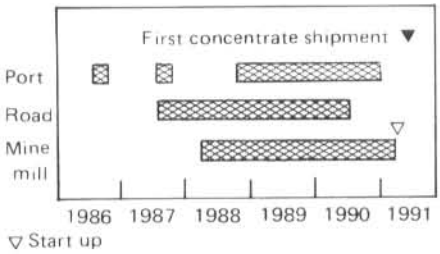

Figure 13. Proposed development of Red Dog zinc-lead-silver-barite project, northwestern Alaska. Data from Giegerich (1986).

costs (not included in table 4) include construction of all-weather machine shops that are scheduled for completion in spring 1987 (fig. 17).

The GOLDEN HORN MINING COMPANY began a unique development project along the Golden Horn gold-tungsten-mercury-antimony shear zone in the historic Iditarod mining district (loc. 3b, fig. 10). Residual mineral deposits directly below the Golden Horn hard-rock mineral deposit were mined, and scheelite-rich heavy-mineral concentrates were collected with a standard sluice box. Quartz-vein float was stockpiled for further processing. Secondary recovery methods involved running mineral concentrates and quartz-vein float through a 3-ft-diam by 6-ft rod mill and a standard 24 ton/day Marcy ball mill (fig. 18). Milled material was processed on a 4-ft by 8-ft wilfrey table. Positive results in 1986 demonstrated the potential to mine bulk tonnages of weathered residual material derived from the Golden Horn shear zone. During the season, a 5-ton bulk sample of scheelite concentrate that contained inclusions of gold was shipped to processing facilities outside the state. Additional scheelite concentrates remain at the mine site awaiting test results.

MAMMOTH MINES (WILBUR CREEK MINE) began development of an underground drift mine in the Livengood mining district with a grant from the State's Placer Demonstration Project (loc. 3c, fig. 10). The 'bench' placer deposit is located west of the active channel of Wilbur Creek, a short tributary of the Tolovana River. The 80-ft-wide paystreak, estimated to contain 300,000 yd^3 of auriferous pay, is capped by 65 to 135 ft of frozen overburden. Previously the property was mined hydraulically to remove the overburden, but limited space for adequate settling ponds made compliance with water-quality regulations difficult. The goal of the project is to develop an economically viable underground mining method applicable to many deeply buried placers in Alaska. Such a method would significantly reduce the amount of water use and discharge.

Figure 14. 'Bima' dredge 2 mi offshore from Front Street, Nome, western Alaska. Photograph courtesy of Inspiration Gold, Inc., 1986.

Development efforts at the drift mine included preparation of a summer stockpile site, construction of service and living quarters, further upgrading of the main service haulroad, installation of a culvert-lined portal, and initial mine operations (fig. 19). Purchased mine equipment includes a single-boom ATH 12 Secoma jumbo drill used to drive 8-ft-long blast holes (fig. 20), a 2-yd^3 Wagner ST 20 'Scoop-tram' mucker, and a 12-yd^3 highway-rated dump truck. Three blasting rounds produce about 200 yd^3 of auriferous gravel per 12-hr shift. By the end of 1986, about 4,600 yd^3 of pay had been stockpiled at a cost of 19.87/yd^3.

ALASKAGOLD MINES, INC. (ALASKAGOLD), continued development work on their 84 claims at Cape Yakataga 100 mi east of Cordova (loc. 3d, fig. 10). Placer-gold strandline deposits were discovered at Yakataga at the turn of the century, and for 15 yr thereafter a small group of local miners worked the rich pay streaks by hand. Before WWI, about 9,771 oz of gold

Table 5. *Reported placer-gold development expenditures by region, 1986.*

Region	Number of operators	Expenditures
Northern	1	$ 10,000
Western	4	7,840,000
Eastern interior	22	477,872
Southwestern	3	206,500
Southcentral	9	2,468,800
Southeastern	1	5,000
TOTAL	40	$11,008,172

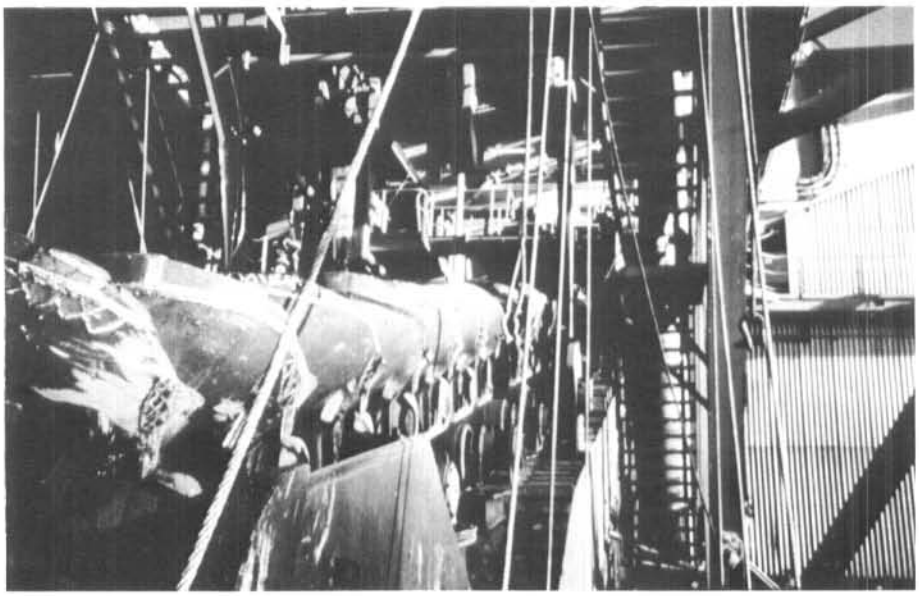

Figure 15. Bucketline of 'Bima' offshore dredge, Nome, western Alaska. Photograph courtesy of Inspiration Gold, Inc.

were recovered from the area. The Yakataga beach deposit consists of beach sands and fine gravels with local concentrations of heavy minerals—mainly red garnet and fine, flat gold. Because the latter is extremely difficult to capture, numerous recovery systems were tested, including flotation, tabling, leaching, amalgamation, and Knelson centrifugal and Flying Dutchman concentrators. Reichert MK VII spirals are expected to be the primary recovery units for the new 500 yd^3/day washing plant that will go into production in 1987. To date, ALASKAGOLD has spent more than $700,000 developing the property.

HEAP-LEACH PROJECT, LA TEKO RESOURCES
Fairbanks mining district (loc. 4, fig. 10)

CITIGOLD, INC., a subsidiary of LA TEKO RESOURCES, completed Alaska's first heap-leach testing program at the Ryan lode in the Fairbanks mining district, eastern interior region. The Ryan lode is an intensely sheared mineralized zone on the southeastern flank of Ester Dome near Fairbanks. It has been a focus of mineral production and exploration activities since the early 20th century. Before 1975, nearly 10,000 tons of selected high-grade ores were produced from underground workings. Previous exploration work by ST. JOE AMERICAN CORPORATION showed that the gold-bearing shear zone is 20 to 130 ft wide and nearly 4,000 ft long. Drill-indicated reserves of 1.9 million tons of ore grade 0.13 oz/ton gold (to the 500-ft level), with credits of silver and antimony. During 1986, 3,500 tons of material grading 0.115 oz/ton gold were processed in the heap-leach project, and a total of 301.6 oz of gold was won at a 73.5-percent rate of recovery.

In October 1986, 750 ft of the shear zone were stripped and sampled, and 70,200 tons of 0.21 oz/ton gold ore were prepared for production. In addition, a carbon test plant that could be expanded to a full-production facility was installed on the property. Although the operating season for leaching is 5 mo, mining will occur year-round.

CHICHAGOF MINING DISTRICT PROJECTS, EXPLORATION VENTURES COMPANY (EXVENCO), also known as Chichagof Joint Venture
Southeastern region (loc. 5, fig. 10)

Two mines under development in the Chichagof mining district on Klag Bay and Kimsham Cove 45 mi north of Sitka were at one time some of the richest hard-rock gold producers in Alaska. From 1918 to 1941, the Chichagof Mine produced 660,000 oz of gold and 200,000 oz of silver from 596,487 tons of ore; the average head grade was 1.2 oz/ton gold. From 1918 to 1943, the nearby Hirst-Chichagof Mine produced 131,000 oz of gold from 140,000 tons of ore. Both orebodies consist of near vertical quartz-gold-sulfide veins that intrude Sitka graywacke of Late Jurassic to Early Cretaceous age along the Chichagof and Hirst-Chichagof fault zones, respectively. The deposits at the main Chichagof Mine were worked to a vertical depth of 4,100 ft; the deepest workings are 2,800 ft below sea level.

Since 1981, the properties have been under evaluation by EXPLORATION VENTURES COMPANY (EXVENCO), a limited partnership based in Spokane, Washington. In 1983, QUEENSTAKE RESOURCES (QUEENSTAKE; Vancouver, B.C) acquired a 25-percent interest in the project. Currently the CHICHAGOF JOINT VENTURE consists of QUEENSTAKE, VECTOR MINING COMPANY, and EXVENCO. The project manager is EXVENCO.

Three major projects are underway at the mines: 1) reprocessing mill tailings, mainly at the Chichagof Mine; 2) developing the Big Croppings vein and Aurum and Sitka shear zones at the same site; and 3) evaluating the 'Kay' oreshoot in the Hirst-Chichagof Mine. At the Chichagof Mine, mill tailings amount to 450,000 tons of ore that average 0.11 oz/ton gold; bulk sampling of the Big Croppings vein indicates reserves of 60,000 tons of ore that grade 0.6 oz/ton gold. Six holes were drilled in the Aurum structure at the Chichagof Mine—with inconclusive results—and a 150-ft-long crosscut was driven into the main shear zone at the Hirst-Chichagof Mine to establish a drill station to evaluate the 'Kay' oreshoot. Additional fan drilling from the drill station is planned during 1987.

In 1986, the CHICHAGOF JOINT VENTURE completed reconstruction of the No. 2 shaft on the main level of the Chichagof Mine. The venture is also considering new mine designs, including a barge-mounted mill and plant that could be inexpensively moved to each property as mine development progresses.

Figure 16. Valdez Creek Mining Company's enclosed washing plant in operation in late November at -32°F, Clearwater Mountains, southcentral Alaska. Photograph by Arne Bakke, 1986.

GREENS CREEK PROJECT, AMSELCO
Southeastern region (loc. 6, fig. 10)

A change of ownership and construction of an access road were the major developments in 1986 at the Greens Creek silver-gold-zinc-lead deposit on northern Admiralty Island 18 mi southwest of Juneau (figs. 21 and 22). Additionally, the year-end announcement by AMSELCO MINERALS COMPANY (AMSELCO) that work on a 6,000-ft-long haulage adit would begin in early 1987 was a positive indication that full development of the mine may be imminent.

Recent exploration results show that the Greens Creek deposit contains recoverable reserves of 3.6 million tons of ore that grade 25.3 oz/ton silver, 0.16 oz/ton gold, 10.8 percent zinc, and 4.2 percent lead, based on over 130,000 ft of drilling and 5,500 ft of underground drifting. According to Scherkanbach and others (1985), metamorphosed exhalative and carbonate rocks of middle Paleozoic or Triassic age host several trough-shaped orebodies along the limb of an overturned anticline. The deposit is similar to the Roseberry and Mt. Isa deposits in Australia and also shows remarkable similarities to precious-metal-enriched deposits in the Boliden/Skellefte mining district of north-central Sweden, a Proterozoic example of a Kuroko-like ore district (Rickard, 1986).

ANACONDA'S interest in the Greens Creek project was advertised for sale in 1985, and in 1986 NORANDA MINING, INC. (NORANDA), headquartered in Canada, sold most of its assets in the United States in an effort to reduce its debt and consolidate operations. AMSELCO, a subsidiary of BP NORTH AMERICA, INC., and part of the BP MINERALS INTERNATIONAL LTD. GROUP, purchased ANACONDA'S 39.5-percent interest in late 1985; in mid-1986, AMSELCO purchased NORANDA'S 39.5-percent interest. The remaining interest in the project is held by CSX OIL AND GAS CORPORATION (12.3 percent) and EXALAS RESOURCES (8.7 percent).

AMSELCO is headquartered in Denver and has other interests in the United States. It is the operating partner with NERCO MINERALS COMPANY (Fairbanks) in the Alligator Ridge Mine in Nevada. Through a subsidiary, AMSELCO is examining the feasibility of developing an open-pit gold mine in South Carolina.

In 1986, approximately 7 mi of road were constructed to connect the mine site on upper Greens Creek with 1½ mi of road built in 1985 from the dock site at Hawk Inlet on the west side of Admiralty Island. In 1987, AMSELCO will complete a feasibility study and begin additional development work, including construction of wastewater containment dikes and a 6,000-ft-long adit. Portal site preparation for the adit was initiated in October. The new adit will be located 430 ft below the existing exploration adit and will serve as the main ore haulageway. In addition to mine and mill facilities, an additional 5 mi of road must be built to connect the existing road system to a dock at Young Bay on the east side of Admiralty Island. The dock and connecting road will permit workers to commute by boat from Juneau. Estimated preliminary development cost for the project is $80 million.

The status of potentially mineralized lands that surround the core, perfectable, and perfected mining claims is still unresolved. In 1985, a complex land exchange was proposed in the U.S. Congress to resolve a number of land-ownership issues on Admiralty Island, including environmental, logging, and Native corporation interests. By the close of the 1986 session, Congress had failed to pass the proposal.

If a final decision is made in early 1987 to proceed with construction, the mine could be in production by late 1988 or early 1989. At a production rate of 1,000 ton/day, about 225 jobs would be created.

QUARTZ HILL MOLYBDENUM PROJECT, U.S. BORAX
Southeastern region (loc. 7, fig. 10)

Limited field work was done on the Quartz Hill project during 1986. With molybdenum prices still below levels necessary to initiate mine development, U.S. Borax continued its environmental base-line studies and permitting activities. The timetable for reissuing the Revised Draft Environmental Impact Statement (RDEIS) was further delayed until early 1987 so that the Environmental Protection Agency (EPA) and the U.S. Forest Service could work

out an agreement on a preferred alternative site for tailings disposal. The Wilson Arm disposal site became a viable alternative to the Boca de Quadra site when new bathymetric and compaction data indicated there was adequate space for mine tailings. Arguments in favor of the Wilson Arm site include restriction of mine development to a single drainage; elimination of the need for any development in a wilderness area; no significant differences in potential impacts between alternative sites; and a reduction in capital costs by an estimated $59 million. When the RDEIS is issued, there will be a 45-day period for public comment, after which the Final Environmental Impact Statement, together with a Record of Decision for the project, will be issued. This final phase is expected to take place sometime after mid-1987.

Reserve estimates for the mineral deposit exceed 1.5 billion tons of ore that average 0.136 percent molybdenite; 490 million tons of near-surface ore average 0.219 percent molybdenite. Mineralization is hosted in a 25-million-yr-old composite felsite stock that intrudes metamorphic rocks of the Coast Range batholith.

The Quartz Hill deposit contains about 10 percent of the free world's known reserves of molybdenum, an alloy used as a hardening agent in the steel industry. Depending on the price of metals, the mine could add from $267 to $457 million/yr to the nation's exports and up to $65 million/yr to the personal income of Alaska residents—an amount equal to over 20 percent of the personal income in the Ketchikan Borough. The company has invested over $100 million in the project, of which 25 percent was spent on environmental studies. In 1983, a 5,000-ton bulk sample was tested at metallurgical facilities in Minnesota. Results indicate that relatively inexpensive milling methods could yield high-grade concentrates.

At the time of discovery, Quartz Hill was within the Tongass National Forest. In December 1978, when the Misty Fiords National Monument was proposed as a wilderness area, Quartz Hill was included. In 1980, with the passage of ANILCA, 149,000 acres around Quartz Hill were excluded from wilderness designation, and the project was allowed to proceed. Since 1985, data have been collected on meteorology, hydrology, water quality, vegetation, wildlife, coastal-and-marine biology, physical-and-chemical oceanography, archaeology, and socioeconomic factors.

Figure 17. Heavy-equipment repair shop under construction, Valdez Creek Mining Company, Clearwater Mountains, southcentral Alaska. Photograph by Arne Bakke, 1986.

CANADIAN MINERAL DEVELOPMENTS THAT AFFECT ALASKA (loc. 8a-c, fig. 10)

Three notable mineral developments in Canada have resulted or may result in economic benefits to ports in southeast Alaska. In late November 1985, CURRAGH RESOURCES (CURRAGH) finalized purchase of the Cyprus Anvil zinc-lead-silver mine in the Yukon Territory from DOME PETROLEUM, INC. The open-pit mine, which operated from 1969 to 1982, was Canada's largest zinc producer until low metal prices and high stripping ratios forced its closure. The purchase involved a complex financial arrangement that included Yukon Territorial and Canadian federal governments, American and Canadian banking institutions, and CURRAGH and TRANS-CANADA PIPELINE, INC.

With $30 million in startup funds, CURRAGH initiated stripping at the mine in January 1986, and production resumed at a rate of 5,500 ton/day in June. Through November 1986, over 1.5 million tons of ore were milled, and about 500,000 tons of sulfide concentrates were trucked 700 mi

Figure 18. Installation of Marcy rod mill at Golden Horn Mine, Flat, southwestern Alaska. Photograph by Maria Miscovich, 1986.

Figure 19. Portal of Wilbur Creek drift mine, Livengood mining district, eastern interior Alaska. Photograph by Rose Rybachek, 1986.

by YUKON-ALASKA TRANSPORT COMPANY to the port of Skagway, Alaska (loc. 8a, fig. 10). At Skagway, concentrates were loaded into 40,000-ton-capacity vessels and transported to smelters in Australia (10 percent), Japan and Korea (45 percent), and Europe (45 percent) (fig. 23). Concentrates were previously hauled by road to Whitehorse and transferred to the White Pass and Yukon Railroad for the final leg to Skagway. CURRAGH spent $1 million for road paving and bridge improvements in Alaska during 1986. Employment levels at the port facilities in Alaska ranged from 15 to 35 people.

QUEENSTAKE RESOURCES, LTD. (QUEENSTAKE), and HAINES GYPSUM COMPANY are involved in the development of a high-grade gypsum deposit at O'Connor Creek 6 mi from the Haines Highway in British Columbia and about 60 mi from the port of Haines, Alaska (loc. 8b, fig. 10). On the basis of 10,000 ft of diamond drilling, the deposit is estimated to contain a minimum of 500,000 tons of ore that grades 88 percent gypsum, 7 percent anhydrite, and 5 percent carbonate. The gypsum, which is pure white, is suitable for cement and wallboard and may also be used as flux, paper filler, or in fertilizer and pharmaceuticals. In 1987, QUEENSTAKE plans to ship 50,000 tons of bulk samples through Haines for testing in industrial applications. If the tests are favorable, crushed and screened gypsum will be shipped through Haines. HAINES GYPSUM COMPANY is also exploring the possibility of constructing a wallboard plant in Haines and exporting a finished product to Pacific Rim markets.

SKYLINE EXPLORATIONS, LTD., is developing the Reg Gold Mine on the Iskut River (western British Columbia) about 40 mi east of Wrangell, Alaska (loc. 8c, fig. 10). The company met with Wrangell officials in 1986 and is exploring the possibility of housing up to 40 families in Wrangell. Production may begin in 1987 after completion of the mill.

Figure 20. Jumbo drill in underground drift mine at Wilbur Creek, Livengood mining district, eastern interior Alaska. Photograph by Rose Rybachek, 1986.

COAL DEVELOPMENTS STATEWIDE (loc. 9a-c, fig. 10)

Coal developments in 1986 were concentrated in the southcentral region. ROCKY MOUNTAIN ENERGY (RME), a Colorado-based subsidiary of the UNION PACIFIC CORPORATION, and HAWLEY RESOURCE GROUP (HRG) continued feasibility and development studies on four state leases located in the Wishbone Hill district of the Matanuska coal field 45 mi northeast of Anchorage (loc. 9a, fig. 10). These leases, which are located in the western part of the district, contain 1,570 acres. In late 1984, RME and HRG acquired three competitive leases that total 5,200 acres in the eastern part of the district. Geologic mapping and channel sampling were conducted on the new leases during the 1986 field season. Subsequent drilling confirmed the presence of 18 million tons of bituminous coal in two blocks that can be mined by open-pit methods. Heat content of run-of-mine coal from this deposit varies from 8,700 Btu/lb in the west block to 11,000 Btu/lb in the east block. Typical washed-coal quality averages 12,460 Btu/lb, with 0.4 percent sulfur.

According to a 1986 study funded by RME and two Alaska utilities, a coal-fired power plant can be built in the lower Matanuska Valley in full compliance with environmental standards. RME's preliminary mine-feasibility studies indicate the western and eastern reserve blocks could supply a mine-mouth, fluidized-bed power plant and serve a small export market.

DIAMOND ALASKA COAL COMPANY (DIAMOND), a subsidiary of DIAMOND SHAMROCK CORPORATION, continued engineering, environmental-permitting, and marketing activities in the Beluga coal field near Anchorage (loc. 9b, fig. 10). DIAMOND'S feasibility studies project annual production rates of 2 to 10

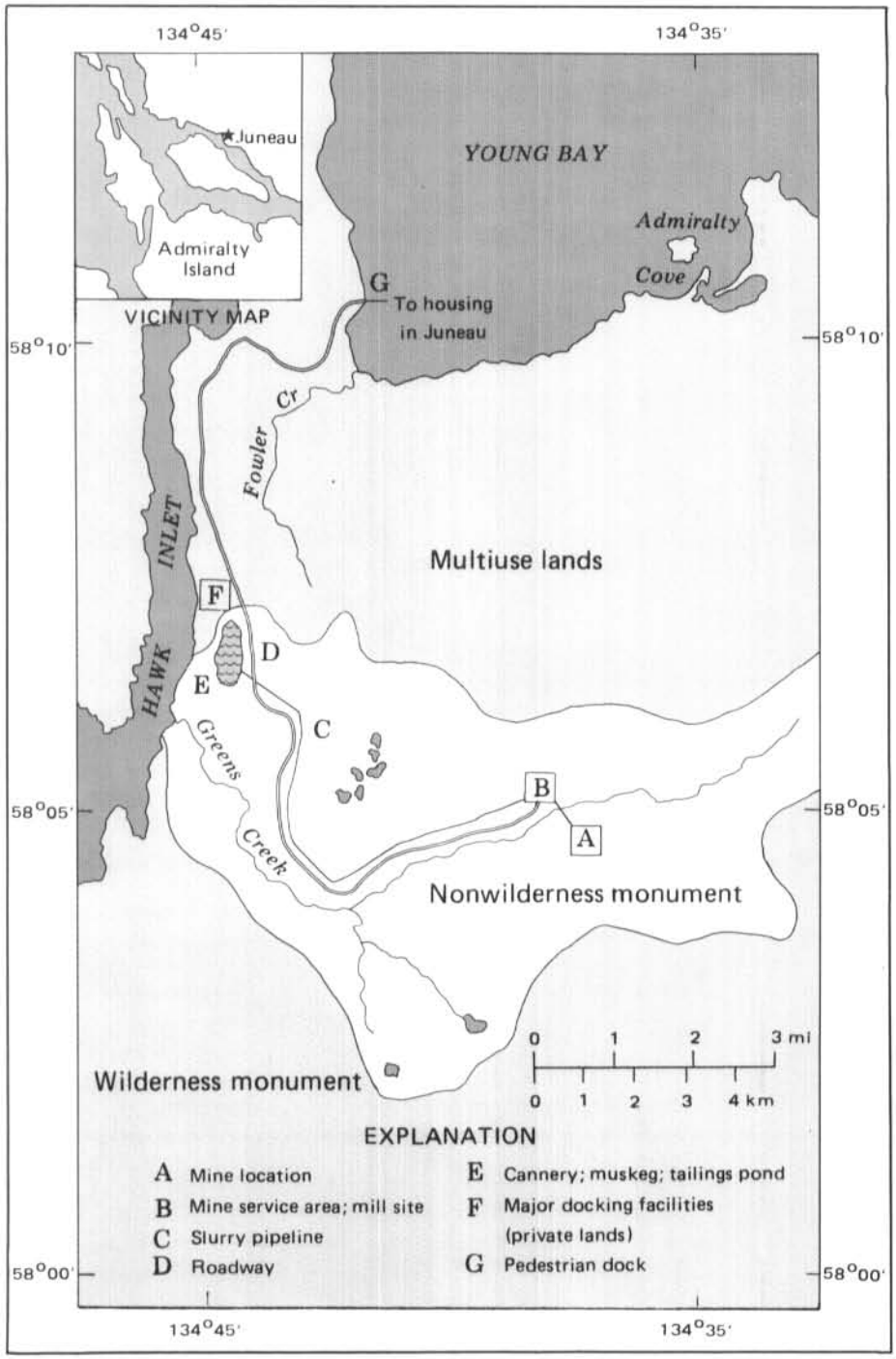

Figure 21. Proposed infrastructure of Greens Creek project, Admiralty Island, southeastern Alaska. Data courtesy of Noranda Mining, Inc.

million tons, depending on market demand. The latter rate would produce 330 million tons of coal during a 34-yr mine life. According to the feasibility study, a 150-megawatt power plant in the Beluga field would cost from $300 to $475 million.

PLACER U.S., INC. (PLACER), continued to evaluate its Center Ridge property in the Beluga coal field (loc. 9c, fig. 10). The current reserve base includes 150 million tons of coal on 17,686 acres of state leases and 9,240 acres owned by COOK INLET REGION, INC., an Alaska native corporation. During 1986, an access road was constructed to the main development properties on Center Ridge (fig. 24). Development plans include using the existing 1,475-ft-long pier at North Foreland near Tyonek, where 40,000 dwt ships could be loaded. Coal production of 1 million ton/yr will require $33 million in startup funds. PLACER met with Electric Power Development Corporation of Japan to examine marketing aspects of the operation.

Figure 22. Roadwork by Southcoast Construction Company from Hawk Inlet to Greens Creek, southeastern Alaska. Photograph courtesy of AMSELCO Minerals, Inc., 1986.

Figure 23. Ore carrier leaving Skagway with lead-zinc concentrates from Anvil Mine in Yukon Territory, Canada. Photograph by Al Clough, U.S. Bureau of Mines, 1986.

Figure 24. Construction of access road to Placer U.S., Inc., properties on Center Ridge, Beluga coal field, southcentral Alaska. Photograph courtesy of Placer U.S., 1986.

Mineral production in 1986

INTRODUCTION

The value of Alaska's mineral production in 1986 was $198.5 million, down 12.4 percent from the 1985 estimate of $226.6 million (table 6). Gross quantities and values for 1986 mineral commodities were 20.9 million tons of sand and gravel worth $75.8 million, 160,000 oz of gold worth $60.8 million, and 1.49 million short tons of coal worth $40.1 million, which comprise 89 percent of gross mineral dollar value. Building stone, tin, silver, antimony, peat, jade, soapstone, platinum, and mercury constitute the remaining 11 percent ($21.8 million). Principal gold, coal, and industrial-mineral extraction sites and mines are shown in figure 25.

Production statistics are based on data computed from 217 DGGS questionnaires returned by private companies and individuals, responses to a telephone survey of 51 companies that mine sand and gravel and nine that extract stone, and responses from the U.S. Bureau of Mines, U.S. Geological Survey, University of Alaska, precious metal refiners, and consultants. Historic production levels for gold, sand and gravel, and coal are compiled in figures 26, 27, and 28, respectively. A summary of production estimates for 13 minerals since 1880 (apps. E and F) shows that Alaska metal production has been dominated by gold.

Sand-and-gravel production decreased 26 percent in volume (28.2 to 20.9 million tons) and 32 percent in value ($112.1 to $75.8 million) from 1985. The substantial decrease can be attributed to reduced infrastructure development on the North Slope and a reduction in the number of construction projects in the southcentral and southeastern regions of the state. Building-stone production increased substantially because of the Nome seawall project, shoreline-facility construction on the Pribilof Islands, and the Bradley Lake hydroelectric-development project on the Kenai Peninsula.

Alaska tin production reached another high of 440,000 lb of cassiterite concentrate, but antimony production declined from 1985. The USIBELLI COAL MINE, INC., continued to export coal to Korea; most of the 10-percent increase in total coal production is attributed to this market (722,781 tons in 1986 vs. 616,000 tons in 1985).

Estimates of gold production in 1986 were improved by increased private-sector participation in the form of completed questionnaires with production estimates from 115 mechanized operations (up from 78 in 1985); company news releases and annual reports to stockholders; information from DGGS employees working in three of seven regions of the state (fig. 5);

Table 6. *Reported mineral production in Alaska, 1984-86.*[a]

Metals	Volume 1984	Volume 1985	Volume 1986	Value[b] 1984	Value[b] 1985	Value[b] 1986
Gold (oz)	175,000	190,000	160,000	$ 63,000,000	$ 61,175,000	$ 60,800,000
Mercury (lb)	380	2,094	912	1,500	10,000	2,800
Antimony (lb)	135,000	65,000	45,000	225,792	98,000	67,500
Platinum (oz)	W	--	W	W	--	W
Silver (oz)	20,000	28,500	24,000	159,000	171,000	134,400
Tin (lb)	225,000	300,000	340,000	400,000	650,000	890,000
Tungsten (stu)	NR	NR	120	NR	NR	22,800
Subtotal				$ 63,786,292	$ 62,104,000	$ 61,917,500
Industrial minerals, coal, peat						
Jade & soapstone (ton)	5.5	W	2.0	$ 16,500	$ W	$ 12,000
Sand & gravel (mt)	27.0	28.2	20.9	95,000,000	112,062,750	75,761,507
Building stone (mt)	2.7	2.5	4.2	16,000,000	12,150,000	20,320,000
Subtotal				$111,016,500	$124,212,750	$ 96,093,507
Coal (ton)	849,161	1,370,000	1,492,707	$ 23,775,000	$ 39,730,000	$ 40,100,000
Peat (yd^3)	125,000	85,000	50,000	859,375	552,500	350,000
Subtotal				$ 24,634,375	$ 40,282,500	$ 40,450,000
TOTAL				$199,437,167	$226,599,250	$198,461,007

[a]Production data from DGGS questionnaires, U.S. Bureau of Mines, precious-metal outlet data, interviews with mine operators, and other confidential sources.

[b]Average price of gold in 1986 assumed to be $380/oz; silver, $5.60/oz; antimony, $1.50/lb; mercury, $300/flask; tungsten, $190/stu; coal (FOB Healy), $26.86/ton; peat, $7/$yd^3$; and building stone, $4.80/ton. Statewide sand and gravel averages $3.75/ton, but prices vary according to region (table 9).

W = withheld
mt = million ton
stu = short-ton unit
NR = Not reported

estimates from precious-metal refiners; and information from two informal surveys conducted by the mining community.

Results of the DGGS survey show that 160,000 oz of refined gold and 16,000 oz of byproduct silver were produced primarily by placer mines throughout the state, a decrease of 16 percent from the previous year. The decline occurred despite the fact that the average selling price of Alaska placer gold increased about 23 percent (from $325 to $380/oz) from January 1, 1985, to January 1, 1986.

An estimated 195 mechanized mines operated in 1986, down from 266 in 1985, a decline of about 27 percent. During 1986, employment ranged from one to 136 employees per mine, with an average of six employees per mine. A total of 1,155 miners were employed in mechanized mines during the 1986 season, compared to 1,540 employed in 1985. Activities of recreational miners (pick-and-shovel, long-tom, and suction-dredge projects) and claim holders doing annual assessment work also decreased during 1986: 95 operations employed 275 in 1985, whereas 80 operations employed 230 in 1986. The average placer mine (excluding recreational mining and assessment work) produced 820 oz of gold in 1986 vs. 720 oz of gold in 1985, which amounts to 139 oz/employee in 1986 compared to 124 oz/employee in 1985. These data suggest increased output and efficiency for individual mine operations during 1986.

These results are corroborated by other state statistics on mining activity. During 1986, the number of annual placer-mining applications (APMA) decreased 28.6 percent (718 in 1985 vs. 512 in 1986), and the number of State land-use permits for mining decreased 17.9 percent (201 in 1985 vs. 165 in 1986). Of 156 companies that responded to DGGS questionnaires, 26.2 percent that mined in 1985 did not operate in 1986.

An independent study conducted by the Placer Committee, Alaska Miners Association (AMA), indicates that the average placer miner has worked on Alaska gold properties for 17 yr and that the average placer mine employs 4.5 people, 35 percent of whom reside in villages and rural areas within the mining district (Tryck, 1986). The AMA study, which was conducted early in the year, predicted that up to 44 percent of currently active mining companies may eventually cease operation if regulatory issues are not resolved.

The mineral industry employed 2,950 people in 1986, down 19 percent from the 3,650 employed in 1985

(table 7). Mechanized gold mining continues to be the largest employer (39 percent), followed by sand and gravel (37 percent), recreational and assessment work (8 percent), building stone (7½ percent), coal mining (4 percent), and miscellaneous extraction (4½ percent). Individual employment in this survey does not consider seasonal vs. year-round employment. For example, most employees in the coal industry work year round, but many gold miners and sand-and-gravel and building stone operators work seasonally.

