

ALASKA'S MINERAL INDUSTRY 1985



Office of Mineral Development
Division of Mining
Division of Geological & Geophysical Surveys
SPECIAL REPORT 39



Front cover: *Suneel Alaska, Inc., ship-loading facility at Seward, Alaska. Photograph courtesy of Ken Houston, Walker-Alaska Aerial Survey, Inc., 1985.*

ALASKA'S MINERAL INDUSTRY, 1985

By T.K. Bundtzen, G.R. Eakins, C.B. Green, and L.L. Lueck

DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS
SPECIAL REPORT 39



STATE OF ALASKA
Bill Sheffield, *Governor*

Fairbanks, Alaska
1986

STATE OF ALASKA

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FOREWORD

Special Report 39, 'Alaska's Mineral Industry - 1985,' is the fifth annual report produced by the Department of Commerce and Economic Development's Office of Mineral Development 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 companies and individuals who provide information on their projects and activities.

The value of the mineral industry to the Alaska economy in 1985 was \$269.9 million, a slight decrease from 1984. Increases in the production of sand and gravel and coal helped balance a significant drop in exploration expenditures, which declined from \$75 million in 1981 to less than \$10 million in 1985.

In 1985, Alaska's mineral industry entered the international market by exporting 616,000 tons of steam coal from the port of Seward to the Republic of Korea. This venture involved the Seward shiploading facilities operated by the Suneel Alaska Corporation, the inaugural use of coal unit-trains by the Alaska Railroad, and a 60-percent increase in production by the Usibelli Coal Mine.



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ALASKA'S MINERAL INDUSTRY, 1985

By T.K. Bundtzen,¹ G.R. Eakins,¹ C.B. Green,² and L.L. Lueck¹

EXECUTIVE SUMMARY

This report summarizes the exploration, development, and production activities of the mineral industry in Alaska, excluding oil and gas, in 1985. The gross values of the principal minerals produced were 28.2 million tons of sand and gravel valued at \$112.1 million, 190,000 oz of gold valued at \$61.2 million, and 1.4 million tons of coal valued at \$39.7 million. Sand and gravel, gold, and coal account for 94 percent of the gross value of 1985 production. Building stone, mercury, antimony, tin, silver, jade, soapstone, and peat account for the remaining 6 percent. Although gold production in 1985 increased about 9 percent, the value was similar to that in 1984 due to a drop in average price from \$360/oz in 1984 to \$325/oz in 1985. Coal production and value increased more than 60 percent, and sand-and-gravel value increased 18 percent. Total mineral production amounted to \$226.6 million, up 13 percent from 1984. At least 3,650 individuals were employed by the industry during the year.

Exploration expenditures in 1985 (\$9.2 million) dropped 59 percent from the 1984 level, which had dropped 35 percent from 1983 (fig. 1). Decreased exploration activity reflects low base-metal prices and budget cuts by several major mining companies. The ANACONDA MINERALS COMPANY (ANACONDA), Alaska's most active exploration group for nearly a decade, was dissolved on April 30, 1985, by the owner ATLANTIC RICHFIELD COMPANY.

In contrast to Alaska's reduced exploration expenditures are those of neighboring Yukon Territory and British Columbia, where reported 1985 exploration costs were \$26 and \$79 million, respectively (Morin, 1985; British Columbia Ministry of Energy, Mines and Petroleum Resources, 1986).

Development expenditures totaled \$34.1 million, a drop of about 36 percent from the record \$53.3 million spent in 1984. However, most of the decrease is explained by the \$21-million expenditure for construction of the Seward Coal Terminal in 1984. Overall, development expenditures have been relatively constant since 1982. Total combined expenditures for exploration, development, and production were \$269.9 million, a 2-percent decrease from 1984.

In northwest Alaska, progress continued on the Red Dog project owned by NANA REGIONAL CORPORATION

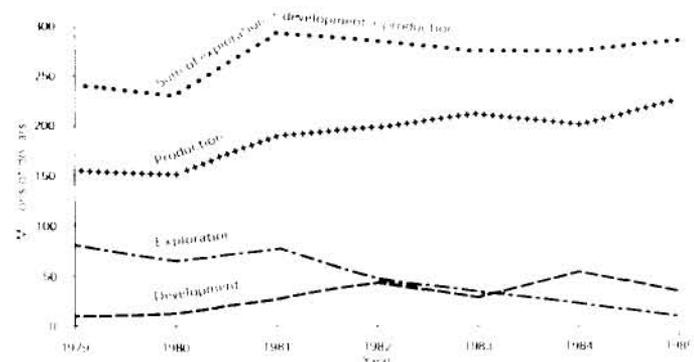


Figure 1. Value of mineral activity in Alaska, 1979-85.

(NANA) and operated by COMINCO ALASKA, INC. (COMINCO). The State legislature passed a bill that authorizes the Alaska Industrial Development Authority (AIDA) to finance up to \$175 million for construction of the road and port facilities. A November 1985 agreement between AIDA, COMINCO, and NANA specifies that the State-financed loan will be repaid at 6.5-percent interest. Construction of road and port facilities may begin in 1986 if all parties approve the language of the enabling contract. NANA petitioned the State Boundary Commission to remove land, including the Red Dog deposit, from the North Slope Borough for inclusion in the proposed NANA Borough. The North Slope Borough insisted on reimbursement for the loss; at the end of 1985, the issue remained unresolved.

In 1985, the Grant Gold Mine near Fairbanks was developed by owners SILVERADO MINES, LTD., TRICON MINING, INC., and AUREX, INC. (AUREX), a subsidiary of MARUBENI AMERICAN CORPORATION. Over \$5 million was spent on the project during the year, and a shop, a tailings pond, and a 230 ton/day (tpd) mill and other facilities were completed. Production began in October, and over 5,000 tons of ore were milled by the end of the year. However, operations were suspended December 31, 1985, when the major financial backer, AUREX, withdrew from the project. About 60 employees were laid off. An agreement was reached between AUREX and the remaining partners whereby AUREX will retain a royalty interest, and a new partner(s) can be brought in to continue mine operation.

NORANDA MINING, INC., operator of the GREENS CREEK JOINT VENTURE, completed another encouraging drilling program at the silver-gold-zinc deposit at Greens Creek, 18 mi west of Juneau. The company completed geotechnical

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studies, and 47,000 ft of subsurface and surface drilling was conducted to validate claims around the core discovery claims before the December 1985 exploration deadline mandated by the Alaska National Interest Lands Conservation Act of 1980. An agreement proposed in late 1985 between the joint venture, Native groups, and conservation interests involved a complex land exchange in which SEALASKA NATIVE CORPORATION would acquire rights to the peripheral claims. The joint venture was given a 1-yr extension by Congress to continue exploration on adjacent claims. Ironically, any new information gained during the extended exploration period may not be used to validate the claims.

In 1985, the USIBELLI COAL MINE (USIBELLI) exported 616,000 tons of steam coal to the Korean Electric Power Company. Total mine production exceeded 1.37 million tons, a record for the Alaska coal industry. Support facilities of the ALASKA RAILROAD were improved and upgraded, and more work at the SEWARD COAL TERMINAL is planned. The DIAMOND ALASKA COAL COMPANY (DIAMOND) continued with plans to market steam coal from the Beluga coal field west of Anchorage. Although no sales contracts were secured, up to 10 million ton/yr of coal could be mined for export. The Kenai Borough has authorized up to \$250 million in revenue bonding to provide financing for construction of port facilities. PLACER U.S., INC. (also operating as BELUGA COAL COMPANY in the Beluga coal field); ROCKY MOUNTAIN ENERGY (operating at Wishbone Hill north of Palmer); BERING DEVELOPMENT CORPORATION (operating in the Bering River coal field near Cordova); and DELTA COAL COMPANY (operating near Delta Junction, interior Alaska) are also seeking local and foreign markets for coal.

The sand-and-gravel industry had another good year despite a 20-percent reduction in aggregate use in the Anchorage metropolitan area. Gravel production on the North Slope increased nearly 70 percent due to construction of two gravel islands, the Endicott causeway, and infrastructure for developing North Slope oil fields. The total value of aggregate production in the state increased to \$112.4 million, 18 percent above that of 1984.

The placer-gold industry produced about 9 percent more gold in 1985 than in 1984, but the total value decreased due to lower average prices. DENALI MINES, INC., also referred to as the VALDEZ CREEK JOINT VENTURE (Eakins and others, 1985), produced nearly 31,000 oz of placer gold, which surpassed their 1984 output by 50 percent. This operation, located east of Cantwell, continues to be Alaska's largest gold producer.

Unresolved regulatory problems continued to plague the placer industry. In July, U.S. District Court Judge James von der Heydt ruled that the National Park Service failed to conduct adequate environmental studies of the effects of mining operations in national parks in Alaska and ordered that 30 mining companies cease operations by September 5, 1985. The deadline was extended to the end of the mining season in October. Most mines affected were placer operations in the Denali National Park and Preserve, the Wrangell-St. Elias National Park and Preserve, and the Yukon-Charley

Rivers National Preserve. Mining companies are submitting detailed operating plans for 1986 and hope that the National Park Service will be able to comply with the court order while allowing miners to continue their activities during 1986.

To help resolve water-quality problems, the State legislature awarded \$2.7 million to qualifying Alaska miners through the Placer Mining Demonstration Grant Project. The grants were awarded to placer-mine operators after their proposals and qualifications were reviewed. The project, which had its first field demonstrations in 1985, funds industry innovations in placer-mining technology that focus on fine-gold recovery, water-use reduction, water-pollution control, and waste disposal.

'The role of placer mining in the Alaska economy - 1985' (Peterson and others, 1986) summarizes the results of an economic survey of the industry. The report, which was published by the Department of Commerce and Economic Development's Office of Mineral Development (OMD), estimates gross expenditures, income, and employment levels for the placer-mining industry in Alaska. Secondary effects on the statewide economy are also discussed.

Federal and state agencies conducted mineral-resource studies in Alaska under several cooperative programs. A 4-yr, \$300,000 contract initiated in 1984 calls for geologic and mineral studies in the Skagway subdistrict of the Juneau mining district in southeastern Alaska. This cooperative program between the Alaska Department of Natural Resources' Division of Geological and Geophysical Surveys (DGGS) and the U.S. Bureau of Mines (USBM) is funded by a special appropriation through the office of U.S. Senator Ted Stevens. DGGS will concentrate on geologic mapping, and the USBM will examine mineral prospects and mines. Preliminary reports on geologic and geochemical investigations in the Porcupine mining district near Haines were released by DGGS and the USBM (Redman and others, 1985; Still and others, 1985).

The USBM also released a series of inventory reports on Alaska's strategic-mineral resources, including chromium (Dahlin and others, 1985; Foley and Barker, 1985; Foley and others, 1985), tin, tantalum, and columbium (Warner, 1985). The reports contain important reserve-base information and discuss metallurgical characteristics and regional distributions of strategic minerals in Alaska.

The U.S. Geological Survey (USGS) and DGGS continued a cooperative geologic and mineral-resource investigation in the Iditarod Quadrangle of western Alaska, which includes the historic Innoko and Iditarod mining districts. DGGS is concentrating on detailed 1:63,360-scale geologic mapping and topical mineral studies; the USGS is conducting regional 1:250,000-scale mapping that emphasizes geology and geochemistry. A summary of the area's placer resources (Bundtzen and others, 1985) was recently produced as part of this cooperative effort.

To help stimulate trade with the Pacific Rim nations, 12 representatives from Japan's largest mineral and energy companies were invited by the state to tour several coal and mineral-development projects in Alaska. The Office of Mineral

Development (OMD) coordinated visits with Native corporations, mining companies, and government agencies during the 9-day tour in late November.

The 'Alaska Resources Kit: Minerals,' an educational program designed for the state's public-school system, was distributed to schools in 1985. Development of the program was a joint effort of the Alaska Department of Education, which supervised preparation of the curriculum, and private industry, which provided financial support through the Alaska Mineral and Energy Resources Educational Fund (AMEREF).

This report includes five 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 and 1985. Appendix B lists the functions, names of key personnel, and mailing addresses of state, federal, and private agencies involved in mineral-development activities in 1985. Appendix C lists selected significant mineral deposits in Alaska. Appendix D lists mining licenses issued by the Alaska Department of Revenue, 1985. Appendix E lists production estimates for nine metal commodities for Alaska from 1880 through 1985, and appendix F lists production estimates for industrial minerals and coal for the same period. Both reflect the diversity of the Alaska mineral industry.

ACKNOWLEDGMENTS

This report was 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's Office of Mineral Development (OMD). The success of this fifth annual report on Alaska's mineral industry continues to be dependent on information provided voluntarily by the private sector. We thank Alaska's miners, industry explorationists, consultants, sand-and-gravel companies, Native corporations, and federal agencies for their cooperation. Petroleum companies, including ARCO, SHELL, SOHIO, and CONOCO and their major contractor (AIC-Martin), supplied specific information on the use of sand and gravel on the North Slope.

L.L. Lueck and G.R. Eakins (DGGS) mailed over 900 questionnaires on mineral activity in Alaska. A.G. Sturmman, C.H. Stevenson, and M.E. Brown (DOM) compiled claim statistics shown in appendix A and figures 3 and 4. T.K. Bundtzen wrote the executive summary and the development and production sections and compiled the statistics used in those sections. Eakins wrote the exploration section. J.L. Gallagher and R.J. Peterson (DOM) provided data on offshore placer developments. Lueck compiled appendixes B and D, and Bundtzen, M.S. Robinson (DGGS), and Lueck compiled and modified the list of significant mineral deposits (app. C). Bundtzen compiled the historical minerals data shown in appendixes E and F, and R.D. Merritt (DGGS) described the Seward Coal Terminal. C.B. Green (OMD) designed the initial report format and wrote the drilling section. A.C. Schell (DGGS) prepared the illustrations and Jim Deagen (OMD) oversaw cover design and printing of the report. Bundtzen, C.L. Daniels (DGGS), Deagen, Eakins, Gallagher, F.J. Rue (DLWM), Green, Lueck, V.L. Reger (DGGS), and J.F.M. Sims reviewed and edited the report.

EXPLORATION ACTIVITY DURING 1985

INTRODUCTION

Mineral-exploration activity in Alaska declined sharply in 1985. Total reported expenditures for mineral exploration in 1985 were \$9,150,000, compared to \$22,283,650 in 1984, a decline of 59 percent. Mineral-exploration expenditures are listed by commodity and region in tables 1 and 2 and shown graphically in figures 1 and 2. The large drop in exploration can be attributed primarily to the dissolution of the ANACONDA MINERALS COMPANY (ANACONDA) in April 1985. Their withdrawal substantially impacted exploration expenditures because the company had, for nearly a decade, conducted the largest exploration program in Alaska. HECLA MINING COMPANY, PHILLIPS MINERALS DIVISION, TETON EXPLORATION, and ST. JOE AMERICAN CORPORATION also closed their Alaska operations during the last several years. In late 1985, KENNECOTT CORPORATION announced closure of its Anchorage office; its Alaska operations will be managed from KENNECOTT offices in Salt Lake City. The decline in exploration activity in 1985 is also indicated by the lower number of new claims staked; 6,700 compared to 8,400 in 1984 (fig. 3). Figure 4 shows the number of claims on which affidavits of annual assessment work were filed. Further details on claim staking and annual labor are listed by quadrangle in appendix A.

The lack of drilling on several coal projects now on hold or in the development stage also contributed to the sharp drop in reported exploration expenditures during 1985. Another contributing factor is the progression of several major projects

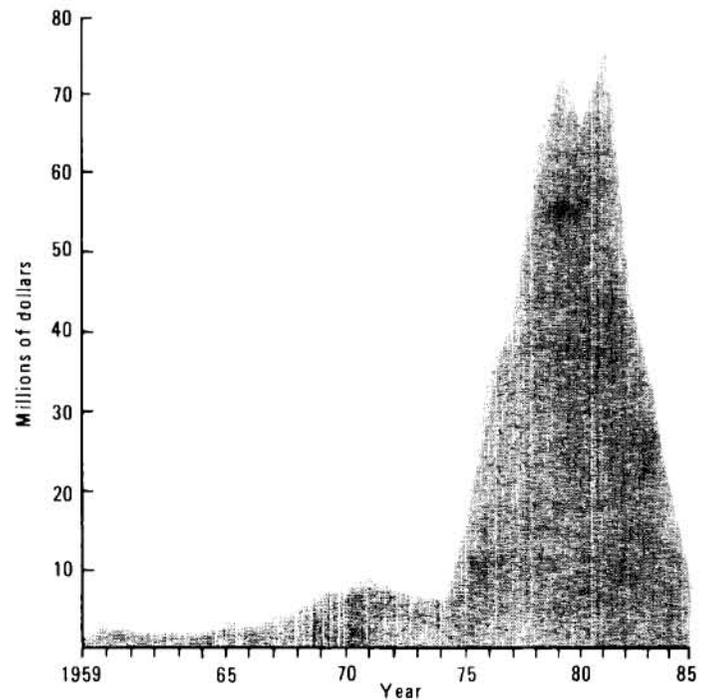


Figure 2. Mineral-exploration expenditures in Alaska, 1959-85.

Table 1. *Reported exploration expenditures in Alaska by commodity groupings, 1981-85.*

	1981	1982	1983	1984	1985
Metals	\$63,535,400	\$42,702,000	\$30,656,315	\$19,669,150	\$8,880,000
Industrial materials	10,300,000	---	2,068,300	270,000	---
Coal	2,341,000	2,900,000	1,338,454	2,065,000	270,000
Other ^a	127,000	15,300	10,000	279,500	---
Unspecified	---	---	60,000	---	---
TOTAL	\$76,303,400	\$45,617,300	\$34,133,069	\$22,283,650	\$9,150,000

^aIncludes jade, soapstone, and uranium.

from the exploratory phase to the development phase. However, some new companies, including ECHO BAY MINES, LTD., LONG LAC MINERALS, and EXVENCO, recently initiated precious-metal exploration programs in the southeastern region (fig. 5).

In recent years, activity has increasingly focused on precious metals while exploration for base metals has declined. Statistics compiled by the Metals Economic Group (1986) indicate that almost 90 percent of the currently active exploration projects in the United States involve precious-metal prospects, mostly gold. The greatest amount of activity occurred in Nevada with 178 exploration and development projects. Arizona is second with 101, followed by California (98), Colorado (75), Idaho (72), and Alaska (66). Selected mineral-exploration projects in Alaska are shown in figure 6.

NORTHERN REGION

Reported exploration expenditures for the northern region totaled \$1,860,000 in 1985, compared to \$2,557,500 in 1984. Major copper, lead, and zinc discoveries were made during the last 15 yr in the 100-mi-long Ambler sequence along the south flank of the Brooks Range and in the De Long Mountains. The most famous discovery, the Red Dog deposit, is located 80 mi north of Kotzebue. The deposit, which is in

the development stage, is owned by NANA and operated by COMINCO. Interest in the nearby Noatak River drainage also continued, but exploration activity was primarily confined to assessment work on claims held by several major companies.

METALS

NORANDA EXPLORATION, INC. (NORANDA), and GENERAL CRUDE OIL MINERALS COMPANY (GCO) signed a \$25-million, 20-yr agreement to jointly explore the Lik deposit located 12 mi west of the Red Dog deposit (loc. 15, fig. 6). Earlier announced reserves at Lik are 24 million tons that grade 9 percent zinc, 3.1 percent lead, and 2.3 oz/ton silver. During 1985, NORANDA drilled 17,000 ft at the deposit, but new reserve figures have not been released. The Lik project will probably use the proposed 57-mi-long haul road and port facility that will be constructed for the Red Dog property. HOUSTON OIL AND MINERALS, a former partner with GCO at Lik, is no longer active in the area but retains an interest in the property. GCO holds other large claim blocks in the region.

In addition to developing the Red Dog deposit, COMINCO maintained a strong exploration program in other parts of northern Alaska. With a crew of 10, they conducted 3,569 ft

Table 2. *Reported exploration expenditures in Alaska by region and commodity, 1985.*

Commodity	Region						
	Northern	Western	Eastern interior	South-western	South-central	South-eastern	Alaska Peninsula
Metals	\$1,860,000	\$500,000	\$1,699,000	\$115,000	\$1,211,000	\$2,534,000	\$961,000
Industrial materials	---	---	---	---	---	---	---
Coal	---	150,000	50,000	---	70,000	---	---
TOTAL	\$1,860,000	\$650,000	\$1,749,000	\$115,000	\$1,281,000	\$2,534,000	\$961,000

of diamond core drilling and geological, geochemical, and geophysical surveys in the Wulik Basin during 1985 (loc. 4a, fig. 6). Assessment work was performed on 2,283 claims. COMINCO also drilled 3,300 ft of diamond core in the Ambler mining district where a crew of eight spent 30 days testing copper, zinc, lead, and silver prospects and performing assessments on 1,100 claims (loc. 4b, fig. 6).