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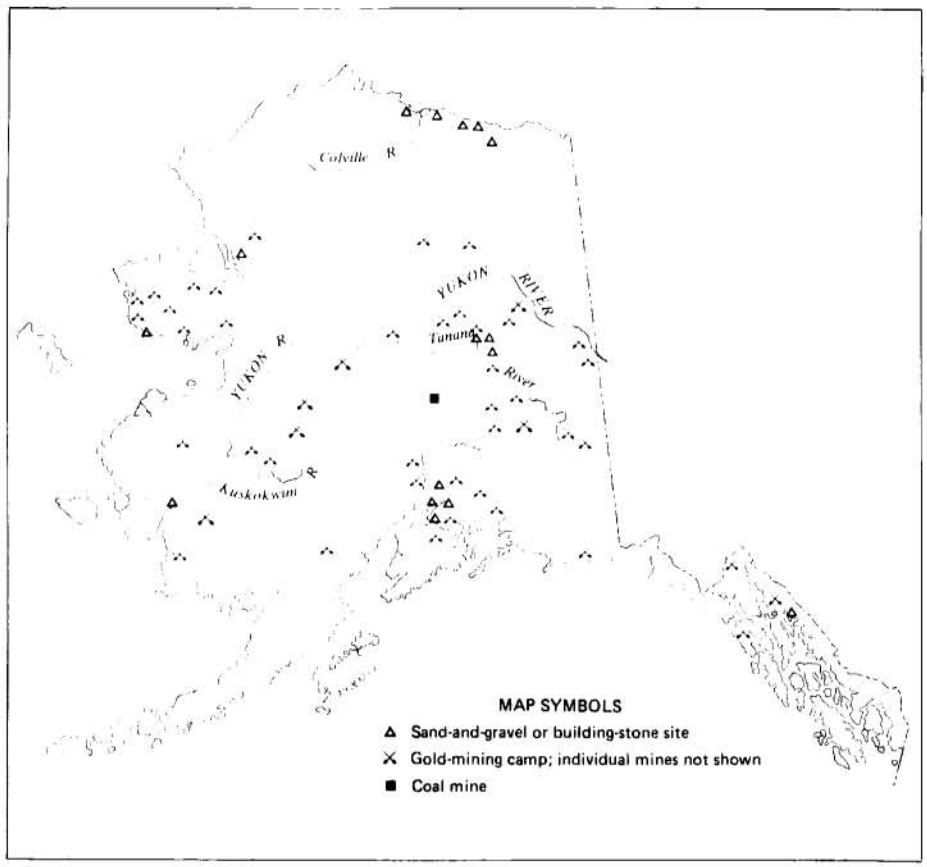

Figure 25. Principal gold-mining camps, coal mines, and industrial-mineral sites in Alaska, 1986.

Table 7. *Mineral-industry employment in Alaska, 1986.*[a]

Mineral industry	Number of employees
Gold (mechanized)	1,155
Recreational mining and claim assessment	230
Sand and gravel	1,100
Building stone	225
Coal mining	125
Peat	60
Tin, antimony, jade, mercury, and soapstone	55
	2,950

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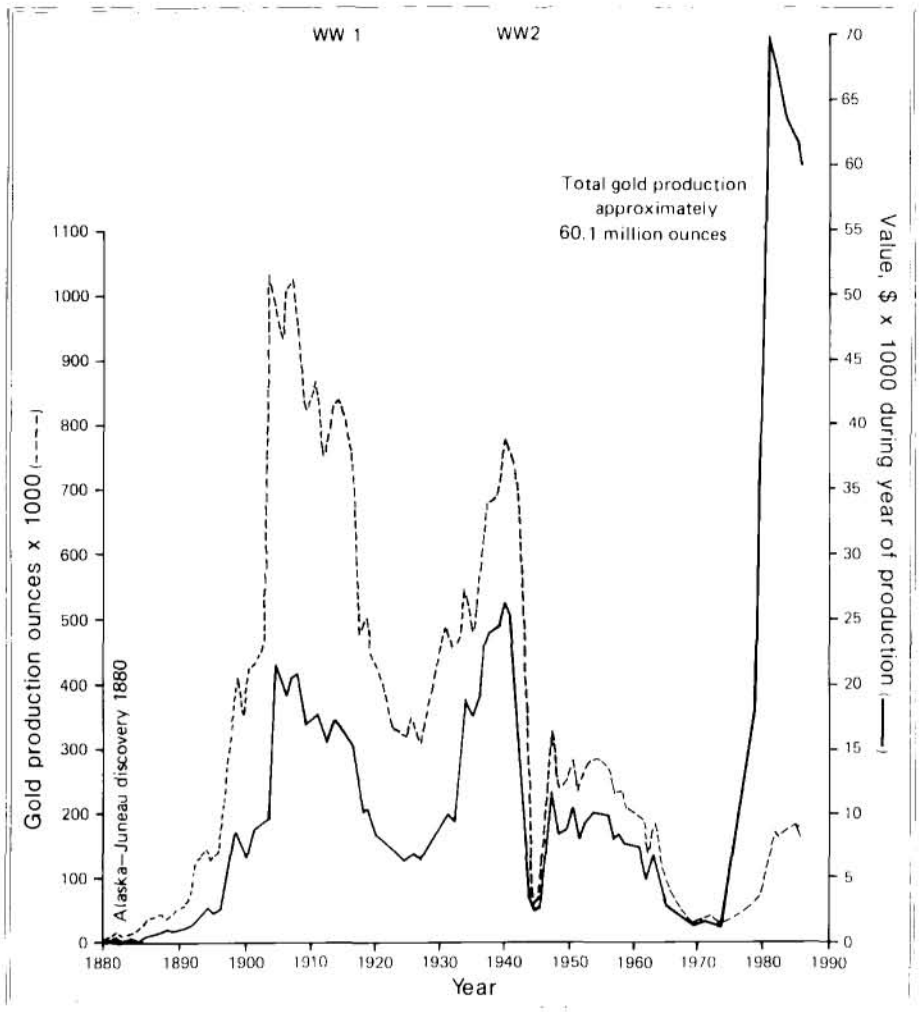

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WESTERN REGION

Responses to the DGGS questionnaire show that 42 mining operations in the western region produced 53,000 oz of gold in 1986, an increase of 33 percent from 1985. This region was the only area in the state that showed a significant increase in production activities. Nearly 85 percent of the production took place in mining districts on the Seward Peninsula; other productive areas include the Ruby-Poorman mining district in the Yukon River drainage and the Tolstoi mining district in the Innoko River drainage.

The ALASKA GOLD COMPANY'S Nome operation was once again the largest producing gold mine in the western region, ranking second statewide in gold production. In 1986, Dredge No. 6 operated 155 days between late May and late October and processed 800,000 yd^3 of ore at an average rate of 5,160 yd^3/day (fig. 29). Dredge No. 5 did not operate in 1986,

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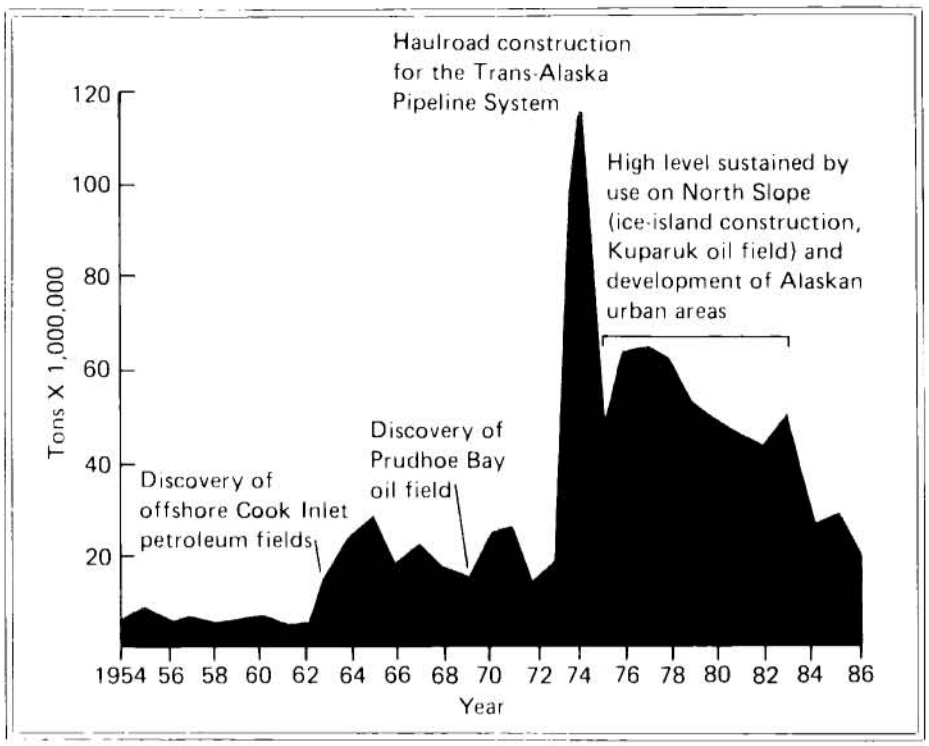
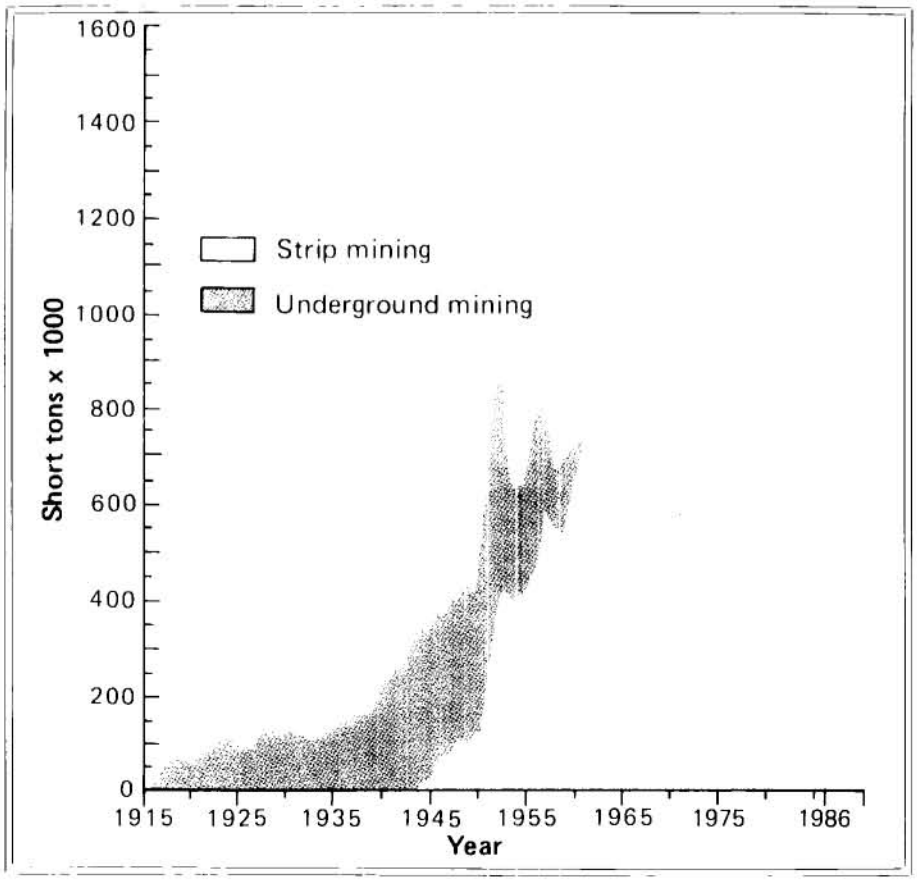


Figure 27. Sand-and-gravel production in Alaska, 1954-86.



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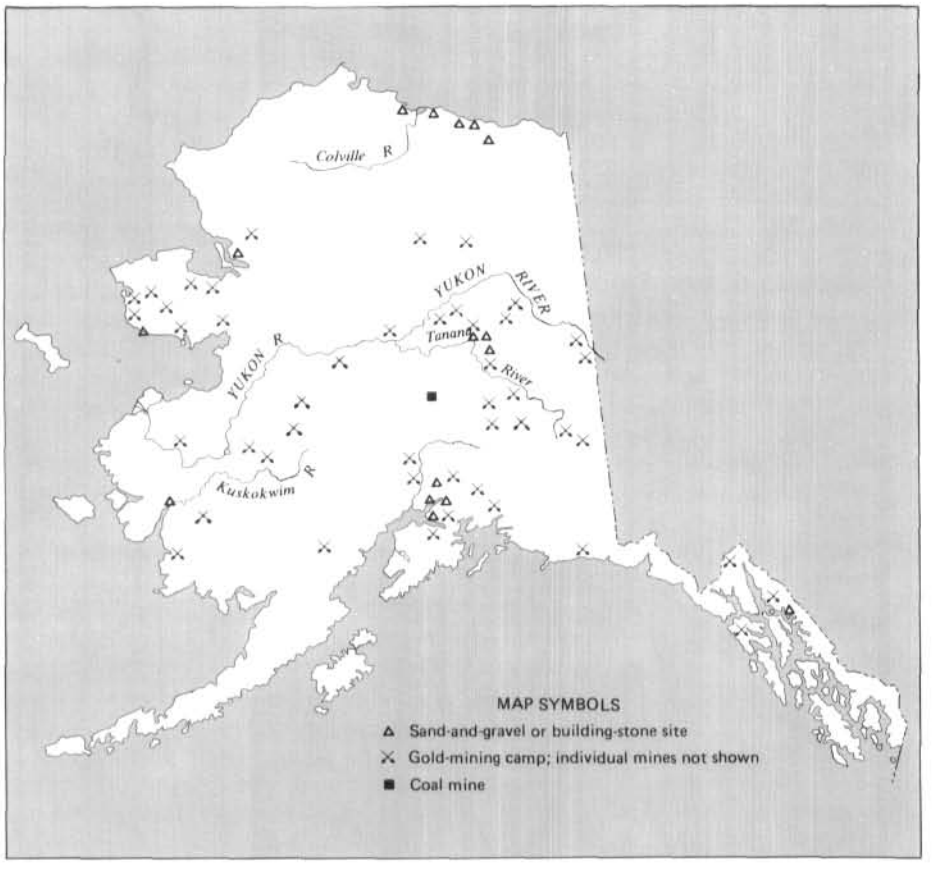

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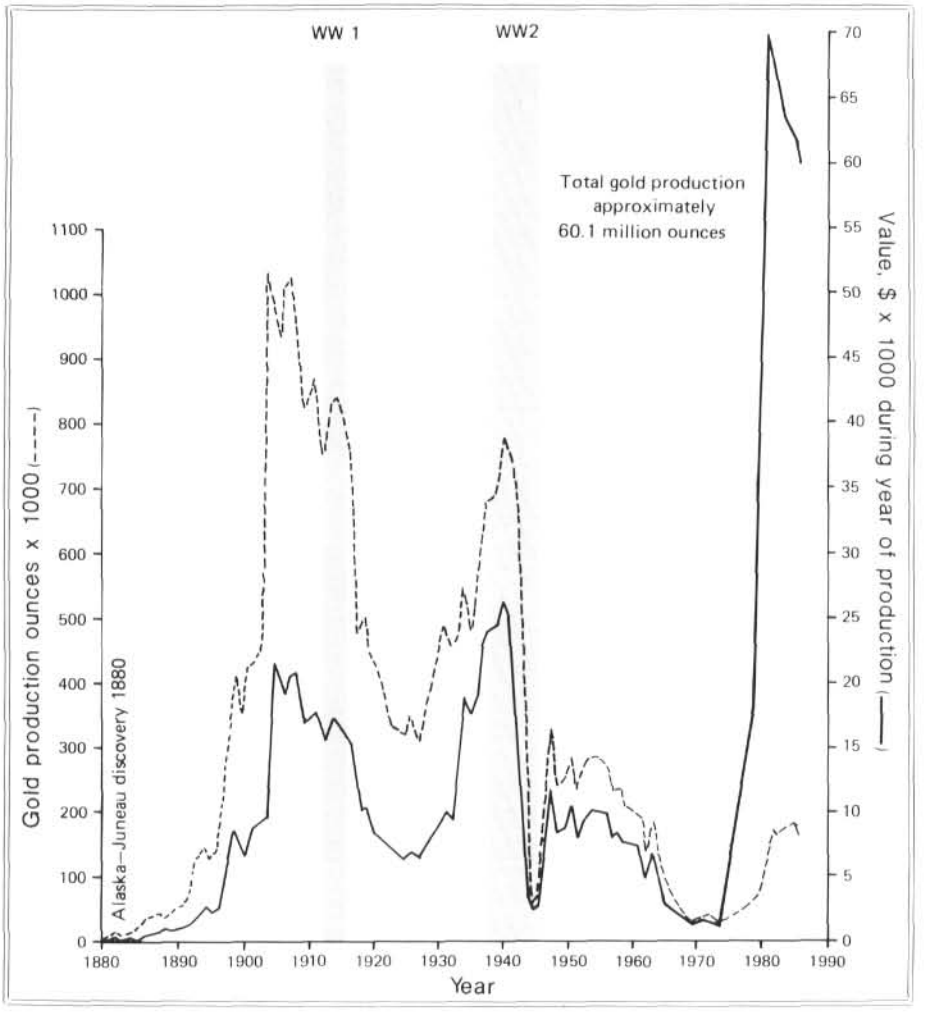

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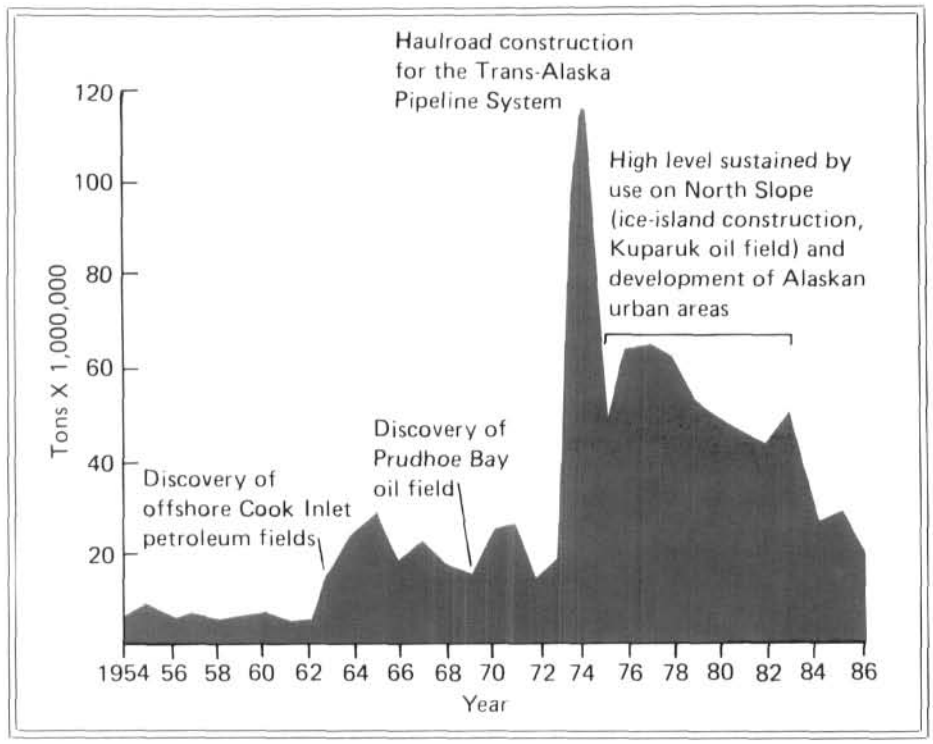

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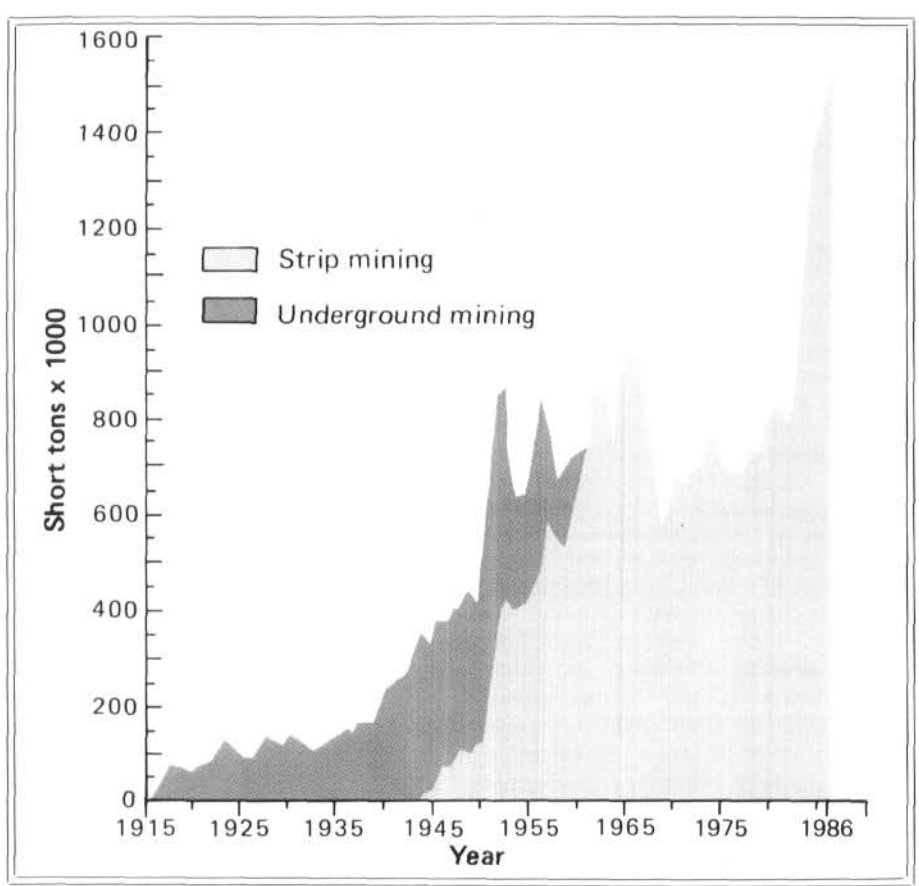


Figure 28. Coal production in Alaska, 1915-86.

Table 8. *Reported refined gold production, number of operators, and industry employment in Alaska by region and mining district, 1985-86.*

Region and mining district	1985 Mechanized units[a]	1985 Production (troy oz)	1985 Number of employees	1986 Mechanized units[a]	1986 Production (troy oz)	1986 Number of employees
Northern	18	14,400	70	4	4,500	15
Chandalar						
Shungnak						
Koyukuk-Nolan						
Western	40	40,000	340	42	53,000	363
Nome						
Kougarok						
Koyukuk-Hughes						
Port Clarence						
Fairhaven						
Ruby						
Solomon						
Koyuk						
Council						
Eastern Interior	135	66,000	740	83	45,350	375
Circle						
Livengood-Tolovana						
Fairbanks						
Fortymile						
Manley-Eureka						
Richardson						
Bonnifield						
Kantishna						
Rampart						
Southcentral	38	52,500	263	30	39,000	268
Cache Creek						
Nizina						
Chistochina						
Valdez Creek						
Kenai Peninsula						
Nelchina						
Southwestern	32	17,000	125	33	18,000	128
Innoko-Tolstoi						
Iditarod-George River						
Moore Creek						
Nyac						
Crooked Creek						
Lake Clark-Mulchatna						
Southeastern and Alaska Peninsula	3	100	7	3	150	6
TOTAL	266	190,000	1,545	195	160,000	1,155

[a]Mechanized-placer and small lode operations are included; small 'recreational-assessment' projects such as panning, long-tom sluicing, suction-dredging, and pick-and-shovel prospecting are not included. We estimate that 95 operations employed 275 people in 1985 and 80 operations employed 230 people in 1986.

operate pending resolution of water-quality issues. In the Tolstoi region, ROSANDER MINING COMPANY employed a crew of seven on Colorado Creek; ALAMIN MINING again mined Bear Creek; and DEGNAN MINING took out a cut on Madison Creek.

EASTERN INTERIOR REGION

An estimated 83 mechanized mines in the eastern interior region produced 45,350 oz of gold in 1986, compared to 135 mines and 66,000 oz in 1985. This amounts to a 39-percent drop in the number of producing mines, a 31-percent drop in the volume of production, and a 49-percent drop in employment (740 to 375 employees). The major reasons for the declines are the cumulative effects of water-quality issues, litigation, and exhaustion of mineral reserves.

During the early 1980s, the Circle mining district was Alaska's largest placer camp, with as many as 90 active mine setups. Of these, 40 to 50 mechanized units annually produced gold, and seasonal employment levels ranged from 400 to 750. However, in 1986 only 21 mine operations produced placer gold, down significantly from levels of activity in the previous 5 yr.

V.F. HALVERSON (Miller Creek) and GHD RESOURCES (Eagle Creek) were the largest and most successful gold-mining operations in the eastern interior region. Other companies active in the Circle mining district during 1986 were the F.E. COMPANY, COLD CACHE MINING, and GOLD DUST MINES on Bottom Dollar Creek; JAMES WILDE on Switch Creek; T.J. MINING on Faith Creek; RON WREDE and FLAT PICK MINING on Deadwood Creek; ACKMAN MINING on Harrison Creek; ROBERT COY and BOB CASEY on Portage Creek; STEVE WEBER and STAN GELVIN on Crooked Creek; RUSSELL MINING COMPANY and GEORGE HASKINS on Independence Creek; DICK LOUD on Mastadon Creek; and several small operations on Half Dollar, Squaw, and Ketchum Creeks.

With 12 mines in operation, 1986 activities in the Fortymile mining district were comparable to those in 1985. G.A. HANKS AND SONS operated on Lost Chicken Creek; AURUM PHILOSOPHORUM, INC., mined on Switch Fork of Chicken Creek; SMITH BENCH MINING PARTNERS took pay out of the Smith Bench of Fortymile River; 45 PUP MINING COMPANY (Charles Hammond) mined on 45 Pup Creek; and KAVIC MINING trenched on Jack Wade Creek. Mines on the Walker Fork produced gold, but details are unavailable. Suction-dredge operations did particularly well using various small-capacity floating units. EARL SCHENE reported that his mine was not permitted due to water-quality regulations. M.A. 'BEAR' PAVEY was unable to move heavy equipment across a boggy area during the summer season, but will move mining equipment this winter in preparation for the 1987 season.

The Rampart and Manley Hot Springs mining districts produced at the same levels as last year. HOOSIER CREEK MINING completed another good year on Hoosier Creek; BOULDER CREEK MINING COMPANY (Les and Dorthy Fickes) took out a cut on Boulder Creek; and BILL CARLO produced at 'status quo' in the Rampart mining district. Longtime producers SHIMSKY MINING COMPANY and ZIMMERMAN EXPLORATION completed assessment work only on their claims on Omega and Eureka Creeks.

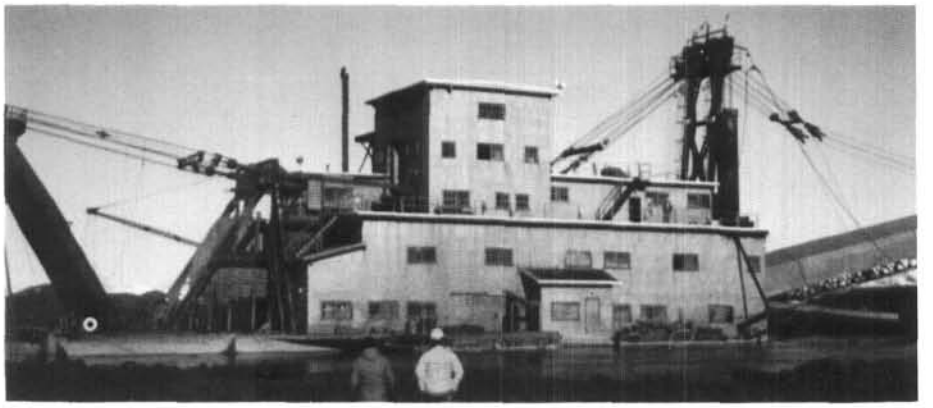


Figure 29. Dredge No. 6 at work in Nome field, western Alaska. Photograph by C.B. Green, 1986.

The level of activity was down in the Livengood mining district. The HANNEMAN-KNAEBEL PARTNERSHIP continued to sluice on the Livengood Bench, but they are running out of stripped reserves. NELSON MINING COMPANY worked on Amy Creek, but indicated that lack of water and developed reserves may force closure of the operations. We do not have records of 1986 mining activities on Olive and Ruth Creeks, which have produced placer gold in the past. MAMMOTH MINES' (Stan and Rose Rybachek) hydraulic-mining operation was halted due to court action by the Environmental Protection Agency, but the company did initiate underground mining in the winter months (see Development section). MAMMOTH faced fines of up to $700,000 for water-quality violations; resolution of court action is pending.

Activity in the Fairbanks mining district, Alaska's largest producing gold camp, was about the same as last year with eight companies in operation. Gold producers in the district included COOK'S MINING on Fairbanks Creek; WALTER ROMAN on Last Chance Creek; SMITH BROTHERS MINING on Nugget Creek; and OSCAR TWEITEN on Chatham Creek (fig. 30). Details of other operations on Lower Goldstream, Fish, Ester, and Eldorado Creeks were not available. JOHN RUBEL mined the Sparkle Group in the Tenderfoot mining district.

The Bonnifield mining district supported six operations in 1986, down from eight in 1985: one on California Creek, one on Tatlanika Creek, two on Moose Creek, one on St. George Creek, and one on the Totatlanika River. D'LOG ENTERPRISES on Tatlanika Creek and JACK LACROSS on California Creek were the most successful producers. ART SCHMUCK and TOMMY VAN, INC., did not operate because of regulatory problems.

The most sobering regulatory problem in the eastern interior region was the wholesale shutdown of mining in the Kantishna mining district, an area with a long history of gold, silver, and antimony production. Both the Kantishna and Dunkle mining districts were included in the nearly 4 million acres surrounding Mount McKinley National Park (now Denali National Park and Preserve) that were added to the Park by ANILCA in 1980. In conjunction with ANILCA, the U.S. Congress mandated that a 3-yr study be conducted and that recommendations be made concerning future mining activity in these areas. In 1984, a joint federal-state study that was released by the Alaska Land Use Council asked Congress to open 103,435 acres in the Kantishna Hills to mining. This would include most of the previously active mines. The request recognized grand-

Figure 30. Oscar Tweiten with '2U' cable dozer on his claims at Chatham Creek, Fairbanks mining district, eastern interior Alaska. Photo by E.H. Beistline, 1986.

father rights on existing claims and recommended that additional lease options be implemented for mineralized areas identified in the study.

In 1985, some 17 mechanized placer operations mined gold in the Kantishna mining district, concentrating on various tributaries of Moose, Glacier, and Caribou Creeks. However, as a result of the 1985 Sierra Club vs. National Park Service lawsuit, the U.S. District Court prevented the National Park Service from issuing plans of operations to active mines. Although 14 companies applied for permits to mine gold in 1986, none were approved and there was no mining activity. For the first time since its discovery in 1905, no gold was produced in the Kantishna mining district. National Park Service officials have publically stated that they must comply with the Mining in Parks Act of 1975. Therefore, mining permits will be considered on a case-by-case basis to protect the miner and the environment. Final approvals may take several years.

Hardrock-mining activities in the eastern interior region were limited to the Fairbanks mining district. RUDY VETTER AND ASSOCIATES assembled a small 1 ton/day jaw crusher and roll mill and processed 34 tons of ore that averaged 4.2 oz/ton gold. Byproduct antimony ore and concentrates were also produced and shipped from the mine site. LA TEKO RESOURCES produced over 300 oz of gold from their heap-leach test at the Ryan Lode on Ester Dome.

SOUTHWESTERN REGION

DGGS surveys show that in southwestern Alaska 33 placer mines produced 18,000 oz of gold and 2,400 oz of silver, an increase of 6 percent from 1985. According to the Kuskokwim Area Plan released by the Department of Natural Resources, mining is the largest private sector employer (128) in the Kuskokwim River basin above Bethel. Nearly 75 percent of all employees were from local communities (Bundtzen and others, 1986a). Large operations in the southwest had a good season and benefitted from slightly improved output and an increase in gold prices. Regulatory difficulties did not affect the southwestern or western regions to the extent that they affected the eastern interior, southcentral, and northern areas of Alaska.

In the Innoko mining district, MAGNUSON MINING COMPANY exploited placer deposits from several mine setups on Ganes Creek, but reported a decline in production from 1985. BABE and EEP ANDERSON and SMOKEY STOVER continued to mine fractions, side pay, and tailings on Yankee Creek, and JOHN O'CARROLL worked deposits on Spruce Creek. PAUL SAYER and the NORCROSS-STONBERG PARTNERSHIP continued their long-time efforts on Little, Ester, and Anvil Creeks near Ophir. Longtime Innoko miner and prospector JOHN WORTMAN passed away during the summer.

In the Iditarod and Moore Creek mining districts, GOLDEN HORN MINING COMPANY (formerly MISCO-WALSH COMPANY or JOHN MISCOVICH family operation) mined stream, hillslope, and residual deposits immediately below workings of the GOLDEN HORN tungsten-gold mine. This unique operation also used secondary crushing and recovery techniques that are described in the Development section. GOLDEN HORN incurred a substantial expense in 1986 to reclaim mine tailings from the 1981-85 seasons.

DON HARRIS trenched on Moore Creek where auriferous tailings still yield economic pay. FLAT CREEK PLACERS stripped overburden to mine pay and constructed several large settling ponds on the Willow bench to comply with environmental regulations. The ALVIN AGHOFF family operation took out a cut on Prince Creek, and WILBUR and ANN WILLIAMS mined tailings on Granite Creek, a tributary to the George River. L.E. WYRICK had another successful year on Granite Creek and discovered gash veins of stibnite in his mine cut and bedrock drain (Bundtzen and others, 1986b).

JULIAN CREEK MINES worked Julian Creek for a short time late in the fall; this operation did not produce in 1985 due to water-quality enforcement by the Alaska Department of Fish and Game. LYMAN RESOURCES OF ALASKA, INC., prepared and mined ground leased from CALISTA CORPORATION in the Snow Gulch area. DAVE PENZ worked the Bonneyville Claim Group on Kako Creek in the Iliuit Mountains of the Marshall mining district. This is the first record of activity we have received from the Marshall area for many years.