KENNECOTT CORPORATION (KENNECOTT) has a long history of exploration in northern Alaska, largely through its former subsidiary, the BEAR CREEK MINING COMPANY. KENNECOTT'S holdings include the high-grade Ruby Creek copper deposit near Bornite in the Cosmos Hills and the Arctic copper-zinc deposit in the Brooks Range. KENNECOTT, GCO, HOUSTON OIL AND MINERALS, and WGM retain varying interests in the Sunshine Creek, Horse Creek, 4-B Puzzle, Picnic Creek, DH, and Nora deposits, all located in the Ambler sequence. KENNECOTT reported diamond core drilling six holes (total 1,132 ft) in the region during 1985 (loc. 12a, fig. 6).

PARADISE VALLEY MINING (Bettles), operated by the Mick Manns family, explored for precious metals, lead, and zinc on several creeks in the southcentral Wiseman Quadrangle. They tested lode and placer ground, staked 14 new claims, and performed assessment work on 86 other claims.

ALMINCO, INC., (Anchorage) explored for precious metals in the Wiseman area. They mapped, sampled, and performed assessment work on 36 claims. GREEN MINING AND EXPLORATION (Fairbanks) churn drilled and sunk shafts on Smalley Creek in the Bettles area.

SUNSHINE MINING COMPANY (SUNSHINE; Kellogg, Idaho) reported that they discontinued their Brooks Range activities and dropped 801 claims, including the Cliff, Bud, Kogo, Pipe, Cynbad, and Tom-Tom prospects in the Ambler mining district. Apparently this does not apply to SUNSHINE'S interest in the AMBLER MINING COMPANY, which is a SUNSHINE - ANACONDA MINERALS COMPANY partnership.

Lode- and placer-gold deposits in the Chandalar mining district that are owned by the LITTLE SQUAW GOLD MINING COMPANY (Spokane) were explored (with intermittent production) during recent years by various operators. Owner Eskil Anderson reported that legal problems recently halted activity on the properties.

COAL

The extensive bituminous and subbituminous coal resources that underlie Alaska's North Slope may be greater than those of any single province in the world. During the late 1800s and early 1900s, a few scattered, small mines produced coal for whaling ships plying the Arctic Ocean and for several small villages. Because of the region's remoteness and sparse population, coal development has been minimal. However, renewed interest in alternative energy sources to replace expensive, imported fuel oil led to a state-funded program to evaluate coal resources in the Cape Beaufort area. The program is administered by the Department of Community and Regional Affairs. Drilling during 1984 proved a total of 38

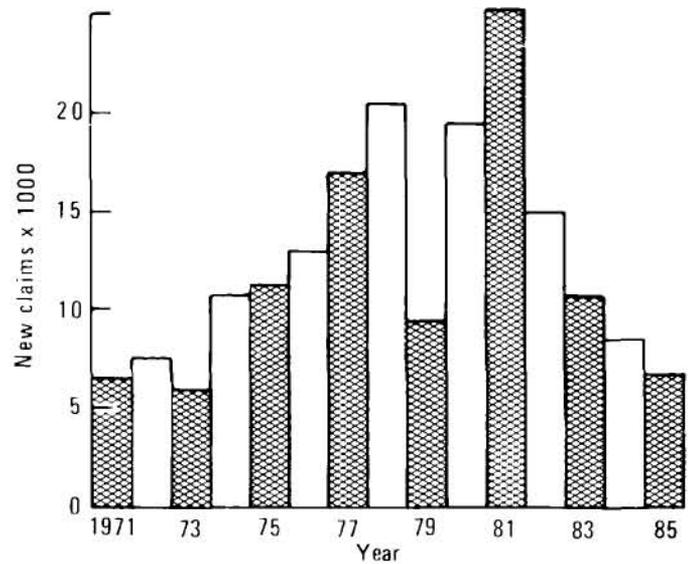


Figure 3. New claims filed in Alaska, 1971-85.

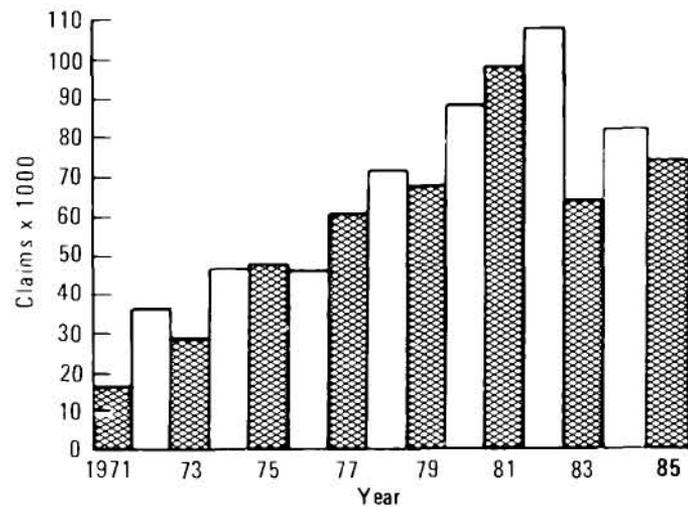


Figure 4. Assessment work filed in Alaska, 1971-85.

million tons of measured reserves and 85 million tons of inferred reserves in the Cape Beaufort and Deadfall syncline areas. The ARCTIC SLOPE REGIONAL CORPORATION reported that during 1985, the project advanced to a pre-development stage. Several consulting firms conducted additional drilling, geophysical surveys, and environmental and feasibility studies that concentrated primarily on the Deadfall syncline. Coal seams in the area are low in sulphur, near the surface, fairly flat-lying, and up to 16 ft thick.

WESTERN REGION

The western region includes several historic placer-gold districts and the mineral-rich Seward Peninsula. Exploration expenditures in the region declined dramatically in 1985

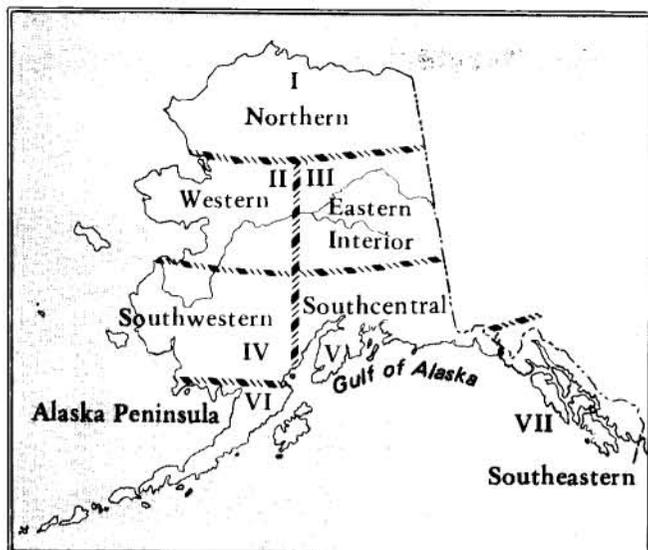


Figure 5. Regions of mineral activity in Alaska, 1985.

with the dissolution of ANACONDA and termination of their Illinois Creek project. No activity was reported on the Kougarak tin deposit, which was intensely tested by ANACONDA during 1983. Reported exploration expenditures for the western region during 1985 were \$650,000, compared to \$4,938,000 for 1984.

METALS

CORNWALL PACIFIC ALASKA, INC., in a joint venture with NIGHT HAWK RESOURCES, LTD., drilled 6,500 ft of diamond core and trenched 2,000 ft at the historic Big Hurrah lode-gold mine during a 14-wk period (loc. 5, fig. 6). The HAWLEY RESOURCE GROUP, INC., is the consultant for the project. Last October, INSPIRATION MINES, INC., operated their 380-ft offshore gold dredge approximately 11 mi west of Nome (loc. 11, fig. 6). Although this project has progressed to the production stage, the operators indicated that some exploratory bulk sampling and metallurgical testing was done during the year. In late 1985, the Alaska Department of Natural Resources (DNR) released preliminary best-interest findings on the issuance of two offshore-mining leases, one to NOMECO at Nome, the other to AURIC at nearby Bluff.

GREATLAND EXPLORATION, LTD. (GREATLAND), remained active on the Seward Peninsula, where they drilled 6,000 ft on several placers in the Anvil River area near Nome (loc. 9, fig. 6), trenched at Granite Mountain, and assessed tin deposits at Lost River and in the Kougarak area. The offshore gold project in Norton Sound conducted by COASTAL EXPLORATION and GREATLAND during 1984 was suspended during 1985 because COASTAL EXPLORATION withdrew from the program. GREATLAND retains the offshore prospecting-permit applications.

Four people from SOLOMON MINES, INC., (Nome) evaluated placer-gold prospects on the Solomon River for 1 mo (loc. 19, fig. 6). They conducted drilling and magnetometer surveys and dug test pits on 52 leased claims. A block of

ground suitable for large-scale dredging operations was reported, and tailings are being evaluated for fine-gold recovery.

The 100-day exploration program of BATTLE MOUNTAIN GOLD COMPANY, formerly DUVAL CORPORATION, consisted of drilling, mapping, and conducting geophysical surveys on the Nixon Fork gold deposit and several silver-tin prospects northwest of McGrath (loc. 3, fig. 6). About 5,000 ft of drilling was completed. The Nixon Fork deposit produced about 57,000 oz of gold and byproduct copper and silver from 1921 to 1941. Most members of the 16-person crew were residents of McGrath and other nearby villages.

The AU MINING COMPANY spent 6 mo on Candle Creek (Seward Peninsula) testing placer ground owned by long-time miners Rhinehart Berg and Thor Wetlesen. The company used an air drill to drill 44 holes.

STEVENS EXPLORATION MANAGEMENT CORPORATION (Anchorage) performed annual assessment work on LOST RIVER ALASKA CORPORATION'S tin property. Two people with MACKLIN PLACER MINES and ANVIL MINING COMPANY (Nome) made prospect cuts and collected samples on Anvil, Macklin, and Ruby Creeks. The COOK INLET REGION, INC., maintained their interest in the Kougarak prospect and Tonzona coal field near Farewell.

COAL

The state-supported assessment of the Chicago Creek coal resource continued during 1985. The purpose of the assessment is to determine if it is practical to develop coal for heat and power in the villages in northwest Alaska, and possibly as a power source for future mines in the De Long Mountains. Under contract to DGGs, the HAWLEY RESOURCE GROUP, INC., (Anchorage) completed 7,709 ft of rotary drilling and 224 ft of core drilling at the site in 1985 (loc. 20, fig. 6). Demonstrated reserves at Chicago Creek are 4.5 million tons of lignite that average about 7,000 Btu/lb. A team of specialists is preparing a feasibility study on the possible uses of the Chicago Creek coal.

EASTERN INTERIOR REGION

The eastern interior region contains more placer mines than any other region in the state. In addition to the placer- and lode-gold deposits in the Yukon-Tanana Upland, tin, tungsten, and antimony have been mined. Exploration in the Alaska Range during the last 10 to 15 yr has resulted in the discovery of major stratiform base-metal deposits. Many small-scale miners and prospectors in the region reported spending from a few hundred to several thousand dollars, mostly for drilling or making cuts to test placer ground. As in other regions, large-scale exploration programs were reduced or terminated. Total expenditures for exploration in the eastern interior region during 1985 were \$1,749,000, compared to \$3,207,100 in 1984.

METALS

NERCO MINERALS COMPANY (NERCO) and its subsidiary, RESOURCE ASSOCIATES OF ALASKA (RAA), hold several promising mineral deposits in Alaska. Their

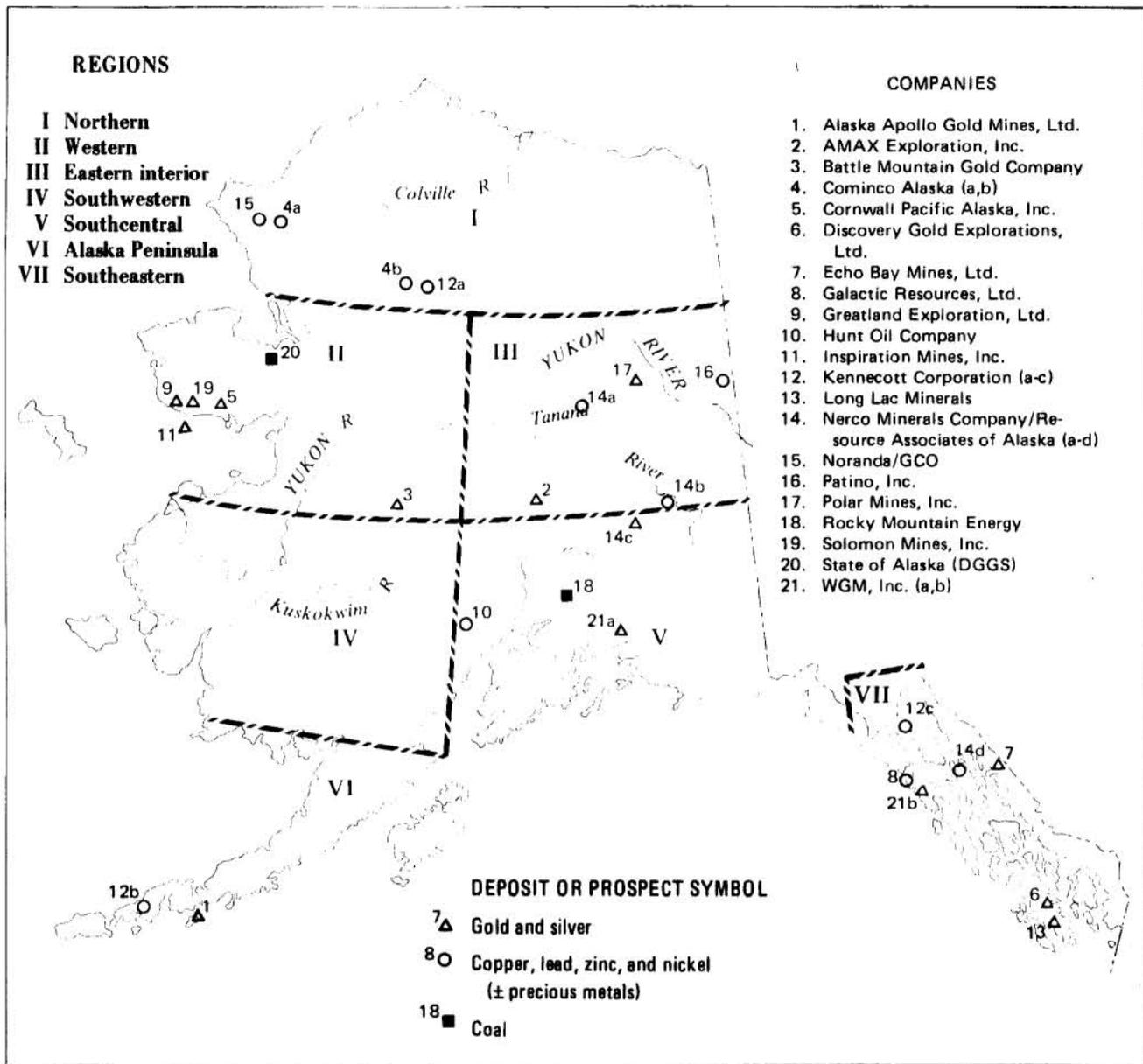


Figure 6. Selected mineral-exploration projects in Alaska, 1985.

largest holdings are in the Delta mineral belt in the Tok mining district, eastern Alaska Range (loc. 14b, fig. 6). The company reported that at least 30 deposits in the district collectively contain over 40 million tons of lead, zinc, copper, silver, and gold ore. NERCO/RAA claims in the area exceed 225,000 acres. During 1985, an eight-person crew from NERCO/RAA spent 2 mo mapping, trenching, and performing geochemical and geophysical surveys on the claims (fig. 7). NERCO also continued its precious- and base-metals program in the Pedro Dome - Gilmore Dome area about 15 mi north of Fairbanks (loc. 14a, fig. 6), where a 10-person crew conducted geochemical and geophysical surveys, geologic mapping, drilling, and trenching. Although NERCO operates large silver and gold

mines in Nevada, Idaho, and Colorado, it maintains its headquarters in Fairbanks. Ninety percent of the firm's stock is owned by PACIFIC CORPORATION, a utility company with headquarters in Portland, Oregon.

AMAX EXPLORATION, INC., (Golden, Colorado) explored for precious metals by mapping and sampling during 90 days at Moose Creek in the Bonfield mining district south of Fairbanks (loc. 2, fig. 6). They also conducted reconnaissance and exploration in other regions. According to a company spokesman, they will probably work in Nevada rather than Alaska in 1986.

DOYON, LTD. (DOYON), the regional Native corporation based in Fairbanks, has an ongoing program to assess the



Figure 7. Nercio geologists map the geology of the Delta mineral belt, Tok mining district, Alaska. Photograph by Bruce Forster, courtesy of Nercio Minerals, Inc., 1985.

region's metallic resources. The mineral assessments will help the corporation make final land selections that total 12 million acres under the Alaska Native Claims Settlement Act.

PATINO, INC., the United States subsidiary of NORTH-GATE EXPLORATION, LTD., (Toronto, Ontario) diamond drilled two 100-ft-deep holes at Step Mountain north of Eagle to test promising silver-lead-zinc deposits (loc. 16, fig. 6).

Operators of the BROKEN SHOVEL MINE sent four people to the Eagle Quadrangle for 3 mo to test placer ground on Bullion Creek for gold, silver, and platinum. They staked 17 claims and assessed 13 old claims. The ARCTIC KNIGHT MINING COMPANY (Fairbanks) reported a 90-day program of sampling, mapping, and digging test pits on St. George Creek in the Bonfield mining district to evaluate placer-gold deposits. GREATLAND did some additional surveying on their Little Eldorado Creek claims north of Fairbanks near Olmes and examined the feasibility of developing a drift mine to exploit the deep gold-bearing gravels.

ST. JOE AMERICAN CORPORATION (Seattle office) reported that they have suspended exploration activities in Alaska until the mining economy improves. Their lease on the Ryan Lode on Ester Dome near Fairbanks was released to CITIGOLD (Vancouver, British Columbia), which is conducting a 10,000-ton heap leach test. GOLD DUST MINES (Fairbanks) contracted ON-LINE EXPLORATION SERVICES to conduct geochemical and geophysical surveys and dig trenches on placer claims in the Circle mining district.

NORTHERN LIGHTS EXPLORATION COMPANY (Anchorage) performed assessment work on 814 claims south of the Bonfield mining district in the Healy A-6 Quadrangle. The claims are being evaluated for precious metals. EXPLORATION GEO CONSULTANTS (Fairbanks) conducted various geophysical surveys, located drill-hole sites, and mapped geology on Spruce Creek in the Pedro Dome area to evaluate gold, silver, bismuth, and antimony occurrences.

During 1985, GHD RESOURCES drilled and dug test pits on Eagle Creek in the Circle mining district. A large crew from

POLAR MINES, INC., (Fairbanks) spent 5 mo trenching and drilling to test gravels on Crooked, Mastodon, and Portage Creeks in the Circle mining district (loc. 17, fig. 6). Three people with PLANETARY DATA (Fairbanks) prospected for precious metals east of St. George Creek in the Nenana mining district. A helicopter-supported crew mapped and dug test holes for HERNING EXPLORATION AND MINING (Fairbanks) on Wolverine, Ottetail, and Palmer Creeks (tributaries to the East Fork Chena River) looking for gold and silver.

INDUSTRIAL MINERALS

DOYON owns large asbestos deposits about 40 mi west of Eagle. Reported reserves are over 55 million tons that contain 6.3 percent fiber. The corporation continues to research safe mining and processing methods that would allow extraction and marketing of their high-quality asbestos reserves.

COAL

A reconnaissance study of the Nulato coal deposits (located downstream from Galena on the Yukon River) was conducted by geologists with DOYON, DGGs, USBM, and the University of Alaska MINERAL INDUSTRY RESEARCH LABORATORY. DGGs and USBM also examined a recently discovered coal occurrence on Preacher Creek in the White Mountains. DGGs geologists sampled and measured coal beds near Tramway Bar on the Middle Fork Koyukuk River. These deposits are located only a few miles from the North Slope haul road and not far from Bettles and Wiseman.

DIAMONDS

The recovery of two diamonds from widely separated placer-mining operations on Crooked Creek in the Circle mining district in 1982 and 1984 created considerable interest in the alluvial-diamond potential of the Crooked Creek gravels and in the location of the primary diamond sources.

No diamonds have been found by placer-mining operators on Crooked Creek since 1984. However, because the high-volume sluice plants currently used on Crooked Creek are designed for gold recovery, diamonds (specific gravity = 3.5) would generally not be retained in the riffles.

In 1985, R.B. Forbes (contracted by DGGs), J.T. Kline (DGGs), and Al Clough (USBM) conducted a reconnaissance study of the Crooked Creek gravels and investigated possible sources of primary diamonds in the surrounding region. Concentrates from sluice clean-ups, reprocessed tailings, pilot jig runs, and pan samples were examined for possible kimberlite indicator minerals (pyrope garnet, chrome diopside, and magnesium ilmenite) and diamonds (fig. 8). The lithology and depositional history of the Crooked Creek gravels are being analyzed to identify bedrock sources of the gravels and help define the depositional history of the diamonds.

SOUTHWESTERN REGION

The southwestern region includes the Kuskokwim and lower Yukon River basins, a large mercury province, and the

Iditarod, Nyac, Innoko, and Goodnews Bay placer-mining districts. Several major mineral companies that showed considerable interest in the region in 1983 and 1984 were absent during 1985. Although some claim holders performed assessment work, exploration in the region declined substantially. Total estimated exploration expenditures were \$115,000, compared to \$1,021,000 for 1984.

METALS

AMAX EXPLORATION, INC., (Golden, Colorado) mapped and sampled in the Aniak mining area. CLARENCE FRY of Homer worked on Fortyseven Creek in the Sleetmute Quadrangle for over 3 mo, mapping and hand-digging test pits on lode and placer prospects. HOWARD BOWMAN (Port Alsworth) conducted a magnetometer survey on the Bowman claims on Portage Creek near Lake Clark.

SOUTHCENTRAL REGION

The southcentral region covers portions of the Alaska Range and the Talkeetna, Wrangell, and Chugach Mountains. Nelchina, Willow Creek, and Kennecott are historic mining districts in the region. Mining activity is still widespread, but exploration expenditures were only \$1,281,000 in 1985, compared to \$6,490,350 in 1984. Most of the decline in exploration expenditures is attributed to the lack of drilling programs in the Beluga, Yentna, and Bering River coal fields and to the withdrawal of ANACONDA from the Johnson River project. The principal activities are described in the following summary; numerous small-scale operators who prospected and conducted assessment work are not included.

METALS

WGM, INC. (WGM), conducted exploration programs at two sites in southcentral Alaska. Work included underground and surface sampling, mapping, and road construction on the Cliff mine project and adjacent lode claims on the north shore of Valdez Arm near Shoup Bay (loc. 21a, fig. 6). WGM also conducted additional exploration for the DENALI MINING COMPANY, a five-member joint venture at Valdez Creek east of Cantwell on the south flank of the central Alaska Range. Also active on Valdez Creek was RUSS MILLER (Wasilla), assisted by consulting geologist JIM HALLORAN. Five people were employed for 26 days to dig test pits and collect bulk samples. ASPEN EXPLORATION CORPORATION performed assessment work on 50 claims in the AGR group on Valdez Creek.

NERCO/RAA, with TETON EXPLORATION (TETON), conducted a geochemistry, geophysics, mapping, and trenching program at the Zackly project in the eastcentral Alaska Range near the headwaters of the Maclaren River (loc. 14c, fig. 6). The favorably situated skarn deposit contains high-grade copper-gold ore. Current reserve estimates are 1.25 million tons that average 0.17 oz/ton gold, 1.0 oz/ton silver, and 2.6



Figure 8. Al Clough (U.S. Bureau of Mines) examines concentrates for diamonds during the joint DGGs/USBM study of Crooked Creek gravels, Circle mining district, Alaska. Photograph by R.B. Forbes, 1985.

percent copper. TETON dropped its interest, which leaves NERCO/RAA as the sole participant in the venture. Three employees of BLACK SANDS MINING COMPANY (Wasilla) worked underground for about 3 mo driving a crosscut in the Arch gold-silver lode in the Anchorage A-6 Quadrangle.

COOK INLET REGION, INC., (Anchorage) a regional Native corporation in southcentral Alaska, reported assessment work on 3,500 claims that consisted of mapping and geophysical and geochemical studies as part of their 1985 statewide minerals program. They employed four people for 60 days to evaluate coal, base- and precious-metals, and sand-and-gravel resources.

In 1985, no exploration was conducted on the Johnson River prospect located 10 mi southwest of Tuxedni Bay on the west side of Cook Inlet. This area was explored by ANACONDA in 1983-84 when the presence of a significant gold-silver base-metal deposit at Johnson River was discovered. About 50 people were employed during 1984 to conduct 20,000 ft of drilling and geophysical and geochemical surveys. ANACONDA also discovered gold-silver-lead deposits at Difficult Creek 6 mi from the Johnson River deposit. As a result of ATLANTIC RICHFIELD COMPANY'S 1985 decision to dissolve ANACONDA, COOK INLET REGION, INC., owner of the properties, is reportedly negotiating with other firms to continue exploration.

The HAWLEY RESOURCE GROUP, INC., and NEW STRATEGIC MINERALS, LTD., drilled 3,000 ft at the historic Golden Zone Mine near Cantwell. Announced reserves are 5 million tons of proven, probable, and possible high-grade

gold-silver-copper ore that could be mined by open-pit methods. HUNT OIL COMPANY (Denver) drilled for base and precious metals in the southern Alaska Range and performed annual labor on 320 claims (loc. 10, fig. 6). FINNBEAR MINING COMPANY, INC., (Anchor Point) engaged three people in a drilling, mapping, and geochemical program at their precious-metal properties in the central Alaska Range.

A six-person crew employed by SONSHINE MINING AND EXPLORATION (Palmer) made bench cuts and tested for gold, tungsten, and platinum at the Sonshine claim group on Metal Creek, Chugach Mountains. GOLD CORD DEVELOPMENT CORPORATION (Anchorage) drilled at the Gold Cord mine in the Willow Creek mining district and dug trenches on the Sheared claim.

ASPEN EXPLORATION CORPORATION (ASPEN; Denver) applied for an offshore prospecting permit to evaluate possible economic concentrations of gold in Cook Inlet. After the application was denied by the State, ASPEN filed a lawsuit seeking a reversal of the decision. The firm's president, R.V. Bailey, said that the company spent about \$1 million over a 5-yr period sampling and surveying offshore material for gold. Fishermen and some local residents oppose the project. ASPEN hired DAMES AND MOORE to study benthic (bottom-dwelling) invertebrates in Cook Inlet, with special emphasis on the area between Anchor Point and Ninilchik. WAYNE BOLT and others continued their work on the Rambler and Nabesna gold deposits in the Wrangell Mountains. Promising gold values were encountered during diamond drilling.

GEMSTONES

Two respondents to the DGGS survey stated that they were specifically exploring for gemstones. EARLE FOSTER reported mapping, drilling, and conducting geophysical surveys in southcentral Alaska in his search for lode and placer gemstones, but offered no other information. A.L. RENSHAW (Anchorage) mapped and made dozer cuts while prospecting for gemstones in the Nelchina mining district.

COAL

ROCKY MOUNTAIN ENERGY and the HAWLEY RESOURCE GROUP, INC., continued exploratory and development work on coal resources at their Wishbone Hill coal project near Palmer (loc. 18, fig. 6). This is the third year for the joint venture, which is also studying the feasibility of constructing a mine-mouth power plant. PLACER U.S., INC., (PLACER; operating as BELUGA COAL COMPANY) contracted DOWL ENGINEERS to conduct reclamation work at their bulk-sampling site in the Lone Ridge area, where announced reserves are 100 million tons of subbituminous coal with moderate moisture and ash contents. DIAMOND, operating partner for DIAMOND SHAMROCK - CHUITNA COAL JOINT VENTURE, has applied for a coal-exploration permit to drill approximately 60 holes in the Beluga area during 1986.

ALASKA PENINSULA REGION

Little data are available for the few companies that are currently active in this region. Exploration expenditures totaled about \$961,000 for 1985, compared to \$1,010,000 for

1984. Several major companies withdrew from the area in 1985, but as a result of resumed exploration on Unga Island and on Aleut Corporation lands, expenditures almost equaled those of 1984.

METALS

ALASKA APOLLO GOLD MINES, LTD., (Vancouver, B.C.) conducted 1,827 ft of shallow drilling and trenching on their Unga Island properties as part of their intensive program initiated in 1983 to evaluate the veins near the Apollo and Sitka gold mines (loc. 1, fig. 6).

KENNECOTT and NERCO/RAA conducted induced-polarization surveys, geochemical sampling, and diamond core drilling to evaluate prospects on land owned by the Aleut Corporation (loc. 12b, fig. 6). NERCO/RAA also conducted some geochemical prospecting, mapping, and trenching on their BRISTOL BAY NATIVE CORPORATION project near Lake Iliamna.

SOUTHEASTERN REGION

The greatest mineral-exploration expenditures occurred in this region, which includes the southern Panhandle and islands in the Alexander Archipelago. Good base- and precious-metal prospects, a generally favorable location, and a relatively mild climate contributed to the level of activity. Reported exploration expenditures for 1985 were \$2,534,000, compared to \$2,886,200 in 1984.

METALS

LONG LAC MINERALS (Reno, Nevada) based 12 people on Prince of Wales Island for 3 mo to conduct 4,000 ft of core drilling, geochemical and geophysical surveys, and assessment work on about 260 claims (loc. 13, fig. 6). Prospect areas included Niblack Anchorage (off Moria Sound), Ruby Tuesday on the south fork of Cholmondely Arm (Prince of Wales Island), and the Kaigani prospect (Dall Island).

A six-person field party employed by HOUSTON OIL AND MINERALS focused most of their drilling, mapping, and sampling work on southeastern Alaska. Details were not available. GALACTIC RESOURCES, LTD. (GALACTIC; Del Norte, Colorado), in a joint venture with TOUCHSTONE RESOURCES COMPANY, mapped for 50 days and core drilled 475 ft on 376 nickel-copper-cobalt claims on Yakobi and Chichagof Islands (loc. 8, fig. 6). SALISBURY AND DIETZ, INC., are consultants on the project. Released reserve figures for the Yakobi Island claims are 16.2 million tons that grade 0.31 percent nickel, 0.18 percent copper, and 0.02 percent recoverable cobalt. Platinum may also be recoverable.

KENNECOTT, in a joint venture with SOUTHEASTERN MINERALS COMPANY, MARMOT MINING EXPLORATION COMPANY, and ALYU MINING CORPORATION, worked at the Jarvis Glacier project near Haines (loc. 12c, fig. 6). A crew of 12 diamond drilled 3,730 ft of core, conducted geological mapping and geophysical surveys (radar), and performed assessment work on 343 federal claims. The Jarvis Glacier prospect contains copper and zinc with precious-metal credits.

ECHO BAY MINES, LTD., (ECHO BAY) acquired an option from BARRICK RESOURCES CORPORATION

(BARRICK) to explore the AJ Mine at Juneau and the Treadwell Mine on Douglas Island. ECHO BAY contracted WGM, INC., (loc. 7, fig. 6) to conduct their reclamation program. Preliminary estimates of ore reserves were also made by WGM. BARRICK (Toronto) made arrangements with the Juneau City-Borough Assembly to lease 3,300 acres that span the Gastineau Channel. During 1985, the USBM mapped over 30,000 ft of drifts, declines, and raises as part of the federally funded Juneau gold-mining project.

WGM acquired the LCM lode-gold property (12 mi east of Sitka) from PHILLIPS PETROLEUM (loc. 21b, fig. 6). Their crew surveyed, mapped, and sampled the Baranof Island property for 40 days. WGM also reported examining prospects in the Juneau gold belt, on Baranof and Chichagof Islands, and at the Apex - El Nido claims near Pelican.

NERCO/RAA conducted geochemical and geophysical surveys, geological mapping, and trenching on 262 claims on the HI property near Hawk Inlet on Admiralty Island (loc. 14d, fig. 6). They also began work on a helipad and other access facilities.

A new venture in the southeastern region was initiated by DISCOVERY GOLD EXPLORATIONS, LTD., (Vancouver, B.C.) at the Dawson mine on Prince of Wales Island. John Mitchell, a consulting geologist from Fairbanks, managed the project. Work in 1985 included a diamond-drilling program. WINK BROTHERS DRILLING drilled five holes (150 to 350 ft deep) that reportedly encountered rich gold veins on the Dawson Mine property (loc. 6, fig. 6).

MINERAL DEVELOPMENT IN 1985

INTRODUCTION

Mineral-development expenditures in Alaska during 1985 totaled \$34.1 million, compared to \$53.3 million reported for 1984 (table 3). However, over half of the 1984 expenditures were made for construction of the multimillion dollar Seward Coal Terminal. Otherwise, the 1985 development figure compares favorably with those of the last 4 yr. About 38 percent, or \$13 million, of the 1985 total was spent on early development phases for the Red Dog, Greens Creek, and

Quartz Hill projects. The largest increase in development expenditures was for placer and lode gold-silver projects, which increased 11 percent, from \$15.1 million in 1984 to \$16.9 million in 1985.

Most projects and activities described in this section fit the fairly narrow definition of development—that is, activities preparatory to the actual mining process (fig. 9). Several intermediate-stage projects are included because industry announcements or activities placed them in this category. Some companies indicated that they do not distinguish between exploration, production, and development expenditures. A major mineral-development project initiated in 1985 by the CHICHAGOF JOINT VENTURE is the development of a high-grade gold property on Chichagof Island north of Sitka.

RED DOG PROJECT, COMINCO/NANA

Northern region

(loc. 1, fig. 9)

World-class, black-shale-hosted, zinc-lead-silver-barite deposits at Red Dog Creek in the Wulik River drainage (northwest Alaska) continue to be developed by owner NANA REGIONAL CORPORATION (NANA) and operator COMINCO ALASKA, INC. (COMINCO). According to COMINCO geologists and Lueck (1986), the fine-grained, layered to coarse-grained vein sulfides of Mississippian to Pennsylvanian age were formed as submarine exhalations in a tensional tectonic environment. However, Lange and others (1985) compare the Red Dog deposit with that at Drenchwater Creek about 125 mi to the east and conclude that both deposits may have formed in an incipient island arc near an upper Paleozoic continental margin.

Tikkanen (1983) and Green (1983) summarized the exploration history of the deposit. By 1984, drilling of the Main deposit indicated reserves of 85 million tons that grade 17.1 percent zinc, 5.0 percent lead, and 2.4 oz/ton silver. The Main deposit is about 5,000 ft long, 1,500 ft wide, and 100 ft thick. The nearby Hilltop deposit is up to 95 ft thick and contains metal grades similar to those of the Main deposit.

On-site activity during 1985 included geotechnical drilling for the mine, mill, and port-facility sites and limited rotary

Table 3. *Mineral-development expenditures in Alaska by commodity, 1981-85.*

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

^aIncludes \$8,017,500 from seven lode silver-gold developments and \$5,883,275 from 45 placer-gold developments.

^bDoes not include coal-related development expenditures by the Alaska Railroad.

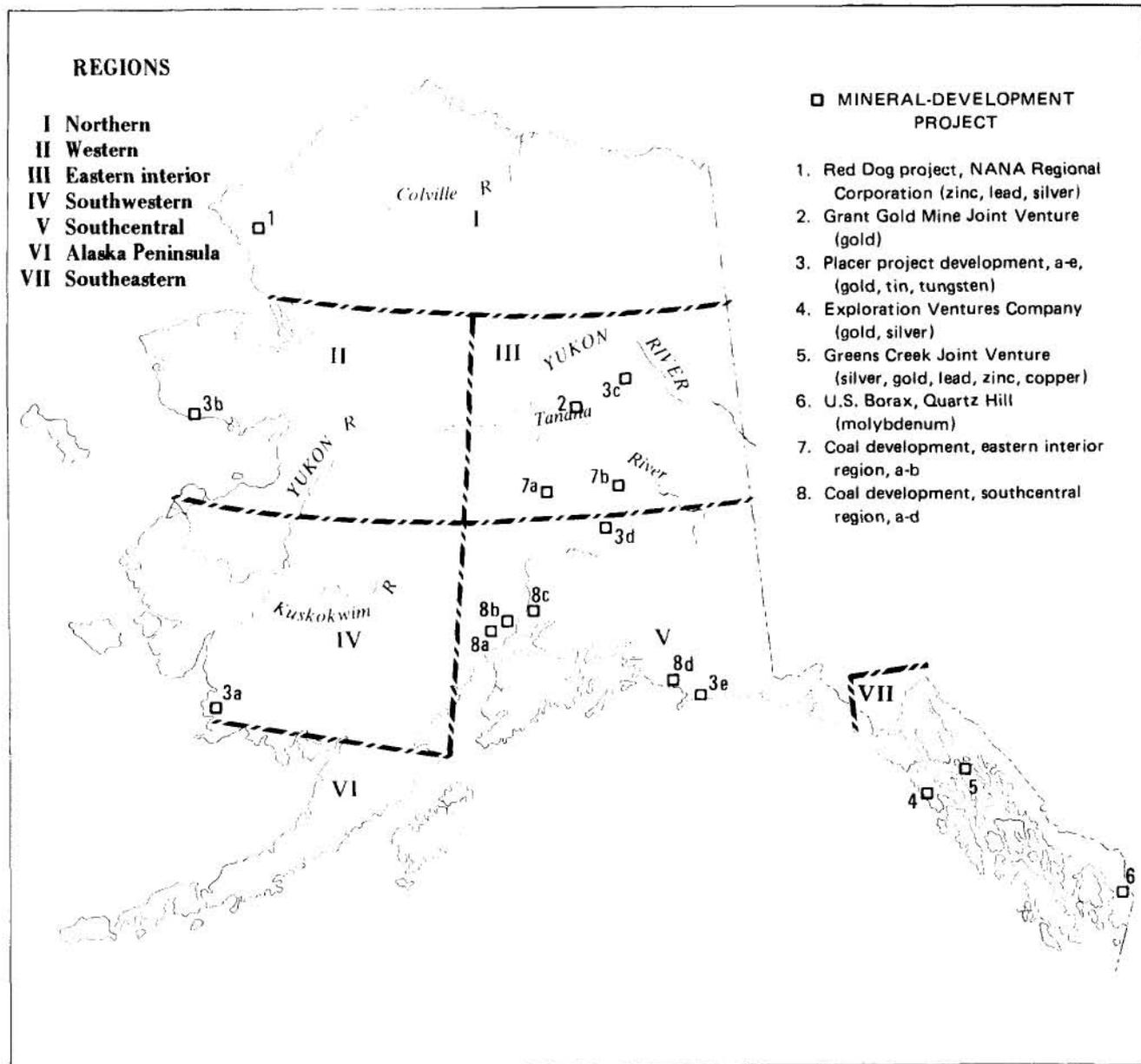


Figure 9. Selected mineral-development projects in Alaska, 1985.

drilling of the Main deposit for metallurgical testing. The company also drilled to locate sources of road and foundation aggregate and rip-rap.

In 1985, COMINCO selected the RALPH M. PARSONS COMPANY (PARSONS) for engineering, procurement, construction management, and logistical planning during the development phase. Using technology developed for COMINCO'S Polaris Mine in Canada, components of the mill and support plants will be constructed and assembled in large prefabricated modules outside of Alaska—probably at Vancouver, B.C. After assembly, the units will be barged to a port that will be built near Cape Thompson on the Chukchi Sea. From there they will be moved inland 57 mi to the mine

site. PARSONS will design and build the 6,400-tpd concentrator, the mine-support units that include living quarters, and a transportation network that includes the port facility. The plant is expected to begin production in 1989 or 1990 and will initially produce 580,000 ton/yr of zinc-lead-silver concentrate. Production will eventually increase to full capacity of 700,000 ton/yr (Giegerich and Parker, 1985). Concentrate from the Red Dog Mine will initially be shipped to COMINCO'S metallurgical complex in Trail, B.C., but Pacific Rim and European outlets are also being considered.

During 1985, the Red Dog project also made important progress on political, environmental, and regulatory issues. The State legislature passed a bill that allows the Alaska Industrial

Development Authority (AIDA) to arrange financing of up to \$175 million to construct port facilities and a road. This legislative action recognized the enormous costs of building transportation facilities in remote areas of Alaska. In November 1985, a preliminary agreement was reached among AIDA, COMINCO, and NANA that includes repayment of the State loans at 6.5-percent interest.

Because the administrative procedures required to gain access to the Red Dog property through the Krusenstern National Monument were untested and could be challenged by special-interest groups, U.S. Senator Frank Murkowski sponsored a bill that was passed by Congress and signed by the President in October 1985. The measure provides for a 99-yr lease and clears the way for road construction.

Another important consideration in the development of the Red Dog property involves a land dispute between the North Slope Borough (NSB) and NANA. The Red Dog deposit is located in an area where the boundaries of the NANA region and the NSB overlap. NANA applied for detachment of 3,298 square miles from the NSB for inclusion in a new NANA-area borough. The application was submitted by the Alaska Department of Community and Regional Affairs and will be considered by the Local Boundary Commission. Last October, NSB voters rejected the transfer of their lands to the new borough. The Red Dog property is expected to generate \$2 to \$5 million in property taxes and may constitute the principal tax base of the proposed borough. In early 1986, public meetings will be held in various cities to present NANA'S petition.