The NORTHLAND DREDGING COMPANY'S 6-ft^3-capacity floating

undisclosed amount of riprap to construct a shallow-water, steel sheet-pile loading dock and gravel pad that will be used as a staging area for construction of road and port facilities for the Red Dog zinc project in northwest Alaska. Work was started mid-summer and completed by September.

WESTERN REGION

The KIEWIT CONSTRUCTION COMPANY (KIEWIT) completed the 2-yr, $22 million state and federally funded Nome Seawall Project in September 1986. During the 2-yr construction period, nearly 700,000 tons of shot rock were excavated and hauled from sites near Nome. Excavation equipment included a front shovel, two loaders, three 85-ton haul trucks, and four 50-ton haulers. Nearly 100 people were seasonally employed during the 2-yr period. The rock quarry also supplied some sea-wall-quality stone for construction of harbor-containment projects in the Pribilof Islands. Some 340,000 tons of sand and gravel were used by the Department of Transportation and Public Facilities (DOTPF) to maintain the Nome-Kougarok and Nome-Council Road systems on the Seward Peninsula. The roads were damaged by breakup conditions and floods early in the year.

EASTERN INTERIOR REGION

Nearly 7.1 million tons of sand and gravel were quarried in the eastern interior region, a 317-percent increase from the 1985 level. The increase was due in part to general highway improvements in the eastern interior region and to construction activities by the private sector in preparation for the arrival of a U.S. Army Light Infantry Division at Fort Wainwright (Fairbanks). Other large projects near Fairbanks included the North Pole overpass (490,000 tons) and flood control along the Tanana River (480,000 tons). However, nearly 70 percent of total sand-and-gravel production was for completion of large DOTPF projects along the Alaska Highway from Dot Lake to the United States - Canada border. Because of increases in activity, several Anchorage-based sand-and-gravel firms entered the interior and competed for various construction contracts.

FOUNTAINHEAD CONSTRUCTION, INC., continued their 2-yr-old suction-dredge operation near North Pole and drew from other pits regionwide with standard loaders and dump trucks. FAIRBANKS SAND AND GRAVEL produced 300,000 tons from their Tanana River flood-plain operation using a $4\frac{1}{2}$-ft^3 floating clamshell dredge. The company expressed concern about proposed changes in the State mining-tax regulations, which may adversely affect their economic viability.

EARTHMOVERS, INC., mined from pits throughout the Tanana River flood plain. One of their major construction projects was to modify International Airport Road (170,000 tons). H & H CONTRACTORS mined from pits along the Chena River at the same production level as in 1985. Other gravel companies include EVECO, INC., which mined tailings at Fox; INTERIOR EXCAVATION; ROGERS AND BABLER (based in Anchorage); and GARY NEWMAN TRUCKING.

The major DOTPF project in the eastern interior was rerouting the Alaska Highway between the Robertson River and Yerrick Creek west of Tok and between Miles 1256 and 1285 near the United States - Canada border. During the 18-mo project, nearly 30 haul trucks, numerous loaders and tractors, and a crew of 200 moved 5 million tons of borrow and unclassified gravel.

YUTAN CONSTRUCTION COMPANY (Carroll-Vondra partnership) again mined basalt from their Browns Hill Quarry off Badger Road, but production levels (about 375,000 tons) were slightly lower than those in 1985. The basalt is used for road metal, ornamental stone, crushed fill for leach fields, and flood control (riprap) along the banks of the Tanana and Chena Rivers.

SOUTHWESTERN REGION

Sand and gravel and stone continued to be used in maintenance projects in southwestern Alaska. THE GALLIETT COMPANY and GEORGE SILIDES completed their $15-million erosion-control project at Bethel. Earlier estimates by the U.S. Army Corps of Engineers showed that the Kuskokwim River would erode about half of Bethel by the year 2030. The project used 6,950 ft of steel piling that was backfilled with sand and gravel excavated from Birch Tree crossing, which is located 100 mi upriver from Bethel. The Kuskokwim River is also eroding its banks at McGrath, but consultants have recommended that high-quality riprap be used to armor the banks against further erosion.

CALISTA CORPORATION developed their riprap-quality basalt-picrite quarry (owned by KUITSARAH VILLAGE CORPORATION) at Goodnews Bay. Markets are currently being sought for the stone.

SOUTHCENTRAL REGION

Use of sand and gravel in the most populated region of the state continued to decline from record levels established in 1983-84. During 1986, 5.4 million tons were used, compared with 10.1 million tons in 1984, a decline of 46 percent. About 2.2 million tons (41 percent) of gravel used regionwide were hauled from pits in the Palmer-Wasilla area to Anchorage on the Alaska Railroad, only about a third as much as was hauled in 1984 (table 10). During the 1986 construction season, the Alaska Railroad operated four 80-car trains daily.

Nearly 80 percent of the 1986 rail haul originated from Wasilla-Palmer pits operated by ANCHORAGE SAND AND GRAVEL and ROGERS AND BABLER, INC. Both companies indicated that their gravel reserves in the Palmer area exceed 35 million tons, which should satisfy construction needs in the Anchorage area for the forseeable future. ROGERS AND BABLER also drew from their Chugiak pit and operated a crusher in Anchorage. GREEN CONSTRUCTION COMPANY and EAGLE DOME AGGREGATE, INC., both active in the Anchorage gravel business, ceased mining operations during the year.

WALDO AND RUBY COYLE produced pit-run gravel from private property on the Kenai Peninsula, and CHUGACH ALASKA CORPORATION sold aggregate to users from sources on their lands. BRASS MONKEY RANCH did not mine in 1986, although they have produced small amounts of gravel in previous years. DOTPF used about 20,000 tons of pit-run gravel from property administered by the U.S.

Table 10. *Major commodity tonnages hauled by the Alaska Railroad 1975-86 (thousands of short tons).*[a]

Calendar year	Sand and gravel	Bulk petroleum	Coal	Other[b]	Total
1975	1	557	584	720	1,862
1976	104	624	607	853	2,188
1977	700	532	550	523	2,305
1978	727	374	593	484	2,178
1979	637	220	524	427	1,808
1980	396	252	590	503	1,741
1981	1,797	379	653	533	3,362
1982	2,754	439	654	656	4,503
1983	4,398	462	626	522	6,008
1984	6,537	498	642	595	8,272
1985	3,937	553	1,205	694	6,389
1986	2,200	750	1,438	617	5,005

[a]Figures for 1975-83 modified from Secretary of Transportation (1984); figures for 1984-85 by W.F. Coghill, Alaska Railroad; figures for 1986 by Bruce Carr, Alaska Railroad.
[b]Includes forest and agricultural products and manusfactured goods.

Forest Service (Mile 27, Copper River Highway) to repair roads in the Cordova area.

Construction for the 90-megawatt Bradley Lake Hydroelectric Project, Alaska's largest capital-improvement undertaking, was initiated in 1986, and site preparation was 70 percent complete during the year. ENSERCH ALASKA CONSTRUCTION, INC., was awarded $23 million to build the road, airstrip, dock, construction camp, and other facilities at Bradley Lake. The construction involved excavation of sand and gravel and shot rock from three pits near the project area. If the Bradley Lake Project continues, stone and sand-and-gravel use is expected to increase from 1987 to 1990, when the dam and power plant are scheduled to be built.

ALASKA PENINSULA REGION

Sand-and-gravel and building-stone production increased significantly from previous years due to several large State and federal capital-improvement projects. EARTHMOVERS, INC. (Fairbanks), was contracted to prepare dock and airport facilities at King Salmon. The company used 380,000 tons of sand and gravel to accomplish these tasks. Long-time gravel-operator ALEUTIAN AGGREGATE VENTURES, a supplier of gravel to military and civilian users on Unalaska Island, was permanently dissolved in 1986.

Major construction projects in the region were the $13.5-million port-facility projects on St. George and St. Paul Islands, Pribilof Islands group. BRICE, INC. (BRICE), and S & S CONSTRUCTION (Anchorage) were awarded contracts to construct containment facilities for the two ports. The Pribilof Islands are located in one of the highest energy marine environments in Alaska, and destructive storms commonly damage shoreline facilities. In 1984, the harbor on St. Paul Island was extensively damaged by a storm; work there has focused on rebuilding the harbor seawall facility.

Modeling of wave height and wave energy for the St. George Project was performed at Oregon State University and at the Danish Hydraulic Institute for PERATROVICH, NOTTINGHAM, AND DREDGE, the design firm for the project. This work showed that harbor reinforcement requires rocks that range from 1.7 to 10.0 tons in weight. BRICE is using two 400,000-lb Liebherr Corporation (German) excavators originally used to mine Australian uranium deposits. The 7-yd^3 shovels and 1,200-lb ripper shanks on the excavators are used to move and emplace the material that lines the seawalls. The St. George operation has used 185,000 yd^3 (320,000 short tons) of basalt adjacent to the harbor; an 8-acre boat basin was created from the rock quarry.

Because the Pribilof Islands commercial fur-seal harvest lost essential federal subsidies through U.S. Congressional action several years ago, the port-facility projects may help diversify the region's economy into industries such as tourism and seafood processing. The projects make it possible for large fishing vessels to offload their catches. Economic ventures like a fish-processing plant recently proposed by TAMPA SHIPYARDS, INC., may also be viable. Some 85 employees have been involved in the construction phase of the projects.

SOUTHEASTERN REGION

Estimated sand-and-gravel usage in the Panhandle region for 1986 is 510,000 tons, a decrease of 16 percent from 1985. As in other areas of the state, the major reason for the drop in production is declining State revenues.

The largest single producer of aggregate was again HILDRE SAND AND GRAVEL (JUNEAU REDI MIX, INC.), which produces gravel for concrete, plaster, gunnite, and fill from their Lemon Creek pits in Juneau. This company produced nearly a third of the total aggregate used in southeast Alaska.

Other producers in the region include RED-SAMM CONSTRUCTION, INC., CHANNEL CONSTRUCTION, INC. (Juneau), and ISLAND CONSTRUCTION, INC. Longtime shot-rock quarry-operator KETCHIKAN REDI MIX AND QUARRY did not report activities for the year.

COAL AND PEAT

Coal mining had another good year in 1986, with production increasing from record levels set in 1985. USIBELLI COAL MINE, INC., the only operating coal mine in the state, produced 1,492,707 tons of subbituminous-C coal from the Nenana coal field in the eastern interior region (table 11). This is a 10-percent increase from 1985 and exceeds by over 50 percent the combined production records set by mine operators in the Matanuska and Nenana coal fields in the 1960s. During 1986, 147 unit trains carried 5,100 to 5,500 tons of coal each to Seward, where coal is loaded onto 60,000-dwt-capacity (Panamex) ships bound for the KOREAN ELECTRIC POWER COMPANY (KEPCO) at Honam, South Korea (fig. 32).

In September and October 1986, competition from Canadian and Australian producers that supply coal to KEPCO resulted in difficult contract renegotiations among the ALASKA RAILROAD, SUN EEL SHIPPING COMPANY (Seward), USIBELLI COAL MINE, INC., and KEPCO. Specific results of the renegotiated contract are confidential, but the overall result will be a 15-percent price reduction in coal that is shipped to the Honam Power Plant. The USIBELLI prices are now more competitive with prices quoted by the Australian and Canadian companies.

Peat production continued to decline from peak levels in 1984 primarily because of a decline in construction activity. In 1986, 50,000 yd^3 worth $350,000 were used mainly in landscaping and horticulture in the Anchorage and Fairbanks areas (table 6). This represents a 41-percent decrease from 1985 production levels and a 60-percent decrease from 1984 levels. Anchorage peat distributors include GORDER EXCAVATING, A & A SERVICES, and NORTHWEST LANDSCAPING; Fairbanks distributors include COX ENTERPRISES and GREAT NORTHWEST LANDSCAPING, who produced from pits in the College and Chena Pump Road areas.

Table 11. *Market breakdown for 1986, Usibelli Coal Mine, Healy, Alaska.*[a]

Site location	Coal (short tons)
Clear Air Force Base	82,907
Fort Wainwright (U.S. Army)	184,789
Eielson Air Force Base	166,353
Fort Richardson (U.S. Army)[b]	4,970
Golden Valley Electric Association	149,963
University of Alaska (Fairbanks)	47,503
Fairbanks Municipal Utilities System	123,453
Reliable Coal (home heating in eastern interior region)	9,988
Sun Eel shipments to Honam, Korea	722,781
TOTAL	1,492,707

[a]Information provided by John F.M. Sims, Vice President of Marketing, Usibelli Coal Mine, Inc.
[b]Only for annual testing of coal-fired boilers formerly in use at this installation.

Figure 32. Sun Eel coal loader, Seward, southcentral Alaska. Photograph by C.B. Green, 1986.

Drilling activity in 1986

INTRODUCTION

Contract drilling of placer, coal, and hard-rock deposits totaled 328,400 ft in 1986, a 49-percent increase from the 220,400 ft drilled in 1985 (table 12). Nearly 70 percent of the 1986 total drill footage consisted of thaw-field drilling for placer-dredging operations (ALASKA GOLD COMPANY) in Nome. When thaw-field development drilling is excluded from total footage, exploration drilling decreases 68 percent, from 314,000 ft in 1982 (when drilling statistics were first collected) to 101,400 ft in 1986.

Excluding thaw-field activity, placer exploration drilling decreased 30 percent, from 46,000 ft in 1985 to 32,400 ft in 1986. Hard-rock drilling decreased 62 percent, from 131,700 ft in 1985 to 50,200 ft in 1986. The number of companies that conducted major drilling programs in Alaska decreased from 19 in 1985 to 13 in 1986 (table 13), reflecting the drop in hard-rock drilling footage. Only coal drilling increased, more than doubling from 8,700 ft in 1985 to 18,800 ft in 1986.

Table 12. *Contract mineral-drilling footage in Alaska, 1982-86.*

	1982	1983	1984	1985	1986
Placer	124,000	53,000	129,000	80,000	259,400
Coal	80,000	12,000	25,700	8,700	18,800
Hard rock	200,000	180,500	176,000	131,700	50,200
TOTAL	404,000	245,500	330,700	220,400	328,400

Table 13. *Companies that conducted major drilling programs in Alaska, 1986.*

Alaska Gold Company
Battle Mountain Gold Company
Chichagof Joint Venture
Cominco Alaska, Inc.
Valdez Creek Mining Company
Diamond Alaska Coal Company
Echo Bay Mines
GHD Resources
Golden Zone Development Ltd.
Greens Creek Mining Company
Houston Oil & Minerals
Nerco Minerals Company
Placer U.S., Inc.

PLACER DRILLING

Contract placer drilling, which represented 79 percent of total drill footage in Alaska, totaled 259,400 ft in 1986. Exploration drilling accounted for only 32,400 ft of the total footage, with over half of that footage drilled at the VALDEZ CREEK MINING COMPANY'S project in southcentral Alaska.

The remaining 227,000 ft of placer footage consisted of thaw-field development drilling for the ALASKA GOLD COMPANY in Nome. In winter, the frozen gravels are drilled to bedrock and water pipe is inserted in the drill holes. During the following summer, water is injected into the pipes to percolate through and thaw the gravel for dredging. The substantial footage drilled in 1986 represents a major investment in preparing a large yardage of reserves for dredging in future years.

COAL DRILLING

Before spring breakup, the DIAMOND ALASKA COAL COMPANY drilled nearly 11,000 ft to further assess the quality of their coal reserves in the Beluga coal field. PLACER U.S., INC., also completed additional exploration drilling on their coal deposits in the Beluga coal field. No drilling was reported in the Matanuska or Bering River coal fields in 1986. USIBELLI COAL MINE, INC., completed 10,000 ft of rotary drilling to prove up additional reserves in the Poker Flats area. Because this drilling was done 'in-house,' the footage is not included in the total drill footage.

HARD-ROCK DRILLING

In 1986, drilling on hard-rock deposits totaled 50,200 ft, a decline of 62 percent from the 1985 total of 131,700 ft. This drop reflects the completion of major exploration projects, the reduction in the number of active companies, and the present focus on precious metals.

No drilling was done on the Red Dog or Quartz Hill deposits because the exploration phases of those programs have been completed. Exploration drilling continued at the Greens Creek deposit, although the program was much smaller than in 1985 when the company was mandated by ANILCA to complete exploration on part of the project claims.

The number of companies with major drilling programs on hard-rock deposits declined from 14 in 1985 to eight in 1986. Many companies active in 1985 are maintaining their Alaska properties and may resume exploration-related drilling programs in the future. However, ENSERCH EXPLORATION and NORANDA EXPLORATION disposed of their holdings and ceased all exploration activities in Alaska.

ECHO BAY MINES, LTD. (ECHO BAY), the operator of several Canadian mines, was the only new company to begin a drilling program in Alaska in 1986. Following up on preliminary work done in 1985, ECHO BAY conducted a significant drilling program to reevaluate remaining reserves at the historic Alaska Juneau Mine in Juneau.

Over 90 percent of the hard-rock footage in 1986 was drilled on precious-metal deposits; only one company continued exploration-related drilling on base-metal deposits. This reflects a 3-yr trend in which metals exploration in Alaska has increasingly focused on precious metals.

Mineral resources and mineral potential of lands owned by native regional corporations

INTRODUCTION

The Alaska Native Claims Settlement Act (ANCSA), passed in December 1971, provided for the conveyance of approximately 44 million acres of land to Alaska natives. Under the terms of ANSCA, 12 landed regional corporations (fig. 33) and numerous Native village corporations within the regions were formed to select and manage the land settlement. The entitlement of each regional corporation is based on land areas covered by the region and on the number of Native corporation stockholders.

Under ANCSA, the village corporations receive title to the surface estate of approximately 22 million acres. The regional corporations receive title to the subsurface estate of the village lands, title to surface and subsurface estates for approximately 16 million additional acres, and subsurface title for much of 2 million acres of special-purpose lands. The balance of the land settlements is for 3.7 million acres, which comprises the settlement for seven Native village corporations located on five revoked reserves. These seven

village corporations hold title to both the surface and subsurface estates of their former reserves, which were created prior to ANCSA.

As major land owners, the Native regional corporations may contribute substantially to Alaska's mineral industry. The corporations selected much of their land entitlement on the basis of mineral potential and are currently involved in broad-based mineral exploration and joint-venture agreements and in secondary activities that support mineral exploration and mining.

Ten of the 12 landed corporations provided information on mineral resources and mineral potential for this report.

ARCTIC SLOPE REGIONAL CORPORATION

ARCTIC SLOPE REGIONAL CORPORATION (ASRC) is located in northern Alaska (fig. 33), with headquarters in Barrow and an office in Anchorage. Their land entitlement of 4.7 million acres includes mineral rights to coal, oil and gas, sand and gravel, and hardrock minerals. Mineral interests are focused on bituminous coal in the Deadfall syncline area near Cape Beaufort; chromite deposits in the De Long Mountains; and precious metals, strategic minerals, and Red Dog-type zinc-lead-silver mineral deposits in other areas of the Brooks Range.

Bituminous and subbituminous coal reserves of the North Slope are among the largest in the United States (Merritt and Hawley, 1986). ARCTIC SLOPE CONSULTING ENGINEERS (ASCE), a subsidiary of ASRC, conducted a detailed study of coal reserves in the Deadfall syncline area on the Chukchi Sea coast (loc. 3, fig. 34) and published a study of the feasibility of using coal as an energy source for western Alaska.

Significant mineral deposits may exist in the Noatak mining district, a 50-mi-wide belt that stretches from Point Hope on the Chukchi Sea east to Anaktuvuk Pass in the northcentral Brooks Range. Known mineral deposits include zinc-lead-silver reserves at Kivliktort Mountain (loc. 4, fig. 34) and on Story (loc. 5, fig. 34) and Drenchwater (loc. 6, fig. 34) Creeks.

Gravel resources of the corporation have been used in North Slope oil-field development, and several large gravel reserves have been identified by ASCE near Kaktovik (loc. 1, fig. 34) and Barrow (loc. 2, fig. 34). These reserves may be of future value to ASRC and local village corporations.

Additional information on mineral resources of the ASRC region is available from Charles Barnwell, Geologist, ARCTIC SLOPE CONSULTING ENGINEERS, 313 E Street (Ste. 2), Anchorage 99501.

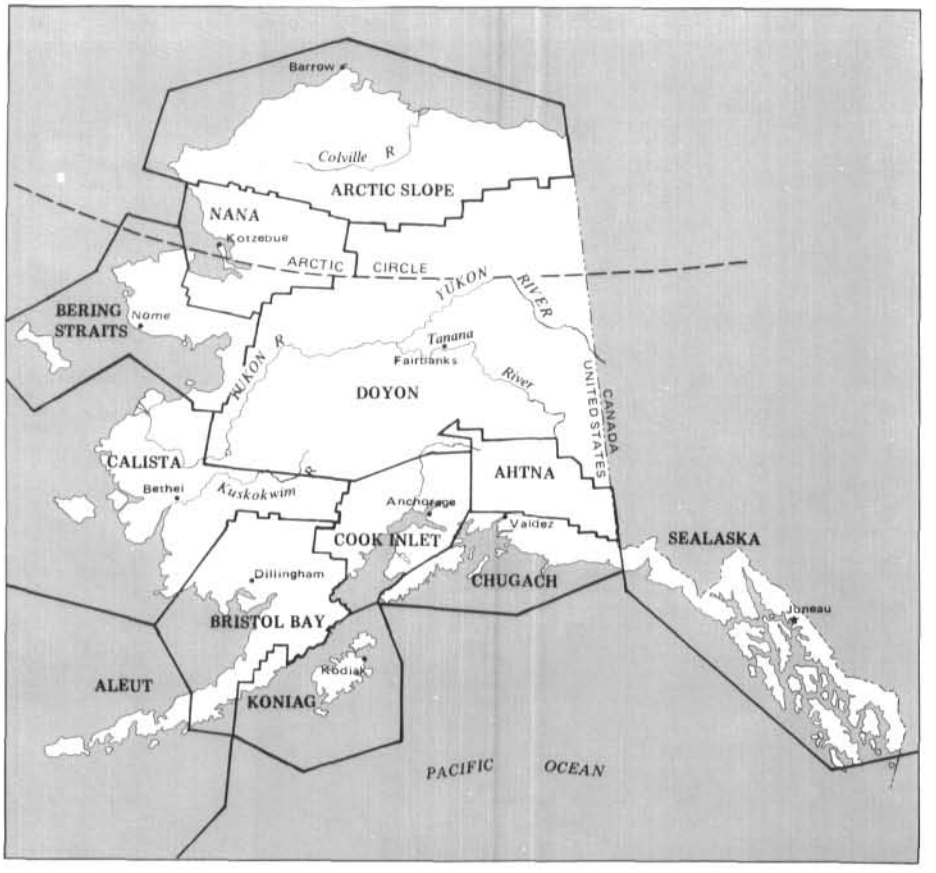


Figure 33. Native regional corporations in Alaska.

NANA REGIONAL CORPORATION

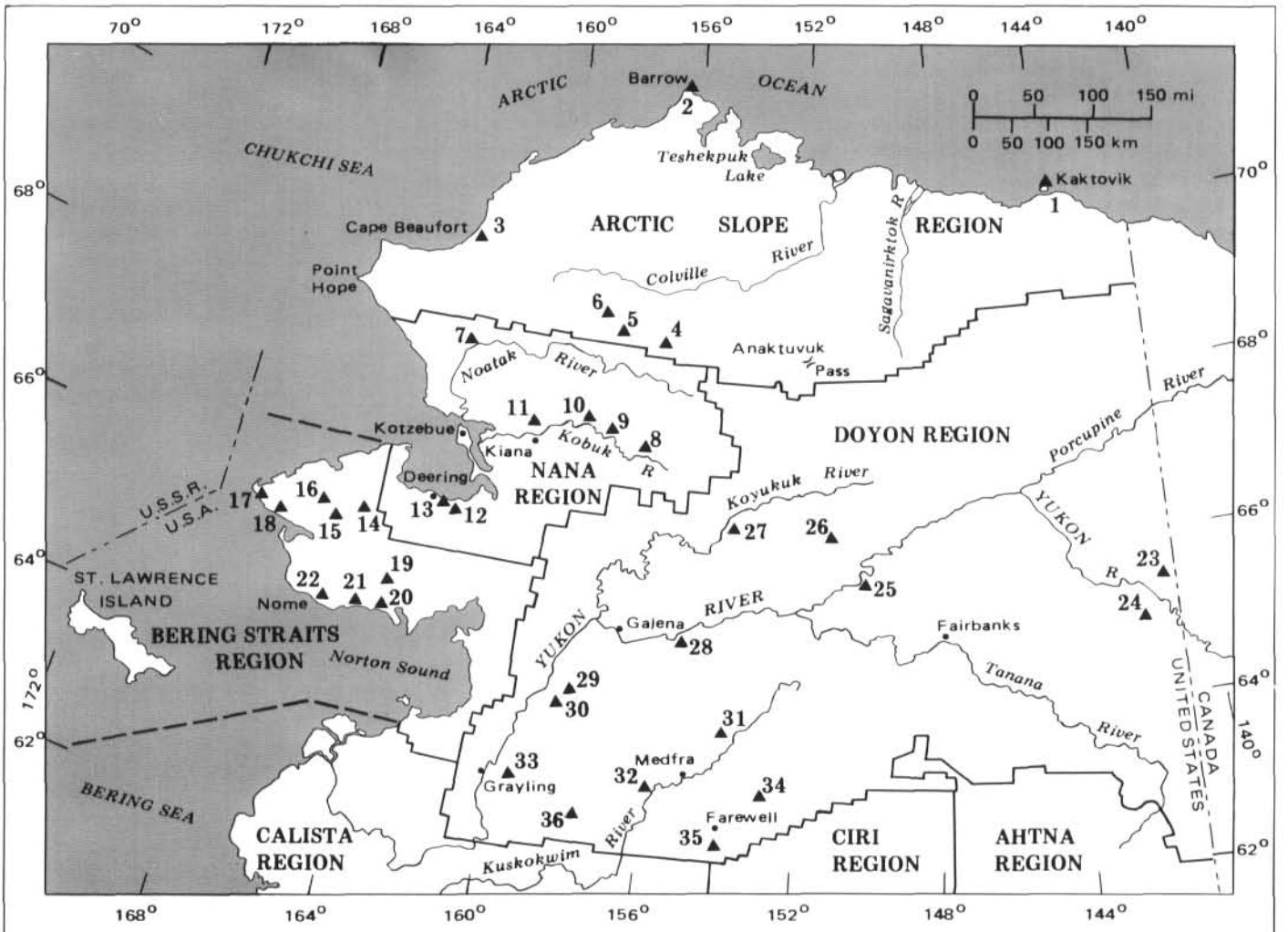
NANA REGIONAL CORPORATION (NANA), headquartered in Kotzebue, stretches across 2 million acres in western Alaska (fig. 33). NANA owns the zinc-lead-silver deposit at Red Dog (loc. 7, fig. 34) and selected land in the Ambler mining district (loc. 9, fig. 34), including property in the Bornite area around the copper and zinc deposits in the Cosmos Hills (loc. 8, fig. 34).

The Red Dog zinc-lead-silver property (see Development section) is the largest undeveloped zinc deposit in the world. Proven reserves total 85 million tons of ore that grade 17 percent zinc, 5 percent lead, and 2.4 oz/ton silver. Construction of an access road from the coast to the mine should begin in mid-1987, and mineral production is scheduled for early 1991. Red Dog is being developed as a joint venture between NANA and COMINCO ALASKA, INC.

In addition to the base-metal potential of NANA lands, there is a high lode-gold potential, particularly for 'Hemlo'-type gold deposits at the west end of the Ambler mining district and for auriferous stockwork quartz veins in the York Slate on the Seward Peninsula.

Good potential also exists for the discovery of placer-gold deposits. On Klery Creek north of Kiana (loc. 11, fig. 34), substantial amounts of placer gold have been produced. A bucketline dredge operated on the creek for several years, but current operations use conventional earthmoving equipment. The potential exists for significant placer reserves at the confluence of Klery Creek and the Squirrel River.

South of Deering, placer gold has been produced from the Inmachuk



1. Kaktovik gravel reserves (Arctic Slope)
2. Barrow gravel reserves (Arctic Slope)
3. Deadfall syncline coal deposit (Arctic Slope)
4. Kivliktort Mountain zinc-lead-silver deposit (Arctic Slope)
5. Story Creek zinc-lead-silver deposit (Arctic Slope)
6. Drenchwater Creek zinc-lead-silver deposit (Arctic Slope)
7. Red Dog zinc-lead-silver deposit (NANA)
8. Cosmos Hills copper-zinc deposit (NANA)
9. Ambler mining district copper-lead-zinc-silver-gold deposit (NANA)
10. Jade Mountains jade deposit (NANA)
11. Klery Creek placer-gold deposit (NANA)
12. Chicago Creek coal reserve (NANA)
13. Inmachuk River placer-gold deposit (NANA)
14. Kougarok placer-gold deposit (Bering Straits)
15. Kougarok tin-tantalum prospect (CIRI)
16. Kelly Creek gold prospect (CIRI)
17. Potato Mountain tin prospect (Bering Straits)
18. Lost River tin-tungsten-fluorite-beryllium deposit (Bering Straits)
19. Council placer-gold deposit (Bering Straits)
20. Bluff lode-gold deposit (Bering Straits)
21. Solomon placer-gold deposit (Bering Straits)
22. Nome placer-gold deposit (Bering Straits)
23. Step Mountain lead-zinc-silver deposit (Doyon)
24. Slate Creek chrysotile-asbestos reserve (Doyon)
25. Rampart mining district gold deposits (Doyon)
26. Kanuti River placer-tin deposit (Doyon)
27. Hughes mining district gold-uranium deposits (Doyon)
28. Ruby mining district gold-tin deposits (Doyon)
29. Illinois Creek mining district lead-zinc-silver-copper deposits (CIRI)
30. Waterpump Creek silver-lead-zinc prospect (CIRI)
31. Medfra lead-zinc-silver deposit (Doyon)
32. Candle Creek mining district gold-tungsten-mercury deposits (Doyon)
33. Grayling molybdenum deposit (Doyon)
34. Tonzona coal field (Doyon)
35. Farewell mining district silver-zinc-lead-tungsten deposits (CIRI)
36. Iditarod mining district gold-silver-tungsten-mercury-antimony deposits (Doyon)

Figure 34. Selected mineral properties held by Arctic Slope, NANA, Bering Straits, Doyon, Ltd., and Cook Inlet Region, Inc. (CIRI), regional corporations, 1986.

River and its tributaries (loc. 13, fig. 34), where at least four gold dredges operated before 1940. Excellent potential for additional pay exists below the lower limit of the previous mining operations and adjacent to active mining claims.

Auriferous paleochannels, about 1,200 ft wide, are the source of much of the gold derived from the Inmachuk River. The paleochannels, which are partly buried under Quaternary basalt flows, have been exploited primarily with drift mining techniques, but in one location the channels beneath the volcanic rock were hydraulically mined.

AMBLER VILLAGE CORPORATION, a subsidiary of NANA, owns property in the southern part of the Jade Mountains (loc. 10, fig. 34), where high-quality jade is produced. Jade reserves on the village lands have not been quantified, but the potential exists for substantial tonnages of the semiprecious stone.

The Chicago Creek coal deposit (loc. 12, fig. 34) is located on land controlled by DEERING VILLAGE CORPORATION, another NANA subsidiary. According to a recent evaluation by the State, the coal can be used for heat, power, and economic development (Retherford and others, 1986). Recent drilling under a State-supported contract indicates that economically exploitable reserves exist in the area.

The NANA region has substantial gravel reserves. Every major river valley contains gravel, and every village has a nearby gravel source to meet local needs.

Additional information on the mineral resources of the NANA region is available from John Rense, Vice President-Resources, NANA REGIONAL CORPORATION, 4706 Harding Drive, Anchorage 99517.

BERING STRAITS NATIVE CORPORATION

The land entitlement for BERING STRAITS NATIVE CORPORATION (BERING STRAITS) consists of nearly 2 million acres on the Seward Peninsula (fig. 33). Lands selected by BERING STRAITS and related village corporations have significant mineral potential. BERING STRAITS has its headquarters in Nome, with offices in Anchorage.

The Nome area (loc. 22, fig. 34) is historically one of Alaska's primary gold-producing regions. Since the discovery of gold on Anvil Creek in 1898, at least 4.5 million oz of placer gold have been produced. Other placer deposits in the Council (loc. 19, fig. 34), Solomon (loc. 21, fig. 34), and Kougarok (loc. 14, fig. 34) areas have produced substantial quantities of gold, and there is good potential for the discovery of additional placer deposits. Pay-channels delineated by previous exploration work and tailings from prior placer-mining operations may represent additional economic reserves.

On the outskirts of Nome, the ALASKA GOLD COMPANY, a subsidiary of SHARON STEEL, has delineated over 1 million oz of proven gold reserves and operates two bucket-line dredges. Land adjacent to the patented mining claims may contain placer gold in paying quantities. Exploration work funded by BERING STRAITS has resulted in the discovery of carbonate rocks that contain anomalous amounts of gold. Several other types of gold deposits were found, but detailed follow-up work has not been initiated.

UTAH INTERNATIONAL, INC., has an exploration agreement with BERING STRAITS for selected lands, including the Bluff area (loc. 20, fig. 34), which is known for its stratabound lode-gold potential. Rich placer deposits downstream from Bluff were mined in past years.

BERING STRAITS controls the land around the Lost River tin-tungsten-fluorite-beryllium deposits (loc. 18, fig. 34; loc. 24, app. C). Thorough exploration of the area may result in discovery of additional deposits. Preliminary work indicates that Potato Mountain (loc. 17, fig. 34), located northwest of Lost River on BERING STRAITS land, is a promising tin prospect.

Additional information on mineral resources of the BERING STRAITS region is available from Dan Fondell, Executive Vice President-Chief Executive Officer, BERING STRAITS NATIVE CORPORATION, 3111 C Street (Ste. 200), Anchorage 99503.