GRANT GOLD MINE

Eastern interior region (loc. 2, fig. 9)

In 1985, a joint venture among SILVERADO MINES, LTD. (SILVERADO), TRICON MINING, INC., and AUREX, INC., a subsidiary of MARUBENI AMERICAN CORPORATION, began production at the Grant Gold Mine located on the flank of Ester Dome near Fairbanks. The principal ore systems consist of several northeast-trending, cross-cutting, quartz-sulfide-gold veins, including the Irishman and O'Dea vein-faults that are hosted in polymetamorphic schist of undetermined age. Fluid-inclusion studies suggest deposition of ore fluids in the mesothermal range (Bundtzen and Kline, 1981; Murton and Bundtzen, 1982). The original discovery was made in the 1920s when prospectors O.M. Grant and E.R. Pilgrim noticed rich, gold-bearing vein-quartz float at the bottom of a shaft that was originally sunk to explore a hillside placer deposit. Exploration and development have been intermittent, but before 1950, about 6,000 tons of ore that averaged 1 oz/ton gold were selectively mined from the Irishman vein.

The property was purchased in 1973 by ROGER BURGGRAF, a resident of Fairbanks. Burggraf and Gilbert Dobbs drove the shaft to the 220-ft level, where they discovered the O'Dea vein. This new vein system constitutes the major resource/reserve base for the property. In 1978, Burggraf signed an agreement with SILVERADO (Vancouver) to continue exploration. From 1978 to 1983, SILVERADO conducted an aggressive exploration and development program

that involved constructing a pilot mill, shop facilities, head frame, and driving about 3,000 ft of drifts and raises, mainly on the O'Dea ore system. Pre-1984 mill tests on about 2,500 tons of development ore produced 1,425 oz of gold and 392 oz of silver. Initial precious-metal recovery from the pilot mill was under 70 percent, but metallurgical testing by Conwell (1982) and the company showed that recoveries in the 85- to 94-percent range are possible.

In early 1984, SILVERADO signed a joint-venture agreement with AUREX. Later during that year, a two-phase, \$1.9-million exploration program was completed at the Grant Gold Mine. Phase 1, the drilling program, began in April and defined a substantial ore tonnage in the O'Dea system, which extends 4,000 ft along strike with a down-dip extension of at least 600 ft. Phase 2, completed in December 1984, consisted of additional drilling to confirm phase 1 findings.

A decision to begin construction of mill and mine facilities was made in February 1985. Foundations for the mill and mine complex were in place by mid-June (fig. 10). Mill machinery, including ball mills, a cyanide batch leach plant, and conveyor systems, were purchased at discount rates from auctions in the western United States. An extremely wet summer and fall complicated compaction of material for the tailings-pond dam and resulted in added expense and a startup delay of several weeks.

On October 20, 1985, the mine and mill opened with three shifts of miners operating the mill and two shifts working underground. The mill is designed with two 115-tpd ball mills. Initially, a single mill processed ore. During 8 wk of production (October 20 to December 15), the mill increased capacity from 30 to 106 tpd and reached a peak of 136 tpd in the fifth week.

The head assays increased from 0.20 to 0.52 oz/ton during the production period and averaged 0.345 oz/ton for the 5,036 tons of ore milled. The first dore bullion bar was poured in November, weighed 161 oz, and assayed 71.5 percent gold and 26.4 percent silver (fig. 11). In early December, SILVERADO announced that the property contained



Figure 10. Workers lay the foundation for the mill at the Grant Gold Mine, Fairbanks, Alaska. Photograph by C.B. Green, June 1985.



Figure 11. Gary Anselmo (President of Silverado Mines, Ltd.) and Jack Sutherland (Project Manager) pour first dore bar from the Grant Gold Mine, Fairbanks, Alaska. Photograph by C.B. Green, November 1985.

drill-indicated reserves of 591,000 tons that average 0.61 oz/ton gold. Production costs for this reserve were estimated at \$220/oz of gold.

On December 31, 1985, SILVERADO suspended all operations of the Grant Gold Mine because AUREX (the major financial backer) withdrew from the project. AUREX informed SILVERADO that they decided to withdraw because initial operating results did not meet their expectations.

According to SILVERADO, an independent engineering study will support the viability of the mine. They expect to resume operations when new financing is arranged. During the 1984-85 development phase, the GRANT GOLD MINE JOINT VENTURE consisted of 55-percent participation by SILVERADO and TRICON and 45 percent by AUREX. Expenditures since inception of the project total \$12 million.

MISCELLANEOUS PLACER PROJECTS (locs. 3a-e, fig. 9)

Placer-gold development expenditures reported by 45 mining companies during 1985 totaled \$5,883,275, or about \$131,000 per operation (table 4), compared to \$85,000 per mine in 1984 and \$55,000 per mine in 1983. Many respondents to the survey indicated that increased expenditures were made for water-recycling systems, redesigning pumps and mine layouts, and purchasing gold-recovery equipment, including spiral concentrators and jigs. Other development costs listed by miners included development drilling, road construction, camp maintenance, and modifications to existing mechanized units.

A major offshore gold-dredging operation began in 1985 about 12 mi west of Nome (loc. 3b, fig. 9). During 1984, POWERCO RESOURCES CORPORATION (POWERCO; Lakewood, Colorado) conducted production tests on their offshore leases near Nome. These tests involved sampling gold-bearing sediments dredged from submarine beaches and

processing the material aboard a 10,000-ton converted naval vessel. INSPIRATION RESOURCES, INC. (INSPIRATION; Claypool, Arizona) optioned the mining rights from POWERCO and began test production in September 1985. The operation used a 5-yd³ clamshell to remove material in water up to 40 ft deep until November, when sea ice forced the operation to shut down for the winter. The clamshell discharged material through a deck-mounted grizzly to a sophisticated gold-separation plant below deck on the 380-ft-long barge 'Koko-head.' The concentrate was transported to Nome for final recovery where INSPIRATION has built processing facilities as well as an office and warehouse. The company employed 45 people.

In conjunction with this operation, INSPIRATION is required to conduct extensive biological and water-quality monitoring programs that include a detailed evaluation of the effects of mining on crab habitat. According to INSPIRATION officials, because most fine material was apparently washed away by wave and tidal action during and after deposition, little fine or silt-sized material remains in the auriferous offshore glacial deposits.

INSPIRATION applied to state and federal agencies for permits to increase production in 1986 from 1,200 to 6,000 yd³/day. To meet this increase, INSPIRATION will modify or replace its existing dredge and use a cutter-head suction dredge or a bucket-line system. No major permitting problems are expected because of this modification.

The USBM conducted a limited offshore sampling program in the Goodnews Bay area (loc. 3a, fig. 9). This study should provide much useful geologic information on the submarine placer-platinum concentrations that exist in the area. No individuals or private companies currently hold offshore-prospecting permits (OPPs) or leases in this area. The state has no plans to issue any OPPs at Goodnews Bay, but will review the results of this study to determine what action should be taken.

GOLD DUST MINES (GOLD DUST; Central, Alaska) continued to perfect their highly successful IHC jig recovery system (loc. 3c, fig. 9). After analyzing a variety of gravity-base gold-recovery systems, GOLD DUST decided to use jigs

Table 4. Reported placer-gold development expenditures by region, 1985.^a

Region	Number of operations	Expenditures
Northern	3	\$ 73,000
Western	5	1,162,000
Eastern interior	22	1,334,185
Southcentral	12	3,224,090
Southwestern	3	90,000
TOTAL	45	\$5,883,275

^aDoes not include \$2,702,260 expended in the State of Alaska Placer Mining Demonstration Grant Program administered by the Department of Natural Resources and the Department of Environmental Conservation.

and purchased a customized plant in 1984 (Ackels, 1985). The efficiency of the mining unit, which was built in Holland by the IHC CORPORATION, exceeded company expectations: greater quantities of fines could be processed, and water use could be decreased by as much as 70 percent—a key to decreasing turbidity and siltation problems in settling ponds and streams. The extraordinary efficiency in recovery of fine gold in the 120- to 400-mesh range indicates that mining placer tailings with fine-gold content deserves reevaluation.

DENALI MINES, INC., completed 35,000 ft of reverse-air, churn, and rotary development drilling to prepare ground for mining in the 1986 and 1987 seasons (loc. 3d, fig. 9). Their existing reserve base of about 80,000 oz was increased to about 105,000 oz. Grades range from 0.05 to 2.0 oz/yd³. The company also continued to analyze their wash plant and settling-pond system in an attempt to comply with state and federal environmental regulations.

ALASKA GOLD COMPANY (Richmond, British Columbia) constructed a pilot plant in the Yakataga mining district near Cordova and processed about 500 yd³ of beach sands for feasibility estimates (loc. 3e, fig. 9). They indicated plans to operate a plant that would process 500 yd³/day for 100 days in 1986 or 1987; by 1988, they plan to process 5,000 yd³/day.

EXPLORATION VENTURES COMPANY (EXVENCO); also known as Chichagof Joint Venture Southeastern region (loc. 4, fig. 9)

The Chichagof Gold Mine on Klag Bay, 45 mi north of Sitka, was formerly one of the richest hard-rock gold mines in Alaska. From 1918 to 1941, the mine produced 660,000 oz of gold and nearly 200,000 oz of silver from 596,487 tons of ore with an average head grade of 1.2 oz/ton gold. The ore deposit consists of near-vertical quartz-gold-sulfide veins that intrude Sitka graywacke of Jurassic to Early Cretaceous age. The ore was contained in a complex series of splays along a 3,800-ft-long section of the northwest-trending Chichagof shear zone. The deposits have been mined to a vertical depth of 4,100 ft; the deepest workings are about 2,800 ft below sea level.

The property has been evaluated since 1981 by EXVENCO, a limited United States partnership in Spokane, Washington. In 1983, QUEENSTAKE RESOURCES (QUEENSTAKE; Vancouver, B.C.) acquired a 25-percent interest in the project. The current (1985) CHICHAGOF JOINT VENTURE consists of QUEENSTAKE, VECTOR MINING COMPANY, and EXVENCO, the project manager.

Three major development targets are being evaluated: 1) reprocessing former mill tailings; 2) extensions of the Big Croppings vein; and 3) new gold-bearing structures, including the Aurum and Sitka shear zones. Five separate testing programs by various companies and government agencies from 1967 to 1981 identified a mill-tailings reserve that totals 450,000 tons and averages 0.11 oz/ton gold.

In 1985, exploration and development work of the CHICHAGOF JOINT VENTURE concentrated on a two-phase underground drifting and drilling program. Phase 1 consisted of surface drilling to evaluate the Big Croppings vein, driving the Golden Gate No. 1 tunnel, and excavating underground

drill stations (fig. 12). The main level of the Chichagof Mine was evaluated by geologic mapping, sampling, and analysis for its suitability as an underground tailings-disposal site. Environmental studies were initiated concurrently with exploration. Phase 2 evaluated specific ore targets by drilling the Aurum, Aurum West, Sitka, Big Croppings, and Golden Gate structures. Metallurgical testing of ores began, environmental studies continued, and permit applications were submitted. During 1985, subsurface exploration included 2,000 ft of drifting and 2,500 ft of drilling. The underground crew consisted of eight miners.

In addition to the previously defined tailings reserve, indicated reserves are 60,000 tons of ore that grade approximately 0.6 oz/ton gold. An accelerated development schedule with a \$10 million budget is expected in 1986.

GREENS CREEK JOINT VENTURE Southeastern region (loc. 5, fig. 9)

High-grade, silver-gold-lead-zinc deposits at Greens Creek on northern Admiralty Island 18 mi west of Juneau have been explored and developed since their discovery in 1974 by the PAN-SOUND JOINT VENTURE, a group that was composed of MARIETTA RESOURCES INTERNATIONAL, EXALAS



Figure 12. Miners work the face of the Big Croppings vein in the Chichagof Mine located north of Sitka, Alaska. Photograph courtesy of Exploration Ventures Company, 1985.

RESOURCES CORPORATION, and NORANDA MINING, INC., the joint venture operator. According to Scherkenbach and others (1985), metamorphosed exhalative and carbonaceous clastic sedimentary rocks of middle Paleozoic or Triassic age host several trough-shaped orebodies along the limb of an overturned anticline. The geologic setting for the deposit may be a back-arc or strike-slip extensional basin with characteristics of polymetallic, volcanogenic massive-sulfide and shale-hosted exhalative deposits. The deposit is similar to the Roseberry and Mount Isa deposits in Australia, but Greens Creek may represent a separate class of deposits.

By the end of 1985, over 132,000 ft of core drilling was completed on 180 surface and subsurface stations, including 47,000 ft drilled in 1985 (fig. 13). The drilling and about 5,500 ft of drifting established reserves of over 4 million tons of ore that contain an average of 10.3 oz/ton silver, 0.09 oz/ton gold, 6.4 percent zinc, and 2.1 percent lead. Recent exploration included drilling (using two Longyear 38 rigs) and driving crosscuts into the hanging wall to establish drill stations.

About 1 3/4 mi of the 7-mi-long road from the mill site to the docking facilities at Hawk Inlet were completed during 1985 (fig. 14). Stone quarries and other material sites were investigated for possible use in completing construction of the



Figure 13. Peter Richardson (Project Manager) and Tom Crafford (geologist) check core from the Greens Creek project on Admiralty Island, Alaska. Photograph by Mark Kelly, 1984.

road, slurry pipeline, tailings pond, and docking facilities (fig. 15).

Proposed mining and milling is expected to use open-stope methods to produce 300 and eventually 600 tpd. Depending on the scale of mining, 150 to 300 workers would be employed. Greens Creek appears to be one of the most promising hard-rock mining developments in Alaska.

The Alaska National Interest Lands Conservation Act (ANILCA) of 1980 placed the Greens Creek property in a nonwilderness area of Admiralty Island National Monument and mandated that all claims be perfected and declared valid by December 2, 1985. In 1983, a U.S. Forest Service (USFS) Environmental Impact Statement (EIS) confirmed the validity of eight mining claims in the core area, but did not confirm any others in the claim block. However, geologic inference, reconnaissance drilling, geochemistry, and geophysics attested to extensions of known mineralized areas. During 1984 and 1985, substantial subsurface exploration and drilling was conducted on additional claims held by NORANDA.

To eliminate the ANILCA time limitation, the U.S. Forest Service released a draft EIS in December 1983. In it, they proposed a land exchange that would exclude 17,225 acres from the Admiralty Island Monument (including Greens Creek) by moving the northern boundary about 3 mi. In exchange, 18,174 acres of the popular Young Lake area would be added to the monument. Although no action was taken on the land exchange, it was supported by the State of Alaska and the USFS. During the fall of 1985, the joint venture, Native groups, and conservation interests involved in the Greens Creek dispute and other land disputes on Admiralty Island made a proposal to the U.S. House Interior Committee: In return for forfeited timber and subsurface rights elsewhere on Admiralty Island, the SEALASKA NATIVE CORPORATION would acquire the lands around the core Greens Creek deposit.

In late December 1985, the U.S. Congress gave the joint venture an additional year to explore the company's peripheral claims, but an ironic provision precludes the use of information gained during the extension to validate peripheral claims. Previously, NORANDA MINING, INC., had to validate its claims by December 2, 1985.

In recent years, several partnership changes have occurred in the joint venture. ANACONDA, which purchased the interest share of MARIETTA RESOURCES INTERNATIONAL in 1983, was dissolved on April 30, 1985, by its parent company ATLANTIC RICHFIELD. ANACONDA'S interest in the project was offered for sale in 1985, and a new partner is expected to be announced in early 1986. NORANDA MINING, INC., remains the operator and holds controlling interest.

QUARTZ HILL MOLYBDENUM DEPOSIT PACIFIC COAST MOLYBDENUM COMPANY Southeastern region (loc. 6, fig. 9)

U.S. BORAX, an affiliate of the PACIFIC COAST MOLYBDENUM COMPANY, continued development work on the Quartz Hill molybdenum deposit during 1985. U.S. BORAX completed more than 250,000 ft of diamond core drilling from 1974 to 1982. Reserve estimates for the mineral deposit exceed 1.5 billion tons of ore that average 0.136 percent molybdenite. This figure includes 490 million tons of

near-surface ore that grades approximately 0.219 percent molybdenite. Mineralization is hosted in a 25-m.y.-old composite felsite pluton that intrudes metamorphic and plutonic 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 metal used as a hardening agent in the steel industry. Depending on the price of metals, the mine could annually add from \$267 to \$457 million to the nation's exports and up to \$65 million to the personal income of Alaska residents—an amount equal to over 20 percent of the total 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, tests on a 5,000-ton bulk sample that was shipped to metallurgical facilities in Minnesota indicated 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 Fjords National Monument was established and 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 the wilderness designation, and the project was allowed to proceed. Since 1975, data have been collected on meteorology, snow, hydrology, water quality, vegetation, wildlife, coastal-and-marine biology, physical-and-chemical oceanography, archaeology, and socioeconomic factors.

The timetable for issuing the Final Environmental Impact Statement (FEIS) was rescheduled in 1985 due to the presentation by U.S. BORAX of newly acquired information about alternative sites for the marine disposal of tailings

(fig. 16). Wilson Arm was initially excluded as a tailings site because preliminary estimates indicated it was too small to contain the tailings that would be disposed of during the mine's life. In 1984, a consultant for U.S. BORAX concluded that Wilson Arm is large enough to contain the tailings. State and federal officials are restudying the alternatives for tailings disposal. The present target date for issuance of the FEIS is June 1986.

The company also applied for a National Pollutant Discharge Elimination System (NPDES) permit to discharge treated mine waters from the Quartz Hill and Bear Meadow mine adits. Currently there are no mining activities in the adit, and the company is treating water seepage before it enters White and Beaver Creeks.

U.S. BORAX and Ketchikan officials recently met to make financial arrangements that will soften the impact on the city and borough once the project gets underway. Development and production schedules for the project will depend on an increase in molybdenum prices and development of export markets.

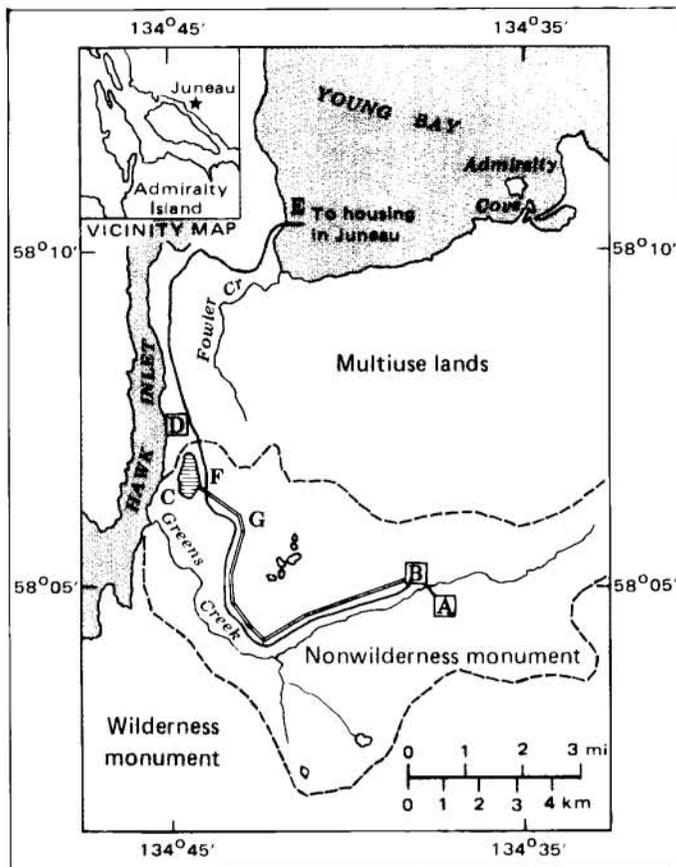
USIBELLI COAL MINE AND EASTERN INTERIOR COAL DEVELOPMENTS

Eastern interior region
(locs. 7a,b, fig. 9)

The USIBELLI COAL MINE (Healy) continues to be one of the bright spots in Alaska's mineral industry (loc. 7a, fig. 9). When the Seward Coal Terminal was completed in 1984, Alaska's aspirations to export minerals became a reality. On January 25, 1985, the first ship loaded with 63,000 tons of



Figure 14. Dock facility for the Greens Creek project at Hawk Inlet, Admiralty Island, Alaska. Photograph courtesy of Noranda Mining, Inc., 1985.



EXPLANATION

- | | |
|-----------------------------------|---|
| A Mine location | D Major docking facilities
(private lands) |
| B Mine service area/
mill site | E Pedestrian dock |
| C Cannery muskeg tailings
pond | F Roadway |
| | G Slurry pipeline |

Figure 15. Location map showing the proposed infrastructure for the Greens Creek project, Admiralty Island, Alaska. Data courtesy of Noranda Mining, Inc.

coal from USIBELLI left Seward for the port of Pohang in the Republic of Korea. The coal is being used by the KOREAN ELECTRIC POWER COMPANY. A total of 616,000 tons of coal was shipped through the coal-loading facility during 1985.

The coal shipment represented the culmination of several years of cooperation, planning, and work by the USIBELLI COAL MINE, the State of Alaska, the SUNEEL SHIPPING COMPANY, LTD., the Alaska Railroad, and the Port of Seward.

Unfortunately, in November 1985, a fire damaged the conveyor system that spans the Nenana River at the Usibelli Coal Mine. Built during 1983-84, the conveyor system—including the 'tube' that houses the conveyor belt—was almost completely destroyed, but the trestle and superstructure were not damaged. The fire, which lasted 4 hr, was put out by mine employees and the local Healy Volunteer Fire Department. By improvising with available heavy equipment for loading rail

cars, coal shipments were not seriously curtailed, and repairs to the conveyor system will be completed in March 1986.

In 1985, the Alaska Railroad's commitment to transporting coal included purchasing five 2,800-hp locomotives at \$950,000 each, 60 new coal-hopper cars, rail anchors to restrain longitudinal rail movement caused by southbound traffic, and upgrading a difficult curve 14 mi north of Seward. An additional \$5 million was spent upgrading five tunnels between Miles 51.8 and 52.7.

The DELTA COAL COMPANY continued feasibility studies on its 2,500-acre preference-right coal lease in the Jarvis Creek coal field near Delta Junction (loc. 7b, fig. 9). About 10,000 tons of subbituminous coal were mined for local use in the 1950s. About 1 million tons from an estimated resource base of 150 million tons can be mined by open-pit methods. Pit-run bulk samples average 8,750 Btu/lb, air-dried coal averages 9,570 Btu/lb, and moisture-free samples average 11,000 Btu/lb. The coal averages 1 percent sulfur, 10 percent ash, and 17 percent moisture. Mine feasibility studies show that a 10-ft-thick seam can be mined by truck-and-shovel methods at a stripping ratio of 1:1. The company anticipates producing 50,000 ton/yr of coal over the planned 20-yr mine life.

Of key importance to development is a 1984 announcement by the Federal Defense Agency (FDA) that the boiler system for the 7.5-megawatt power plant at Fort Greely would be converted from oil to coal. A study by EBASCO SERVICES and GEORGETOWN UNIVERSITY recommended a combined coal gasification - fuel cell power plant to supply power to Fort Greely and the Delta Junction area. The power plant is estimated to cost \$40 million. Funding for the FDA plans has not been approved. The Copper Valley Cooperative Electric Association is also considering converting their power plant from oil to coal, which presents a second potential market for the DELTA COAL COMPANY.

COAL-FIELD DEVELOPMENTS Southcentral region (locs. 8a-d, fig. 9)

The DIAMOND ALASKA COAL COMPANY (DIAMOND) is working on engineering and environmental designs, arranging financing, and seeking sales contracts for its coal-export project in the Beluga coal field (loc. 8a, fig. 8).

DIAMOND initially plans to produce 2 million tons of coal annually with the potential for increasing production up to 10 million ton/yr, depending on market demand. The proposed open-pit mine would use two draglines for stripping. Production would be from five seams, each 6 to 20 ft thick. After the coal is initially crushed, it would travel on a 13,000-ft-long conveyor belt to a secondary crusher. The total length of the conveyor system from mine site to loading dock would be 11 mi. Plans include mining 330 million tons of coal during a 34-yr mine life.

Fieldwork during 1985 included geotechnical drilling for a 12,000-ft-long trestle foundation that will extend from Granite Point into Cook Inlet and provide docking and loading facilities (fig. 17). Nineteen holes (drilled an average of 75 ft deep) encountered sediments that will support pilings.

Financial support for the project was obtained through a \$250 million revenue-bond authorization approved by residents of the Kenai Borough. This bond would provide for the construction of a 300-acre, on-shore port complex and a 2-mi-long coal-docking facility at Granite Point. Ships up to 120,000 dead-weight tons (dwt) could be loaded for Pacific Rim markets. The bond authorizes DIAMOND to lease the facility from the Borough.

The ELECTRIC POWER DEVELOPMENT CORPORATION (EPDC) of Japan and DIAMOND jointly completed a market feasibility study in 1985. Price cuts by South African, Australian, and Canadian producers have caused marketing problems for the project. However, the low sulfur content of the Beluga coal, a stable political climate, and lower transportation costs contribute to the attractiveness of the project. If sales contracts can be secured, construction could begin by 1987, and coal could be shipped by 1990.

PLACER U.S., INC. (PLACER) is also studying the feasibility of annually exporting 1 to 1.5 million ton/yr of coal from the Beluga field (loc. 8b, fig. 9). PLACER'S coal lands (17,686 acres of state leases and 9,240 acres owned by the COOK INLET REGION, INC.) are divided into the Capps, Chuitna, and Three-mile deposits that are located 25, 15, and 8 mi northwest of Tyonek, respectively. During 1985, the project obtained right-of-way, stream-crossing, and wetlands permits from various federal and state regulatory agencies. Coal reserves of 1 billion tons average 7,500 Btu/lb, 25 percent moisture, and 0.2 percent sulfur. Development plans include using an 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 capital. PLACER met with EPDC of Japan to examine marketing aspects of the operation.

ROCKY MOUNTAIN ENERGY (ROCKY MOUNTAIN), a Wyoming-based subsidiary of UNION PACIFIC RAILROAD, and HAWLEY RESOURCE GROUP, INC., continued feasibility and development studies on a 2,000-acre state lease near Wishbone Hill in the Matanuska coal field, 60 mi northeast of Anchorage (loc. 8c, fig. 9). In late 1984 and early 1985, ROCKY MOUNTAIN acquired three competitive leases (State Coal Lease Sale No. 6) that total 5,200 acres and conducted detailed geologic mapping during the 1985 field season. The company has 64-percent controlling interest in the properties. Drilling confirmed the presence of 14 million tons of sub-bituminous coal amenable to surface-mining methods. The deposit, which contains some coking-quality coal, averages 12,460 Btu/lb. The sulfur content is 0.4 percent, and the ash content is low.

During 1985, SIGNAL ENERGY SYSTEMS, contracted by ROCKY MOUNTAIN and HAWLEY RESOURCE GROUP, INC., performed preliminary mine-feasibility studies. They suggest that truck-and-shovel methods be used to feed a 150-megawatt mine-mouth power plant at a production cost of \$1.40/million Btu. The mine complex would also include a crusher-conveyor system (to process and deliver coal to the power plant) and environmental safeguards, such as stack scrubbers and water-treatment facilities. Similar studies by the MATANUSKA POWER PROJECT suggest that coal may compete with local oil and gas by the year 2000.

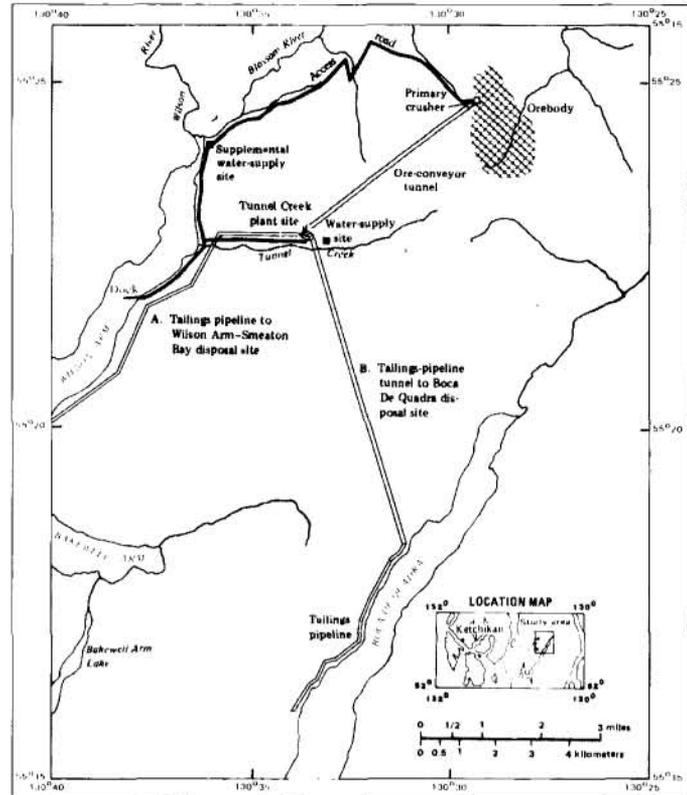


Figure 16. Location map showing proposed development elements of the Quartz Hill molybdenum deposit near Ketchikan, Alaska. Alternative tailings-disposal sites on (A) Wilson Arm and (B) Boca de Quadra are shown. Modified from U.S. Borax data.

During the last 4 yr, the BERING DEVELOPMENT CORPORATION tested deposits at the Bering River coal field near Cordova (loc. 8d, fig. 9) and initiated mine-design and feasibility studies based on exporting 500,000 to 1,500,000 ton/yr. No fieldwork was done in 1985.

MINERAL PRODUCTION IN 1985

INTRODUCTION

The value of Alaska's mineral production in 1985 is estimated at \$226.6 million, up 14 percent from the 1984 estimate of \$199.4 million (table 5). The leading minerals were sand and gravel (\$112.1 million), coal (\$39.7 million), and gold (\$61.2 million). Collectively, they accounted for 94 percent of the total reported mineral production in Alaska. The value of silver, tin, antimony, and mercury production collectively increased 18 percent in 1985 to \$929,000, even though the price for each commodity decreased. Production of building stone decreased 24 percent, and no platinum was produced in 1985. Principal gold, coal, and industrial-mineral mines and quarries are shown in figure 18.

This section reports the production statistics computed from 174 DGGS questionnaires returned by private companies



Figure 17. A crew conducts geotechnical foundation drilling for Diamond Alaska Coal Company's proposed ship-loading facility in Cook Inlet, southcentral Alaska. Photograph courtesy of Diamond Alaska Coal Company, 1985.

and individuals, responses to a telephone survey of 64 companies that mine sand and gravel and building stone, and responses from the Alaska Railroad, the University of Alaska, and consultants. Historic production levels for gold, sand and gravel, and coal are compiled in figures 19, 20, and 21, 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.

To help offset declining tin prices, operations in Alaska increased production of cassiterite (SnO_2) concentrate to 400,000 lb in 1985, the largest production since 1954. Less antimony was produced in 1985 than 1984.

As a result of coal exports to the Republic of Korea from the Usibelli Mine, Alaska's coal production (by tonnage) increased 61 percent to an all-time high of 1,370,000 tons (table 5; fig. 21). Coal value increased to \$40 million, up 67 percent from 1984.

Sand-and-gravel production increased about 4 percent in volume and 18 percent in value (from \$95.0 to \$112.1 million). This increase is attributed to a demand for sand and gravel on the North Slope, where aggregate costs are much higher than in most urban areas. Peat, stone, jade, and soapstone production decreased because of lower demand.

Gold production is always difficult to estimate. Several information sources for gold production are used in this report: 1) completed questionnaires with production estimates from 78 mechanized operations (up from 48 in 1984); 2) company news releases and annual reports to stockholders; 3) information from DGGs and DOM personnel working in three of the seven regions shown in figure 5; and 4) estimates by precious-metal refiners and others.

An estimated 188,500 oz of gold and 27,400 oz of silver were produced by 266 placer mines in 1985, an 8-percent increase over 1984 estimates (tables 5 and 6). The survey indicates that gold production increased even though the number of operators decreased. Virtually all of this increase is due to stepped-up-production from four large mines that collectively produced nearly 65,000 oz of gold, 34 percent of statewide production. Gold production by other operators decreased slightly due to difficulties in procuring permits, court-ordered shutdowns, low metal prices, water shortages, and exhaustion of reserves. Many miners said that an abnormally cool, wet fall caused them to stop work at their mines several weeks early.

Average gold and silver prices declined 10 percent from 1984 to 1985 (\$360 to \$325/oz for gold and \$7.60 to 6.00/oz for silver). The decline also contributed to a decrease in production value. Less than 1 percent of gold production was from lode mines. The major lode-gold contributor was the Grant Gold Mine near Fairbanks.

Results from the DGGs survey indicate that 266 placer-gold mines operated in 1985, 15 less than in 1984. Employees per mine varied from one to 103, with an average of five people per mine. A total of 1,540 miners were employed in mechanized mines statewide, and another 190 participated in recreational mining. The average placer mine produced 720 oz of gold, or 124 oz/employee.

The results of an independent survey of the placer industry made in 1985 were published in 'The role of placer mining in the Alaska economy - 1985' (Peterson and others, 1986). Responses to 228 detailed questionnaires indicate that 319 active mechanized placer mines operated in 1985. Total employees in the industry, including those involved in recreational and assessment activities, were estimated at 2,226. An estimated \$63.4 million was expended by the placer industry within the state, and the total impact of these expenditures on sales and income was \$127.4 million.

The sand-and-gravel industry (table 7) employed 1,435 people statewide, according to firms contacted in a telephone survey. About 355 people were employed in stone, antimony, tin, and jade-soapstone extraction; the USIBELLI COAL MINE employed 125 people.

About 3,650 people were employed in Alaska's mineral-production industry in 1985. This figure does not include

Table 5. Reported mineral production in Alaska, 1983-85.^a

Metals	Volume			Value ^b		
	1983	1984	1985	1983	1984	1985
Gold (oz)	169,000	175,000	190,000	\$ 67,600,000	\$ 63,000,000	\$ 61,175,000
Mercury (lb)	--	380	2,094	--	1,500	10,000
Antimony (lb)	22,400	135,000	65,000	25,000	225,792	98,000
Platinum (oz)	W	W	--	100,000	W	--
Silver (oz)	33,200	20,000	28,500	332,000	159,000	171,000
Tin (lb)	215,000	225,000	300,000	1,100,000	400,000	650,000
Subtotal				\$ 69,157,000	\$ 63,786,292	\$ 62,104,000
Industrial minerals, coal, and peat						
Jade & soapstone (ton)	2.3	5.5	W	42,000	16,500	W
Sand & gravel (mt)	50.0	27.0	28.2	105,000,000	95,000,000	112,062,750
Building stone (mt)	5.3	2.7	2.5	20,000,000	16,000,000	12,150,000
Subtotal				\$125,042,000	\$111,016,500	\$124,212,750
Coal (ton)	803,000	849,161	1,370,000	18,000,000	23,775,000	39,730,000
Peat (yd ³)	15,000	125,000	85,000	200,000	859,375	552,500
Subtotal				\$ 18,200,000	\$ 24,634,375	\$ 40,282,500
TOTAL				\$212,399,000	\$199,437,167	\$226,599,250

^aProduction data from DGGS questionnaires, the U.S. Bureau of Mines, interviews with mine operators, and other confidential information.

^bAverage price of gold in 1985 assumed to be \$325/oz, silver \$6.00/oz, antimony \$1.50/lb, coal (FOB Healy) \$29/ton, peat \$6.50/yd³, and building stone \$4.80/ton. Statewide, sand-and-gravel prices average \$3.98/ton, but prices differ according to region (table 7).
W = withheld
mt = million short tons

employees of secondary-support industries, such as trucking companies, the Alaska Railroad, or mineral-industry exploration and development personnel.

The placer-mining industry continues to deal with the problems of satisfying the turbidity and settleable-solids standards required by the Environmental Protection Agency (EPA) and the Alaska Department of Environmental Conservation (DEC). During 1985, 26 mines examined by EPA were cited for noncompliance, and some mines were issued violation notices by regulatory agencies. New technology for decreasing water usage, water recycling, and flocculent treatment were tested by a growing number of mine operators.

In response to the controversial issues concerning water use and the placer-mining industry, the State established the Placer Mining Demonstration Grant Project in May 1984. The project promotes innovative design and implementation of mining techniques that involve fine-gold recovery, water-use reduction, and water-pollution and waste-disposal control (fig. 22). Of 82 applications received, 16 grants totaling \$1,415,000 are administered by DOM; 14 grants totaling \$1,287,260 are administered by DEC. The maximum limit for

an individual grant is \$100,000, but miners may obtain a grant from each agency. The mining community and regulatory agencies are currently analyzing the results of the project (Alaska Division of Mining, 1985).

METALS

NORTHERN REGION

An estimated 18 operations in the Koyukuk-Nolan (Wiseman Quadrangle), Shungnak, and Chandalar areas produced 14,400 oz of gold and 2,000 oz of silver, about the same as in 1984. About 85 percent of the production was from Emma, Linda, Archibald, and Nolan Creeks near Coldfoot and Davis and Grubstake Creeks near Bettles. TIMBER CREEK MINING again produced gold on Weise and Timber Creeks near Klery Creek in the Shungnak-Kobuk mining district. ALMINCO, INC., mined gold from their Eldorado claim group in the Koyukuk-Nolan area and reportedly had a good season. PARADISE VALLEY MINING mined on Birch Creek, and GREEN MINING AND EXPLORATION mined on their

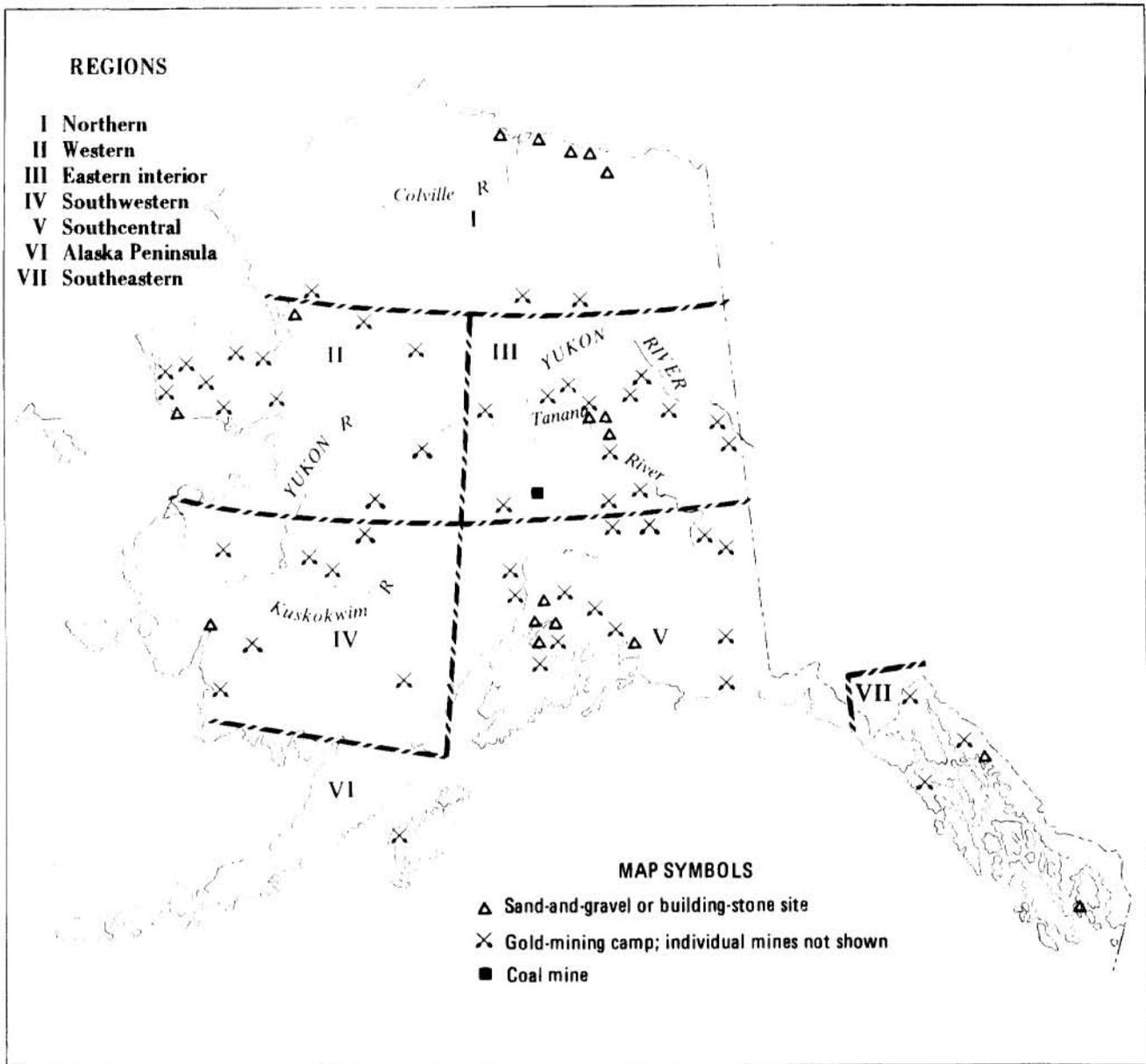


Figure 18. Principal gold-mining camps, coal mines, and industrial-mineral sites in Alaska, 1985.

Discovery Group off the Dalton Highway near Bettles. WILD RIVER VENTURES again operated their underground drift mines on Lake Creek in the Chandalar mining district with mechanized hoisting equipment. During the winter, they brought over 5,000 tons of high-grade gravel and loose bed-rock to the surface, where they stockpiled it for summer sluicing. The DGGs survey indicates that WILD RIVER VENTURES continues to be the only producing drift-mining operation in Alaska.