DOYON, LTD.

The land entitlement for DOYON, LTD., includes approximately 12.5 million acres with mineral rights. By the end of 1986, 9.1 million acres of land had been conveyed to the corporation. The DOYON region, which encompasses approximately one-third of Alaska (fig. 33), extends from the Brooks Range to the Alaska Range and from the Alaska-Yukon border almost to Norton Sound. DOYON headquarters are located in Fairbanks.

Recent mineral exploration on DOYON lands indicates that the area contains diverse geologic environments with recognized mineral potential. The geology of the region includes intermediate to felsic intrusive rocks, volcanic centers, skarn, Precambrian greenstone belts, quartz veins in schists, and both alkalic and ultramafic complexes. Several hundred prospects and areas of anomalous mineralization have been identified. The most clearly identified prospects include volcanogenic massive sulfides, carbonate- and shale-hosted lead and zinc, vein and disseminated gold and silver, porphyry copper, stockwork molybdenum, placer gold and tin, lode tin, tungsten skarns, vein mercury and antimony, sedimentary and hydrothermal uranium, and coal. Further evaluation is necessary to determine the type and economic potential of most deposits.

DOYON holds substantial lands in several well-known historic placer-gold districts, including the Iditarod mining district (loc. 36, fig. 34), which has produced over 1.6 million oz of gold, and the Candle Creek (loc. 32, fig. 34), Rampart (loc. 25, fig. 34), Hughes (loc. 27, fig. 34), and Ruby (loc. 28, fig. 34) mining districts, which have produced 100,000 to 500,000 oz of gold each.

Silver is the major exploration target in several areas of precious-metal mineralization. The most promising areas include intrusive-volcanic complexes in the Kuskokwim Mountains, where disseminated and vein silver deposits grade up to several ounces silver per ton.

Disseminated and skarn copper and molybdenum mineralization associated with intermediate to felsic intrusive rocks have been identified on DOYON lands. East of Grayling (loc. 33, fig. 34), drill-hole data confirmed ore-grade mineralization, and petrologic studies indicate that a stockwork molybdenum deposit is present within 1,000 ft of the surface.

Near Medfra (loc. 31, fig. 34) and at Step Mountain (loc. 23, fig. 34),

major carbonate- and shale-hosted lead-zinc-silver deposits that resemble producing deposits in northern Canada have been identified. Other lead-zinc occurrences have been located but not evaluated. Several poorly exposed Paleozoic and Precambrian lead-zinc occurrences of strata-bound sphalerite and galena mineralization in intermediate to felsic schists resemble volcanogenic massive-sulfide deposits. Rock and soil anomalies in these areas extend to several thousand feet along strike.

The Kanuti River region (loc. 26, fig. 34) has potential for several million cubic yards of ore-grade placer cassiterite—as demonstrated by test pits and drilling—and at least three other areas of disseminated, felsic-intrusive-hosted tin have been identified. Anomalous tin concentrations grade to several percent in bedrock and in surrounding soils and stream gravels. In addition, byproduct cassiterite has been recovered in gold placers at several localities.

Tungsten has been the object of extensive exploration on DOYON land. Prospective sites have been identified for tactite, strata-bound, and stockwork deposits, and several sites have been drilled with favorable results.

Vein occurrences of stibnite and cinnabar are present in the Iditarod area (loc. 36, fig. 34), and both minerals have been recovered as byproducts in some placer-gold operations. Two areas of felsic intrusives may contain rare-earth minerals, but exploration has been cursory.

Evidence of uranium mineralization on DOYON land includes vein enrichments, highly anomalous uranium and thorium in soils, and local and regional anomalous radioactivity in intrusive rocks similar to those that host uranium. No significant exploration for sandstone or unconformity-type uranium deposits has been conducted on several large fluvial basins present on DOYON land.

Drilling and regional studies indicate that major coal resources are located on DOYON land. The Tonzona coal field (loc. 34, fig. 34), located along the north flank of the Alaska Range, contains a +100-million-ton reserve; drill-hole intercepts indicate at least 150 ft of subbituminous coal. The geologic setting and quality of the coal deposit resemble those of the Usibelli Coal Mine near Healy.

A world-class chrysotile-asbestos district has been defined near Slate Creek (loc. 24, fig. 34) in the Yukon-Tanana Upland. Three surface deposits have drill-indicated reserves of 55 million tons of 6.35 percent asbestos fiber.

Very limited field work suggests that several ultramafic complexes on DOYON lands are favorable environments for chromite, nickel, and platinum-group metals.

Additional information on mineral resources of the DOYON region is available from Morris Thompson, President, DOYON, LTD., 201 1st Avenue, Fairbanks 99701.

COOK INLET REGION, INC.

COOK INLET REGION, INC. (CIRI), owns 601,360 acres of fee-simple estate, 21,832 acres of surface estate, and 516,878 acres of subsurface estate (fig. 33). The lands contain significant deposits of minerals, coal, and gravel.

Late in 1985, ANACONDA MINERALS COMPANY (ANACONDA) transferred their mineral holdings in Alaska (with one exception) to CIRI. The holdings are located throughout the state and include significant prospects for precious metals, tin, and chromium. As part of the Anaconda acquisition, CIRI obtained the largest mineral-exploration data base in Alaska. Descriptions of several properties are listed below:

Kougarok tin-tantalum prospect (loc. 15, fig. 34): This prospect is located on the Seward Peninsula, 80 mi north of Nome (Puchner, 1986). High-grade tin mineralization in greisenized granite was discovered at Kougarok Mountain in 1979. From 1980 to 1983, exploration on the prospect consisted of detailed mapping, geochemical and geophysical surveys, 33,000 ft of drilling, and over 3,000 ft of trenching. High-grade tin mineralization at Kougarok occurs in greisenized granitic plugs, dikes, and sills of Cretaceous age that intrude a sequence of pelitic schist and marble. Low-grade tin mineralization occurs as veins and stockworks within the schist. A high-grade tin resource of more than 150,000 tons that grades better than 1 percent tin has been outlined, and up to 0.1 percent tantalum is found in selected zones.

Kelly Creek prospect (loc. 16, fig. 34): This prospect is located on the Seward Peninsula at Quartz Creek, 45 mi northwest of the end of the Nome-Taylor Highway. The prospect consists of three zones of anomalous gold, arsenic, mercury, and antimony associated with graphitic schist and schistose marble. Drilling intersected disseminated-gold mineralization in graphitic schist over widths of 40 to 75 ft; average grade is 0.035 oz/ton gold.

Illinois Creek mining district (loc. 29, fig. 34): This district includes numerous precious- and base-metal prospects located in the Kaiyuh Mountains, 60 mi southwest of Galena. Mineralization was discovered during a regional reconnaissance program in 1980. Subsequent work included trenching, drilling, regional exploration, and construction of a large camp and airstrip. The two most promising prospects in the district are on Illinois and Waterpump Creeks. On Illinois Creek, trenching and drilling outlined a gossan body (120 ft wide and over ½ mi long) that contains significant gold in oxidized zones that may be amenable to open-pit mining.

Waterpump Creek prospect (loc. 30, fig. 34): High-grade silver-lead-zinc mineralization has been identified at this prospect. The shallow oxidized zone of the deposit contains silver that grades from 15 to 20 oz/ton. The deeper sulfide zone contains about 20 percent combined lead and zinc with silver credits.

Farewell mining district (loc. 35, fig. 34): Deposits in the mining district are located on the north flank of the Alaska Range, 150 mi northwest of Anchorage. Government investigations (Reed and Elliott, 1968) and industry reconnaissance studies in 1980 and 1981 located 15 deposits of polymetallic sulfide mineralization. Only six deposits have been evaluated in detail, and only two have

been drilled. At the Dall prospect, black shale hosts structurally controlled massive-sulfide mineralization (1 to 4 percent copper and 12 oz/ton silver). The mineralized zone varies from 12 to 30 ft wide and extends to at least 500 ft along a strike length of at least 1 mi. At the 6920, Tin Creek, and Little Bird prospects, the mineralization appears to be classic, low-temperature, fracture-controlled lead-zinc-silver skarns that occur as replacement bodies in limestone (Szumigala, 1987). In addition to sulfide mineralization, the 6920 prospect contains appreciable gold that grades to 0.36 oz/ton, and the Little Bird prospect contains tungsten and other base and precious metals.

Red Mountain chrome deposit (loc. 1, fig. 35): This deposit is located on the Kenai Peninsula, 140 mi south of Anchorage, and is accessible by road from Seldovia. Through the ownership of patented claims and fee-simple title, CIRI controls about 75 percent of the property with the highest mineral potential. Chromite mineralization at Red Mountain is hosted by a layered ultramafic body 4 mi long and 2 mi wide. About 37,000 tons of high-grade chromite ore were produced intermittently from 1942 to 1976. Based on estimates by the U.S. Bureau of Mines, about 100,000 tons of 28.6-percent chromite ore remain in at least five high-grade zones. More than 20 million tons of open-pit, minable resources that grade 5.6 percent chromite have been outlined in low-grade stringer zones (Foley and others, 1985); considerable potential exists for additional tonnage at depth. The Red Mountain deposit is one of the largest low-grade chrome resources in North America.

Johnson River mineralized area (loc. 2, fig. 35): CIRI holds mineral rights to over 20,000 acres in this mineralized area, which is located in Lake Clark National Park-Preserve, 130 mi southwest of Anchorage on the west side of Cook Inlet. The Johnson River mineralized area contains several important gold-zinc prospects in the volcanic and volcaniclastic rocks of the Jurassic Talkeetna Formation. Detailed work on the main Johnson River deposit outlined significant gold-zinc mineralization with credits of copper and lead in a steep quartz-stockwork zone. CIRI negotiated a Letter of Agreement with HOWARD KECK to conduct furthern exploration of the deposit, which is being evaluated as a potential underground high-grade gold mine.

Manhattan gold-silver-lead-zinc prospect (loc. 17, fig. 35): This prospect is located on the Alaska Peninsula, 30 mi south of Port Heiden and 20 mi north of Chignik. The prospect consists of multiple steeply dipping sulfide veins that cut a northeast-trending ridge of andesite porphyry. Surface assays over vein widths of 2 to 4 ft grade 0.5 oz/ton gold, 9 oz/ton silver, and 15 percent lead and zinc. Vein intercepts that contain similar amounts of gold have been drilled to 400 ft. Additional exploration is required to determine the feasibility of mining.

Additional information on mineral resources in the CIRI region is available from Kurt Humphrey, Manager, Oil and Gas Administration, COOK INLET REGION, INC., 2525 C Street (Ste. 500), P.O. Drawer 4-N, Anchorage 99509.

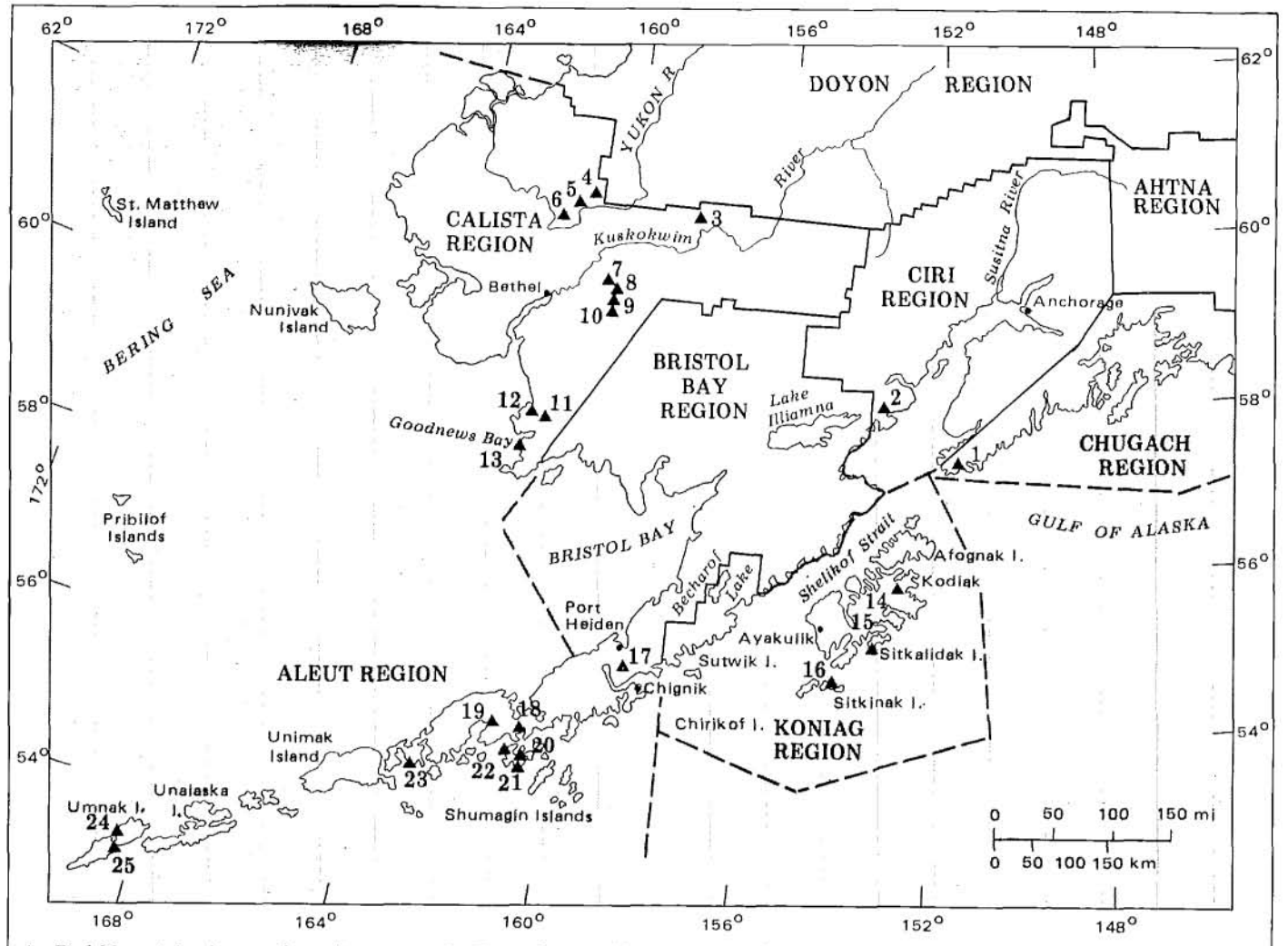
CALISTA CORPORATION

CALISTA CORPORATION'S land entitlement totals about 7 million acres in southwestern Alaska (fig. 33). Prior to selecting their land entitlement, CALISTA conducted a 3-yr mineral inventory of the CALISTA region to identify lands with mineral-resource potential. As a result of the survey, lands in several historic placer-gold districts and lands near the Goodnews Bay placer-platinum district (loc. 13, fig. 35), which contains the country's largest identified platinum deposit, were selected. Historic recovery from the district exceeded 641,000 oz of unrefined platinum-group metals (PGM). CALISTA'S land selection includes both the Red and Susie Mountain ultramafic complexes, which are the source of the PGM at Goodnews Bay. CALISTA is presently negotiating with owners of the Goodnews Bay Mine to evaluate the district's lode-PGM potential, to reprocess the placer tailings, and to develop unmined, deep placer reserves.

Forty placer-gold deposits with recorded production are present in the CALISTA region. Nearly all deposits were discovered during the early 1900s by prospectors who participated in the Nome stampede. Although many placer operations didn't evolve past hand-mining methods and were active for only a few years, the Bear (loc. 9, fig. 35), Tuluksak (loc. 8, fig. 35), and Marvel (loc. 10, fig. 35) prospects and streams in the Marshall mining district [Stuyahok River (loc. 4, fig. 35) and Kako (loc. 5, fig. 35) and Willow Creeks (loc. 6, fig. 35)] became profitable gold producers using either floating dredges or sluicing operations. All placer mines in the CALISTA region were closed by government order in World War II, and only the Wattamuse Mine and mines in the Nyac mining district on Bear and Tuluksak Creeks reopened. In addition to the sizable number of former placer producers, numerous drainages in the CALISTA region host fine-gold placers of undetermined economic potential. These drainages include Bogus Creek (loc. 7, fig. 35), the Aerolic River (loc. 12, fig. 35), and tributaries of the lower Yukon River.

Most gold placers in the CALISTA region are either along the lower Yukon River or on the west flank of the Kilbuck Mountains. Both terranes are composed of Mesozoic 'greenstone belts' that are potential hosts of intrusive- and exhalitive-type gold deposits. In addition, two auriferous hot-spring jasperoid sinters have been discovered on the west flank of the Kilbuck Mountains, which indicate that the area may also host a younger, epithermal gold deposit.

CALISTA has fielded its own exploration program for the past 2 yr. During the 1986 field season, CALISTA geologists mapped and sampled the Marshall mining district and 'rediscovered' the Arnold prospect on upper Willow Creek (loc. 6, fig. 35). The prospect, which was originally discovered in 1913, is a stockwork breccia in greenstone tuff that has been sheared and cut by several hydrothermally altered albite-diorite and quartz-porphyry dikes. The gold occurs in late-



1. Red Mountain chrome deposit (CIRI)
2. Johnson River gold-zinc deposit (CIRI)
3. Donlin Creek placer-gold deposit (Calista)
4. Stuyahok River placer-gold deposit (Calista)
5. Kako Creek placer-gold deposit (Calista)
6. Arnold lode-gold prospect (Calista)
7. Bogus Creek placer-gold deposit (Calista)
8. Tuluksak placer-gold prospect (Calista)
9. Bear placer-gold prospect (Calista)
10. Marvel placer-gold prospect (Calista)
11. Wattamuse Creek placer-gold deposit (Calista)
12. Aerolic River placer-gold deposit (Calista)
13. Goodnews Bay placer-platinum district (Calista)
14. Chalet Mountain lode-tungsten deposit (Koniag)
15. Sitkalidak Island lode-copper deposit (Koniag)
16. Sitkinak Island coal deposit (Koniag)
17. Manhattan gold-silver-lead-zinc prospect (CIRI)
18. Pyramid Peak copper-molybdenite deposit (Aleut)
19. Canoe Bay gold prospect (Aleut)
20. Aquilla-Orange Mountain-Shumagin gold-silver prospect (Aleut)
21. Apollo-Sitka gold prospect (Aleut)
22. Hog silver-gold prospect (Aleut)
23. Walrus Peak gold-silver prospect (Aleut)
24. Kigunak gold-silver prospect (Aleut)
25. Steeple Mountain gold prospect (Aleut)

Figure 35. Selected mineral properties held by Cook Inlet Region, Inc. (CIRI), Calista, Koniag, Inc., and Aleut regional corporations, 1986.

stage quartz veins that assay 0.12 to 2.72 oz/ton gold with an average uncut assay of 0.9 oz/ton gold. The property has not been drilled.

The Stuyahok River placer deposit (loc. 4, fig. 35) was examined by CALISTA in 1985. The main deposit lies in the headwaters of the Stuyahok River in an area of subdued relief and no outcrop; at least one-third of the paystreak has not been mined. The most interesting aspect of this property is its lode potential.

In 1916, placer gold was discovered on Wattamuse Creek (loc. 11, fig. 35) and, except during the war, the mine produced until 1961. The creek drains a Cretaceous granitic stock that intrudes marine andesite, slate, and chert of early Mesozoic age. Intrusive gabbro contains gold that grades 0.1 oz/ton.

The Donlin Creek placer area (loc. 3, fig. 35), currently leased by CALISTA to LYMAN RESOURCES OF ALASKA, INC., is located in the Aniak gold-mercury district in the middle Kuskokwim region. The area is underlain by a thick sequence of Upper Cretaceous marine sedimentary rocks that have been cut by a northeast-trending swarm of Tertiary rhyolite porphyry dikes. Donlin Creek has been a sporadic producer of placer gold, which occurs in benches and tributaries on the south side of the creek, since its discovery in 1910. On the ridge south of the creek, a series of rhyolite porphyry dikes are exposed in trenches. Gold associated with stibnite and pyrite occurs along the sheared contact of the dikes and in tight shear zones within and adjacent to the intrusive rock. CALISTA sampled the property in the early 1970s and in 1985. Anomalous gold values were traced for 3 mi along strike of the rhyolite. Ten- and 25-ft channel samples yielded 2.05 oz/ton uncut gold and 0.08 oz/ton gold, respectively.

Additional information on mineral resources in the CALISTA region is available from Mike Neimeyer, Vice President, Land and Natural Resources, CALISTA CORPORATION, 516 Denali Street, Anchorage 99501.

BRISTOL BAY NATIVE CORPORATION

The BRISTOL BAY NATIVE CORPORATION (BBNC) entitlement includes 3.1 million acres of land east of the Aleutian Islands and west of Cook Inlet (fig. 33). This area consists of coastal lowlands, volcanic terrain, and broad river valleys. Mountains on the west, north, and northeast are composed primarily of sedimentary rocks, including shale, siltstone, graywacke, and limestone, with minor igneous intrusions. Limited mineral exploration has shown that the most prevalent metallic minerals are gold, silver, copper, zinc, lead, molybdenum, tin, tungsten, and iron; the region also has coal resources.

In the early 1980s, RESOURCE ASSOCIATES OF ALASKA initiated an exploration program on BBNC lands in southwest Alaska, but many areas in the region have not been explored.

Additional information on mineral resources in the BBNC region is available from Mike Mark Anthony, Mining Engineer-Land Planner, BRISTOL BAY NATIVE CORPORATION, P.O. Box 100220, Anchorage 99501.

KONIAG, INC.

The KONIAG, INC., area includes Kodiak Island, Afognak Island, and the eastern Alaska Peninsula between Kujulik Bay and Becharof Lake (fig. 33). Kodiak Island, particularly the northwestern half, contains gold, silver, copper, lead, zinc, and tungsten deposits. Along the western beaches of the island, placer deposits of gold, magnetite, pyrite, chromite, and platinum have been mined on a small scale in recent decades. A small tungsten lode occurs on Chalet Mountain (loc. 14, fig. 35), 10 mi west of Kodiak, and a small copper lode is located on the northwest side of Sitkalidak Island (loc. 15, fig. 35). The presence of chromite and platinum placers suggests that additional lode deposits may be associated with a belt of intrusive rocks also located along the northwest coast of Sitkalidak Island. Coal outcrops are located near Ayakulik and on Sitkinak Island (loc. 16, fig. 35), where coal was gathered from the beaches by early explorers.

Additional information on mineral resources in the KONIAG region is available from Frank Pagano, President, KONIAG, INC., 201 Kashaveroff (Ste. 6), Kodiak 99615.

ALEUT CORPORATION

The ALEUT CORPORATION has rights to about 1.4 million acres of subsurface estate and 50,000 acres of fee-simple estate in the lower Alaska Peninsula and Aleutian Islands (fig. 33).

Numerous prospects for gold, silver, coal, porphyry copper, and other base metals have been identified in exploration programs conducted on ALEUT lands by KENNECOTT CORPORATION, FREEPORT MINING COMPANY, UNC TETON, RESOURCE ASSOCIATES OF ALASKA, HOUSTON OIL AND MINERALS, and QUINTANA-DUVAL. Descriptions of several prospects are listed below:

Pyramid Peak (loc. 18, fig. 35): A copper-molybdenite monzonite porphyry that intrudes black siltstones of the Cretaceous Hoodoo Formation. Estimated to contain 113 million tons of 0.403 percent copper with credits of molybdenite in a smaller but richer chalcocite blanket. Drilled for copper; follow-up sampling indicated anomalous gold and silver.

Canoe Bay (loc. 19, fig. 35): A rhyolite porphyry dome intruded into a thick clastic pile. Stockwork development displays anomalous gold, silver, mercury, and arsenic throughout the 1-mi^2 project area.

Aquilla-Orange Mountain-Shumagin trend (loc. 20, fig. 35): An epithermal vein and stockwork system that contains the Orange Mountain prospect, a 2.7-mi^2 area of brecciation and intense silica alteration that displays potential for both large-tonnage disseminated-gold deposits and smaller, bonanza-type gold-silver vein deposits. Anomalous gold that grades 0.083 oz/ton, silver that grades 0.76 oz/ton, mercury, thallium, tellurium, and bismuth are found in the area; property has been tested with three drill holes.

Apollo-Sitka trend (loc. 21, fig. 35): An epithermal vein system that may contain extensions of mineralization associated with the Apollo-Sitka Mine, which produced 107,900 oz of 0.22-oz/ton gold from 1892 to 1912.

Hog prospect (loc. 22, fig. 35): Volcanic-breccia-hosted silver-gold mineralization in the ring-fracture zone of the Unga caldera. The prospect area is anomalous in silver that grades 7.9 oz/ton, gold that grades 0.04 oz/ton, arsenic, and mercury; property has been tested with six drill holes.

Walrus Peak (loc. 23, fig. 35): A shear zone with strong argillitic alteration produced by a solfataric system; contains anomalous gold that grades 0.186 oz/ton, silver that grades to 1.14 oz/ton, mercury, and arsenic.

Kigunak (loc. 24, fig. 35): A volcanic-hosted, multiphase granodiorite intrusive with alteration indicative of acidic hydrothermal fluids (kaolinite, sericite, silica, and alunite). Areal extent of gold mineralization is difficult to determine because of ash cover; channel samples average 0.10 oz/ton gold and 0.56 oz/ton silver; property has been tested with five drill holes.

Steeple Mountain (loc. 25, fig. 35): The prospect is similar to Kigunak prospect with extensive zones of silicification, quartz-stockwork veining, potassium flooding, and detectable gold that ranges from 0.005 to 1.3 ppm.

Additional information on mineral resources in the ALEUT region is available from Wayne Lewis, Director of Lands and Minerals, ALEUT CORPORATION, 4000 Old Seward Highway, One Aleut Plaza (Ste. 300), Anchorage 99503-6028.

AHTNA, INC.

The AHTNA, INC., region includes the Wrangell Mountains, Chugach Mountains, Gulkana upland, Lake Louise plateau, Copper River basin, and parts of the Alaska Range (fig. 33). Most of Alaska's historical copper and lode-silver production are from deposits on AHTNA property in the Kennecott mining district (loc. 1, fig. 36). AHTNA is a joint-venture partner in the Valdez Creek placer operation (loc. 2, fig. 36) near the Denali Highway (see Development section). The geology of the AHTNA region is favorable for metallic-mineral deposits, including gold, copper, silver, zinc, and strategic minerals. However, federal land withdrawals have severely limited the potential for new discoveries.

Additional information on mineral resources in the AHTNA region is available from Roy Ewan, President, AHTNA, INC., Drawer G, Copper Center 99573.

CHUGACH ALASKA, INC.

Land holdings of CHUGACH ALASKA, INC., headquartered in Anchorage, are situated along 450 mi of the Alaska coast from lower Cook Inlet to Icy Bay and include the cities of Cordova, Valdez, Seward, and Whittier (fig. 33). The region is rich in minerals and has produced 215 million lb of copper and 144,000 oz of gold, including 54,000 oz of byproduct gold mined from copper deposits (Moffit and Fellows, 1950).

The Port Valdez and Port Wells areas contain notable lode-gold deposits. In the Port Valdez area, mineralization occurs in the uplands on the north side of Valdez Arm and near the Cliff Mine (loc. 3, fig. 36). In the Port Wells area, the mineralized zone is a few miles wide at the north end of College Fiord, widening to 30 mi at the south end between Portage Pass and Eaglek Bay. The Granite Mine (loc. 5, fig. 36), an area of promising mineral potential, is located at Golden. According to PIONEER RESOURCES, INC., known mines and prospects at Port Wells contain about 300,000 oz of gold that grade 0.65 oz/ton gold.

Placer-gold deposits are located in beach sands on Middleton Island (loc. 10, fig. 36) and in the dry channel of the Copper River. Other fine-grained, low-grade placer deposits are located in many streams in the King's Bay, Unakwik, Port Wells, Valdez Arm, Copper River, and Lowe River areas. CHUGACH ALASKA has selection rights to beach-placer properties at Cape Yakataga near those being developed by ALASKAGOLD MINES, INC. (see Development section).

Significant copper mineralization is found at Knight (loc. 7, fig. 36) and LaTouche (loc. 9, fig. 36) Islands and at Ellamar (loc. 4, fig. 36). Sedimentary-hosted copper deposits with significant credits of gold have been identified at Ellamar, LaTouche Island, and on the south side of Port Fidalgo. The Beatson Mine on LaTouche Island is responsible for 90 percent of the copper produced in the Prince William Sound region.

Manganese is found in low concentrations on Chenega Island (loc. 8, fig. 36), and a chrome deposit has been identified in the English Bay and Port Graham areas. Cobalt and nickel, which are associated with many of the copper deposits described above, have been identified at Miners River.

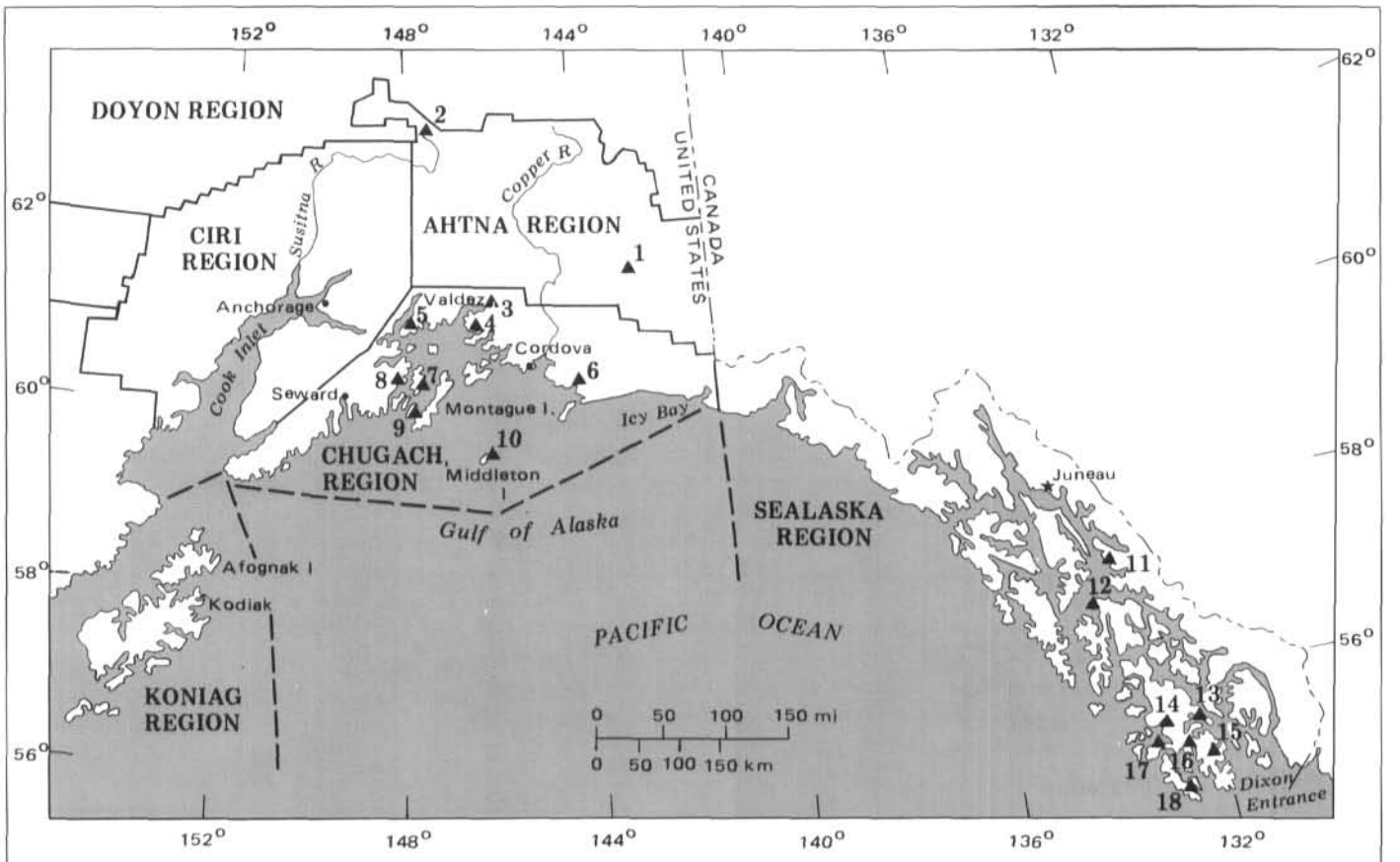
In the Bering River area (loc. 6, fig. 36), extensive coal deposits (estimated at 3.6 billion tons that cover 80 mi^2) are present in four formations. Parts of the coal seams are structurally dismembered. The eastern half of the coal field contains mainly anthracite, whereas the western half consists primarily of subbituminous coal. The coals have low ash and moisture contents and high heating values (from 12,000 to 15,000 Btu's).

For additional information on mineral resources in the CHUGACH region, contact Pio Park, Manager, Exploration, CHUGACH ALASKA, INC., 3000 A Street (Ste. 4000), Anchorage 99503.

SEALASKA CORPORATION

The SEALASKA CORPORATION selected lands throughout southeastern Alaska (fig. 33). As of December 1986, 102,700 acres had been patented and 385,700 acres had been conveyed by the federal government to the corporation.

SEALASKA partially identified its subsurface resource potential with two reconnaissance exploration surveys that were conducted from 1975 to 1979. The surveys covered about 40 percent of each withdrawal area (except Yakutat) and included literature review, field exploration, geochemical surveys of stream sediments, rock-chip assays, and limited follow-up investigations of mineral anomalies. About 5,000 stream-sediment samples and 500 rock samples were collected and analyzed for mineral values. In addition, SEALASKA catalogued and studied several thousand rock, stream-sediment, and drill-core samples collected by private industry and state and federal agencies.