WESTERN REGION

About 40 mechanized operations produced 40,000 oz of gold, an 11-percent increase from 1984 production of 36,000

oz. About 80 percent of the production was derived from various mining districts on the Seward Peninsula; the remainder was from the Ruby and Tolstoi mining districts in the Yukon River drainage.

The Nome operation of the ALASKA GOLD COMPANY (ALASKA GOLD) continued to be the largest mine in the region. In 1985, Dredge No. 6 operated 160 days (from late May to early November) and processed 5,300 yd³/day for a season total of just over 850,000 yd³. Dredge No. 5 did not operate during 1985 because of a lack of thawed ground. An intensive thaw-field drilling program for both dredges will begin in 1986. Lessee WINDFALL GOLD MINING COMPANY mined ALASKA GOLD'S property using scrapers and loaders. They fed their sluice box 4,000 yd³/day for a total

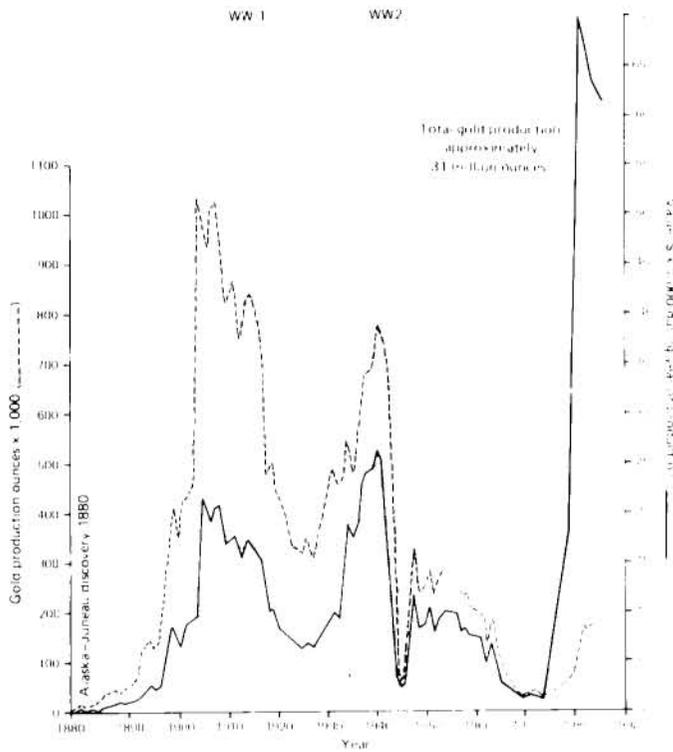


Figure 19. Gold production in Alaska, 1880-1985.

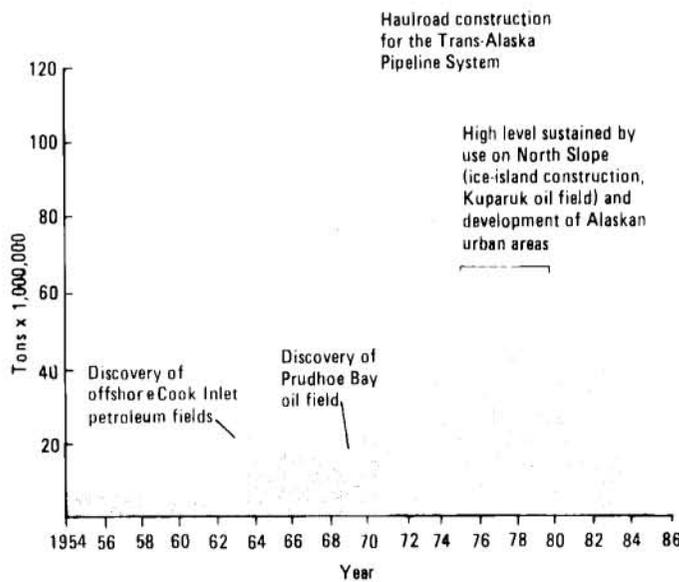


Figure 20. Sand and gravel production in Alaska, 1954-85.

of 600,000 yd³ during the season. ALASKA GOLD'S Hogatza Dredge has not operated since 1983. INSPIRATION RESOURCES, INC., produced gold from their offshore dredging operation just off the coast near Nome (fig. 23).

The ENGSTROM, TWEET, and PETERSON families operated floating bucket-line dredges (1½ to 3 ft³ capacity) on Quartz and Henry Creeks in the Kougarak and Council mining districts, respectively. MACKLIN PLACER MINES tested and mined ground on Ruby and Anvil Creeks near Mt. Distin, and

Table 6. Reported gold production, number of operators, and industry employment in Alaska by region and mining district, 1985.

Region and mining district	Mechanized operators	Production (troy oz)	Number of employees
Northern	18	14,400	70
Chandalar			
Shungnak			
Koyukuk-Nolan			
Western	40	40,000	340
Nome			
Kougarak			
Koyukuk-Hughes			
Port Clarence			
Fairhaven			
Ruby			
Solomon			
Koyuk			
Council			
Eastern interior	135	66,000	740
Circle			
Livengood-Tolovana			
Fairbanks			
Fortymile			
Manley-Eureka			
Richardson			
Bonnifield			
Kantishna			
Rampart			
Southcentral	38	52,500	263
Cache Creek			
Nizina			
Chistochina			
Valdez Creek			
Kenai Peninsula			
Nelchina			
Southwestern	32	17,000	125
Innoko-Tolstoi			
Iditarod -			
George River			
Moore Creek			
Nyac			
Crooked Creek			
Lake Clark -			
Mulchatna			
Southeastern and Alaska Peninsula	3	100	2
TOTAL	266^a	190,000	1,540

^aSurveys by Peterson and others (1986) indicate that 319 small, medium, and large placer-gold mines and 91 recreational ventures are active statewide.

TACHICK MINING COMPANY mined the Carra Lee Bench near Nome. AU MINING COMPANY and CLARA BEATRICE, INC., completed successful placer-mining seasons in the Candle mining district on the eastern Seward Peninsula; sonic drilling substantially improved their reserve base. Other nonfloat mining activities on the Seward Peninsula include

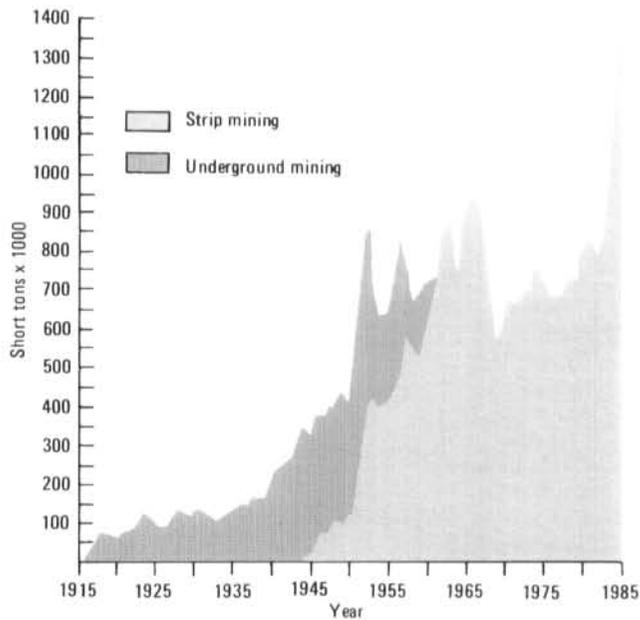


Figure 21. Coal production in Alaska, 1915-85.

D.B. PARENT on Bear Creek and BERG AND WETLESEN on Jump Creek and Bull Hill. ALASKA PLACER COMPANY (formerly LOST RIVER MINING) produced nearly 400,000 lb of high-grade cassiterite concentrate from Cape Creek on the western Seward Peninsula. This mine has produced since 1902 and is presently the largest primary source of tin in the United States.

At least six operations produced in the Ruby mining district and five in the Tolstoi mining district. SWIFT CREEK MINING worked in the Basin Creek drainage of Ruby

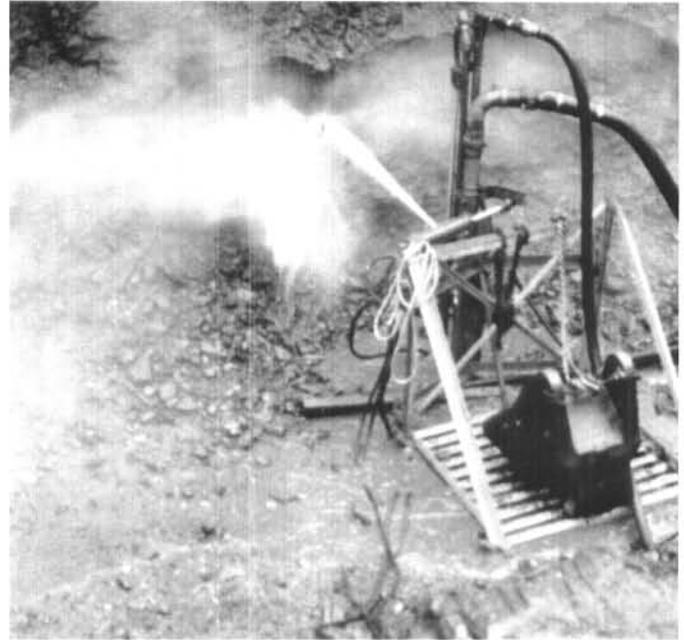


Figure 22. A high-velocity water jet is tested in a deep placer-mine cut near Fairbanks, Alaska. The test was funded by the Placer Mining Demonstration Grant Project. Photograph by G.R. Eakins, 1985.

Creek, but had difficulty obtaining permits for the operation. ROSANDER MINING COMPANY employed a crew of eight on Colorado Creek in the Tolstoi mining district. ALAMIN MINING worked Bear Creek, PETE SNOW sluiced upper Colorado Creek gravels, and DEGNAN MINING took another cut from their ground on Madison Creek. The SHERRER/LACROSS partnership continued to develop a

Table 7. Reported sand-and-gravel production and industry employment by region, 1985.

Region	Volume (short tons)	Number of respondents	Stated value ^a	Number of employees
Northern	16,735,000	7	\$ 4.12/ton	700
Western	17,900	12	3.25/ton	25
Eastern interior	1,662,000	10	3.88/ton	185
Southcentral	7,979,500	22	3.75/ton	325
Southeastern	613,600	8	3.70/ton	165
Southwestern	26,080	2	46.00/ton	15
Alaska Peninsula	300,000	3	2.50/ton	20
Other statewide DOTPF ^b contracts	850,000	-	2.50/ton	--
TOTAL	28,184,080	64		1,435

^aThe stated value for each region is the weighted average values given either in questionnaires or from a telephone survey of private gravel operators, oil companies, and the Alaska Department of Transportation and Public Facilities (DOTPF). Northern region production value includes only costs incurred by raw extraction; lease and transportation expenses are not included.

^bBecause the DOTPF figures for the northern and southern regions were not completely compiled by the January report deadline, the stated volume is conservative.

drift mine on Boob Creek and recovered gold from pre-World War I drift-mine tailings piles.

EASTERN INTERIOR REGION

About 135 mechanized mines in this region produced 66,000 oz of gold, a 6-percent decrease from 1984 production. This amounts to about 34 percent of the statewide bullion production, down from 40 percent in 1984. Lower gold prices, exhaustion of easy-to-mine reserves, and water-quality regulations affected the 1985 production. Alaska's largest placer camp is located in the Circle mining district and borders, or is part of, the Steese National Conservation Area, the Yukon-Charley Rivers National Preserve, and the Birch Creek Wild and Scenic River System.

Several of the 40 mining companies that operated in the Circle mining district are listed here: EAGLE ROCK/BURNS operation on Bottom Dollar Creek, UNDERWOOD MINING on Porcupine Creek, THE MINING COMPANY on Faith Creek, DOXAUCO on Half Dollar Creek, BATEST MINING on Birch Creek, LESTER MINES on Butte Creek, the ECHOLA operation on Wickersham Creek, PAVEY MINING COMPANY on Nome Creek, JOHNSON MINING COMPANY and HOT CLAIMS COMPANY on Ketchum Creek near Central, STAN GELVIN on Crooked Creek, GHD RESOURCES on Eagle Creek, LAKEWOOD MINING on Mammoth Creek, and POLAR MINING on Crooked and Mastadon Creeks. These companies (and others) contribute significantly to the economy of the Circle City, Central, and Steese Highway areas.

Results of the DGGs survey showed a decrease in the number of operators in the Fortymile mining district in 1985. AURUM PHILOSOPHRUM again mined on Chicken Creek, but indicated that difficulty in obtaining permits substantially shortened their work season. Several past producers who responded to DGGs questionnaires, including ROYANN MINING and KAVIC MINING on Jack Wade Creek, indicated that they did not produce in 1985.

Placer mining continued at relatively low levels in the Manley and Rampart mining districts. Those active in 1985 included JOHN SCHILLING in the Rampart mining district and SHIMSKY MINING on Eureka Creek near Manley. In late fall, BURGESS MINING began to develop a drift mine on Sullivan Bench at Tofty. WAYNE GIBSON mined placer deposits of cassiterite in the Tozimoran area north of Tanana.

The Livengood mining district maintained previous production levels, but experienced regulatory difficulties. Long-time producer MAMMOTH MINES on Wilbur Creek was cited for noncompliance with water-quality regulations and faced court action. NELSON MINING approached the end of their paystreak on Amy Creek. The KNAEBEL/HANNEMAN partnership mined on the Livengood Bench.

Gold producers in the Fairbanks mining district included LUCKY SEVEN MINING on Fish Creek; SMITH BROTHERS MINING on Nugget Creek, a tributary of Smallwood Creek; and COOK'S MINING on Fairbanks Creek. Production reportedly dropped by 15 percent from previous years.

After several years of dormancy, there was some renewed activity in the Tenderfoot or Richardson mining district.



Figure 23. Clamshell recovers paydirt from an offshore mining dredge operated by Inspiration Resources, Inc., Nome, Alaska. Photograph by J.L. Gallagher, 1985.

ANDERSON MINING and KEN BEVARD conducted small-scale gold recovery on Tenderfoot Creek, where they exploited former drift-mine tailings piles.

Placer-gold mining was the dominant economic enterprise in the Kantishna mining district in the central Alaska Range. About 17 operations mined gold during the May to October season. However, on July 22, 1985, Kantishna-area miners received a preliminary injunction by the U.S. District Court of Alaska that prevented the National Park Service (NPS) from approving plans of operation in national parks until individual environmental analyses and a cumulative environmental-impact statement were completed. Existing NPS approvals were declared void. Later court decisions rescinded an earlier action that would have closed the mines on September 5, at least a month before normal seasonal shutdowns. Thus the miners were allowed to complete the 1985 season. This severe action affects 30 mines that employ at least 175 people in the Denali National Park and Preserve (Kantishna mining district), the Yukon-Charley Rivers National Preserve (Coal Creek and the Circle mining district), and the Wrangell - St. Elias National Park and Preserve (Chitina, Shushana, and Nizina mining districts). The NPS strongly recommended that miners in the Kantishna mining district submit a detailed plan of operation by December 31, 1985. The NPS might then be able to conduct appropriate environmental reviews before the plan is approved, and the miners might be allowed to operate in 1986. Unfortunately, the NPS memoranda suggest that more stringent reviews are required for the Yukon-Charley Rivers National Preserve and Wrangell - St. Elias National Park and Preserve. Hence, 1986 mining activities in these units are more doubtful.

The Bonnifield mining district east of Healy continued to support eight mining operations: three on Moose Creek, two on California Creek, and one each on the Totatlanika River,

St. George, Rex, and Tatlanika Creek drainages. As suggested by Metz (1985), this mining district may contain very large, low-grade gold placers hosted in Tertiary gravels. Many placer deposits in the eastern part of the mining district apparently represent very large bench placers that do not correspond to present drainage patterns. Preliminary work tends to confirm this hypothesis.

Metals were produced from at least three hard-rock mines in the eastern interior region. JOHN MILLHOUSE shipped stibnite (antimony) ore from his mine in the Kantishna mining district, and another operator shipped small amounts of stibnite ore from his mine in the Fairbanks mining district. Stibnite ores were also recovered from deposits on Sawtooth Mountain west of Livengood. The GRANT GOLD MINE JOINT VENTURE recovered 1,563 oz of gold and 1,178 oz of silver from 5,036 tons of ore milled from October 20 to December 17. Recovery was about 90 percent for both metals.

SOUTHWESTERN REGION

About 32 mining operations produced 17,000 oz of gold and approximately 2,190 oz of silver in the southwestern region during 1985, a 6-percent increase from the previous year. Regional mines employed more than 125 people and represented a significant percentage of private-sector jobs in the sparsely populated area. About 70 percent of all employees are from local communities. Some of the larger operations in the Innoko, Iditarod, and Nyac mining districts had good seasons, and production was increased at a new operation in the remote George River drainage east of the Iditarod mining district. In the Innoko mining district, the MAGNUSON MINE had a good year on Ganes Creek. SMOKEY STOVER and BABE and EEP ANDERSON reactivated the Yankee Creek placers that were dormant for many years after the ROSANDER/REED shutdown in 1968. O'CARROLL mined the Spruce Creek deposits, and PAUL SAYER operated on nearby Little and Ester Creeks. JOHN WORTMAN produced a small amount of gold on Ophir Creek, and the NORCROSS/STONBERG partnership continued their long-time venture on Anvil Creek. An 8-in.-diam suction dredge recovered gold from the Innoko River near the town of Ophir.

In the Iditarod mining district, the MISCO-WALSH COMPANY (the John Miscovich family operation) again mined old dredge tailings of the RILEY CREEK DREDGE COMPANY on Otter Creek, where they recovered pay with a backhoe and front-end loader. Evidently the earlier dredging operations 'bounced' over bedrock paystreaks and left areas with good pay (fig. 24). Miscovich indicated that in 1986 he will use hydraulic-mining methods and recycling technology to mine hard-rock and residual deposits rich in tungsten, gold, silver, and zirconium in the Golden Horn shear zone (fig. 25).

FLAT CREEK PLACERS stripped overburden and mined part of the Willow Bench after a year of development work in 1984. The ALVIN AGHOFF family made a cut on Prince Creek, and ANN WILLIAMS mined on Granite Creek. KEN DAHL mined a unique residual placer deposit on the Idaho Claim near the summit of Chicken Mountain south of Flat;



Figure 24. Inactive Riley Creek dredge on Otter Creek near Flat, Alaska. Photograph by T.K. Bundtzen, 1985.



Figure 25. Head frame of the Golden Horn tungsten-gold-silver deposit near Flat, Alaska. Photograph by T.K. Bundtzen, 1985.

gold-bearing quartz veins directly underneath the paystreak are probably the source of the placer gold. ALASKA CONSTRUCTION AND MINING (Don Harris) continued work on Deadwood Creek, and L.E. WYRICK had another successful year on Granite Creek at the headwaters of George River (fig. 26).

GLENN BASS mined a small bench that overlooks Michigan Creek, also a tributary of George River. The WILMARTH BROTHERS did not mine on nearby Julian Creek because of difficulties with water-quality requirements. They hope to operate the mine in 1986 after the regulatory problems are solved. The LYMAN BROTHERS again mined the Donlin Bench at Snow Gulch, a tributary of Crooked Creek; this

ground is leased from the CALISTA NATIVE CORPORATION. Other Native groups, including DOYON, LTD., which holds placer ground in the Iditarod-Flat and Innoko-Candle mining districts, have expressed interest in leasing properties to mining companies.

The NORTHLAND DREDGING COMPANY (NORTHLAND) did not resume production with their rebuilt 3-ft³ dredge on the Tuluksak River, but federal action in 1985 may clear the way for future operation. In July, the Interior Board of Land Appeals (IBLA) upheld a February decision by the U.S. Bureau of Land Management (BLM) to allow NORTHLAND to proceed with operations in the historic Nyac mining district near Bethel. Earlier, various interest groups opposed the BLM decision because it did not include an environmental-impact statement. Twice BLM has granted NORTHLAND permission to mine, and both times local conservation groups and residents appealed to IBLA. The nearby TULUKSAK DREDGING COMPANY operated their floating dredge for the 13th consecutive year.

HOWARD BOWMAN developed and mined the Bowman Group on Portage Creek on the north side of Lake Clark using magnetometer surveys to delineate placer pay zones. FORTYSEVEN CREEK MINES worked ground on Fortyseven and Taylor Creeks in the uplands south of the Kuskokwim River. Part of their work included road building, stripping, and placer and lode sampling to prepare for larger scale mining in 1986.

JAMES R. WYLIE again operated the Mountain Top Mercury Mine southwest of Sleetmute. His primary obstacle in increasing the scale of mining is the low price of mercury. HANSON PROPERTIES, owners of the Goodnews Bay Platinum Mine, did not operate in 1985; they are seeking a buyer for the property.

SOUTHCENTRAL REGION

Gold production from 38 mine operators in the south-central region totaled 52,500 oz, a 41-percent increase from 1984. The 1985 estimate indicates the region is responsible for 28 percent of total statewide production, compared with about 20 percent last year. The increased gold output is primarily due to the activities of two highly successful non-float, mechanized placer-gold mines in the Denali and Chistochina mining districts on the southern flank of the Alaska Range.