1. Kennecott mining district lode-silver and lode-copper deposits (Ahtna)
2. Valdez Creek placer-gold deposit (Ahtna)
3. Cliff Mine lode-gold deposit (Chugach)
4. Ellamar copper deposit (Chugach)
5. Granite Mine (Chugach)
6. Bering River coal field (Chugach)
7. Knight Island copper deposit (Chugach)
8. Chenega Island manganese deposit (Chugach)
9. LaTouche Island copper deposit (Chugach)
10. Middleton Island placer-gold deposit (Chugach)
11. Juneau lode-gold deposit (Sealaska)
12. Kake lead-zinc-silver deposit (Sealaska)
13. Kasaan Peninsula copper-iron deposit (Sealaska)
14. Trocadero Bay copper-zinc-silver deposit (Sealaska)
15. Cholmondelay Sound base- and precious-metal deposit (Sealaska)
16. Jumbo Basin base- and precious-metal deposit (Sealaska)
17. Black Bear Lake molybdenite-copper and lead-zinc deposits (Sealaska)
18. Dall Island lead-zinc deposit (Sealaska)

Figure 36. Selected mineral properties held by Ahtna, Inc., Chugach Alaska, Inc., and Sealaska regional corporations, 1986.

SEALASKA recently completed atlases that list resource inventories and land-management programs for their lands. Included in the atlases are descriptions of surface resources, timber, and topography and land-management and geologically hazardous areas. The subsurface resource inventory lists known minerals and energy occurrences, discusses studies conducted in areas that have available subsurface data, identifies areas that have no subsurface data, and briefly describes geologic investigations that may improve the data base.

Minerals with potential for commercial development include lead, zinc, molybdenite, copper, silver, and gold; a potential for development of calcium-rich limestone exists. Areas of mineral potential include Prince of Wales withdrawal areas [Hydaburg, Craig, Klawock, Kassan, and Cholmondelay Sound (loc. 15, fig. 36)] and Chichagof, Dall, Kuiu, and Admiralty Islands.

Four areas with especially high mineral potential are located near Trocadero Bay, Sunny Hay Mountain, Black Bear, and Shinaku Inlet in the Craig-Klawock area on Prince of Wales Island. The Trocadero Bay area (loc. 14, fig. 36) has moderate to high geochemical values of copper, zinc, and silver with trace amounts of gold and appears to have a mineralized shear zone in Paleozoic metasedimentary and metavolcanic rocks. In the Black Bear Lake area (loc. 17, fig. 36), mineralized veins contain anomalous concentrations of molybdenite-copper and lead-zinc.

Hydaburg, located on southwestern Prince of Wales Island, contains two large areas of sulfide-mineral potential. Copper, zinc, and silver have been identified in the Soda Bay area, which is

composed of Paleozoic metasediments and altered volcanics. Local faulting and shearing appear to be responsible for the structurally complex altered volcanics.

In the Hetta Inlet area, metamorphic rocks of the Precambrian or Paleozoic Wales Group have been intruded by mafic to intermediate igneous rocks of Mesozoic age. Sulfide minerals are found as epigenetic mineralization that consists of veinwork massive sulfides in faults and fissures or contact-metamorphic replacement lodes in bedded rocks, especially in the Jumbo Basin area (loc. 16, fig. 36). Minerals with moderate to high economic potential include copper, lead, silver, gold, zinc, barite, and iron. The Hetta Inlet area is geologically similar to the Kasaan Peninsula (loc. 13, fig. 36), where copper-iron deposits have been produced commercially. Most of the 42 million lb of copper and several hundred thousand ounces of gold and silver produced on Prince of Wales Island came from the Hetta Inlet and Kasaan Peninsula regions. Summaries of the geologic framework of these areas are presented in Herreid and others (1978) and Gehrels and Saleeby (1987).

The Dall Island area (loc. 18, fig. 36), a withdrawal of KLUKWAN VILLAGE CORPORATION, is located on central Dall Island off the southwest corner of Prince of Wales Island. The porphyry and massive-sulfide mineral potential of the area is promising. SEALASKA currently owns about 36,865 acres of surface and subsurface estate on Dall Island. A geologic reconnaissance of the area by SEALASKA outlined an extensive area with anomalous lead-zinc geochemical values in carbonate and sedimentary rocks of Paleozoic age. Mineralized float and veinwork indicate the presence of Cretaceous to Jurassic porphyritic intrusive rocks. Other than logging roads in east-central Dall Island, access to the island is by air or boat from Ketchikan, about 60 mi to the east.

Geologic reconnaissance work by SEALASKA indicates lead, zinc, and traces of silver over an extensive area near Kake (loc. 12, fig. 36). High to very high geochemical values of galena, sphalerite, and chalcocite have been found in a structurally complex area of Paleozoic metasedimentary rocks. The geologic setting is similar to that of the Greens Creek deposit on northern Admiralty Island.

SEALASKA also has important land positions in the Juneau Gold Belt (loc. 11, fig. 36), Alaska's largest producer of lode gold.

For further information on mineral resources in the SEALASKA region, contact Robert Loescher, Vice President, Resource Management, SEALASKA CORPORATION, One Sealaska Plaza (Ste. 400), Juneau 99801.

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APPENDIX A

Total active claims and new claims staked in 1984, 1985, and 1986.[a] (listed by quadrangle)[b]

		Active claims assessment work			New claims staked						Total active claims		
					Federal			State					
	Quadrangle	1984	1985	1986	1984	1985	1986	1984	1985	1986	1984	1985	1986
13	Umiat	0	0	1	0	0	0	0	0	0	0	0	1
14	Sagavanirktok	0	0	0	0	2	1	0	0	0	0	2	1
15	Mt. Michelson	0	0	0	0	0	0	1	0	0	1	0	0
17	Point Hope	548	0	547	0	0	0	0	0	0	548	0	547
18	De Long Mts.	6,735	6,772	4,617	0	0	0	14	0	0	6,749	6,772	4,617
23	Philip Smith Mts.	20	6	36	2	11	19	0	2	10	22	19	65
26	Noatak	5,721	2,298	905	0	0	0	0	142	15	5,721	2,440	920
27	Baird Mts.	46	15	89	7	101	2	0	5	0	53	121	91
28	Ambler River	2,369	1,476	839	0	0	0	0	0	0	2,369	1,476	839
29	Survey Pass	584	384	346	0	0	0	0	0	0	584	384	346
30	Wiseman	1,616	1,505	1,755	169	160	30	74	25	30	1,859	1,690	1,815
31	Chandalar	736	1,111	909	4	105	22	182	119	12	922	1,335	943
32	Christian	1	1	1	0	0	0	0	0	0	1	1	1
36	Selawik	0	2	0	0	2	0	0	0	0	0	2	0
37	Shungnak	77	69	71	7	2	0	0	0	0	84	71	71
38	Hughes	11	118	54	0	0	0	0	4	0	11	122	54
39	Bettles	400	539	597	232	37	7	6	0	4	638	576	608
43	Teller	1,616	1,566	1,388	0	0	0	9	0	15	1,625	1,566	1,403
44	Bendeleben	1,739	1,343	1,363	16	13	4	72	41	24	1,827	1,397	1,391
45	Candle	330	423	557	0	15	0	0	19	78	330	457	635
47	Melozitna	39	108	32	0	0	0	0	0	27	39	108	59
48	Tanana	1,501	1,605	1,518	6	0	0	120	24	71	1,627	1,629	1,589
49	Livengood	2,893	2,942	3,719	0	1	0	370	362	189	3,263	3,305	3,908
50	Circle	3,875	3,740	3,268	0	0	2	217	105	351	4,092	3,845	3,621
51	Charley River	183	263	263	0	0	0	0	0	4	183	263	267
52	Nome	496	486	358	0	0	0	2	35	59	498	521	417
53	Solomon	750	1,045	829	0	12	1	152	36	39	902	1,093	869
54	Norton Bay	10	110	110	0	0	0	0	0	0	10	110	110
55	Nultao	5,203	3,213	3,173	1,065	6	16	0	0	144	6,268	3,219	3,333
56	Ruby	954	1,951	1,152	6	0	0	320	85	9	1,280	2,036	1,161
57	Kantishna River	348	318	299	20	0	0	0	0	0	368	318	299
58	Fairbanks	2,228	2,341	2,127	0	8	75	342	373	195	2,570	2,722	2,397
59	Big Delta	1,272	1,402	1,056	33	1	55	104	75	60	1,409	1,478	1,171
60	Eagle	5,775	2,269	2,069	5	4	0	429	240	163	6,209	2,513	2,232
63	Unalakleet	50	0	0	4	0	0	46	0	0	100	0	0
64	Ophir	578	587	384	1	0	0	63	62	8	642	649	392
65	Medfra	490	583	502	0	0	0	140	34	56	630	617	558
66	Mt. McKinley	258	382	287	0	0	0	0	0	0	258	382	287
67	Healy	3,037	3,579	3,790	242	127	704	156	173	150	3,435	3,879	4,644
68	Mt. Hayes	3,563	4,203	3,515	169	289	56	136	194	337	3,868	4,686	3,908
69	Tanacross	1,208	645	751	0	0	0	0	121	168	1,208	766	919
72	Holy Cross	0	14	14	0	0	0	0	0	0	0	14	14
73	Iditarod	468	524	565	62	3	13	69	69	4	599	596	582
74	McGrath	366	396	109	0	0	0	0	37	0	366	433	109
75	Talkeetna	1,649	2,899	1,935	21	62	0	595	488	209	2,265	3,449	2,144
76	Talkeetna Mts.	2,254	2,298	1,292	8	82	0	274	138	129	2,536	2,518	1,421
77	Gulkana	97	131	16	7	2	0	7	3	0	111	136	16
78	Nabesna	325	411	440	12	0	8	0	4	7	337	415	445
81	Russian Mission	31	115	50	0	0	1	0	0	0	31	115	51
82	Sleetmute	288	270	295	0	0	0	4	0	28	292	270	323
83	Lime Hills	444	360	368	0	0	0	13	4	4	457	364	372
84	Tyonek	5,189	5,990	6,575	0	0	0	121	254	492	5,310	6,244	7,067
85	Anchorage	1,063	1,300	1,052	0	2	0	251	205	231	1,314	1,507	1,283
86	Valdez	185	157	283	33	0	9	117	1	24	335	158	316
87	McCarthy	89	308	170	0	0	0	0	0	0	89	308	170
91	Bethel	478	371	600	0	0	0	3	59	0	481	430	600
92	Taylor Mts.	117	408	283	0	0	0	153	0	0	270	408	283
93	Lake Clark	113	431	411	0	0	0	236	50	0	349	481	411
94	Kenai	8	9	2	0	0	0	0	0	6	8	9	8
95	Seward	904	1,715	1,444	340	331	164	162	108	58	1,406	2,154	1,666
96	Cordova	35	23	23	1	0	2	0	0	0	36	23	25
97	Bering Glacier	303	539	231	0	0	0	38	34	22	341	573	253
101	Goodnews	48	9	26	0	0	0	0	0	0	48	9	26
102	Dillingham	18	18	18	0	0	0	0	0	0	18	18	18
103	Iliamna	127	255	23	0	0	0	102	102	0	229	357	23
104	Seldovia	108	70	13	0	0	0	0	0	0	108	70	13
105	Blying Sound	3	3	2	0	0	0	0	0	0	3	3	2
107	Icy Bay	6	6	6	0	0	0	24	0	18	30	6	24
108	Yakutat	0	0	2	0	0	0	9	0	0	9	0	2

[a] Totals are based on 1984, 1985, and 1986 assessment affidavits and location notices received by DGGS and DOM by December 31, 1986. Only documents received by December 31, 1986, are included in this appendix. Because BLM does not require that annual assessment work for federal claims be filed until December 31 of the assessment year, many affidavits are not received and counted until January of the following year, which can lead to discrepancies in some totals. Assuming that this effect is random, the large overall drop in annual assessment work and total number of active claims from 1985 to 1986 is probably significant.

[b] Quadrangle numbered northwest to southeast according to DGGS-DOM numbering and Kardex systems.

	Quadrangle	Active claims assessment work 1984	1985	1986	New claims staked Federal 1984	1985	1986	State 1984	1985	1986	Total active claims 1984	1985	1986
109	Skagway	452	515	468	127	5	15	6	109	7	585	629	490
111	Mt. Fairweather	21	37	4	0	0	2	0	0	0	21	37	6
112	Juneau	1,464	1,783	1,184	31	253	211	24	89	68	1,519	2,125	1,463
113	Taku River	3	92	0	0	0	0	0	0	0	3	92	0
114	Sitka	784	739	717	38	40	0	2	0	1	824	779	718
115	Sumdum	354	350	140	4	4	0	0	2	0	358	356	140
116	Port Alexander	184	184	184	0	0	0	0	0	0	184	184	184
117	Petersburg	1,219	677	1,164	305	753	50	0	8	2	1,524	1,438	1,216
118	Bradfield Canal	51	21	8	105	0	4	0	0	0	156	21	12
119	Craig	673	575	702	20	49	112	8	24	38	701	648	852
120	Ketchikan	512	474	430	9	71	152	0	9	0	521	554	582
121	Dixon Entrance	143	512	517	0	1	2	0	0	0	143	513	519
122	Prince Rupert	8	8	8	0	0	0	0	0	0	8	8	8
123	Hagemeister Island	497	338	338	0	0	0	0	0	0	497	338	338
126	Mt. Katmai	24	0	0	0	0	0	0	0	0	24	0	0
127	Afognak	1	1	2	0	0	0	0	0	0	1	1	2
130	Karluk	0	0	0	0	0	0	12	0	0	12	0	0
133	Chignik	105	55	110	0	0	0	0	0	0	105	55	110
135	Trinity Islands	125	131	161	0	0	0	51	146	12	176	277	173
138	Port Moller	16	89	44	0	0	0	0	0	1	16	89	45
TOTAL		78,612	75,009	65,705	3,111	2,554	1,739	5,236	4,219	3,579	86,959	81,782	71,014

APPENDIX B

State, federal, and private agencies involved in mineral-development activities, 1986

STATE OF ALASKA AGENCIES

A. Department of Commerce and Economic Development (DCED)
State Office Building, 9th Fl.
P.O. Box D (mailing)
Juneau, AK 99811
(907) 465-2500
Commissioner - J. Anthony Smith

Function: Promotes economic development in Alaska.

Division of Minerals and Forest Products
State Office Building, 9th Fl.
P.O. Box D (mailing)
Juneau, AK 99811
(907) 465-2094
Director - Thyes Shaub
Development Specialist - James R. Deagen

1001 Noble St., Ste. 420
Fairbanks, AK 99701
(907) 452-7464
Development Specialist - Charles B. Green

111 Steadman, Ste. 204
Ketchikan, AK 99901
(907) 225-4669
Development Specialist - Frank Seymour

Frontier Building
3601 C St., Ste. 722
Anchorage, AK 99503
(907) 562-2728
Development Specialist - Bill Aberle

Function: Primary advocacy agency in state government for mining industry. Provides liaison between state government and private sector. Researches and publishes economic data on Alaska's mining industry.

B. Department of Environmental Conservation (DEC)
3220 Hospital Dr.
P.O. Box O (mailing)
Juneau, AK 99811-1800
(907) 465-2600
Public Information (907) 465-2606
Commissioner - Dennis D. Kelso

Function: Issues permits for activities, including mining, that affect air or water quality or involve land disposal of wastes. Sets air- and water-quality standards. Inspects, monitors, and enforces environmental-quality statutes, regulations, and permits. Reviews all federal permits.

Northern Regional Office
675 7th Ave., Sta. J
P.O. Box 1601 (mailing)
Fairbanks, AK 99707
(907) 452-1714
Permit Information (907) 452-2340
(collect calls accepted)
Regional Supervisor - Larry Dietrich

Southcentral Regional Office
437 E St., Ste. 200
Anchorage, AK 99501
(907) 274-2533
Permit Information (907) 279-0254
(collect calls accepted)
Regional Supervisor - Bill Lamoreaux

Southeastern Regional Office
9000 Old Glacier Hwy.
P.O. Box 2420 (mailing)
Juneau, AK 99803
(907) 789-3151
Permit Information (907) 465-2615
(collect calls accepted)
Regional Supervisor - Deena Henkins

C. Department of Fish and Game (ADF&G)
Capital Office Park
P.O. Box 3-2000 (mailing)
Juneau, AK 99802
(907) 465-4100
Commissioner - Don W. Collinsworth
(907) 465-4105
Acting Director, Habitat Division - Bruce Baker

Function: Protects habitat in fish streams and manages refuges, sanctuaries, and critical habitats. Requires permits for any work involving the blockage of fish passage; equipment crossings or operation in streams with anadromous fish; use, diversion, or pollution of streams containing anadromous fish; construction, exploration, or development work in state game refuges, game sanctuaries, and critical habitat areas.

Also advises land-management agencies by preparing compilations of fish, wildlife and habitat, and public-use information; assessing habitat requirements and potential impacts; setting guidelines and recommendations for preventing, reducing, or mitigating fish, wildlife, habitat, and human harvest losses.

Central Regional Office
Habitat Division
1300 College Road
Fairbanks, AK 99701
(907) 451-6192

Southcentral Regional Office
Habitat Division
333 Raspberry Rd.
Anchorage, AK 99518-1599
(907) 267-2283

Southeastern Regional Office
Habitat Division
803 3rd St., 1st Fl.
P.O. Box 20 (mailing)
Douglas, AK 99824
(907) 465-4290

D. Department of Natural Resources (DNR)
400 Willoughby Center, 5th Fl.
400 Willoughby Ave. (mailing)
Juneau, AK 99801
(907) 465-2400
Commissioner - Judith M. Brady
Deputy Commissioner - Lennie Boston-Gorsuch
Deputy Commissioner - James K. Barnett

Principal state agency that administers Alaska's state lands.

1. Division of Forestry
3601 C St., Frontier Bldg., 13th Fl.
P.O. Box 7005 (mailing)
Anchorage, AK 99510
(907) 762-4482
Director - John Galea

Function: Establishes guidelines to manage mining in state forests.

Northcentral District
3726 Airport Way
Fairbanks, AK 99701
(907) 479-2243
Regional Forester - Lester Fortune

Southcentral District
3601 C St., Frontier Bldg., 10th Fl.
P.O. Box 7005 (mailing)
Anchorage, AK 99510
(907) 762-2117
Regional Forester - Joseph Wehrman

Southeastern Regional Office
400 Willoughby Center, 5th Fl.
400 Willoughby Ave. (mailing)
Juneau, AK 99801
(907) 465-2491
Division Liaison - Jim McAllister

2. Division of Geological and Geophysical Surveys (DGGS)
794 University Ave., 2nd Fl.
794 University Ave., Basement (mailing)
Fairbanks, AK 99709
(907) 474-7147
State Geologist: Robert B. Forbes
(907) 479-7625
Deputy State Geologist (Acting): Wyatt G. Gilbert

Function: Conducts geological and geophysical surveys to determine the potential of Alaskan land for production of metals, minerals, fuels, and geothermal resources; the locations and supplies of ground water and construction materials; the potential geologic hazards to buildings, road, bridges and other installations and structures; and other surveys and investigations as will advance knowledge of the geology of Alaska and general geologic inventories. Publishes a variety of reports that contain the results of these investigations. Advises the public and government agencies on geologic issues. Maintains a library of geologic bulletins, reports, and periodicals and a drill-core storage facility at Eagle River.

Eagle River Office
P.O. Box 772116 (mailing)
Fish Hatchery Road
Eagle River, AK 99577
(907) 696-0070

Juneau Office
400 Willoughby Center, 3rd Fl.
400 Willoughby Ave.
Juneau, AK 99801
(907) 465-2533

3. Division of Land and Water Management (DLWM)
3601 C St., Frontier Bldg.
P.O. Box 7005 (mailing)
Anchorage, AK 99510
(907) 762-4355
Director - Thomas J. Hawkins

Function: Manages surface estate and resources, including materials (gravel, sand, and rock) and water. Handles statewide and regional land-use planning. Issues water-appropriation permits and certificates, leases, material-sale contracts, mill-site permits, land-use permits,

and easements for temporary use of state land and access roads. Responsible for safety of all dams in Alaska.

Northern Regional Office
4420 Airport Way
Fairbanks, AK 99709
(907) 479-2243
Regional Manager - Jerry Brossia

Southcentral Regional Office
3601 C St., Frontier Bldg.
P.O. Box 7005 (mailing)
Anchorage, AK 99510
(907) 762-2251
Regional Manager - Margaret J. Hayes

Southeastern Regional Office
400 Willoughby Center, 4th Fl.
400 Willoughby Ave.
Juneau, AK 99801
(907) 465-3400
Regional Manager - Paula T. Burgess

4. Division of Mining (DOM)
3601 C Street, Ste. 800
P.O. Box 107016
Anchorage, AK 99510-7016
(907) 762-2163
Director - Gerald L. Gallagher

Function: Principal agency for management of mining industry on state land in Alaska. Maintains a *Mining Information Office* in Fairbanks. Issues property rights to leasable minerals; adjudicates locatable mineral filings. Issues permits for hard-rock and placer-mining activity. Maintains records of mineral locations, permits, and leases. Provides technical, legal, and land-status information. Administers the Alaska Surface Mining Control and Reclamation Act (ASMCRA), which includes permitting and inspection of coal-mining activity and reclamation of abandoned mines.

Fairbanks Office
794 University Ave., 2nd Fl.
794 University Ave., Basement (mailing)
Fairbanks, Ak 99709
(907) 474-7147
Mining Information Office staff - Mildred E. Brown and Carole H. Stevenson

E. Department of Public Safety
450 Whittier St.
P.O. Box N (mailing)
Juneau, AK 99811
(907) 465-4322
Commissioner - Art English

1. Division of Fish and Wildlife Protection
5700 East Tudor Rd.
Anchorage, AK 99507
(907) 269-5509
Acting Director - Captain J.R. Nutgrass

Function: Enforce state laws, in particular AS Title 16. Acts as enforcement arm for Alaska Department of Fish and Game.

F. Department of Revenue
State Office Bldg.
11th Fl., Entrance A
P.O. Box S (mailing)
Juneau, AK 99811-0400
(907) 465-2300
Commissioner - Hugh Malone

1. Division of Public Services
1111 West 8th St., Rm. 108
Juneau, AK 99811-0400
(907) 465-2392
Director - Sally Smith
Tax Security and Licensing - Daniel Anderson
(907) 465-2329

Function: Issues licenses (including mining, for production and sale of minerals, and Alaska Business Licenses) and may require filing of nonresident affidavits and bonding.

2. Division of Audit
State Office Bldg.,
11th Fl., Entrance A
P.O. Box SA (mailing)
Juneau, AK 99811-0400
(907) 465-2320
Director - Steven E. Kettel

Function: Administers mining-license tax, which is based on net income, including royalties. On application, will grant certificate of tax exemption for first 3½ yr of new mining operations, except for mining of sand and gravel. Tax returns must be filed annually.

G. University of Alaska
Fairbanks, AK 99775-0760

1. College of Natural Sciences
Department of Geology & Geophysics
Brooks Bldg., Rm. 408
(907) 474-7565
Department Head - Don M. Triplehorn

Function: Provides undergraduate and graduate education in geology and geophysics and conducts basic and applied research in geologic sciences. Offers B.S., M.S., and Ph.D. program options in general geology, economic geology, petroleum geology, geophysics, and ice-snow-permafrost geophysics.

2. School of Mineral Engineering
Brooks Bldg., Rm. 209
(907) 474-7366
Dean - Donald J. Cook

Function: Conducts laboratory and field studies related to minerals and mining. Offers various degree options in mineral, geological, and petroleum engineering.

Mineral Industry Research Laboratory (MIRL)
210 O'Neill Resources Bldg.
(907) 474-7135 or 7136
Director - Donald J. Cook
Associate Director - P.D. Rao

Function: Conducts applied and basic research on location, development, and use of Alaska's minerals and coal resources. Conducts studies on exploration, mine and mill development, coal preparation and use, mineral beneficiation, and environmental concerns of mineral industry. Publishes reports and general information concerning mining and offers assistance to miners.

FEDERAL AGENCIES

A. U.S. Department of the Interior

1. Bureau of Land Management (BLM)
Alaska State Office
701 C St.
P.O. Box 13 (mailing)
Anchorage, AK 99513
State Director - Michael Penfold
Public Room - (907) 271-5960

Function: Administers federal public lands (except National Parks, Wildlife Refuges, National Monuments, National Forests, and military withdrawals). Issues leases for all federal leasable minerals including oil and gas, coal, phosphates, and oil shale. Arranges for sale of minerals other than leasable or salable materials, including sand, gravel, or stone. Issues right-of-way and special- use permits. Monitors mining operations to insure protection of surface resources. Maintains land-status plats and issues patents. Records federal mining claims and annual-assessment affidavits.

Anchorage District Office
6881 Abbott Loop
Anchorage, AK 99507
(907) 267-1200
District Manager - John Rumps

Fairbanks Support Center and Land Information Office (primary contact for information on Interior and northern regions)
1541 Gaffney St.
Fairbanks, AK 99703
(907) 356-5345
Support Center Manager - James Murray
Information Operator - (907) 356-2025

Arctic District Office
1541 Gaffney St.
Fairbanks, AK 99703
(907) 356-5132
District Manager - Thomas Dean

Glennallen District Office
1541 Gaffney St. (mailing)
Fairbanks, AK 99703
(907) 822-3218
District Manager - Gene Terland

2. U.S. Bureau of Mines
Alaska Field Operations Center
201 East 9th Ave., Ste. 101
Anchorage, AK 99501
(907) 271-2455
Chief - Donald P. Blasko
Anchorage Supervisor - Robert Hoekzema

Function: Alaska programs are designed to help develop a viable mineral industry in Alaska with an emphasis on strategic minerals. The two main thrusts of the programs are to provide data on mineral reserves needed by government agencies at all levels, but particularly by Congress and land managers, and to generate, accumulate, and supply mineral data to the mining industry. All Alaska projects are parts of mutually supportive programs: Mineral Land Assessment, Mining and Metallurgical Research, Minerals Availability, Minerals Policy Analysis, and State Activities.

Juneau Field Office
P.O. Box 020550
Juneau, AK 99802-0550
(907) 364-2111
Assistant Chief - David Carnes
State Mineral Officer - Tom Pittman

Fairbanks Field Office
206 O'Neill Resource Bldg.
905 Koyukuk Ave. North
University of Alaska
Fairbanks, AK 99775-5140
(907) 479-4277
Office Supervisor - Robert Hoekzema
(based in Anchorage)

3. Fish and Wildlife Service
Region 7 Office
1011 East Tudor Rd.
Anchorage, AK 99503
(907) 786-3522
Regional Director - Robert Gilmore
Assistant Regional Director
(Habitat Resources) -
Robert Jacobsen

Function: Administers the federal public lands in National Wildlife Refuges, issues special-use permits for activities on refuges, reviews permits and applications for various mining activities on all private and public lands and waters, and provides information to regulatory agencies on fish and wildlife and their habitat. Makes recommendations to regulatory agencies to mitigate adverse environmental impacts.

Fairbanks Fish and Wildlife Enhancement
Ecological Services/Endangered Species Branch
Box No. 20 (mailing)
101 12th Ave.
Fairbanks, AK 99701
(907) 456-0203
Field Supervisor - Tony W. Booth

Juneau Fish and Wildlife Enhancement
Federal Bldg., Rm. 417
P.O. Box 1287 (mailing)
Juneau, AK 99802
(907) 586-7240
Field Supervisor - Waine Olen

Anchorage Fish and Wildlife Enhancement
Sunshine Plaza, Ste. B
411 West 4th Ave.
Anchorage, AK 99501
(907) 271-4575
Field Supervisor - Robert Bowker

4. U.S. Geological Survey (USGS)
4230 University Dr.
Anchorage, AK 99508
(907) 271-4138
Chief, Branch of Alaskan Geology -
Donald L. Grybeck

Function: Investigates and reports on physical resources; configuration and character of land surface; composition and structure of underlying rocks; and quality, volume, and distribution of water and minerals. Conducts 1:250,000-scale geologic mapping under the auspices of the Alaska Mineral Resource Assessment Program (AMRAP).

Alaska Distribution Center (for maps and brochures)
Federal Bldg.
101 12th Ave.
Fairbanks, AK 99701
(907) 456-0244

Public Inquiries Office (for information and publications)
4230 University Dr., Rm. 101
Anchorage, AK 99508-4664
(907) 561-5555

5. National Park Service (NPS)
Alaska Regional Office
2525 Gambell St.
Anchorage, AK 99503
(907) 271-2643
Regional Director - Boyd Evison
Mining Engineer - Lynn S. Griffiths

Function: Administers lands within the National Park System in Alaska. Manages valid prior-right mining claims in parklands through plans of operation under Mining in Parks Act, National Park Service regulations, and other applicable federal and state laws and regulations.

B. U.S. Department of Labor

1. Mine Safety and Health Administration (MSHA)
117 107th Ave. NE., Rm. 100
Bellevue, WA 98004
(206) 442-7037
Western District, Subdistrict Manager -
Martin Rosta

Function: Administers mine-health and safety programs for mines other than coal. Conducts training and safety classes for federal and state mine inspectors and mining personnel. Conducts research in mine safety.

2. Mine Safety and Health Administration
Coal Mine Safety and Health, District 9
P.O. Box 25367, DFC
Denver, CO 80225-0367
(303) 236-2740
District Manager - John W. Barton

Function: Administers health and safety standards according to the Code of Federal Regulations to protect the health and safety of coal miners; requires that each operator of a coal mine comply with these standards. Cooperates with the State to develop health and safety programs and develops training programs to help prevent coal or other mine accidents and occupationally caused diseases in the industry. Coal Mine Inspectors travel from Denver, Colorado, or Price, Utah, to inspect mines in Alaska because no field offices are located here.

C. U.S. Department of Agriculture

U.S. Forest Service (USFS) Regional Office
Federal Bldg.
P.O. Box 021628 (mailing)
Juneau, AK 99802-1628
(907) 586-7847
Regional Forester - Michael A. Barton

Function: Helps meet national mineral and energy needs by encouraging and supporting environmentally sound mineral enterprises on National Forest System lands. Provides joint administration of general mining laws on National Forest System lands with the Bureau of Land Management. Cooperates with Department of Interior agencies in the review and issuance of mineral leases. Issues permits for disposal of sand, gravel, and stone.

D. U.S. Environmental Protection Agency (EPA)
Alaska Operations Office
701 C St.
Box 19 (mailing)
Anchorage, AK 99513
(907) 271-5083
Assistant Regional Administrator -
Alvin L. Ewing

Regional Headquarters
1200 6th Ave.
Seattle, WA 98101
(206) 442-1200
Regional Administrator - Robie Russell

Function: Issues National Pollutant Discharge Elimination System (NPDES) permits under the Clean Water Act to regulate effluent discharges.

Alaska Operations Office
3200 Hospital Dr., Ste. 101
Juneau, AK 99801
(907) 586-7619
Attn: Steven Torok

E. Department of the Army
U.S. Army Corps of Engineers
Regulatory Branch
P.O. Box 898
Anchorage, AK 99506-0898
District Engineer -
Colonel William T. Gregory, Jr.
Write: Attention: NPACO-R-S, or
Call: Tom Skordal (907) 753-2724 or
(800) 478-2712 (in Alaska only)

Function: Regulates work in navigable waters of United States and discharge of dredged or fill material into United States waters, including wetlands. Examples of regulated mining activities include construction of roads, bridges, docks, pads, stockpiles, diversions, and causeways.

COOPERATIVE STATE-FEDERAL AGENCY

Alaska Public Lands Information Center
250 Cushman St., Ste. 1A
Fairbanks, AK 99701
(907) 451-7352
Manager - Deanne Adams
Assistant Manager - Chuck Lennox

Function: Clearinghouse for general information about land and resources in Alaska. Information sources include U.S. Forest Service, U.S. Fish and Wildlife Service, U.S. Bureau of Land Management, U.S. Geological Survey, Alaska Departments of Natural Resources and Fish and Game, and Alaska Division of Tourism.

NONGOVERNMENTAL GROUPS AND ASSOCIATIONS

Alaska Miners Association, Inc.
Roger Burggraf, Statewide President
Curt McVee, Executive Director
Statewide Office
501 West Northern Lights Blvd., Ste. 203
Anchorage, AK 99503
(907) 276-0347

Anchorage Branch
Norm Lutz, Chairman
501 West Northern Lights Blvd., Ste. 203
Anchorage, AK 99503
(907) 274-6473

Fairbanks Branch
Del Ackels, Chairman
P.O. Box 73069
Fairbanks, AK 99707
(907) 451-6650

Juneau Branch
John Mulligan, Chairman
P.O. Box 1684
Juneau, AK 99802
(907) 364-3144

Kenai Branch
Dennis Steffy, Chairman
c/o Mining & Petroleum Training Service (MPTS)
155 Smith Way, Ste. 104
Soldotna, AK 99669
(907) 262-2788

Mat-Su Valley Branch
Jim Barkeley, Chairman
501 West Northern Lights Blvd., Ste. 203
(907) 274-7522

Nome Branch
Ron Engstrom, President
P.O. Box 242
Nome, AK 99762
(907) 443-2586

Alaska Women in Mining
Caroline Roland, President
P.O. Box 83743
Fairbanks, AK 99708
(907) 452-1022

Society of Mining Engineers (SME)
Caller No. D
Littleton, CO 80162-5002
(303) 973-9550

Alaska Section
Milton A. Wiltse, Chairman
794 University Ave., Basement
Fairbanks, AK 99709
(907) 474-7147

David Maneval, Secretary-Treasurer
University of Alaska
210 Brooks Bldg.
Fairbanks, AK 99775
(907) 474-6877

Southern Alaska Branch
Charles Drummond, Chairman
2525 Gambell St., Rm. 107
Anchorage, AK 99503
(907) 271-4213

Jeanine Schmidt, Secretary-Treasurer
4200 University Dr.
Anchorage, AK 99508
(907) 561-1181

American Institute of Professional Geologists
7828 Vance Dr., Ste. 103
Arvada, CO 80003
(303) 431-0831

Bill Slater, President
Alaska Section
Pouch 6900
Anchorage, AK 99502
(907) 338-4200

Miners Advocacy Council
Josh Moore, President
Leslie Noyes, Executive Director
P.O. Box 83909
College, AK 99708
(907) 452-6227

Miners Rights Action Group
Ken Manning
P.O. Box 80325
College, AK 99708
(907) 479-4890

Northwest Mining Association
414 Peyton Bldg.
Spokane, WA 99201
(509) 624-1158

Placer Miners of Alaska
John Korobko
1967 Yankovich Rd.
Fairbanks, AK 99707
(907) 479-0471

Resource Development Council for Alaska, Inc.
Boyd Brownfield, President
807 G St., Ste. 200
P.O. Box 100516 (mailing)
Anchorage, AK 99510-0516
(907) 276-0700

Western Mining Council
Kenai Peninsula Chapter
Oscar H. Bailey, President
Old Nash Rd.
Seward, AK 99664
(907) 224-5963

ORGANIZED MINING DISTRICTS

Circle Mining and Recording District
Steve Weber, President
c/o Del Ackels
P.O. Box 2151
Fairbanks, AK 99708

Fairbanks Mining District
Don Stein, President
105 Dunbar
Fairbanks, AK 99701

Forty-Mile Miners Association
David Kukowski, President
General Delivery
Chicken, AK 99732

Juneau Mining District
Roger Eichman, President
P.O. Box 020765
Juneau, AK 99802

Kantishna Mining District
Sam Koppenburg, President
SRD Box 9070
Palmer, AK 99645

Koyukuk Mining District
Robert Aumiller, President
871 Faultline Dr.
North Pole, AK 99705

Livengood-Tolovana Mining District
Rose Rybachek, President
P.O. Box 73069
Fairbanks, AK 99707

Seward Mining District
Tom Williams, President
Box 66
Hope, AK 99605

Valdez Mining District
Claud Morris, President
P.O. Box 547
Girdwood, AK 99581

Yentna Mining District
John Jacobsen, President
700 Ash Pl.
Anchorage, AK 99501

APPENDIX C
Selected significant mineral deposits in Alaska
(locations shown in figs. 37 through 39)[a]

Map no.

1 **Lik-Su** - Major strata-bound massive-sulfide (Zn-Pb-Ag-Cd-Ba) deposits in black shale and chert. Proven reserve (Lik) estimate of 24 million tons of 9 percent Zn, 3.1 percent Pb, and 1.4 oz/ton Ag.

2 **Red Dog** - At least two major strata-bound massive-sulfide deposits hosted in Pennsylvanian or Mississippian shale; similar to locality 1. According to COMINCO (February 1982), Main deposit at Red Dog contains at least 85 million tons of 17.1 percent Zn, 5 percent Pb, 2.4 oz/ton Ag; nearby Hilltop deposit contains significant undisclosed reserves.

3 **Drenchwater** - Strata-bound (Pb-Zn-Ag) massive-sulfide occurrence associated with black shale, chert, and felsic volcanic rocks; 60- by 120-ft exposure averages 17.4 percent Zn, 3.0 percent Pb, and 3.3 oz/ton Ag; numerous sulfide occurrences and strong geochemical anomalies between localities 1 through 4 and locality 7.

4 **Ginny Creek** - Epigenetic, disseminated Zn-Pb-Ag deposits with barite in sandstone and shale of Noatak Sandstone of Late Devonian through Early Mississippian age. Random grab samples of surface float contain 0.3 to 3.0 percent Zn and highly variable amounts of Pb and Ag.

5 **Story Creek** - Epigenetic replacement deposits of Zn-Pb-Ag-Cu-Au hosted in brecciated zones in Devonian Kanayut Conglomerate or Lower Mississippian Kayak Shale. Grab samples of high-grade material contain up to 0.43 percent Cu, 34 percent Pb, 28.8 percent Zn, 0.04 oz/ton Au, and 30 oz/ton Ag.

6 **Whoopee Creek** - Epigenetic replacement deposits of Zn-Pb-Cu-Ag-Au-Cd in breccia zones in Devonian Kanayut Conglomerate or Lower Mississippian Kayak Shale. Random grab samples of mineralized material contain 0.24 percent Cu, 0.37 percent Cd, 44 percent Zn, 0.14 oz/ton Au, and 14.8 oz/ton Ag.

7 **Omar, Frost** - Epigenetic replacement deposits of Paleozoic age; include bedded barite occurrences. Grab samples contain 15.3 percent Cu, 0.15 percent Pb, 0.95 percent Zn, 0.05 percent Co, and 0.3 oz/ton Ag.

8 **Bornite** - Major stratiform Cu-Zn deposit in carbonate rock of Devonian age; 4.56-million-ton ore body contains 4.0 percent Cu and accessory Zn and Co. Larger reserve estimate of 36.2 million tons of about 2 percent Cu and undisclosed amount of Zn and Co.

9 **Arctic** - Major volcanogenic (Cu-Zn) massive-sulfide deposit hosted in sequence of metarhyolite, metatuff, and graphitic schist of Devonian age; indicated reserves of 35 to 40 million tons grade 4.0 percent Cu, 5.5 percent Zn, 0.8 percent Pb, 1.6 oz/ton Ag, and 0.02 oz/ton Au.

10 **Sun** - Major (Cu-Pb-Zn-Ag) massive-sulfide deposit in sequence of middle Paleozoic metarhyolite and metabasalt; indicated 1976 gross-metal value of Cu, Pb, Zn, and Ag was over $1 billion.

11 **Smucker** - Middle Paleozoic volcanogenic massive-sulfide deposit; contains significant tonnage of Cu-Pb-Zn ore that grades 1.5 percent Pb, 5 to 10 percent Zn, 3 to 10 oz/ton Ag, with minor Au.

12 **Avan Hills** - Disseminated chromite in layered ultramafic rocks; grab samples contain up to 2.5 percent Cr.

13 **Misheguk Mountain** - Chromite occurrences similar to those in Avan Hills.

14 **Klery Creek** - Lode- and placer-Au deposits worked intermittently from 1909 through 1930s. Total production through 1931, mostly from placer deposits, estimated at 31,320 oz.

15 **Ernie Lake** - (Ann Creek) Strata-bound massive-sulfide occurrence in metarhyolite, metatuff, and marble. Gossan zones strongly anomalous in Cu-Pb-Zn and Ag.

16 **Koyukuk-Nolan mining district** - Major placer-Au district; from 1893 to present, produced more than 300,000 oz Au. Significant deep placer reserves remain.

17 **Chandalar mining district** - Major Au-producing district; substantial production in excess of 30,000 oz Au from lode and placer sources; lode gold found in crosscutting quartz veins that intrude schist and greenstone. Active development of placer deposits and lodes in progress.

18 **Porcupine Lake** - Stratiform fluorite occurrences associated with felsic volcanic rocks of late Paleozoic age. Reported grades of up to 25 to 30 percent fluorite reported.

19 **Wind River** - Strata-bound Pb-Zn massive-sulfide prospects; reported grades of up to 5 percent Pb.

20 **Esotuk Glacier** - Disseminated Mo-Sn-W-Pb-Zn mineralization in skarns associated with Devonian(?) schistose quartz monzonite. Grab samples contain up to 0.08 percent Sn and 0.15 percent W.

21 **Bear Mountain** - Major stockwork Mo-W-Sn occurrence in intrusive breccia. Grab samples contain up to 1 percent Cu, 0.16 percent Zn, and 0.002 percent Mo.

22 **Cape Creek** - Major placer-Sn producer. More than 500 tons Sn produced from 1935 to 1941; at least 500 tons produced in last 10 yr.

23 **Buck Creek** - Major placer-Sn producer. More than 1,100 tons Sn produced from 1902 to 1953.

24 **Lost River** - Major Sn, fluorite, W, and Be deposit associated with Cretaceous Sn-granite system. More than 350 tons Sn produced from skarn and greisen lode sources. Measured reserves amount to 24.6 million tons that grade 0.15 percent Sn, 16.3 percent CaF_2, and 0.03 percent WO_3, based on 45,000 ft of diamond drilling.

25 **Ear Mountain** - Placer-Sn district and Sn-Cu-Au-Ag-Pb-Zn skarn mineralization of Cretaceous age. Area also anomalous in uranium.

26 **Kougarok Mountain** - Sn deposit hosted in quartz-tourmaline-topaz greisen of Cretaceous age. Grades may average 0.5 percent Sn and 0.01 percent Ta and Nb.

27 **Hannum** - Stratiform, carbonate-hosted Pb-Zn-Ag massive-sulfide deposit of middle Paleozoic age in heavily oxidized zone that ranges from 30 to 150 ft thick. Mineralized zone reported to assay up to 10 percent Pb, 2.2 percent Zn, 0.04 oz/ton Au, and 1.76 oz/ton Ag.

28 **Independence Creek** - Pb-Zn-Ag massive-sulfide deposit; high-grade ore shipped in 1921 contained 30 percent Pb, 5 percent Zn, and 150 oz/ton Ag. Mineralization restricted to shear zone in carbonates.

29 **Sinuk River** - Stratiform Pb-Zn-Ag-Ba-F massive-sulfide deposits and layered iron deposits of Precambrian or Paleozoic age. Mineralized zones extend over 8,000 ft along strike.

30 **Nome mining district** - Major placer-Au and lode-Au producer. Production in excess of 4,348,000 oz Au. Sporadic Sb and W production in past.

31 **Big Hurrah** - Epigenetic vein deposit in black slate and metasediments of York Slate. Deposit contains some W mineralization and has produced over 20,000 oz Au from nearly 50,000 tons milled ore. Proven, inferred, and indicated reserves total 104,000 tons that grade 0.61 oz/ton Au, 0.55 oz/ton Ag, and credits of WO_3.

32 **Solomon mining district** - Major placer-Au district; produced over 250,000 oz Au.

33 **Kachauik** - Uranium prospect in Cretaceous alkalic intrusive rocks. Highly anomalous geochemical values and U concentrations of 1,000 ppm reported.

34 **Omalik** - Stratiform or vein-type Pb-Zn-Ag massive-sulfide prospect in Paleozoic carbonate rocks; from 1881 to 1900, produced 300 to 400 tons of Pb-Zn ore that averaged about 10 percent Pb and 40 oz/ton Ag. Grades of oxidized Zn ore reported to be up to 34 percent Zn.

35 **Windy Creek** - Disseminated Mo-Pb-Zn mineralization in quartz veins and skarns with reported values as high as 0.15 percent Mo.

36 **Quartz Creek** - Significant Pb-Zn-Ag mineralization; reported grades of 15 percent combined Pb-Zn and 10 oz/ton Ag.

37 **Placer River** - Significant Mo-F mineralization disseminated in intrusive rocks. Reported values of 0.2 percent Mo.

38 **Candle Creek** - Placer-Au deposits with significant reserves. Placer concentrates reported to have significant U and galena concentrations.

39 **Poovookpuk Mountain** - Porphyry-Mo mineralization. Reported grades of up to 0.25 percent Mo.

40 **Purcell Mountain** - Mo and Ag occurrences associated with Cretaceous alkalic igneous plutons, alaskite, and bostonite dikes.

41 **Koyukuk-Hughes mining district** - Production of 230,000 oz Au from 1930 to 1975, mainly from Alaska Gold dredging operation at Hogatza; dredge reactivated in 1981, but deactivated in 1984. Nonfloat mechanized operation on Utopia Creek produced significant amount of placer Au from 1930 to 1962.

[a]This list is not a definitive summary of Alaska's significant mineral deposits or mineral belts; numerous state and federal summaries provide more detailed information about individual deposits.

42 **Flat mining district** - Major placer-Au district; produced 1,535,701 oz Au through 1986. Potential exists for occurrence of significant lode-Au and lode-W reserves at Golden Horn deposit and other known lodes in region associated with shear zones and monzonite intrusive rocks of Late Cretaceous age.

43 **Innoko-Tolstoi mining district** - Major placer-Au district with significant lode Au-Sb-Hg potential; lode sources for placers are volcanic-plutonic complexes of Late Cretaceous age and dike swarms that intrude Mesozoic flysch; mining district produced 582,432 oz Au from placer deposits.

44 **Nixon Fork** - Promising Au-Cu deposits; Nixon Fork Mine produced 57,000 oz Au from Late Cretaceous skarns associated with quartz monzonite - Devonian limestone contact zones.

45 **Bonanza Creek** - Skarn-type W mineralization along intrusive contact; no published information available.

46 **Ruby mining district** - Placer Au-Sn district; produced more than 420,000 oz Au from 1931 to 1960; mining district also contains Pb-Ag prospects with grades reportedly as high as 82 oz/ton Ag.

47 **Hot Springs mining district** - Placer Au-Sn district; produced more than 450,000 oz Au and over 720,000 lb cassiterite through 1981. Includes Eureka and Tofty subdistricts.

48 **Livengood-Tolovana mining district** - Placer-Au district; produced more than 425,000 oz Au since discovery in 1914. Substantial reserves remain.

49 **Fairbanks mining district** - Seventh largest Au-producing district in United States; largest producer in Alaska. Produced more than 7,750,000 oz Au from placer deposits. Major lode-Au and lode-Sb producer; produced more than 250,000 oz Au and over 4 million lb Sb from veins and shear zones through 1970. Production of W exceeded 4,000 ton since 1915, all derived from tactite and skarn near Cretaceous quartz monzonite.

50 **Mt. Prindle** - Significant uranium-rare earth mineralization in Mesozoic alkaline igneous rocks. Rock geochemical values of up to 0.1 percent ^{308}U; up to 15 percent rare-earth elements reported.

51 **Twin Mountain** - Significant W mineralization associated with skarn development along contact zone of quartz monzonite stock of Cretaceous age.

52 **Circle mining district** - Currently Alaska's largest producing placer-Au district; produced 885,000 oz Au since discovery in 1893. Has significant potential for Sn, W, and Au mineralization from variety of lode sources.

53 **Three Castle Mountain, Pleasant Creek, Casca VABM** - Strata-bound Pb-Zn massive-sulfide mineralization. Reported grades of up to 17 percent Zn and 2 percent Pb.

54 **Totatlanika River lode zone, Anderson Mountain, Dry Creek, Virginia Creek** - Significant volcanogenic Cu-Pb-Zn-Ag massive-sulfide deposits of Devonian to Mississippian age in Bonnifield mining district. Potential for high-grade deposits reported. Includes Liberty Bell strata-bound Au deposit and Sheep Creek; latter contains Sn and base metals.

55 **Delta massive-sulfide belt** - Contains at least 30 known volcanogenic massive-sulfide deposits and occurrences. Grades from 0.3 to 1.1 percent Cu, 1.7 to 5.7 percent Zn, 0.5 to 2.3 percent Pb, 0.7 to 2.0 oz/ton Ag, and 0.018 to 0.061 oz/ton Au; estimated potential reserve of 40 million tons for all deposits.

56 **Mosquito, Peternie** - Porphyry-Mo prospects of early Tertiary age; reported grades of up to 0.17 percent Mo.

57 **Taurus** - Major porphyry Cu-Mo prospect of Paleocene age with at least 500 million tons of mineralization. Reported potential for large tonnage of 0.5 percent Cu and 0.05 percent Mo.

58 **Big Creek, Ladue** - Strata-bound Pb-Zn-Ag massive-sulfide prospects in metavolcanic rocks.

59 **Slate Creek** - At least 55 million tons of 6.3 percent, high-quality chrysotile asbestos in serpentenized ultramafic rocks of Permian(?) age.

60 **Fortymile mining district** - Major placer-Au district. Produced over 417,000 oz Au since discovery in 1886.

61 **Kantishna mining district** - Major placer-Au and lode Ag-Au-Pb-Zn-Sb-W district. Produced more than 92,000 oz placer Au, about 260,000 oz lode Ag, and several million lb Sb from shear zones and vein deposits hosted in Precambrian metamorphic units. Potential exists for significant Ag-Au-Pb-Zn deposits. Metalliferous strata-bound deposits occur in schist and quartzite.

62 **Stampede Mine** - Major Sb deposit; produced more than 3.5 million lb Sb from large shear zone in Precambrian metamorphic rocks.

63 **Purkypile** - Significant Ag-Sn-Be mineralization associated with 'McKinley' pluton (55 m.y. old). Grades of up to 4.5 percent Sn reported. Potential exists for U and W mineralization.

64 **Golden Zone Mine** - Major Au-Cu-Ag deposits in Late Cretaceous breccia pipe. Produced more than 1,581 oz Au, 8,617 oz Ag, and 42,000 lb Cu. Proven reserves of about 10 million tons of 0.1 oz/ton Au with Cu and Ag reported.

65 **Nim Prospect** - Porphyry Cu-Ag-Au deposit of Late Cretaceous age. Reported grades of up to 5.0 percent Cu and 9 oz/ton Ag.

66 **Coal Creek** - Greisen-hosted Sn-Cu-W deposit in 'McKinley' age pluton (55 m.y. old). Reported reserves of 5 million tons of ore that grade 0.28 percent Sn and 0.3 percent Cu with credits of W, Ag, and Zn.

67 **Denali Prospect** - At least six small, strata-bound Cu lodes in volcanic-sedimentary rocks of Triassic age that may contain 5 million tons ore that grade about 2 percent Cu with credits of Ag.

68 **Chistochina** - Porphyry-Cu prospects of Tertiary age and placer-Au district; produced more than 177,000 oz Au and small amount Pt from placer deposits.

69 **Nabesna Mine** - Classic high-grade Au skarn that envelopes quartz diorite of Jurassic(?) age; produced over 66,960 oz Au from about 88,000 tons of ore from 1930 to 1941.

70 **Spirit Mountain** - Massive and disseminated Cu-Ni mineralization in mafic-ultramafic complex.

71 **Kennecott deposits** - Major stratiform Cu-Ag massive-sulfide deposits localized near contact between Chitistone Limestone and Nikolai Greenstone of Triassic age; contained some of highest grade Cu lodes mined in North America. From 1911 to 1938, produced more than 1.2 billion lb Cu and 10 million oz Ag from 4.8 million tons ore. Some reserves remain.

72 **Binocular and other prospects** - Kennecott-type Cu-Ag massive-sulfide deposits.

73 **Bond Creek - Orange Hill** - Two major porphyry Cu-Mo deposits of Late Cretaceous age; reported inferred reserves of 850 million tons ore that grade 0.3 to 0.5 percent Cu and 0.03 percent Mo.

74 **Carl Creek** - Porphyry-Cu prospect in altered intrusive complex; similar to locality 73.

75 **Baultoff** - Porphyry-Cu prospect in altered intrusive rocks; inferred reserves of 145.1 million tons of 0.20 percent Cu similar to locality 73.

76 **Horsfeld** - Porphyry-Cu prospect; similar to locality 73.

77 **Midas Mine** - Significant strata-bound Cu-(Ag-Au-Pb-Zn) massive-sulfide deposit in volcanic-sedimentary rocks of Tertiary Orca Group. Produced more than 3.3 million lb Cu from 49,350 tons ore.

78 **Ellamar** - Strata-bound Cu-Zn-Au massive-sulfide deposit in sediment of Eocene(?) Orca Group. Produced more than 16 million lb Cu, 51,307 oz Au, and 191,615 oz Ag from about 301,835 tons ore.

79 **Willow Creek, Independence, Lucky Shot, War Baby** - Major lode Au (Ag-Cu-Pb-Zn-Mo) in veins that cut Mesozoic quartz diorite. Produced more than 448,082 oz Au from lode sources and about 35,000 oz Au from associated placer deposits.

80 **Latouche, Beatson** - Major strata-bound Cu-Zn-Ag massive-sulfide deposits in Orca Group sedimentary rocks and mafic volcanic rocks. Produced more than 205 million lb Cu from 6 million tons ore. Inferred reserves of 4.53 million tons ore that grade 1 percent Cu, 1.5 percent Pb+Zn, and 1 oz/ton Ag may remain.

81 **Rua Cove** - Major strata-bound Cu-Zn massive-sulfide deposit in complex ore shoots enclosed in mafic volcanic rocks of Orca Group. Reported reserves of over 1.1 million tons ore that grade 1.25 percent Cu.

82 **Red Mountain** - Significant Cr occurrence associated with layered ultramafic complex of Tertiary age at Red Mountain near Seldovia. More than 36,000 tons metallurgical-grade ore shipped through 1976; huge low-grade chrome resource may remain.

83 **Red Devil** - Major Hg-Sb deposit; moderate-grade ore hosted in shear zones in Kuskokwim Group sedimentary rocks. More than 35,000 flasks Hg produced from 75,000 tons ore.

84 **Nyac mining district** - Significant placer-Au district. Aniak mining district (of which Nyac is a part) produced more than 230,000 oz Au from placer deposits.

85 **Goodnews Bay** - Major placer-Pt district; estimated to have produced over 540,000 oz refined Pt-group metals from 1934 to 1976; one of the largest known Pt group-metal resources in United States. Possible reserves of 60 million yd^3 of deep, Pt-bearing gravels remain. Lode source believed to be Alaskan-type zoned ultramafic complex of Cretaceous age.

86 **Apollo-Sitka Mines** - Major lode-Au deposits; produced more than 107,900 oz Au from ore that averaged about 0.22 oz/ton Au. Inferred reserves may amount to 1,453,600 tons that grade 0.317 oz/ton Au, 1.37 oz Ag, and several percent base metals.

87 **Pyramid** - Late Tertiary porphyry Cu-Mo deposit; inferred reserves of 125 million tons ore that grade 0.4 percent Cu and 0.03 percent Mo reported.

88 **Ivanof** - Late Tertiary porphyry-Cu prospect; grades of up to 0.72 percent Cu reported. Potential for large tonnages.

89 **Weasel Mountain, Bee Creek** - Porphyry Cu-Mo prospect of late Tertiary to Quaternary age; grades of up to 0.48 percent Cu and

0.035 percent Mo reported. Potential for moderate tonnages of low-grade mineralization.

90 **Mike deposit** - Porphyry-Mo prospect of late Tertiary age; grades of up to 0.21 percent Mo reported. Potential for large tonnages of low-grade Mo mineralization.

91 **Rex deposit** - Porphyry-Cu prospect similar to locality 90; grades of up to 0.3 percent Cu reported. Potential for moderate reserves of low-grade mineralization.

92 **Kasna Creek** - Major stratiform Cu-Pb-Zn and skarn-sulfide deposits of Mesozoic age in mafic, volcanic, and sedimentary rocks; reported reserves of over 10 million tons ore that grade more than 1 percent Cu.

93 **Magnetite Cove** - Massive magnetite-skarn deposit; grades of up to 30 percent Fe reported; also contains Zn-Cu-Ag mineralization.

94 **Jimmy Lake** - Complex Cu-Ag-Sn mineralization of late Tertiary(?) age; reported grades of up to 105 oz/ton Ag and 3 percent Cu.

95 **Haines barite** - Major stratiform Ba-Pb-Zn-Cu-Ag deposit in pillow-basalt-dominated section of Paleozoic or Triassic age; consists of 48- to 60-ft-thick zone of 60-percent barite with upper zone (2 to 8 ft thick) of massive sulfides that contain 2 percent Pb, 3 percent Zn, 1 percent Cu, 2 to 4 oz/ton Ag, and 0.12 oz/ton Au. Estimated to contain 750,000 tons of 65 percent barite with metal credits.

96 **Klukwan** - Major Fe-Ti deposits in zoned ultramafic complex of Mesozoic age; reported to contain 1 to 5 billion tons of material that contain 11 to 20 percent Fe and 1.6 to 3.0 percent Ti.

97 **Nunatak** - Porphyry-Mo deposit; reported reserves of 8.5 million tons ore that grade 0.125 percent Mo and 129 million tons of 0.026 percent Mo.

98 **Brady Glacier** - Major Ni-Cu deposit in layered gabbro-pyroxenite complex of Tertiary age. Proven reserves of 100 million tons ore that grade 0.5 percent Ni and 0.3 percent Cu reported; also contains significant Co and Pt concentrations.

99 **Mertie Lode and Funter Bay mining district** - Contains substantial reserves of lode-Au mineralization. Past production totaled 10,000 to 15,000 oz Au. Deposits also contain significant Ni-Cu and Pb-Zn-Au mineralization. Funter Bay deposit contains reported reserves of 560,000 tons that grade 0.34 percent Ni, 0.35 percent Cu, and 0.15 percent Co in gabbro-pipe system.

100 **Alaska-Juneau** - Major lode-Au deposit that consists of 100- to 300-ft-wide zone that contains en-echelon, gold-bearing quartz veins in metamorphic rocks; produced more than 3.52 million oz Au from 88.5 million tons ore from 1893 to 1944.

101 **Chichagof and Hirst Chichagof** - Major lode-Au deposits in quartz veins that cut Mesozoic graywacke; produced more than 770,000 oz Au. Chichagof Mine produced about 700,000 oz Au and 200,000 oz Ag; Hirst Chichagof Mine produced about 67,980 oz Au and 20,000 oz Ag.

102 **Mirror Harbor** - Ni-Cu mineralization in layered-gabbro complex of Mesozoic age; reported probable reserves of 8,000 tons of 1.57 percent Ni and 0.88 percent Cu and reported inferred reserves of several million tons ore that grade 0.2 percent Ni and 0.1 percent Cu.

103 **Bohemia Basin** - Major Ni-Cu-Co mineralization in layered mafic complex similar to locality 102; reported reserves of 22 million tons ore that grade 0.33 to 0.51 percent Ni, 0.21 to 0.27 percent Cu, and 0.04 percent Co.

104 **Apex - El Nido** - Significant lode-Au-W deposits that occur as crosscutting veins in graywacke; produced more than 50,000 oz Au.

105 **Greens Creek** - Major sediment-hosted Pb-Zn-Cu-Ag-Au volcanogenic massive-sulfide deposit of Devonian or Triassic age; most recent reserve estimate is 3.6 million tons ore that grades 25.3 oz/ton Ag, 0.16 oz/ton Au, 10.8 percent Zn, and 4.1 percent Pb.

106 **Sumdum** - Volcanogenic Cu-Pb-Zn massive-sulfide deposit in Mesozoic metamorphic complex with potential strike length of over 10,000 ft. Inferred reserves of 26.7 million tons ore that grade 0.57 percent Cu, 0.37 percent Zn, and 0.3 oz/ton Ag reported.

107 **Snettisham** - Fe-Ti deposit in mafic zoned-intrusive complex; reported grades of about 18.9 percent Fe and 2.6 percent Ti.

108 **Tracy Arm** - Strata-bound Cu-Zn-Pb massive-sulfide prospect in Mesozoic schist; over 1,100 ft long and up to 12 ft thick. Reported grades of 1.5 percent Cu, 3.9 percent Zn, 0.76 oz/ton Ag, and 0.013 oz/ton Au.

109 **Red Bluff Bay** - Significant chrome mineralization in Mesozoic ultramafic complex (probably ophiolite); reported reserves of 570 tons of material that grade 40 percent Cr and 29,000 tons that grade 18 to 35 percent Cr.

110 **Cornwallis Peninsula** - Volcanogenic Cu-Pb-Zn-Ag-Ba massive-sulfide deposit of Triassic(?) age; reported grades of up to 20 percent Pb-Zn and 23 oz/ton Ag.

111 **Castle Island** - Stratiform barite deposit of Triassic age hosted in carbonate and pillow basalt; about 856,000 tons of raw and refined barite produced from 1963 to 1980; also contains Zn, Pb, and Cu sulfides. Reported to be mined out.

112 **Ground Hog Basin** - Area contains several stratiform massive-sulfide prospects in Mesozoic schist and gneiss whose origins are unknown. Reported grades of up to 8 percent Pb, 29 oz/ton Ag, and 0.5 oz/ton Au. Area also contains potential for porphyry-Mo deposits.

113 **Snipe Bay** - Ni-Cu deposit in zoned mafic-ultramafic complex; inferred reserves of 430,000 tons of 0.3 percent Ni, 0.3 percent Cu, and 0.13 oz/ton Ag reported.

114 **Kasaan Peninsula** - Major skarn-type Cu-Fe-Au massive-sulfide deposit of Jurassic age; area has produced over 28 million lb Cu and 55,000 oz Ag. Reported reserves of 4 million tons ore that grade 50 percent Fe and less than 2 percent Cu.

115 **Salt Chuck** - Cu-PGM-Ag-Au deposit in contact zone between pyroxenite and gabbro within Alaskan-type zoned mafic-ultramafic pluton. From 1900 to 1941, 5 million lb Cu, over 20,000 oz PGM, and Au and Ag credits were produced from 325,000 tons ore.

116 **Union Bay** - Significant Fe-Ti mineralization in ultramafic complex; area also contains Pt and V concentrations.

117 **Hyder mining district** - Area produced more than 25,000 tons high-grade W-Cu-Pb-Zn-Ag ore from 1925 to 1951 from crosscutting ore shoots in Texas Creek granodiorite of Tertiary age. Area also contains potential for porphyry Mo-W mineralization and massive-sulfide skarn Pb-Ag-Au-W deposits.

118 **Jumbo** - Cu-Fe-Mo-Ag skarn deposit; produced more than 10 million lb Cu, 280,000 oz Ag, and 7,000 oz Au from 125,000 tons ore from classic, zoned magnetite-Cu skarns associated with epizonal granodiorite pluton of Cretaceous age. Reported reserves of 650,000 tons ore that grade 45.2 percent Fe, 0.75 percent Cu, 0.01 oz/ton Au, and 0.08 oz/ton Ag.

119 **Copper City** - Stratiform Cu-Zn-Ag-Au massive-sulfide deposit hosted in late Precambrian Wales Group. Reported grades of up to 12.7 percent Cu, 2.7 percent Zn, 2.5 oz/ton Ag, and 0.2 oz/ton Au.

120 **Quartz Hill** - World-class porphyry-Mo deposit in composite felsic pluton (25 m.y. old); proven reserves of 1.5 billion tons ore that grade 0.136 percent Mo, which includes 490 million tons with grades of 0.219 percent MoS_2.

121 **Niblack** - Volcanogenic Cu-Pb-Au-Ag massive-sulfide deposit hosted in Precambrian(?) Wales Group or Ordovician to Silurian Descon Formation; produced more than 1.4 million lb Cu, 11,000 oz Au, and 15,000 oz Ag.

122 **Bokan Mountain** - Numerous U-Th prospects associated with Jurassic peralkaline intrusive complex; from 1955 to 1971, produced more than 120,000 tons ore that graded about 1 percent U_3O_8.

123 **Kemuk Mountain** - Magmatic Fe-Ti deposit hosted in Cretaceous(?) pyroxenite. Inferred reserves of 2.4 billion tons that average 15 to 17 percent Fe, 2 to 3 percent TiO_2, and 0.16 percent P_2O_5.

124 **McLeod** - Porphyry-Mo deposit that contains quartz-molybdenite fissure veins in quartz-feldspar porphyry. Chip samples contain up to 0.09 percent Mo.

125 **Illinois Creek** - Epigenetic(?) and replacement deposits that contain Cu-Pb-Zn-Ag-Au possibly associated with altered quartz monzonite porphyry and schist.

126 **Johnson River** - Epigenetic(?) quartz-sulfide stockwork or massive-sulfide deposit hosted in volcaniclastic, pyroclastic, and volcanic rocks of Jurassic Talkeetna Formation. Average grades of 9.4 to 24.8 percent Zn, 2.8 percent Pb, 1.7 percent Cu, and 0.6 to 1.2 oz/ton Au reported.

127 **Nimiuktuk River** - Small hill of massive, high-grade barite estimated to contain at least 1.5 million tons barite. Widespread stream-sediment Ba anomalies in area indicate further barite potential.

APPENDIX D

Mining licenses issued by the Alaska Department of Revenue, 1986[a] (placer gold + silver unless otherwise noted).