DENALI MINES, INC. (DENALI), 51 percent of which is owned by CAMINDEX MINES, INC., (Canada) continued to be Alaska's largest gold producer. In 1985, about 31,000 oz of placer gold with an average fineness of 852 was recovered from 355,000 yd³ of gravel. Stripping operations moved about 1,700,000 yd³; the waste/ore ratio was about 5:1. The average grade of sluiced material was approximately 0.085 oz/yd³ gold and 0.016 oz/yd³ silver, for an average value of \$31/yd³ at 1985 prices. The mine site includes a complete shop, bunkhouse, mess hall, library, office complexes, and security offices, as well as a washing plant and gold-recovery system of jigs, slurry pipeline, and gold wheels. A suction-dredge that tested the grade of material left in the channel after mining demonstrated that recoveries by DENALI exceed 90 percent (fig. 27). The number of employees on the property ranged from 53 to 105 during the April to November mining



Figure 26. Miner pans a rich paystreak from a rhyolite dike in a mine cut at L.E. Wyrick's operation on Granite Creek near Sleetmute, Alaska. Photograph by T.K. Bundtzen, 1985.



Figure 27. The 'A' channel of Denali Mines, Inc., is incised in bedrock. The steep-walled cut (foreground) defines the channel limits into and on the bedrock strata. The mine is located on the south flank of the Alaska Range east of Cantwell, Alaska. Photograph by Arne Bakke, 1985.

season, with peak employment during drilling programs conducted by WGM, INC., (Anchorage). Geophysical surveys and over 30,000 ft of drilling extended the paleochannel upstream for 8,000 ft, which assures continued production. Mine employees include residents of Glennallen, Cantwell, Paxson, Talkeetna, Healy, and Gakona. Consequently, the operation is probably the most important private-sector employer in this part of the southcentral region.

In response to environmental regulations, DENALI uses a system of five terraced settling ponds and recycles as much mine water as possible. In addition, various grasses and pioneer

plant communities are being tested on tailings for seeding programs. The company has a production goal of 45,000 oz of placer gold for the 1986 season.

ALASKA MINERAL RESOURCES COMPANY mined on Slate and Ruby Creeks in the Chistochina mining district in the eastern Alaska Range on ground formerly worked by RANCHERS EXPLORATION AND DEVELOPMENT, INC. Partners in this joint venture include HARRISON WESTERN CORPORATION and NORTHERN MINERALS COMPANY. In addition to mining, the company extensively modified the washing plant and conducted a \$1.2 million sonic-drilling program. They anticipate nearly \$4 million in additional development expenditures in 1986. Cash-flow estimates for 1985 exceeded \$2.5 million.

The formerly successful NELCHINA MINES, INC., did not mine on Yako Creek in the Nelchina mining district north of the Glenn Highway in 1985, reportedly because of state turbidity standards. The company did some development drilling and anticipates production in 1986, pending resolution of the water-quality permitting problems and acquisition of an additional partner. Six other small-scale mechanized mine operators in the region also indicated that water-quality permitting requirements prevented gold production in 1985. These miners hope to mine in 1986 with improved washing plants and mining methods.

Three mine operators reported production in the Cache Creek - Talkeetna Mountains area. HOWARD McWILLIAMS mined for 133 days on Chunilna and Johns Creeks. MIKE McDANIELS and ALASKA PLACK AND PLACK each processed gravels in the Little Susitna River east of Willow; the latter used a dozer and dredge.

In the Wrangell - St. Elias National Park and Preserve, HOFFMAN MINING (HOFFMAN) mined on patented ground at Rex Creek in the historic Nizina mining district near the Kennecott Copper Mine. At present production rates, HOFFMAN'S reserve base will provide at least 7 yr of mining.

On the Kenai Peninsula, production is predominantly from small suction dredges and small-scale dozer/back-hoe operations. Those who reported details of their 1985 operations include JONES AND COMPANY near Moose Pass, GAEDE AND LINDMAN DREDGING at Heaven's Gate and Canyon Creek, and ROBERT TITCHEVAL on Busch Creek.

Hard-rock mining was confined to gold and silver properties. LIGHTFOOT MINING COMPANY (LIGHTFOOT) mined and processed selected high-grade ore from their gold-carbonate-quartz lode on Black Creek about 7 mi east of the Denali Mine. The LIGHTFOOT operation uses a small, 5-tpd gravity mill to process the ore (fig. 28). Based on subsurface drilling and drifting, they reported an inferred reserve of 140,000 tons of mineralized rock. The geology of the area is summarized by Smith (1981). SILVER STAR MINING (the Barry Brothers) continued work at their Silver Star and Pandora tetrahedrite-rich (silver) lode system on Mill Creek in the Wrangell - St. Elias National Park and Preserve. Low silver prices and environmental restrictions limited production in recent years, including the 1985 season. The company reportedly produced about 30,000 oz of silver during past mining seasons. GOLD CORD DEVELOPMENT CORPORATION again worked the Gold Cord Mine in the Hatcher Pass area, but no production was reported.



Figure 28. This hard-rock gold mill owned by the Lightfoot Mining Company is located on Black Creek, Valdez mining district, Alaska. Photograph by Arne Bakke, 1985.

SOUTHEASTERN AND ALASKA PENINSULA REGIONS

Very little metal production was reported in these two widely separated regions. LORENA and KNOX CHRISTIE worked on Shuyak Island west of Kodiak on lode and placer deposits. JAMES McGLAUGHLIN used a suction dredge to recover gold on McKinley Creek, a tributary of Porcupine Creek near Haines. No other metal production was reported.

INDUSTRIAL MINERALS

The value of industrial-mineral production in 1985 totaled over \$124 million, a 12-percent increase from 1984 and about the same level as 1983 (table 5). The volume increased only about 4 percent in contrast to the 12-percent increase in value because of stepped-up construction on the North Slope, where aggregate has a higher monetary value (table 7).

In addition to petroleum companies on the North Slope, other users of sand and gravel and building stone are Alaska's four largest urban areas: Anchorage, Fairbanks, Juneau, and Ketchikan. State-funded capital-improvement projects in Bethel and on the Kenai Peninsula used substantial amounts of sand and gravel, as did road-improvement projects funded by the Department of Transportation and Public Facilities in the eastern interior and southcentral regions. However, sand-and-gravel production in urban areas leveled off as state funding for capital projects decreased due to a drop in oil-royalty revenues.

By volume, fill was the primary use of gravel in 1985 (74 percent), followed by concrete aggregate (15 percent), asphaltic concrete (5 percent), road base and covering (3 percent), and snow-and-ice control (3 percent). Increased production

of concrete aggregate amounted to nearly 35 percent of total aggregate volume used in the Fairbanks and Anchorage areas. The importance of this commodity to Alaska's development is evident in the following regional summaries.

Continued import of clinker (for grinding in Anchorage) contributed to the supply of Portland cement. Agricultural limestone was mined on the Kenai Peninsula. Building stone was quarried for rip-rap, ornamental uses, and various construction projects statewide.

NORTHERN REGION

Oil-field-development projects on the North Slope continued to be the major consumers of sand-and-gravel in Alaska. From 1974 to 1979, 107.4 million tons of gravel were used for causeway, pad, and haul-road construction. In 1985, six major corporate users and the North Slope Borough indicated that 16.7 million tons of sand and gravel were used on the North Slope. This represents an increase of nearly 35 percent from 1984. The principal need for sand and gravel is for infrastructure development associated with satellite oil fields near the Prudhoe Bay oil field. More than 700 employees were directly involved in sand-and-gravel operations on the North Slope.

ALASKA INTERNATIONAL CONSTRUCTION - MARTIN JOINT VENTURE, INC. (AIC-MARTIN), a subsidiary of the ENSERCH CORPORATION, was the contractor for the largest single earthmoving project in North Slope history, the construction of SOHIO'S Endicott Causeway in 1985. The causeway extends about 6.5 mi offshore in water up to 12 ft deep and permits development of the Endicott oil field. Two other components of the project, the main production island and the satellite drill station, were completed in September 1985. The causeway features two breaches that allow passage of coastal currents important to movement of marine life. About 9.5 million tons of gravel were hauled by a fleet of 44 B-70 dump trucks from an existing materials site 11.5 mi inland on the flood plain of the Sagavanirktok River (fig. 29). Excavation required drilling and blasting the frozen aggregate. Up to 80,000 tons of gravel were moved daily. SOHIO plans to drill 50 wells from the causeway and islands and install a flowline manifold and separation tank facility.

Gravel-island technology advanced significantly with construction of the \$25 million Northstar Island (AMERADA HESS) by AIC-MARTIN (fig. 30). Numerous manmade gravel islands in the Beaufort Sea have been effectively used as bases for petroleum drilling operations. To protect the slopes of these islands from erosion, builders have traditionally used gravel-filled bags. However, maintenance costs can be high—as many as 20 percent of the bags may require replacement annually. On Northstar Island, AIC-MARTIN used large concrete blocks to protect the island against erosion from moving pack ice and wind-driven summer waves. The contractor produced several hundred 4-ft² by 9-in.-thick concrete blocks per day from their North Slope plant, with six-person crews working two 12-hr shifts. About 12,000 blocks were needed for the project. Project designer McCLELLAND-EBA, INC., (Anchorage and Calgary) worked in conjunction with

California consultant TAKMARINE to design a hexagonal shape for the island that allowed square concrete blocks to be used for slope armoring. Other North Slope gravel islands are round and require trapezoidal concrete blocks, which are more expensive.

Northstar Island was constructed in the Beaufort Sea 3 mi north of Long Island in 49 ft of water. Nearly 1.4 million tons of gravel were trucked directly to the site over manmade ice roads. The extremely wide roads allowed hauling to continue on half of the road while repairs and maintenance were performed on the other half. Northstar Island hosts a drill rig and support facilities, including a camp, boat dock, and heliport. Located nearly 8 mi from shore, the island will be supplied by boat and helicopter during the summer and by trucks via an ice road during the winter.

SHELL OIL COMPANY contracted AIC-MARTIN to construct the Sandpiper gravel island northwest of Northstar Island in 50 ft of water, a record depth for gravel-island construction in the Beaufort Sea. The project used 1.4 million tons of gravel. ARCO used an estimated 3.8 million tons of gravel for various construction projects, including drill sites and road construction.

In the near term, gravel islands are preferred over the more expensive concrete or steel structures used by Canadian operators in the Beaufort Sea. However, tests conducted by SOHIO in 1985 using sprayed seawater to create ice islands suggest this technology may eventually be used in water that is greater than 40 ft deep.

Gravel production continued in 1985 from five hydraulic floating dredges owned and operated by the North Slope Borough. The dredge fleet includes the Arctic Star at Point Lay with a 12-in. suction head, the Immunik at Wainwright with a 16-in. suction head (fig. 31), the Nivakti at Atkasuk with a 16-in. suction head, a 12-in. dredge at Kaktovik, and the Savakti or 'worker' dredge at Barrow. Each dredge mined 150,000 to 300,000 tons of aggregate per season since 1982. The dredges operate similarly to the historic floating bucket-line gold dredges and have crews of four to 10 people. A sliding-square spud design, light-weight hulls, and modern cutting heads are characteristic (fig. 32). The sand and gravel are used to construct roads, runways, and other facilities throughout the borough. The 1985 projects included a runway for Atkasuk and sanitary landfill at Wainwright.

WESTERN REGION

Most of the 17,900 tons of sand and gravel produced in western Alaska was used to repair roads on the Seward Peninsula. These include culvert and washout repairs along the Nome Council Road, the Nome Kougarok Highway, and streets and roads within the Municipality of Nome. Gravel usage in other areas in the region, including Kotzebue, is unknown. Aggregate production in the region will increase significantly in 1986 and 1987 if the anticipated 57-mi-long-road associated with the Red Dog project is constructed. The region's major stone project was rip-rap armoring at the Port of Nome.



Figure 29. B-70 dump trucks haul gravel from a materials site on the flood plain of the Sagavanirktok River, Alaska. Photograph by Photo Pros, courtesy of Ensearch-Alaska Services, Inc., 1985.

EASTERN INTERIOR REGION

About 1.7 million tons of sand and gravel were produced in the eastern interior region, a 5-percent increase from the previous year. The increase was due to numerous building projects by the private sector to prepare for the arrival of a new U.S. Army Light Infantry Division at Fort Wainwright near Fairbanks. Production of sand and gravel for state-funded capital-construction projects generally fell below 1984 levels. Considerable aggregate was used to construct clover-leaf intersections at North Pole and at the confluence of Airport Road and the Parks Highway in Fairbanks. FOUNTAINHEAD CONSTRUCTION, INC., has a large suction-dredge operation at a pit near North Pole and smaller production units throughout the Fairbanks North Star Borough. The dredge operation significantly lowered sand-and-gravel production costs for this company. FAIRBANKS SAND AND GRAVEL operated their Tanana Gravel Pit with a $4\frac{1}{2}\text{-ft}^3$ clamshell dredge on a state lease on the Tanana River flood plain.

EARTHMOVERS, INC., mined from pits throughout the Fairbanks area and extracted pit-run flood-plain aggregate

from the Tanana River and from placer-mine tailings at Ester, just outside of Fairbanks. H AND H CONTRACTORS primarily mined with draglines near the Chena River. Other interior-region companies active in 1985 include EVECO, INC., which processes placer-mine tailings at Fox, INTERIOR EXCAVATION, WARREN TRUCK AND TRACTOR, McPEAK SAND AND GRAVEL, KNIK CONSTRUCTION COMPANY, and YUTAN CONSTRUCTION COMPANY.

Department of Transportation and Public Facilities (DOTPF) projects that used aggregate and building stone in the eastern interior region included the Delta Erosion Project, an extensive rerouting and rebuilding of the Alaska Highway between Delta and Tok, and work on the Taylor and Steese Highways. Sand, gravel, and building-stone industries throughout the eastern interior region reportedly employed 185 people, excluding DOTPF-contracted work.

YUTAN CONSTRUCTION COMPANY (Carroll-Vondra partnership) mined about 400,000 tons of basalt from their Browns Hill quarry off Badger Road. The material was used as rip-rap, road metal, crushed fill for leach fields, and ornamental stone. About 20 people were employed at the quarry.



Figure 30. Northstar Island (Beaufort Sea) was completed in 1985. Concrete blocks on the slopes of the island replace the gravel-filled bags traditionally used to protect gravel islands from erosion by pack ice and wind-driven summer waves. Photograph courtesy of AIC-Martin J.V., Inc., 1985.

SOUTHWESTERN REGION

Production of 26,080 tons of sand and gravel was reported for the southwestern region. Almost 95 percent of the total was used for a bulkhead and channel-armoring project in Bethel. The GALLIETT COMPANY and GEORGE SILIDES completed part of a \$15-million contract to control erosion along the Kuskokwim River, which threatens the town. In 1981, the U.S. Army Corps of Engineers estimated that shoreline erosion along the river bank at Bethel averaged 10 ft/yr, and by the year 2030, this erosion would affect about half the townsite. The project used 6,950 ft of steel piling backfilled with sand and gravel that cost nearly \$46/ton. Most sand and gravel for the project was extracted from channel lag deposits at Birch Creek Crossway and other sites on the Kuskokwim River near Aniak, 100 mi upriver from Bethel. Gravel is mined from state leases and Native corporation land. Native groups near Aniak oppose the mining of channel lag deposits because they believe it disrupts fish runs. They are asking the State and gravel users from Bethel to find upland sources of aggregate. In response to their request, DNR will

examine the region for upland gravel sources as part of a resource assessment and planning effort for the Kuskokwim area. DGGs will conduct this investigation for the Division of Land and Water Management.

Another materials problem for the Kuskokwim Delta is the absence of rock quarries for rip-rap. In 1985, about 8,000 tons of granite from Valdez were barged to Bethel to armor and stabilize the banks of the Kuskokwim River. Barges were exposed to the open sea on this long haul, and a Calista Corporation barge sank enroute to Bethel in October, with \$140,000 of building stone on board. CALISTA CORPORATION is developing a rock quarry at Goodnews Bay and has constructed a 2-mi-long access road. A four-person crew is currently developing the property, which is owned by KUIT SARAH VILLAGE CORPORATION. Other potential building-stone sites include Unalaska Island and Seldovia.

Because of its concern about erosion, the City of McGrath contracted LUNDELL AND ASSOCIATES (LUNDELL) to study the feasibility of armoring banks of the Kuskokwim River upstream from a potential oxbow cutoff. The LUNDELL study suggests using about 40,000 tons of rip-rap

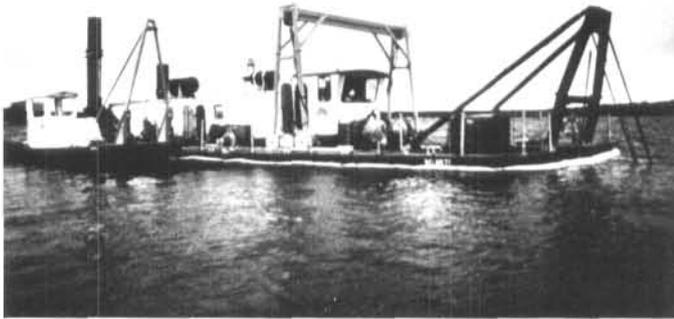


Figure 31. The Immunik dredge at Wainwright, Alaska, has a 16-in. suction head. Photograph courtesy of Rittenhouse, Zeman, and Associates, Inc., 1985.

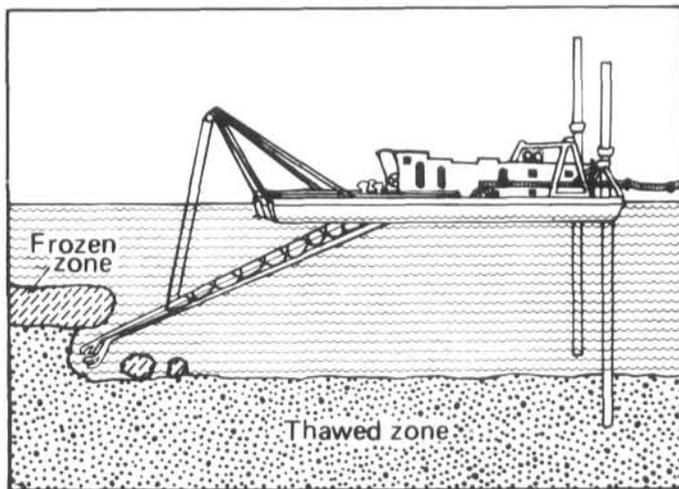


Figure 32. Diagram illustrating how frozen sand and gravel are mined by the Immunik dredge at Wainwright, Alaska. Modified from data from Rittenhouse, Zeman, and Associates, Inc., 1985.

for the job and initially recommended a materials source in the Bethel area. Potential rip-rap and bank-armor materials are identified in DGGs Professional Report 79, 'Geologic map of the McGrath D-6 Quadrangle, Alaska' (Bundtzen and Laird, 1983). DGGs, DOTPF, and LUNDELL may further explore local quarry prospects in 1986.

SOUTHCENTRAL REGION

Use of sand-and-gravel in the southcentral region has decreased as the number of state-funded projects diminishes due to lower oil prices. Nevertheless, nearly 8 million tons of gravel were quarried in 1985, about 20 percent less than in 1984.

About 3.94 million tons, or 49 percent of the production, were hauled from pits in the Palmer-Wasilla area to Anchorage on the Alaska Railroad. This is a 40-percent decrease from the record 6.54 million tons hauled by the railroad in 1984

(table 8). About 60 percent of the rail haul originates from ANCHORAGE SAND AND GRAVEL; the remainder is from ALASKA GRAVEL SALES, BIG LAKE SAND AND GRAVEL, INC., STEPHEN AND SONS, WASILLA AGGREGATE, CENTRAL PAVING PRODUCTS, and KLONDIKE ALASKA, INC. The Alaska Railroad operated six 80-car unit-trains daily to haul gravel during the 1985 construction season; eight trains per day were used in 1984. SUMMIT PAVING AND CONSTRUCTION completed an expansion of the Port of Anchorage by diverting ANCHORAGE SAND AND GRAVEL unit-trains directly to the port site, thus avoiding an expensive haul by dump truck. The project turned a 9-acre tidal flat into a parking area now leased to TOTEM OCEAN EXPRESS, INC., by the Municipality of Anchorage.

Increased amounts of gravel were produced within the Municipality of Anchorage in 1985. LAKE OTIS GRAVEL SALES, INC., ROGERS AND BABLER, and CENTRAL SAND AND GRAVEL all produced gravel in 1985.

EAGLE DOME AGGREGATE, INC., mined gravel from their pit at Eagle River and trucked it to construction projects in north Anchorage. Smaller producers in the southcentral region are HAWLEY'S TRUCKING, OTECO, INC., WILSON CONSTRUCTION, WILDER CONSTRUCTION, and KNIK CONSTRUCTION COMPANY.