AAA VALLEY GRAVEL, INC.
William J. Fuger
P.O. Box 872453
Wasilla, AK 99687
(sand, gravel)

ACHMAN, ROLAND R.
P.O. Box 61185
Fairbanks, AK 99706

ALASKA AGGREGATE CORP. (2)[b]
7800 Lake Otis Parkway
Anchorage, AK 99507
(sand and gravel)

ALASKA COPPER-NICKEL PROPERTIES
Newmont Exploration Limited
200 Park Ave. - 36th Fl.
New York, NY 10166
(exploration)

ALASKA GOLD CO. (2)
P.O. Box 640
Nome, AK 99762

ALASKAGOLD MINES, INC.
Fennimore & Kubek
c/o Kelly & Patterson
201-880 H St.
Anchorage, AK 99501

ALASKA PLACER DEVELOPMENT, INC.
Livengood Placers, Inc., and Callahan Mining Corp.
6245 N. 24th St.
Phoenix, AZ 85016

ALASKA SILVEINIA MINES[b]
Joseph C. Manga
P.O. Box 844
Fairbanks, AK 99707
(silver, lead & other)

ALBERT CREEK MINING CO.
Calvin W. Hutcheson
P.O. Box 33
Eagle River, AK 99577

ALDER CREEK MINES
Patricia S. Franklin
1213 Coppet
Fairbanks, AK 99709

ALOHA GOLD INDUSTRIES LTD. (2)
5940 Crown St.
Vancouver, BC, Canada V6N 3B8

ALYESKA OIL & EXPLORATION INC' (Glenn Couch) (3)
c/o Edward R. Stugart
P.O. Box 737
Tok, AK 99780

AMANETA PLACER
Stephen and Kathleen Alleman & Kevin and Constance McFarlane
Timber Creek
Bettles Field, AK 99726

AMERICAN COPPER & NICKEL CO., INC.
c/o INCO UNITED STATES, INC.
John J. Farrell
One New York Plaza
New York, NY 10004
(exploration)

AMERICAN CREEK PARTNERS
Don deLima
P.O. Box 81467
Fairbanks, AK 99708

ANCHORAGE SAND & GRAVEL CO., INC.
1813 East 1st Ave.
Anchorage, AK 99501
(sand, gravel)

ANDERSEN, CARL I.
P.O. Box 10-0001
Anchorage, AK 99510

ANDERSEN, GARY (2)
Resource Associates of Alaska, Inc.
122 First Ave.
Fairbanks, AK 99701

ANDERSON, RALPH S.
P.O. Box 262
McGrath, AK 99527

ANDERSON, WAYNE S. & RANDI
SR Box 20013
1901 Cheechako Dr.
Fairbanks, AK 997091

ANNASARA ENTERPRISES
Colin W. Towse & James M. Davies
P.O. Box 871594
Wasilla, AK 99687

ANVIL MINING INC.
Alaska Gold Co.
General Delivery
Nome, AK 99762

ARNARIAK, ADAM
Box 95
Togiak, AK 99678

ATTWOOD, WILLIAM (2)
Richard Knudson
P.O. Box 210168
Anchorage, AK 99521

AULT, ROBERT W. & LYNDA S.
P.O. Box 82330
Fairbanks, AK 99708

B.C. ENTERPRISES
Barry L. Clay
P.O. Box 25
Ruby, AK 99768

BPC ALASKA CORP.
Robert M. Smith
24 Hazelton Ave.
Toronto, Ontario, Canada M5R 2E2

BTW MINING & EXPLORATION CORP.
4640 East 113th Ave.
Anchorage, AK 99516

BABCOCK, MIKE F. & JOSEPH PETERSON
17802 Skypark Circle
Irvine, CA 92714

BABCOCK, PATRICIA R. & RON WREDE
SR 3, Box 30160
Fairbanks, AK 99701

BASS, GLENN
10035 Chain of Rock
Eagle River, AK 99577

BATTEST, HAROLD
912 6th Ave.
Fairbanks, AK 99701

BATTLE MOUNTAIN GOLD CO.
600 W. 58th Ave., Unit J
Anchorage, AK 99518

BAUER, TODD
Kantishna Mining Co.
P.O. Box 102596
Anchorage, AK 99510

BAYLESS, HOWARD
Alaska Gold Co.
P.O. Box 1170
Fairbanks, AK 99707

BEISTLINE, EARL H.
P.O. Box 80148
Fairbanks, AK 99708

BELFIELD, J.W. & R.J. HENRICKS
P.O. Box 1934
Fairbanks, AK 99707

BELL, ALBERT L.
General Delivery
Sterling, AK 99672

BELL, ROCKY J.
Box 353
Sterling, AK 99672

BERGLUND, ARTHUR & JEANNE
St. Rt. A, Box 6275
Palmer, AK 99645

BIG WINDY MINING CO.
Curtis J. Freeman
P.O. Box 74261
Fairbanks, AK 99707

BLACK SANDS MINING CO.
Philip D. Strange
P.O. Box 871478
Wasilla, AK 99687
(lode gold)

BLACK VELVET MINING CO. (3)
(Dan Cuevas)
Roy T. George
61 Clark St., No. 2
Salinas, CA 93901

BLISS, PATRICK J. (2)
3105A Lakeshore Dr., Ste. 103
Anchorage, AK 99517

BLONDEAU, ROBERT W. (2)
Box 602
Valdez, AK 99686

BLUE BELL MINING CO.
David J. Moore
Box 1158
Seward, AK 99664
(lode gold)

BOGAN, JEAN & JAMES H. WOOD
809 North Bragaw
Anchorage, AK 99504

BONANZA CREEK & R.G.V. MINING
Douglas L. Miller
P.O. Box 1587
Fairbanks, AK 99707

BONHAM, STEVEN A.
P.O. Box 10522
Fairbanks, AK 99710

BOULDER CREEK MINING
Lester J. & Dorothy M. Fickes
P.O. Box 2618
Fairbanks, AK 99707

BOUTON, GLENN D. & LELA (3)
665 Farmers Loop Rd.
Fairbanks, AK 99712

BRIAN HALL GEOLOGICAL CONS. & CONTRACTING
Quail Hill Mining Corp.
P.O. Box 84,
No. 800-601 W. Hastings St.
Vancouver, B.C., Canada V6B 5A6

BROKEN SHOVEL-WINDY BAR MINE
Wayne McCrary
2020 Wetmore
Everett, WA 98201

BROOKS CO.
Box 534
Cooper Landing, AK 99572

BROWN, THOMAS
Box 532
Cooper Landing, AK 99572

BROWNE, ROBERT W. & PETER J.
2334 Northeast 43rd Ave.
Portland, OR 97109

BRUHN, OPAL J.
P.O. Box 8022
Nikiski, AK 99635

[a]Only licenses for 1986 that were received by DGGS:DOM (Fairbanks) by January 15, 1987, are listed.
[b]Numbers in parentheses indicate the number of separate mining licenses issued to a single individual, partnership, or company. In 1986, 592 licenses were issued to 487 operators. In 1985, 848 licenses were issued to 638 operators, and in 1984, 804 licenses were issued to 621 operators.

BUCY ASSET MANAGEMENT
Gary E. Bucy
2213 West 46th
Anchorage, AK 99502

BUGLI MINING & EQUIPMENT
Lorena Keating
Rt. 2, Box 226
Sterling, AK 99672

BURKE ENTERPRISES
Alan T. Chaffin
P.O. Box 10531
Fairbanks, AK 99710

BURNS, JOHN R.
Mile 54, Taylor Hwy.
Chicken, AK 99732

BURNS, MARK M. & ROBERT
P.O. Box 73992
Fairbanks, AK 99707

C & R MINING
Clifford E. Knowlton
S.R. 20591
Fairbanks, AK 99701

C & S MINING
Steven W. Rowe
General Delivery
Willow, AK 99688

CAMINDEX RESOURCES, INC.
A. Douglas MacKenzie
Ste. No. 1120 - 330 Bay St.
Toronto, Ontario, Canada M5H 2S8

CAMP CREEK MINING
Alvin L. & Eric E. Kile
Box 140434
Anchorage, AK 99514

CANADIAN BARANCA CORP. LTD.
Little Squaw Gold Mining
Box 184
Spokane, WA 99210

CANNADY, MARTHA JED MAGBY
General Delivery
Coldfoot, AK 99701

CARLO & SONS MINING CO.
2113 Southern
Fairbanks, AK 99701

CASSEY, W.C. & W. FRANK ARMSTRONG
Jeffery M. Austin
419 2nd Ave.
P.O. Box 1303
Seward, AK 99664

CAVANAGH, DAVID L. & JOHN G. McCARTHY
Box 689
Girdwood, AK 99589

CHAMBERS, KEVIN
3141 Wendys Way
Anchorage, AK 99517

CHANDALAR ENTERPRISES
2289 Franklin St.
Fairbanks, AK 99707

CHICKMAN MINING CO.
Earl L. Schene
Box 66
Chicken, AK 99732

CHILDERS, WESLEY
Box 686
Fall City, WA 98024

CHRISTOPHERSON, DIANE E.
2261 Belmont Dr.
Anchorage, AK 99517

CHULITNA FORKS PLACER MINING CLAIM
Mark D. Veit
743 East 9th Ave.
Anchorage, AK 99501

CHUMUCKLA MINING CO. (2)
Financing Associates
P.O. Box 749
Fairbanks, AK 99707

CHUNILNA MINERALS
(Tod Bauer)
BMS, Inc. (Clifford H. Driskell)
235 East 9th Ave.
Anchorage, AK 99501

CITIES SERVICE MINERALS CORP.
P.O. Box 300
Tulsa, OK 74102
(copper & others)

CLARA BEA, INC. (2)
David B. Vial & Bruce W. Comstock
P.O. Box 853
Kotzebue, AK 99752

CLARK, J.D.
General Delivery
Boundary, AK 99790

COLD CACHE MINING CO.
695 Roberts Roost Rd.
Fairbanks, AK 99712

COLLINSVILLE MINING CO.
Fairview Group Associates
Box 520925
Big Lake, AK 99652

COMINCO ALASKA INC.
5660 B St.
Anchorage, AK 99518

COMPASS MINING CO.
Mamie Boese
330 3rd Ave., Apt. 210
Fairbanks, AK 99701

CONGDON, CARL J.
925 Commerce St.
Fairbanks, AK 99701

COOK'S MINING
John P. & Mary E. Cook
P.O. Box 393
Fairbanks, AK 99707

COSMO DEVELOPMENT, INC.
William K. DeFrang
10501 Abbott Loop Road
Anchorage, AK 99516

CROLEY, BILL & STEPHEN G. OLSON
Box 191
Tok, AK 99780

D & J MINING (Orlin Jenson)
Robert D. Cross
7129 Shooresin Cr.
Anchorage, AK 99604

D & M CONSULTANTS
Estate of Betty J. & J.H. Alexander
P.O. Box 294
Nome, AK 99762

DATES, SHERLYN DIANE
The Penny Seven
SR1, Box 3443 Klondike St.
Chugiak, AK 99567

DAVIS, STANLEY D.
P.O. Box 1352
Delta, AK 99707

DEBOER, MAURICE E.
729 Oceanview Dr.
Anchorage, AK 99515

DEGNAN, JOSEPH A. & CAROLINE H.
Box 0045
McGrath, AK 99627

DELONG, THOMAS & DAVE
317 Senate Loop
Fairbanks, AK 997018

DEMPSEY, DANIEL K. (2)
P.O. Box 790
Valdez, AK 99686

DENRICH, INC.
Fred R. & Patricia L. Hall
P.O. Box 83557
Fairbanks, AK 99708

DEPEM
Richard Currington & Art Robeson
SR Box 40448
Fairbanks, AK 99701

DEVORE, WESLEY
665 3rd Ave.
Redwood City, CA 94063

DIAMOND LAKE GRAVEL
Everett K. Rains
P.O. Box 520563
Big Lake, AK 99652
(gravel & sand)

D'LOG ENTERPRISES INC.
Ferrel L. Woods
P.O. Box 81410
College, AK 99708

DOBNIK, ADOLPH, RUDY, & SANDY (2)
P.O. Box 341
Bethel, AK 99559

DODIES DREAM ASSOC.
Walter W. & Dorris L. Kopp
Box 1935
Fairbanks, AK 99707

DOLNEY, ANN & PAUL DIONNE
SR 20085
Fairbanks, AK 99701

DOME CREEK MINING & DEVELOPMENT (2)
Thomas A. Weston &
Richard B. Stough
Box 711
Wrangell, AK 99929

DOUBLE D MINING CO.
Dell E. Johnson
2110 Broadmoor Acres
Fairbanks, AK 99701

DOUBLE EAGLE MINING CO.
Juan P. Robertson
10880 Wilshire Blvd., Ste. 1115
Los Angeles, CA 90024

DOUBLE H MINES
Wallace E. Blasingame
P.O. Box 56673
North Pole, AK 99705

DOXAUCO
George G. Superdock
Box 77
Central, AK 99730

EAGLE CREEK MINING
Richard D. Burton
P.O. Box 1
Chicken, AK 99732

EAGLE DOME AGGREGATE, INC.
Leo A. Walsh
P.O. Box 93130
Anchorage, AK 99509
(gravel)

EASTMAN, LEE
1610 Southern
Fairbanks, AK 99701

EBERHARDT, DAVE A. (3)
551 Eberhardt Rd.
Fairbanks, AK 99712

ECLIPSE MINING CO. (2)
c/o Howard Grey & Associates, Inc.
3105 A Lakeshore Dr., No. 103
Anchorage, AK 99517

EEP'S EQUIPMENT RENTAL & MINING
Allan G. Anderson
Dog Alley
Takotna, AK 99675

ELEVEN PUP MINING (2)
Steve Losonsky
2 Mi. Nenana Hwy.
Fairbanks, AK 99701

ELLIS, ED AND JENNIE (3)
Box 824
Cooper Landing, AK 99572

EMERSON, ROBERT C. & ELMER GREEN
1811 Phillips Field Rd.
Fairbanks, AK 99701

ENGSTROM DREDGING CO.
Ronald & Lorena Engstrom
Box 536
Nome, AK 99762

ENSERCH PROCESSING PARTNERS, LTD.
1817 Wood St.
Box 2649
Dallas, TX 75201
(lode gold & silver)

ENVAN
Circle Investments
600 Board of Trade Bank
Duluth, MN 55802

ESPERANZA RESOURCES CO. (2)
Richard L. McIntosh
330 Wedgewood, Apt. 3E
Fairbanks, AK 99709

EVECO MINING, INC.
Alice C. Ebenal
1818 Old Steese Hwy. North
Fairbanks, AK 99701

FAA, THOMAS E. &
RALPH SIMONSON (2)
General Delivery
Healy, AK 99743

FAIRBANKS EXPLORATION
INC. (3)
Curtis J. Freeman
P.O. Box 82549
Fairbanks, AK 99708
(various lode & placer)

FAIRBANKS MINING CO. (2)
Ray Pittman
P.O. Box 641
Twisp, WA 99856
and
Rampart JV c/o Northwest
Exploration, Inc.
P.O. Box 81978
Fairbanks, AK 99708

FAIRBANKS SAND & GRAVEL
7800 Lake Otis Pkw.
Anchorage, AK 99507
(sand & gravel)

FALLS MINING CO.
Mario R. Olivas
P.O. Box 1346
Seward, AK 99664

FAULKNER, HARRY E., &
JEANNINE D.
P.O. Box 1307
Bethel, AK 99559

FELDMAN, GARY & BRIAN
Jim Dunlap (2)
520 5th Ave., No. B 61
Fairbanks, AK 99701

FELTON CONSTRUCTION CO.
Box 7099
Missoula, MT 59807
(gravel)

FERN DEVELOPMENT CO., INC.
G.F. Kalmback
P.O. Box 872148
Wasilla, AK 99687

FIX, HOWARD C. (2)
P.O. Box 432
Northway, AK 99764
and
Vernon Thernou
Tok, AK 99780

FLAT CREEK PLACERS
John E. & Richard S. Fullerton
General Delivery
Flat, AK 99584

FLAT PICK MINING
Gordon D. Fulton
SR
Mackay, ID 83251

FORSGREN, RICHARD E.
Box 65
Willow, AK 99688

FORTUNE MINING CO. OF
ALASKA
Ernest B. Harrell
General Delivery
Wasilla, AK 99687

FOSTER, EARLE & RHEA
7330 Bailey Dr.
Anchorage, AK 99502

FOUR BROTHERS MINING
P.O. Box 81117
College, AK 99708

FOUR GOLD MINING
Kevin D. Thompson & Hall Ingalls
SR 6414-B
Wasilla, AK 99687

FOX, WILLIAM L. (2)
P.O. Box 3996
Soldotna, AK 99669

FREDETTE, RICHARD H. &
KENNETH A. LUND
Michael T. Gottschalk
SR 22138
Fairbanks, AK 99701

FREEMAN, CURTIS J.
P.O. Box 74261
Fairbanks, AK 99707
(various lode & placer)

FRIEND, STEVEN L.
1708 Maryann
Fairbanks, AK 99701

FRY, CLARENCE
P.O. Box 905
Homer, AK 99605

GCO MINERALS CO.
650 West 58th Ave., Unit G
Anchorage, AK 99518

GHD RESOURCES PARTNERS,
LTD.
Berry Holding Co.
P.O. Box X
Taft, CA 93268

GAEDE OR LINDMAN DREDGING
Mark A. Gaede
P.O. Box 2192
Soldotna, AK 99669

GALLAGHER, MICHAEL J.
6310 Habitat Ct.
Anchorage, AK 99504

GALLAGHER, PAUL E. &
KEVIN C.
1341 Silverberry Dr.
Fairbanks, AK 99712

GATES, WILLARD E. &
KENNETH TAINTER
General Delivery
McGrath, AK 99627

GELVIN, STANLEY M. &
EDWIN C.
Box 30120
Central, AK 99730

GERAGHTY, RICHARD W.
405 Juneau Dr.
Fairbanks, AK 99701

GIBSON, WAYNE E. & ELLEN R.
1610 Southern
Fairbanks, AK 99701

GIRDWOOD MINING CO.
McCarthy, Reynolds, & McLinn
3605 Arctic Blvd., No. 476
Anchorage, AK 99503

GLANVILLE, CARL & DESSIE
HCR Box 1195
Anchor Point, AK 99556

GLEN MINING CO.
Charles W. Stowell
308 Haines Ave.
Fairbanks, AK 99701

GLOBAL MINERALS, LTD
Joseph S. LaSpesa
90 Dorchester Rd.
Buffalo, NY 14213

GOLDEN BEAR MINING
Kevin D. Thompson & Edith L. Haas
SR 6414-B
Wasilla, AK 99687

GOLD POST MINING CO.
Richard Lindsten
P.O. Box 23
Central, AK 99730

GOLDUST MINES
Del Ackels
Box 2151
Fairbanks, AK 99707

GOODSON, RICHARD O.
Box 12
Chicken, AK 99732

GORESEN, EDMOND J.
General Delivery
Seward, AK 99664

GRANATH, GENE A.
I.I.S.G. Machine, Inc.
Box 574
Kenai, AK 99611

GRANITE CREEK MINING CO.
Northwest Exploration, Inc.
116 Minnie St.
P.O. Box 81978
Fairbanks, AK 99708

GRANITE INVESTMENT, INC.
James Hansen
P.O. Box 104462
Anchorage, AK 99510

GRATEFUL DOG (2)
Roger B. McPherson
1563 Jones Road
Fairbanks, AK 99709

GREAT AMERICAN MINING
Dale Rameier
P.O. Box 10189
Fairbanks, AK 99710

GREEN MINING & EXPLORATION
Clyde & Martha Dunlap
1025 23rd Ave.
Fairbanks, AK 99701

GREENS CREEK MINING CO.
Jack P. Bingham
Box 32277
Juneau, AK 99803
(various lode)

GRIZZLIES MINING CO.
Angel Vidal
5433 M St.
Anchorage, AK 99501

GULLYCAT ENTERPRISES (2)
Box 80430
College, AK 99708

GUTHRIE, HOWARD P.
P.O. Box 61367
Fairbanks, AK 99701

HAAS, FREDERICK W.
2957 Yale Dr.
Anchorage, AK 99508

HAGGLAND, JAMES P.
Flat Creek Mining Co., Inc.
P.O. Box 81464
Fairbanks, AK 99708

HAMMOND, CHARLES R. (2)
General Delivery
Chicken, AK 99732

HANKS, G.A. & SONS (2)
General Delivery
Chicken, AK 99732

HANSEN, JAMES H. & KATHLEEN
P.O. Box 246
Nome, AK 99762

HANSON PROPERTIES, INC.
P.O. Box 7310
Spokane, WA 99207

HARE, ALBERT J. & ROBERT D.
RR 1
Reiner, MN 56672

HARLING, VICTOR
P.O. Box 86
Central, AK 99730

HAROLDSER ESTATES
John Haroldser
Box 716
Bethel, AK 99559
(sand & gravel)

HASKINS, SCOTT
Nordale Corp./Placid Oil Co.
1600 1st National Bank Bldg.
Dallas, TX 75202

HASKINS, SCOTT &
RUDY VETTER
Victor D. Hart
116 Farewell Ave.
Fairbanks, AK 99701

HATCH, EDWIN L.
Box 1801
Nome, AK 99762

HAYDEN EXPLORATION &
MINING
Leslie L. Maxwell
3916 Laesault
Anchorage, AK 99516

HEFLINGER MINING &
EQUIPMENT CO. (3)
Carl F. Heflinger
665 10th Ave., Apt. 307
Fairbanks, AK 99701
and/or
Fred Heflinger
P.O. Box 74304
Fairbanks, AK 99707

HENDRICKSON EXPLORATION &
MINING (2)
Robert Blowers & Tim Wark
P.O. Box 871118
Wasilla, AK 99687
(lode & placer gold)

HERNING EXPLORATION &
MINING
Bruce G. Herning
P.O. Box 73846
Fairbanks, AK 99707

HERZOG, MARTIN M. &
JEAN A.
11250 Sabine St.
Anchorage, AK 99516

HILL, KENNETH E.
2682 Gold Hill Rd.
Fairbanks, AK 99701

HOFFMAN MINING
Eula Vickery
Box 213
Kenai, AK 99611

HOLLAND, SEAN M.
Paul W. White & Patrick D. Peede
2551 Peede Rd.
North Pole, AK 99705

HOOGENDORN, HOMER E. & WM.
P.O. Box 84
Nome, AK 99762

HOOPER, GERALD W.
P.O. Box 2750
Palmer, AK 99645

HOPE MINING CO. (3)
P.O. Box 101827
Anchorage, AK 99510

HOPEN, ALF
Alaska Gold Co.
P.O. Box 1170
Fairbanks, AK 99707

HORNER, GEORGE
Box 60610
Fairbanks, AK 99707

HOUSE, CONRAD H.
924 Kellum, Apt. 101
Fairbanks, AK 99701

HUNGRY DOG CAMP No. 1 & No. 2
Daniel E. Lepke
P.O. Box 1410
Palmer, AK 99645

HYAK MINING CO.
1114 Glacier Ave.
Juneau, AK 99801

INSPIRATION GOLD, INC.
Box 1559
Claypool, AZ 85532
(offshore gold dredging)

INTERIOR ALASKANA ASSOC.
Richard L. Long
742 Bennett Rd.
Fairbanks, AK 99712

J.C. ANPAS, INC.
Charles A. Paskvan
379 Division St.
Fairbanks, AK 99712

J & S MINING
Jesse G. Smith, Jr.
P.O. Box 11
Captwell, AK 99729

JACKSON MINING CO.
Roy E. Traxler & Naimy Birklid
936 Coppet St.
Fairbanks, AK 99709

JENSEN, DANIEL D.
Box 12
Delta Junction, AK 99737

JILES, OVERTON JACKSON
5250 Auburn-Folsom Rd.
Loomis, CA 95650

JOHNSON, BRIAN C.
Resource Associates of Alaska
122 First Ave.
Fairbanks, AK 99701

JOHNSON, ERNEST
Box 56182
North Pole, AK 99705

JOHNSON, MYRTLE & THOMAS
Box 608
Nome, AK 99762

JONES & CO.
W. Deering Jones
Milepost 49 3/4, Anchorage-Seward Highway
Moose Pass, AK 99631

JORDAN, R. BRADLEY & JERROLD G. PARKER
15300 Longbow Dr.
Anchorage, AK 99516

KC MINING CO.
Kenneth C. Hanson
Box 10657 - Steese Branch
Fairbanks, AK 99710

K & K MINING CO.
Keith R. Mitchell
4850 Alpha Cir.
Anchorage, AK 99516

KACHEMAK MINING CORP. (2)
Robert C. Busby
47660 Falls Creek Dr.
Homer, AK 99608

KALBERG, PETER (2)
Box 1067
Willow, AK 99688

KANTISHNA MINES, LTD.
2020 Lake Otis Parkway
Anchorage, AK 99508
(lode gold, silver)

KEISLING, KELLY L. & DENIS DEWRNE
P.O. Box 12
Hope, AK 99605

KELLIHER, MAURICE
Box 216
Nome, AK 99762

KELLY, TIMOTHY J.
1116 H St.
Anchorage, AK 99501

KENDON MINING
Kenneth E. & Donna J. Wooten
2465 Old Steese Hwy. N.
Fairbanks, AK 99701

KINARD, DON
Alminco
Box 1281
Boerne, TX 78006

KNUDSON, RICHARD & JOHN MALONEY
P.O. Box 210168
Anchorage, AK 99524

KREMER, ROBERT G. & BETTY K.
381 Pauline
Anchorage, AK 99504

KRENAKE, MARK K.
P.O. Box 422
Nenana, AK 99760

KROLL, HENRY F., II & HENRY F., III
Box 181
Seldovia, AK 99663

KUKOWSKI, GORDON L., EDITH, & DAVID
9022 Jewell Terrace
Anchorage, AK 99502

L & B MINING (2)
D.B. Parent, D.A. Young
1015 10th Ave.
Fairbanks, AK 99701

LAKE OTIS GRAVEL SALES, INC.
P.O. Box 102774
Anchorage, AK 99510
(sand, gravel)

LAKEWOOD ASSOCIATION
Box 132
Central, AK 99730

LANGE, ROBERT L. & ROGER COOL
5002 Cambridge Way
Anchorage, AK 99503

LARSON, JUANITA R.
3301 Commercial Dr. No. 9
Anchorage, AK 99501

LARSON, MARVIN A. & EDNA C.
P.O. Box 328
Trinity Center, CA 96091

LAST CHANCE MINING CO.
Walter, Ruth, Robert,
Ron Roman
P.O. Box 141
Fairbanks, AK 99707

LAWLOR, THOMAS A.
P.O. Box 555
Glennallen, AK 99588

LAYMAN, JAMES R. (2)
P.O. Box 44
Eagle, AK 99738

LEACH, JAMES B., III
Box 520682
Big Lake, AK 99652

LESTER, RAY
732 Old Steese Hwy. No. 8
Fairbanks, AK 99712

LILLIAN CREEK MINE, INC.
Gladys H. Parker
P.O. Box 552
Fairbanks, AK 99701

LINDPHIL MINING CO.
Walter T. Phillips &
Stanley Lindskoog
P.O. Box 3304
Homer, AK 99603

LITTLE, HAROLD G.
Box 737
Eagle River, AK 99577

LONE SPRUCE MINING CO.
William R. &
George R. Strickler
16730 Stoneridge Rd.
Anchorage, AK 99516

LOONEY, JAMES P., SR. & JAMES P., JR.
P.O. Box 81261
College, AK 99708

LOPETRONE, ROBERT J.
Lewis B. Wyman
General Delivery
Chicken, AK 99732

LOPEZ, EARTHUM W.
Knox N. & Lorena N. Christie
413 Rezanof Dr. East
Kodiak, AK 99615

LORD, WALLACE J.
3204 Tayshee Cir.
P.O. Box 140296
Anchorage, AK 99514

LORZ, CAMERON
Box 1106
Oroville, Wa 98844

LOST RIVER MINING
Alaska Placer Co.
P.O. Box 1150
Phoenix, AZ 85001

LUCAS, DONALD L.
1803 Kepner St.
Anchorage, AK 99504

LUCAS, RANDY G.
P.O. Box 871481
Wasilla, AK 99687

LUCKY 7 MINING CO.
Alaska Gold Co.
P.O. Box 1614
Fairbanks, AK 99707

LUCY CREEK MINE
Claude H. Morris, Jr.
Box 547
Girdwood, AK 99587

LYMAN RESOURCES IN AK., INC.
Calista Corp.
516 Denali St.
Anchorage, AK 99501

M & M MINING (4)
Lee M. Carter & Daryl Galipeau
3021 Porcupine Trail
Anchorage, AK 99516

M & M MINING
Rodney D. Mitchell
3133 Chena Hot Springs Rd.
Fairbanks, AK 99701

M & M MINING
Wayne G. Mitchell
1731 Bridgewater Dr.
Fairbanks, AK 99701

MACKLIN PLACER MINERS (2)
R.V. McCarty
P.O. Box 331
Nome, AK 99762

MAGIC CIRCLE MINING
(Steve Weber)
James & Joy Morgan
P.O. Box 56
Hope, AK 99605

MAGNUSON MINING CO.
Box 55
McGrath, AK 99627

MALATESTA, JOSEPH & MICHAEL R. JOHNSON
P.O. Box 318
Clam Gulch, AK 99568

MALONE, FRANK D.
9400 Old Seward Hwy.
Anchorage, AK 99515

MANIA MINING
Scott Blair Thorngren
236 Farewell
Fairbanks, AK 99701

MANNS, ALBERT (MICK) OR CECILIA
55 Mi. North of
Bettles, AK 99726

MARMOT MINING & EXPLORATION, INC./DUPERE & ASSOCIATES JV (2)
P.O. Box 1789
Palmer, AK 99645
and
James P. Wheeler,
Howard J. Hunt, &
Glenn Heatherly
6801 Mink Ave.
Anchorage, AK 99504

MARTIN, PEGGY J.
238 Ellingsen
Fairbanks, AK 99701

MASSENGALE, WILLIAM M. & MARK
2900 Boniface Pkwy., No. 517
Anchorage, AK 99504

MASSIE, PERRY (2)
Global Resources
Box 1042
Nome, AK 99762

MATTHEWS, GUY A.
P.O. Box 241
Tok, AK 99780

MAXWELL MINE & EXPLORATION
Leslie L. Maxwell
3910 Loc Sault Ave.
Anchorage, AK 99516

McCARTER, WILLIAM A.
P.O. Box 2760
Anchorage, AK 99510

McCLAIN, JOHN E.
Box 436
Soldotna, AK 99669

McCLANAHAN, ROBERT C.
19502 2nd Ave. Southeast
Bothell, WA 98012

McCOMBE, MURIEL J.
Chicken, AK 99732

McDANNEL, MICHAEL W.
P.O. Box 2442
Palmer, AK 99645

McISAAC, GARRY N.
P.O. Box 531
Abbotsford, B.C. Canada V2S 5Z5

McKRAL, MICHAEL
P.O. Box 50
Eagle River, AK 99577

McPEAK, ROGER
Harold Gilken & Jack LaCross
P.O. Box 58076
Fairbanks, AK 99711

MEISER, M.P.
3701 Eureka Dr., Sp. No. 43B
Anchorage, AK 99503

MENDENHALL, KEITH J.
308 Kody Dr.
P.O. Box 1406
Fairbanks, AK 99701

MERRITT, SHANNON & AL CEREPA
377 Banner Lane
Soldotna, AK 99669

MESPELT & ALMASY MINING CO. (3)
Theodore J. Almasy &
Margaret L. Mespelt
P.O. Box 74
McGrath, AK 99627
(lode & placer, gold & other)

METCALF, JAMES C.
P.O. Box 72933
Fairbanks, AK 99707

MIKNICH, CHARLES M.
3600 Taiga Dr.
Anchorage, AK 99516

MILLER, MARY E.
P.O. Box 101654
Anchorage, AK 99510
(gravel)

MINING & PROSPECTING LIMITED
John Davis
Delta Junction, AK 99737

MISCOVICH, ANDREW W. (4)
Box 1489
Fairbanks, AK 99707

MISCOVICH MINING CO.
Howard P. Miscovich
P.O. Box 262
Galena, AK 99741

MORRIS, WM. H. & MARY D.
Virginia Bench No. 1
Chicken, AK 99732

MRAK PLACER MINE
Mrak, Herman, &
Aklestad, Herman
P.O. Box 1963
Palmer, AK 99645

MUD CREEK MINE, INC.
Kenneth R. Upchurch
627 Gaffney
Fairbanks, AK 99707

MUNJAR, SAMUEL L.
750 Fox Tail Dr.
Fairbanks, AK 99701

MYERS, MICHAEL R.
4040 Folker, Sp. No. 7
Anchorage, AK 99508

MYRTLE CREEK MINING CO.
Mitchell Fleming
Coldfoot, AK 99701

MYSTIC MTN. MINING
(Jack Neubauer)
Warren W. Taylor
P.O. Box 917
Friday Harbor, WA 98250

NAHRING, ELDON L.
Hunt Oil Co.
1125 17th St., Ste. 2400
Denver, CO 80202

NAUMAN, CLYNTON R. (3)
Resource Associates of Alaska, Inc.
122 First Ave.
Fairbanks, AK 99701
and
Michael A. & Vuka R. Stepovich
14 South Margarets Dr.
Toronto, Ontario Canada M4N 3E5
and
Vincent Monzulla
2920 Monzulla Ln.
Fairbanks, AK 99701

NELCHINA MINES
Anson L. Renshaw, Jr.
1850 Wickersham Dr.
Anchorage, AK 99507

NELSON, JOEL V. & TOM FARR
3605 Arctic Blvd., No. 1382
Anchorage, AK 99503

NELSON, LARRY C.
413 Glacier Ave.
Fairbanks, AK 99701

NEMEC, WILLIAM J. & LINDA JOY
Box 83032
College, AK 99708

NEVERS, HAROLD A. (2)
8148 Pinewood Dr.
Juneau, AK 99801

NICHOLSON, DOUGLAS C.
Glenn D. & Vern H. Bouton
665 Farmers Loop
Fairbanks, AK 99712

NORCROSS-STONEBURG MINING CO.
James H. Norcross
Box 242
Willow, AK 99688

NORDEEN, WILLIAM H.
Emma Creek
Coldfoot, AK 99701

NORTH CREEK MINING
Arnold J. Mason
203 E St.
Fairbanks, AK 99701

NORTHERN BONANZA
Richard Busk
P.O. Box 100971
Anchorage, AK 99510

NORTHSTAR MINING PARTNERSHIP
1200 W. Diamond Blvd., No. 1055
Anchorage, AK 99515

NORTHWEST EXPLORATION, INC.
John Dart
Manley Hot Springs, AK 99756

NUGGET ESTATE MINING CO.
Edward W. & Grace J. Montgomery
P.O. Box 60430
Fairbanks, AK 99706

OFFICER, CASEY W.
2615 Southeast Courtney, No. 75
Milwaukie, OR 97222

OLSON, ALAN G. & VICTOR E. LOYER
Box 165
Palmer, AK 99645

OLSON, STEVEN
Keith Clement
741 8th Ave.
Fairbanks, AK 99707

OMEGA MINING CO., INC.
Martin H. Ott
332 N. Boundary St.
Fairbanks, AK 99701

OTECO, INC.
6455 NE. Columbia Blvd.
Portland, OR 97218

OTTER DREDGING CO.
John A. Miscovich
General Delivery
Flat, AK 99584

PMX-TOTEM MINES
(David McClurg)
Larry Westlake &
Antony A. Schuerch
General Delivery
Kiana, AK 99749

P & P MINING
Paul W. White & Patrick D. Peede
2551 Peede Rd.
North Pole, AK 99705

PAGE, MAURICE E.
Mile 92, Taylor Hwy.
Chicken, AK 99732

PAN CENTRAL ALASKA, INC.
and (1 ea.)
PAN CENTRAL EXPLORATIONS, LTD.
Marvin Mandell
61 Richview Rd., Ste. 2109
Islington, Ontario Canada M9A 4M8

PARADISE PEEK MINING ASSOCIATED
John L. Ritter
P.O. Box 2292
Juneau, AK 99803

PARDNERS MINING (3)
Rhinehart Berg
Candle, AK 99728

PARKER, HAROLD F.
General Delivery
Talkeetna, AK 99676

PARR, GLEN C.
624 Maple
Shelton, WA 98574

PARRY, JAMES M.
P.O. Box 1656
Fairbanks, AK 99707

PASQUAL, PETE, III
Wiseman
c/o Coldfoot, AK 99726

PATTON, CACY
Russell H. Williams
P.O. Box 1505
Fairbanks, AK 99707

PAUL & CO. (2)
Bull Knob Mining
Box 11
Cantwell, AK 99729
and
Circle Mining Co.
Box 11
Central, AK 99730

PAVEY, MARION A. & RONALD YENSEN (2)
3293-B Adams St.
Fairbanks, AK 99701

PAYCHECK MINING
Stella D. Lavender
General Delivery
Boundary, AK 99790

PAYSTREAK MINERAL DEVELOPERS
Howard Lambert & Albert Zucchini
P.O. Box 1695
Fairbanks, AK 99707

PEET, LEE & JAMES MARIOTTE
P.O. Box 93
Central, AK 99730

PENZ, DAVID
Kako Mine
Russian Mission, AK 99657

PETERS CREEK MINING
(Walter Bagnell)
Floyd Howell
12521 Hare St.
Anchorage, AK 99515

PETERSON, FRANCES &
LEE HOUSE
P.O. Box 627
Nome, AK 99762

PHILLIPS, GERALD C.
5710 Cope St.
Anchorage, AK 99518

PHILO, ANNA B.
P.O. Box 22
Houston, AK 99687

PHILPOTT, ROY (2)
115 Charles St.
Fairbanks, AK 99701

PLACK, PHILIP & PAUL
P.O. Box 2325
Palmer, AK 99645

POINTS NORTH (J.S. Masterman)
Robert J. Carey, Jr.
Box 106
Central, AK 99730

POLAR MINING, INC. (4)
Donald J. May
4545 Wood River Dr.
Fairbanks, AK 99709
and
Barney & Kathy Harred
1875 Areticloon Cr.
Fairbanks, AK 99709
and
James L. Regan
2027 Lakeview Trailer Ct.
Fairbanks, AK 99701

PORTER, RALPH J.
Box 7
Soldotna, AK 99669

POWERS, WILLARD B. &
HAROLD H. RUPPERT
P.O. Box 1441
Santa Ana, CA 92702

PRINCE CREEK MINING CO.
Alvin H. Agolf
General Delivery
Flat, AK 99584

PRITCHETT, JERRY L.
P.O. Box 145
Central, AK 99730

QUARTZ CREEK EXPLORATION
CO./QUEX
Milo E. Flothe
Rt. 2, Box 242
Sterling, AK 99672

R & L MINING (Red Olson) (3)
Box 199
Central, AK 99730
and
Alan M. & Patricia McQuade
Box 73598
Fairbanks, AK 99707
and
Joe Vogler
Box 110
Fairbanks, AK 99707

R & R MINING (3)
Philip Brandl
14251 Sabine St.
Anchorage, AK 99516

R & S MINING CO.
Ronald W. Whittom
Box 411
Bethel, AK 99559

RTM CO., INC.
Albert M. Hagen
General Delivery
Manley Hot Springs, AK 99756

RAY WOLF MINING, INC.
P.O. Box 625
Cave Junction, OR 97523

RED TAPE MINING
Jim Fuksa
P.O. Box 74624
Fairbanks, AK 99701

REINER, BRAD D. &
JOHN D. GLOVER
P.O. Box 10369
Fairbanks, AK 99707

RESOURCE ASSOCIATES OF
ALASKA, INC. (3)
122 1st Ave.
Fairbanks, AK 99701
and
Cook Inlet Region, Inc.
P.O. Drawer 4-N
Anchorage, AK 99503

RIFE/McMILLAN CO.
William J. Muehlenkamp,
Fred A. McMillan, &
Mack Rife
803 John Cole Rd.
Fairbanks, AK 99712

R. McKINNEY LTD.
Douglas B. Buckley &
M.T. Killion
Box 73962
Fairbanks, AK 99707

ROBERTS, ELLIS & BOB
Bill Meldrum
General Delivery
Chicken, AK 99732

ROCK & FLAKE MINING CO.
A. Mark Gumaer
330 L St.
Anchorage, AK 99501

ROCK N' OTHER FELLERS
Jon S. Adams
4201 Pinnacle Cr.
Anchorage, AK 99504

ROCKSTAD, RONALD D. &
CHARLES G. FORCK
P.O. Box 929
Delta Junction, AK 99737

ROGERS & BABLER (2)
Godfrey/Tollefson Partnership
1301 East 64th Ave.
Anchorage, AK 99502
(gravel)

ROSANDER, RONALD
Box 129
McGrath, AK 99627

ROSS, EDWARD T.
P.O. Box 61017
Fairbanks, AK 99706

ROTTER, RAY
Min-Tex (Dennis Anderson &
Lloyd Mickelson)
Rt. 2, Box 269
Frazee, MN 56544

RUBEL, JOHN D.
8183 Richardson Hwy.
Salcha, AK 99717

RUBY MINING CO. (3)
Al Kangas
P.O. Box 1
Ruby, AK 99768

RUSSELL MINING CO.
A.A. Hadley
Box 889
Bella Vista, CA 96008

RYBACHEK, STANLEY C. (3)
P.O. Box 55698
North Pole, AK 99705

S.E.P.A. MINING CO.
Sidney R. Reed
3100 Seawind Dr.
Anchorage, AK 99516

SMK-2 MINING
Michael A. Sweetsir
Box 18
Ruby, AK 99768

SACKETT, LLOYD
6820 A-1
Palmer, AK 99645

SAGE CHRISTIAN ENTERPRISES
Roland R. Kotowski
321 W. First St.
Park Rapids, MN 56470

SALTER ASSOCIATES
Edward Salter
General Delivery
Manley Hot Springs, AK 99756

SAVAGE, BRUCE D.
Pioneers Home
2221 Egan St.
Fairbanks, AK 99701

SAYER, PHILIP & PAUL
Box 10
Homer, AK 99603

SCHNABEL, JOHN J.
Box 149
Haines, AK 99827

SCHURR, JOHN &
ANDRE SANDERS
1905 Persinger Dr.
Fairbanks, AK 99705

SEE, JACKIE R. &
JAMES H. LANGWORTHY, JR.
541 Riviera Ct.
Fullerton, CA 92635

SEUFFERT, GEORGE, JR.
7705 Port Orford Dr.
Anchorage, AK 99506

SHARP ENTERPRISES
Melvin M. Webber
SRB 7531-B
Palmer, AK 99645

SHILLING, JOHN A.
Box 81424
Fairbanks, AK 99708

SHORT GULCH MINING CO., INC.
Tomi B. Taylor
General Delivery
Trapper Creek, AK 99688

SIMMONS, WALLEY
Alaska Gold
925 Aurora Dr.
Fairbanks, AK 99709

SINGIN' SAM'S RAINBOW
MINE (2)
George Robinson &
Garland H. Achman
P.O. Box 149
Tok, AK 99780

SIPES, JOHN W.
P.O. Box 55254
North Pole, AK 99705

SMITH EQUITIES
7100 Homer Dr.
Anchorage, AK 99502
(gravel)

SMITH MINING
Bill Alder
P.O. Box 1334
Palmer, AK 99645

SMITH, SHERMAN C.
P.O. Box 770
Cooper Landing, AK 99572
(lode travertine)

SMITH, WILLIAM L.
906 Cunningham
Anchorage, AK 99501

SOLDOTNA SAND & GRAVEL
Harold A. Jackson
44605 Killowat Ave.
Soldotna, AK 99669
(gravel)

SOLOMON, ROBERT &
WM. RENTON
Box 1069
Valdez, AK 99656

SORENSON, DONALD W.
P.O. Box 874422
Wasilla, AK 99687

SOULE, BETTY M. & HAROLD L.
2840 E. 142nd Ave.
Anchorage, AK 99516

SOURANT, JAMES D. (2)
Jeff M. Austin
P.O. Box 1363
Seward, AK 99664
and
Joy Morgan
General Delivery
Hope, AK 99605

SOUTHWELL, JOSEPH HOWARD
P.O. Box 511
Glennallen, AK 99588

SPRINKLE, DAVID L. & DELIGHT
8123 Hartzell Rd.
Anchorage, AK 99503

SPRUCE CREEK MINING CO.
John J. O'Carroll
Ophir
McGrath, AK 99627

STAHL, HELEN M. &
JAMES DELLA SILVA
5817 Winding Way
Anchorage, AK 99504

STARVATION MINING CO.
Eric Rayburn
P.O. Box 876
Fairbanks, AK 99707

STATIS, DEMETRIOS
9131 Centennial Dr.
Anchorage, AK 99504

STEPOVICH, VUKA
P.O. Box 81978
Fairbanks, AK 99708

STEVENS, BERTHA E. &
KENNETH DAHL
P.O. Box 681
Bethel, AK 99559

STEWARD, JIM
835 Faultline Ave.
North Pole, AK 99705

STEWART, JACKIE J. (2)
P.O. Box 813
Delta Junction, AK 99737

STRAIGHT CREEK MINING CO.
Key Stone Mining Co.
2046 Goldstream Rd.
Fairbanks, AK 99709

STUBBLEFIELD, Y.R. & JOHN
P.O. Box 570
Soldotna, AK 99669

SUM RESOURCES, INC.
Jean Depatie
625 Dorchester Blvd. West, Ste. 800
Montreal, Quebec Canada H3B 1R2

SUNRISE EXPLORATION
c/o Roger Moore
P.O. Box 51
Hope, AK 99605

SWAN, JAMES W. &
CHARLES McLAUGHLIN
452 Winter Ave.
Fairbanks, AK 99712

SWEET, DAVE &
GEORGE WILSON
Dennis Eich
3915 Devon Ave.
Chicago, IL 60659

SWENSON, LLOYD D.
1843 Bridgewater
Fairbanks, AK 99701

T.J. MINING
SRD Box 9068
Palmer, AK 99645

TACHICK MINING CO.
Richard Lee
Tin City, AK

TALMO, INC.
Dan Creek Placer Mine
P.O. Box 401
Gig Harbor, WA 98335

THE 5 STEWARDS
Les Paul Zerbe
356 Louise Ln.
Fairbanks, AK 99701

THE MINING CO. (3)
Wanda B. Iorio
P.O. Box 4-1721
Anchorage, AK 99509
and
Linda & Larry Raines
4329 San Roberto No. 1
Anchorage, AK 99504

THICKE, HENRY A.
R1
Bangor, WI 54614

THREE G MINE
Boyd Blair
Rt. 1, Mile 260 Parks Hwy.
Healy, AK 99743

THUNDER MINING CO.
(Larry Kendrick)
Jocarbil Mining, Inc.
1013 E. Diamond, Ste. 144
Anchorage, AK 99515

TIHEETI' ALL, INC.
Ernest E. James
General Delivery
Birch Creek, AK 99790
(gravel)

TILLICUM RESOURCES, INC.
4029 Yvonne Ave.
Fairbanks, AK 99709

TIMBER CREEK MINING CO.
Frank Baldwin
1061 Chenowith
The Dalles, OR 97058

TITCHENAL, ROBERT L. &
SHIRLEY J.
7808 Honeysuckle Dr.
Anchorage, AK 99502

TOOHEY, CYNTHIA D. &
CAMDEN W. (3)
P.O. Box 113
Girdwood, AK 99587

TOUPE, WALLACE M.
122 First Ave.
Fairbanks, AK 99701

TRAUTNER, JOHN J.
Box 909
Girdwood, AK 99587

TRI-CON MINING, INC. (5)
Silverado Mines (U.S.), Inc.
P.O. Box 2357
Fairbanks, AK 99701
and
Frank Figlenski & Lyle Carlson
P.O. Box 2741
Fairbanks, AK 99707
and
William A. Ohman
P.O. Box 10094
Fairbanks, AK 99701
and
Range Minerals Corp.
2742 Badger Rd.
Fairbanks, AK 99701
and
Kenneth E. O'Harra &
Arley R. Taylor
753 Park St.
Ashland, OR 97520

TRINITY MINING (2)
N.B. Tweet & Sons
Box 503
Teller, AK 99778

TRIPLE 'B' MINING
William S. Stock
Box 671484
Chugiak, AK 99567

TRIPLE S MINING (2)
Bruce D. Pelkey
General Delivery
Boundary, AK 99790

TUCKER, ROBERT
3101 Rose St.
Anchorage, AK 99508

TULUKSAK DREDGING, LTD. (2)
737 'E' St.
Anchorage, AK 99501

TUNDRA EXPLORATIONS (2)
D.B. Vial & R.W. Comstock
General Delivery
Candle, AK 99790

TUNGSTEN MINING CO.
John C. & Martha Thomas
P.O. Box 98
Central, AK 99730

TURNER, WALLACE O., II &
JAMES G. ROLAND
2564 State St.
Fairbanks, AK 99701

TWEITEN, OSCAR
Box 162
Fairbanks, AK 99707

UNDERWOOD, DAVID &
LESLIE
Box 53
Central, AK 99730

UTTER, SHERYL & MIKE,
HENRY E. KRIZMEN, &
LINDA & GORDON FERGUSON
16500 Chasewood Ln.
Anchorage, AK 99516

VALDEZ CREEK MINING CO.,
INC.
6421 Winchester
Anchorage, AK 99507

VAN OSTRAND, TOM C.
P.O. Box 314
Healy, AK 99743

VEGOREN, EARL
P.O. Box 274
Delta Junction, AK 99737

VELIKANJE, BETTY K.
2600 Draper Dr.
Anchorage, AK 99517

VENTURES NORTH
Box 81467
Fairbanks, AK 99708

VETTER, GRACE (2)
P.O. Box 342
Fairbanks, AK 99707
(lode gold)

VIAL, MICHEAL
Rhinehart Berg
General Delivery
Candle, AK 99728

VIDAL, ANGEL
915 W. 25th St., Apt. No. 7
Anchorage, AK 99503

VOGLER, JOSEPH E.
P.O. Box 40
Fairbanks, AK 99707

WALKER, TOM
3034 Riverview Dr.
Fairbanks, AK 99709

WALLER, CECIL W. &
ROBERT D. BRADLEY
Box 503
Soldotna, AK 99669

WARREN, FRANK R.
Circle Mining Co.
P.O. Box 11
Central, AK 99730

WATERFIELD, HENRY W.
Box 93610
Anchorage, AK 99509
and
Michael D. Bragg
3605 Arctic Blvd., No. 561
Anchorage, AK 99503

WAYSON, MARK N.
1148 Sunset Dr.
Fairbanks, AK 99709

WESCOTT, ANDREW G.
1132 Lakeview Terrace
Fairbanks, AK 99701

WESTERN CONSTRUCTION &
MINING
Pat Cochran
P.O. Box 56047
North Pole, AK 99705

WHITE, HARRY O.
Sr 1, Box 2672
Chugiak, AK 99576

WHITE, MICHAEL P.
P.O. Box 2794
Fairbanks, AK 99707

WILD RIVER VENTURES
Wallace E. Gordon, Jr.
Bettles Field, AK 99726

WILKES, FRED &
LARRY KENDRICK (2)
1063 Diamond
Anchorage, AK 99515

WILKINSON, FRED D. (3)
P.O. Box 1
Central, AK 99730

WILLFORD, FRANK E. &
VIVIAN D.
1079 Victor Ct.
North Pole, AK 99705

WILLIAMS, BILL R.
P.O. Box 10324
Fairbanks, AK 99710

WILLIAMS, WILBUR A. &
ANN J. (2)
Flat, AK 99584

WILMARTH, RICHARD C.
Red Devil, AK 99656

WILMOTH, MICHAEL R.
P.O. Box 4-2285
Anchorage, AK 99509

WILSON, GEORGE R.
SRC, Box 8360
Palmer, AK 99645

WILSON, HARRY & CY BRAS
P.O. Box 47
Chicken, AK 99732-0047

WILSON MINING CO.
Sean R. McGrane
427 'D' St.
Anchorage, AK 99501

WINDFALL GOLD MINING CORP.
P.O. Box 1920
Nome, AK 99762

WINDY CREEK TIMBERLINE MINING CO. (2)
Roy & Irene Tansy
P.O. Box 231
Copper Center, AK 99573

WINGETTE, INC.
Ed Salter
General Delivery
Manley Hot Springs, AK 99756

W. MARTIN EXPLORATION, INC.
Chena Mining Co.
8540 Williwa Ave.
Anchorage, AK 99504

WOLCOTT, JIM L.
P.O. Box 200283
Anchorage, AK 99520

WOLFF, ROBERT V.
General Delivery
Boundary, AK 99790

WOLTERS, MORRIS
Barry Holding Co.
9300 View Dr.
Juneau, AK 99801

WORLD WIDE MINES
Howard P. Guthrie
RR 2
Mesick, MI 49668

WRIGHT P.M., INC.
Carson Holt
½ Mile Van Horn Rd.
Fairbanks, AK 99701

WYATT, FRED & HANK GRADNEY
P.O. Box 1384
Fairbanks, AK 99707

WYLIE, JAMES R.
P.O. Box 208
Aptos, CA 95001-0208
mercury

WYMAN, LEWIS B. & DAVE SWEET
General Delivery
Chicken, AK 99732

WYMAN, WILLIAM F., C.M. READER, & HUGO LINDFORS
P.O. Box 355
Nome, AK 99762

WYRICK, L.E. & MARILYN
P.O. Box 261
McGrath, AK 99627

YOUNG, ROBERT V.
P.O. Box 211
Talkeetna, AK 99676

YOUNG, ROBIN A.
P.O. Box 101377
Anchorage, AK 99510

YUKON MINING CO., INC. (2)
P.J. & J.S. Ramstad
P.O. Box 101454
Anchorage, AK 99510

ZIMMER, GEORGE W. (2)
P.O. Box 8174
Anchorage, AK 99508

ZIMMERMAN, JOSEPH D.
General Delivery
Manley Hot Springs, AK 99756

APPENDIX E
Metals production in Alaska, 1880-1986.[a]

Year	Gold (oz)	Gold (md)	Silver (oz)	Silver (td)	Mercury (flask[b])	Mercury (td)	Antimony (lb)	Antimony (td)	Tin (lb)	Tin (td)	Lead (tons)	Lead (td)	Platinum (oz)	Platinum (td)	Copper (lb)	Copper (md)	Chromium (tons)	Chromium (td)
1880-1899	1,153,889	23.85	496,101	32.9	--	--	--	--	--	--	250	17.0	--	--	--	--	--	--
1900	395,030	8.17	73,300	45.5	--	--	--	--	--	--	40	3.4	--	--	--	--	--	--
1901	335,369	6.93	47,900	28.6	--	--	--	--	--	--	40	3.4	--	--	250,000	0.04	--	--
1902	400,709	8.28	92,000	48.5	--	--	--	--	30,000	8.0	30	2.5	--	--	360,000	0.04	--	--
1903	420,069	8.68	143,600	77.8	--	--	--	--	50,000	14.0	30	2.5	--	--	1,200,000	0.16	--	--
1904	443,115	9.16	198,700	114.9	--	--	--	--	28,000	8.0	30	2.5	--	--	2,043,586	0.28	--	--
1905	756,101	15.63	132,174	80.2	--	--	--	--	12,000	4.0	30	2.6	--	--	4,805,236	0.75	--	--
1906	1,066,030	22.04	203,500	136.4	--	--	--	--	68,000	38.6	30	3.4	--	--	5,871,811	1.13	--	--
1907	936,043	19.35	149,784	98.8	--	--	--	--	44,000	16.8	30	3.2	--	--	6,308,786	1.26	--	--
1908	933,290	19.29	135,672	71.9	--	--	--	--	50,000	15.2	40	3.4	--	--	4,585,362	0.61	--	--
1909	987,417	20.41	147,950	76.9	--	--	--	--	22,000	7.6	69	5.9	--	--	4,124,705	0.54	--	--
1910	780,131	16.13	157,850	85.2	--	--	--	--	20,000	8.3	75	6.6	--	--	4,241,689	0.54	--	--
1911	815,276	16.85	460,231	243.9	--	--	--	--	122,000	52.8	51	4.5	--	--	27,267,778	3.40	--	--
1912	829,436	17.14	515,186	316.8	--	--	--	--	260,000	119.6	45	4.1	--	--	29,230,491	4.82	--	--
1913	755,947	15.63	362,563	218.9	--	--	--	--	100,000[c]	44.1[c]	6	0.6	--	--	21,659,958	3.35	--	--
1914	762,596	15.76	394,805	218.3	--	--	--	--	208,000	66.6	28	1.3	--	--	21,450,628	2.85	--	--
1915	807,966	16.70	1,071,782	543.3	--	--	520,000	W	204,000	78.8	437	41.1	--	--	86,509,312	15.14	--	--
1916	834,068	17.24	1,379,171	907.4	--	--	1,200,000	W	278,000	121.0	820	113.2	8	0.7	119,654,839	29.50	--	--
1917	709,049	14.66	1,239,150	1,020.6	--	--	500,000	W	200,000	123.3	852	146.6	53	5.5	88,793,400	24.40	1,100	W
1918	458,641	9.48	847,789	847.8	--	--	540,000	W	136,000	118.0	564	80.1	284	36.6	69,224,951	17.10	1,100	W
1919	455,984	9.42	629,708	705.3	--	--	--	--	112,000	73.4	687	72.1	569	73.7	47,220,771	8.80	--	--
1920	404,683	8.37	953,546	1,039.7	--	--	--	--	32,000	16.1	875	140.0	1,478	160.1	70,435,363	13.00	--	--
1921	390,558	8.07	761,085	761.1	45	1.5	--	--	8,000	2.4	759	68.3	40	2.7	57,011,597	7.40	--	--
1922	359,057	7.42	729,945	729.9	--	--	--	--	2,800	0.9	377	41.5	29	2.8	77,967,819	10.50	--	--
1923	289,539	5.98	814,649	668.1	--	--	--	--	3,800	1.6	410	57.4	--	--	85,920,645	12.60	--	--
1924	304,072	6.29	669,641	448.6	2	0.3	--	--	14,000	7.1	631	100.9	28	2.6	74,074,207	9.70	--	--
1925	307,679	6.36	698,259	482.4	44	3.6	W	W	28,600	15.4	789	140.6	10	1.2	73,055,298	10.30	--	--
1926	324,450	6.70	605,190	377.0	22	1.7	W	W	16,000	10.4	778	124.4	3,570	274.5	67,778,000	9.49	--	--
1927	286,720	5.97	350,430	215.0	--	--	--	--	53,400	34.0	1,008	127.0	--	--	55,343,000	7.25	--	--
1928	331,140	6.85	351,730	187.0	--	--	--	--	82,000	41.0	1,019	118.0	120	9.0	41,421,000	5.96	--	--
1929	375,438	7.76	472,900	252.0	4	0.5	--	--	77,200	35.0	1,315	166.0	475	32.0	40,570,000	7.13	--	--
1930	408,983	8.47	408,570	157.3	--	--	--	--	29,400	9.3	1,365	136.5	--	--	32,651,000	4.24	--	--
1931	459,000	9.51	352,000	102.0	15	1.2	--	--	8,200	2.0	1,660	126.0	393	14.0	22,614,000	1.88	--	--
1932	493,860	10.20	234,050	66.0	8	0.5	--	--	--	--	1,260	75.6	--	--	8,738,500	0.55	--	--
1933	469,286	9.70	154,700	55.0	--	--	--	--	5,800	2.3	1,157	85.6	605	18.6	29,000	0.02	--	--
1934	457,343	16.01	154,700	100.0	--	--	--	--	8,200[c]	4.3	839	62.1	2,555	85.6	121,000	0.06	--	--
1935	455,429	15.94	286,600	206.0	--	--	--	--	98,800	49.8	815	65.2	8,685	259.6	15,056,000	1.25	--	--
1936	526,000	18.43	484,306	375.0	--	--	--	--	226,000	105.0	941	86.6	5,654	241.9	39,267,000	3.72	--	--
1937	582,085	20.37	494,340	382.0	--	--	962,000	147.6	372,000[c]	202.3[c]	823	97.1	9,823	313.4	36,007,000	4.74	--	--
1938	662,000	23.17	479,853	310.0	8	0.6	444,000	54.8	210,000	89.1	994	91.5	41,000	2,460.0	29,760,000	2.98	--	--
1939	665,114	23.28	201,054	136.5	--	--	210,000	25.9	66,000	38.0	937	88.1	33,900	2,034.0	278,500	0.04	--	--
1940	747,943	26.18	191,679	136.3	156[c]	130.9	306,000	42.8	92,000	52.0	840	72.0	28,886	1,093.0	110,000	0.02	--	--
1941	692,314	24.23	199,700	142.0	W	W	774,000	87.3	93,600[c]	61.0[c]	742	58.0	22,630	813.0	144,000	0.02	--	--
1942	487,657	17.07	135,200	96.0	W	W	316,000	41.0	5,600	2.5	523	44.0	22,000	779.0	48,000	0.01	--	--
1943	99,583	3.49	31,700	22.0	786	153.4	368,000	33.3	2,000[c]	1.0[c]	200	22.0	27,900	1,020.0	54,000	0.01	5,564	186.3
1944	49,296	1.73	15,240	10.8	841	165.0	70,080	30.0	--	--	44	5.8	33,616	2,017.0	4,000	0.01	1,845	64.6
1945	68,117	2.38	9,983	6.2	275	180.0	W	W	--	--	11	1.8	22,949	1,377.0	10,000	0.01	--	--
1946	226,781	7.93	41,793	26.3	699	68.7	W	W	--	--	115	25.0	22,882	1,418.7	4,000	0.01	--	--
1947	279,988	9.79	66,150	46.3	127	10.6	52,000	16.1	2,000	2.2	255	76.5	13,512	1,351.2	24,000	0.06	--	--
1948	248,395	8.69	67,341	58.7	108	7.8	88,000	29.3	10,000	10.8	317	88.9	13,741	1,209.2	28,000	0.07	--	--
1949	229,416	8.03	36,056	32.4	102	7.9	88,000	31.3	114,000	100.8	49	11.2	17,169	1,545.2	7,700	0.02	--	--
1950	289,285	10.13	52,638	48.0	W	W	W	W	158,000	170.3	144	27.5	W	W	12,000	0.03	--	--
1951	239,628	8.38	32,870	29.8	28	W	1,718,000	2,061.6	138,000	198.0	21	7.2	W	W	2,000	0.01	--	--
1952	240,571	8.42	31,825	28.7	40	W	740,000	1,406.0	180,000	243.9	1	0.3	W	W	--	--	W	W

[a]References are listed in DGGS Public-data File 86-19.
[b]76-lb flask.
[c]When state and federal figures differ significantly, state figures are used.
[d]Not traceable by year.
[e]Crude platinum; total production of refined metal is about 575,000 oz.
W = Withheld.
-- = Not reported.
td = Thousand dollars.
md = Million dollars.

Year	Gold (oz)	Gold (md)	Silver (oz)	Silver (td)	Mercury (flask[b])	Mercury (td)	Antimony (lb)	Antimony (td)	Tin (lb)	Tin (td)	Lead (tons)	Lead (td)	Platinum (oz)	Platinum (td)	Copper (lb)	Copper (md)	Chromium (tons)	Chromium (td)
1953	253,771	8.88	35,387	32.1	1,023	270.0	W	W	98,000	105.9	--	--	W	W	--	--	W	W
1954	248,511	8.70	33,694	31.8	1,046	276.0	--	--	398,000	409.9	--	--	W	W	8,000	0.02	2,953	208.0
1955	249,294	8.73	33,693	30.4	43	12.0	--	--	172,000	182.5	1	0.3	W	W	2,000	0.01	7,082	625.3
1956	204,300	7.33	26,700	24.1	3,414	837.0	134,400	150.0	--	--	1	0.3	W	W	--	--	7,200	711.5
1957	215,467	7.54	28,862	26.0	5,461	1,349.0	71,120	80.0	--	--	9	3.0	W	W	--	--	4,207	431.0
1958	186,000	6.53	24,000	22.0	3,380	774.0	--	--	--	--	--	--	W	W	10,000	0.03	--	--
1959	171,000	5.99	22,000	20.0	3,750	852.0	--	--	--	--	--	--	W	W	72,000	0.04	--	--
1960	180,000	6.30	23,000	21.0	4,450	938.0	W	W	--	--	--	--	W	W	82,000	0.04	--	--
1961	114,228	3.99	--	--	4,080	816.0	--	--	--	--	--	--	W	W	184,000	0.06	--	--
1962	165,142	5.78	--	--	3,843	711.0	--	--	--	--	--	--	W	W	--	--	--	--
1963	99,000	3.48	6,100	9.0	400	76.0	W	W	--	--	5	1.1	W	W	--	--	--	--
1964	58,000	2.05	7,200	6.0	303	95.0	46,400	60.3	--	--	--	--	W	W	22,000	0.01	--	--
1965	43,000	1.51	5,000	6.0	180	104.0	46,400	60.3	--	--	14	4.0	W	W	64,000	0.03	--	--
1966	27,325	0.96	7,000	9.0	185	101.0	16,000	19.2			19	4.3	W	W				
1967	22,948	0.80	6,000	9.0	161	79.0	20,000	22.0	--	--	--	--	W	W	W	W	--	--
1968	21,000	0.81	3,000	6.5	156	78.0	6,000	6.0	--	--	--	--	W	W	--	--	--	--
1969	21,227	0.88	2,000	4.2	238	100.0	94,000	100.0	--	--	2	0.5	W	W	--	--	--	--
1970	38,400	1.38	4,000	7.0	3,100	1,260.0	365,000	410.0	--	--	--	--	W	W	W	W	--	--
1971	34,000	1.36	2,000	4.0	675	285.0	68,000	74.0	34,000	47.0	--	--	W	W	--	--	--	--
1972	8,639[c]	0.56	1,000	2.0	125	44.0	160,000	185.0	W	W	--	--	W	W	--	--	--	--
1973	15,000[c]	1.86	13,200	22.0	70	52.5	420,000	515.0	10,000	12.0	6	2.0	W	W	--	--	--	--
1974	16,000[c]	2.56	1,500	3.5	70	52.5	80,000	95.0	W	W	--	--	W	W	--	--	--	--
1975	14,980[c]	3.35	6,000	25.0	--	--	120,000	145.0	22,000	60.0	--	--	W	W	--	--	--	--
1976	22,887[c]	6.90	6,500	24.0	--	--	160,000	165.0	W	W	14	6.0	W	W	--	--	8,000[c]	1,200.0[c]
1977	50,000[c]	7.80	8,000	20.0	--	--	W	W	W	W	--	--	--	--	--	--	--	--
1978	60,000[c]	12.00	6,000	50.0	--	--	W	W	W	W	--	--	--	--	--	--	--	--
1979	65,000[c]	18.00	6,500	93.0	--	--	100,000	125.0	100,000	830.0	--	--	--	--	--	--	--	--
1980	75,000[c]	32.00	7,500	111.0	--	--	--	--	120,000	984.0	31	29.0	--	--	--	--	--	--
1981	134,200[c]	55.20	13,420	111.3	W	W	--	--	106,000	700.0	--	--	900	200.0	--	--	--	--
1982	175,000[c]	69.90	22,000	198.0	--	--	--	--	198,000	1,365.0	--	--	W	W	--	--	--	--
1983	169,000[c]	67.60	33,200	332.0	--	--	22,400	45.0	215,000	1,100.0	--	--	W	W	--	--	--	--
1984	175,000[c]	62.13	20,000	159.0	5	1.5	135,000	225.8	225,000	400.0	--	--	W	W	--	--	--	--
1985	190,000	61.18	28,500	171.0	27	10.0	65,000	98.0	300,000	650.0	--	--	--	--	--	--	--	--
1986	160,000[c]	60.80	24,000	134.4	12	2.8	45,000	67.5	340,000	890.0	--	--	W	W	--	--	--	--
Other[d]	--	--	--	--	1,438	W	--	--	--	--	--	--	333,936	16,940.3	--	--	--	--
TOTAL	31,470,905	1,216.94	19,915,595	15,378.3	40,945	9,910.5	11,070,800	6,655.1	6,419,400	10,162.9	26,300	3,014.8	668,497[c]	65,792.1	1,373,793,932	228.04	39,051	3,426.7

Back cover: *Upper left: Bill Shaffer (GHD Resources) with pan of gold from the GHD Resources' Eagle Creek placer mine, Circle mining district, Alaska. Photograph by Earl Beistline, 1986.*

Upper right: Geologists from the U.S. Bureau of Mines use a portable drill to sample a prospect in southeast Alaska. Photograph by Jeff Foley, 1986.

Center left: Barge prepares to unload construction equipment at the port site for the Red Dog Mine, Chukchi Sea, northwest Alaska. Photograph by Lisa Parker, 1986.

Center right: Sluice box fed by a dragline is used to process gold-bearing gravels at the John Cook placer mine located near Fairbanks, Alaska. Photograph by Charles Green, 1986.

Bottom: The Bima, the world's largest offshore mining vessel, is used to evaluate offshore placer-gold gravels near Nome, Alaska. Photograph by Keith Beuerman, Inspiration Gold, Inc., 1986.