N.R. ENTERPRISES produced gravel for local projects in Glennallen. GRAVEL, INC., mined glacial-outwash gravels near Valdez. SUNRISE EXPLORATION SERVICES mined building stone from their quarry on Hope Road off the Seward Highway. Over 8,000 tons of granite were quarried near Valdez and shipped to Bethel by barge for flood-control and river-engineering projects.

ALASKA PENINSULA REGION

KONIAG, INC., and KODIAK CONTRACTORS, INC., mined gravel on Kodiak Island for road repair and construction projects. DOTPF subcontracted projects in several communities in the Alaska Peninsula region, including Naknek and Unalaska. Long-time gravel operator ALEUTIAN AGGREGATE VENTURES reportedly shut down in 1985.

SOUTHEASTERN REGION

A total of eight sand-and-gravel companies and federal and municipal governments reported producing 616,600 tons of gravel worth \$2.28 million, about a 300-percent increase above the 220,000 tons reported in 1984. The 1985 telephone survey indicated that production was significantly understated in previous annual reports, and most southeastern operators felt that their 1984 activities decreased by 5 to 10 percent in 1985.

The largest single producer of sand and gravel continued to be JUNEAU REDI MIX, INC., which produces gravel for concrete, plaster, gunnite, and fill from their Lemon Creek pits in Juneau. RED-SAMM CONSTRUCTION, INC., produced sand and gravel from pits throughout the Panhandle, and CHANNEL CONSTRUCTION, INC., (Juneau) mined gravel

and loose rock for asphaltic concrete. ISLAND CONSTRUCTION, INC., used minor amounts of sand and gravel to repair roads at Klawock. Government users of aggregate for landfill and road repairs in the Panhandle include DOTPF, the U.S. Bureau of Indian Affairs, the U.S. Forest Service, and the City of Ketchikan. KETCHIKAN RED MIX AND QUARRY mined about 50,000 tons of basalt for blacktop and shot-rock applications in the Ketchikan Gateway Borough.

COAL AND PEAT

Coal mining had a milestone year in 1985, and numerous employment, production, and output records were broken. The USIBELLI COAL MINE (USIBELLI), the only major operating coal mine in Alaska, produced an estimated 1,370,000 tons of coal. This is about a 48-percent increase over the previous state record set in 1966, when 926,000 tons were produced by several mines in the Matanuska and Healy coal fields. Table 9 summarizes the 1985 market breakdown for USIBELLI. In December, a monthly production record of 151,916 tons of coal was set despite a fire that severely damaged the conveyor system that transported coal from the crushers across the Nenana River to the automated unit-train loading facility. During 1985, 138 unit-trains that each carried 5,100 to 5,500 tons of coal arrived at Seward, where the coal was loaded onto 60,000- to 120,000-dwt ships bound for South Korea (fig. 33).

In 1985, concern was voiced over the status of the KOREAN ELECTRIC POWER COMPANY'S (KEPCO) contract for USIBELLI coal. The contract allows for some fluctuation of annual coal shipments above or below the base amount, depending on several market factors. KEPCO also purchases coal from Canadian and Australian mines and will import Alaska coal at a base level of 800,000 ton yr.

Spontaneous combustion has not been a problem during transport of Alaska coal. The performance of USIBELLI coal has demonstrated that the coal is suitable for boilers, and its coal-and-ash handling properties are generally favorable compared to Canadian coal. However, Alaska coal produces 210 megawatts/ton compared with 270 megawatts/ton for coal from Crowsnest, British Columbia.

A telephone survey of peat producers indicated that 85,000 yd³ of peat valued at \$550,000 were produced in 1985, a 42-percent decrease in value and volume from 1984 levels. Most peat producers were disappointed that the high level of construction in Anchorage and Fairbanks during 1984 did not produce a greater demand for peat use in landscaping and building trim in 1985. Also, heavy rains in both areas during the summer and fall limited production. Chief producers in the Anchorage area—which accounted for 80 percent of statewide peat production—were GORDER EXCAVATING; A & A SERVICES; NORTHWEST LANDSCAPING; COX ENTERPRISES; McKINLEY LANDSCAPING; APE, INC.; SHAMROCK EXCAVATING; and JEFF'S TOPSOIL.

Peat producers in the Anchorage area sell a raw-peat product valued at \$3.50 to \$4/yd³ and a refined horticultural peat blended with sand and red loam (a distinctive Anchorage area soil) valued at \$7 to \$10/yd³. The red loam is a high-quality agricultural soil that is becoming scarce in the Anchorage area and is in high demand for use in blended peat products.

Table 8. Major commodity tonnages hauled by the Alaska Railroad, 1975-85^a (thousands of tons).

Fiscal year	Sand and gravel	Bulk petroleum	Coal	Other ^b	Total
1975 ^c	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 ^c	1,797	379	653	533	3,362
1982 ^c	2,754	439	654	656	4,503
1983 ^c	4,398	462	626	522	6,008
1984 ^c	6,537	498	642	595	8,272
1985 ^c	3,937	553	1,205	694	6,389

^aFigures for 1975-83 modified from Secretary of Transportation (1984); figures for 1984-85 from W.F. Coghill, Alaska Railroad.

^bIncludes forest and agriculture products and manufactured goods.

^cIndicates years that line operated at a profit.

One large and three small companies continue to produce horticultural peat in the Fairbanks area. Their products and prices are similar to those in the Anchorage area. GREAT NORTHWEST LANDSCAPING and COX ENTERPRISES are the interior's largest producers. Peat also continues to be evaluated as a potential energy or horticultural resource in several villages, including McGrath and Dillingham.

Table 9. Market breakdown for 1985, Usibelli Coal Mine, Healy, Alaska.^a

Site location	Coal (tons)
Military power plants along rail belt: (Clear and Eielson Air Force Bases and Ft. Wainwright)	405,000
GVEA power plant: (mine mouth, Healy)	150,000
Municipal Utilities System (power plant, Fairbanks)	135,000
University of Alaska	52,500
Local home heating and Alaska Railroad	11,500
Suneel shipments to Korea	616,000
TOTAL	1,370,000

^aInformation provided by the Alaska Railroad, Fairbanks Municipal Utilities System, Golden Valley Electric Association, University of Alaska (Fairbanks) Physical Plant, and Usibelli Mines, Inc.



Figure 33. The collier *Vigan* loads coal at the Seward Coal Terminal, Alaska. Photograph by R.D. Merritt, September 1985.

THE SEWARD COAL TERMINAL

The Seward Coal Terminal was completed with public and private funding in late 1984 at a cost of \$21 million. The facility, which occupies about 34 acres at Resurrection Bay on the southeast coast of Kenai Peninsula (fig. 34), is Alaska's first deep-water coal port. The facility handled about 616,000 tons from USIBELLI in 1985. The terminal is owned and operated by SUNEEL ALASKA CORPORATION, a subsidiary of SUNEEL SHIPPING COMPANY, LTD.

Coal from the Usibelli Coal Mine is loaded on the Alaska Railroad at Healy. From there, it is transported to the Seward Coal Terminal and loaded on 60,000-ton ships (fig. 33) owned by the HYUNDAI MERCHANT MARINE for transport to Pohang, Republic of Korea, where it is unloaded and barged to Honam. The coal is used in the 1,000-megawatt power plant owned by KOREAN ELECTRIC POWER COMPANY (KEPCO). The Honam plant is located on the southern tip of South Korea (Usibelli Coal Mine, 1984).

The terminal facility at Seward includes 12 major components: 1) a new railroad spur; 2) a receiving hopper system; 3) a 6,590-ft-long belt conveyor system; 4) junction towers; 5) rail shakers; 6) a stacker-reclaimer named the 'Big Dipper'; 7) a dust-collection system; 8) a water-spray stockpile fire-fighting system; 9) an operations-control building; 10) a 1,800-ft-long dock trestle system; 11) a dock to support an elevated shiploader; and 12) various marine breasting and mooring dolphins (Suneel Alaska Corporation, 1985).

The port can accommodate vessels up to 120,000 dwt with a maximum draft of 58 ft. The facility is capable of loading 1,100 ton/hr of coal, or a 60,000-ton ship in 3 days; annual capacity is rated at 3.3 million tons. The on-site coal stockpile has a capacity of 130,000 tons. The 'Big Dipper' has a stacking capacity of 3,300 ton/hr and a reclaiming capacity of 1,100 ton/hr.

The capabilities of the port facility have not been fully realized. The facility may eventually be used to export other Alaska products, such as grain, minerals, and forest products. The port's favorable location is an advantage in trading with

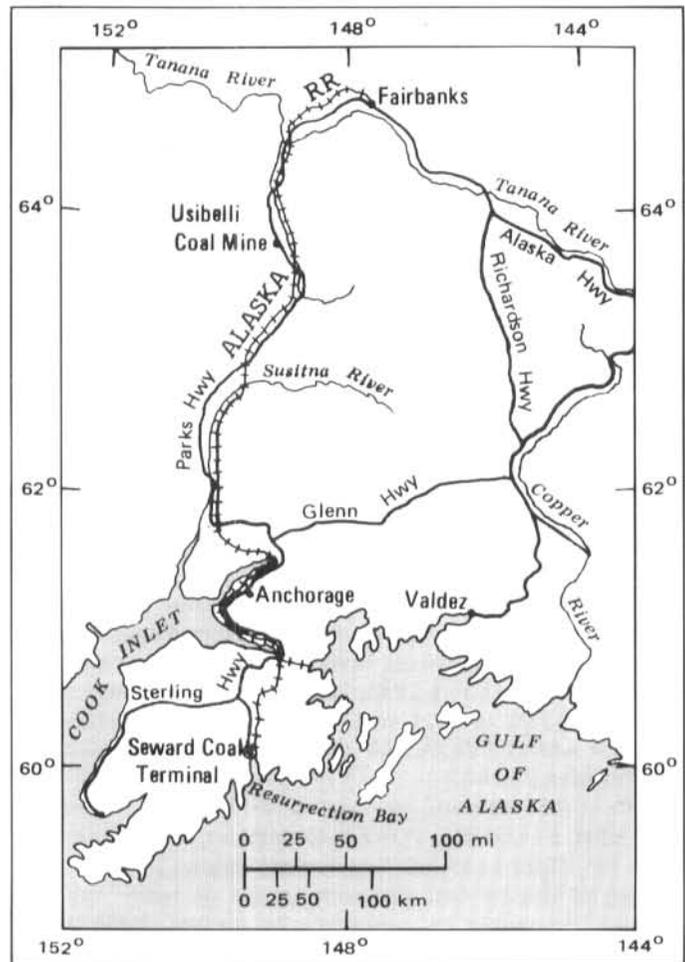


Figure 34. Map of Alaska's rail-belt region showing the locations of the Usibelli Coal Mine and the Seward Coal Terminal. Modified from PlanGraphics, Inc., 1983.

Pacific Rim countries. The round-trip voyage between Alaska and the Republic of Korea is 36 days (26 days cruising) vs. 45 days between Australia and the Republic of Korea. However, Alaska coal was less competitive in 1985 because of lower Canadian and Australian prices. Although the value of the United States dollar fell relative to the currencies of several nations, it did not drop substantially relative to the Canadian and Australian dollars in 1985.

DRILLING ACTIVITY IN 1985

INTRODUCTION

Contract drilling of placer, coal, and hard-rock deposits totaled 220,400 ft in 1985, which represents a 33-percent decrease in mineral drilling activity from the 1984 total of 330,700 ft. This is the lowest footage recorded in the 4 yr that drilling statistics have been compiled. Between 1984 and 1985, contract placer drilling decreased from 129,000 to 80,000 ft; coal drilling decreased from 25,700 to 8,700 ft; and hard-rock drilling decreased from 176,000 to 131,700 ft (table 10).

Although the total footage for 1985 was far below that of 1984, the number of companies that conducted major drilling programs in Alaska increased from 17 to 19 (table 11). Table 12 lists drilling contractors who were active in Alaska in 1985.

PLACER DRILLING

Contract placer drilling totaled 80,000 ft in 1985. Exploration drilling accounted for 46,000 ft and consisted primarily of reverse-circulation rotary drilling with some sonic or resonant drilling. Because placer exploration often involves in-house drilling programs, this figure does not fully express total placer-exploration footage.

The remaining footage (34,000 ft) consisted of thaw-field drilling in which frozen placer gravels were drilled for water injection to thaw and prepare the ground for dredging.

A significant increase in thaw-field drilling is planned for 1986 and will increase total placer footage above 1985 levels. A sustained increase in gold prices in early 1986 could also stimulate additional exploration drilling.

COAL DRILLING

The only major coal-drilling program in 1985 was at Chicago Creek on the Seward Peninsula. The project, operated by HAWLEY RESOURCE GROUP, INC., under contract to DGGs, consisted of 7,800 ft of rotary drilling and 250 ft of core drilling. A minor program of over 600 ft of shallow auger drilling accompanied a geophysical survey and ongoing feasibility studies to develop coal beds at Cape Beaufort for the western Arctic coal project.

As in 1984, no coal exploration drilling occurred in the Beluga coal field. However, geotechnical drilling (not included in the total) was conducted by the DIAMOND ALASKA COAL COMPANY (DIAMOND) to evaluate offshore foundation conditions for a proposed coal-loading facility at Granite

Table 10. *Contract mineral-drilling footage in Alaska, 1982-85.*

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

Table 11. *Companies that conducted major drilling programs, 1985.*

Alaska Apollo Gold Mines, Ltd.	Houston International Minerals, Inc.
Alaska Gold Company	Kennecott Exploration
Alaska Minerals Company	Long Lac Minerals
Battle Mountain Mines	Nerco Minerals, Inc.
Chichagof Joint Venture	Noranda Exploration, Inc.
Cominco Alaska, Inc.	Noranda Mining, Inc.
Enserch Exploration, Inc.	Placid Oil Company
Golden Zone, Inc.	Silverado Mines, Ltd.
Greatland Exploration	SUM Resources
Hawley Resource Group, Inc.	

Point. Although 17,000 ft of exploration drilling by the BERING DEVELOPMENT CORPORATION was anticipated in the Bering River coal field, none was done in 1985.

DIAMOND plans to drill additional footage on their Beluga coal leases in February 1986. The company estimates that 11,000 ft of drilling will be done to further analyze the quality of their coal reserves. This program will increase 1986

Table 12. *Drilling contractors active in Alaska, 1985.*

Alaska Drill Company Anchorage, Alaska	Exploration Supply & Equipment, Inc. Anchorage, Alaska	Salisbury & Dietz, Inc. Spokane, Washington
Alsinco Fairbanks, Alaska	Hardrock Construction Ketchikan, Alaska	Skidmore Machine & Tool Company Fairbanks, Alaska
Ambler Explorations Anchorage, Alaska	Interstate Exploration, Inc. Anchorage, Alaska	Southeast Drilling Company, Inc. Ketchikan, Alaska
Arctic Resources Drilling, Inc. Anchorage, Alaska	Longyear, Inc. Anchorage, Alaska	Sprague & Henwood, Inc. Scranton, Pennsylvania
Boyles Brothers Drilling Company Anchorage, Alaska	M-W Drilling, Inc. Anchorage, Alaska	Thibideau Drilling Contractors Fairbanks, Alaska
Denali Drilling Anchorage, Alaska	NANA-Coates Diamond Drilling, Inc. Anchorage, Alaska	Thrasher & Associates, Inc. Nome, Alaska
Diamond Drill Contracting Company Anchorage, Alaska	Penn Jersey Wasilla, Alaska	Wink Brothers Drilling, Inc. Juneau, Alaska

coal-drilling footage over 1985 levels. Other possible drilling projects could take place on state coal leases in the Matanuska field, at the Bering River deposit of the CHUGACH ALASKA CORPORATION, and on state-supported projects at Chicago Creek on the Seward Peninsula and at Cape Beaufort.

HARD-ROCK DRILLING

In 1985, total hard-rock drilling totaled 131,700 ft, 25 percent below the 1984 total of 176,000 ft. Over 80 percent of the 1985 footage was associated with exploration of precious-metal deposits, up 5 percent from the 1984 figure. Additional footage included annual assessment work or fill-in drilling on base-metal projects. Not included in the hard-rock totals were 4,100 ft of geotechnical drilling for the mill, road, and port sites at the Red Dog project in northwest Alaska.

Over one-third of the statewide hard-rock drilling was conducted at the Greens Creek project (NORANDA MINING, INC.) near Juneau. The company was mandated by ANILCA to complete the exploration of its claims by December 1985. To meet that deadline, an extraordinary drilling program was conducted.

As in 1984 and 1985, most hard-rock exploration drilling in 1986 will be associated with the evaluation of precious-metal properties. Stable or rising gold prices in early 1986 will maintain the high level of interest in precious-metal properties in Alaska and may increase the number of exploration-drilling programs. However, this may be offset by a decline in drilling on several major projects as their exploration phases are completed.

REFERENCES CITED

- Ackels, Del, 1985, Some aspects of gold recovery with IHC rigs, *in* Madonna, J.A., ed., Proceedings of the 7th annual conference on Alaskan Placer Mining: Fairbanks, Alaska Prospectors Publishing Company, p. 86-99.
- Alaska Division of Mining, 1985, SB-461 Placer mining grant demonstration project; 1985 status and summary report: Fairbanks, Alaska Division of Mining report, 31 p.
- British Columbia Ministry of Energy, Mines and Petroleum Resources, 1986, British Columbia mineral exploration review 1985: Vancouver, Information Circular 1986-1, 77 p.
- Bundtzen, T.K., 1982, Alaska's strategic minerals, *in* Rennick, Penny, ed., Alaska's oil and gas and minerals industry: Anchorage, Alaska Geographic, v. 9, no. 4, p. 52-63.
- Bundtzen, T.K., Eakins, G.R., and Conwell, C.N., 1982, Review of Alaska's mineral resources: Alaska Department of Commerce and Economic Development report, 114 p.
- Bundtzen, T.K., and Kline, J.T., 1981, Geologic mine map, Grant Gold Mine, Fairbanks mining district, Alaska: Alaska Division of Geological and Geophysical Surveys Open-file Report 141, 2 p., scale 1 in. = 10 ft., 1 sheet.
- Bundtzen, T.K., and Laird, G.M., 1983, Geologic map of the McGrath D-6 Quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 79, scale 1:63,360, 1 sheet.
- Bundtzen, T.K., Miller, M.L., Laird, G.M., and Kline, J.T., 1985, Geology of heavy mineral placer deposits of the Iditarod and Innoko precincts, western Alaska, *in* Madonna, J.A., ed., Proceedings of the 7th annual conference on Alaskan Placer Mining: Fairbanks, Alaska Prospectors Publishing Company, p. 35-41.
- Bundtzen, T.K., and Smith, T.E., 1982, Alaska's industrial minerals, *in* Rennick, Penny, ed., Alaska's oil and gas and minerals industry: Anchorage, Alaska Geographic, v. 9, no. 4, p. 64-71.
- Conwell, C.N., 1982, Mineral preparation, Grant Gold Mine: Alaska Division of Geological and Geophysical Surveys Geologic Report 74, 15 p.
- Dahlin, D.C., Kirby, D.E., and Brown, L.L., 1985, Chromite deposits along the Border Ranges fault, southern Alaska: Part 2, Mineralogy and results of beneficiation tests: U.S. Bureau of Mines Information Circular 8991, 37 p.
- Eakins, G.R., Bundtzen, T.K., Lueck, L.L., Green, C.B., Gallagher, J.L., and Robinson, M.S., 1985, Alaska's mineral industry - 1981: Alaska Division of Geological and Geophysical Surveys Special Report 38, 57 p.
- Foley, J.Y., and Barker, J.C., 1985, Chromite deposits along the Border Ranges fault, southern Alaska: Part 1, Field investigations and descriptions of chromite deposits: U.S. Bureau of Mines Information Circular 8990, 58 p.
- Foley, J.Y., Barker, J.C., and Brown, L.L., 1985, Critical and strategic mineral investigations in Alaska: Chromium: U.S. Bureau of Mines Open-file Report 97-85, 54 p.
- Giegerich, Henry, and Parker, C.M., 1985, The Red Dog project: Anchorage, Cominco Alaska, Inc., Information brochure, 74 p.
- Green, C.B., 1983, Red Dog update: Anchorage, The Alaska Miner, v. 11, no. 10, p. 20-21.
- Lange, I.M., Nokleberg, W.J., Plahuta, J.T., Krouse, H.R., and Doe, B.R., 1985, Geologic setting, petrology, and geochemistry of stratiform sphalerite-galena-barite deposits, Red Dog Creek and Drenchwater Creek areas, northwestern Brooks Range, Alaska: Economic Geology, v. 80, no. 9, p. 1896-1926.
- Lueck, L.L., 1986, Petrologic and geochemical characterization of the Red Dog and other base-metal sulfide and barite deposits in the De Long Mountains, western Brooks Range, Alaska: Fairbanks, University of Alaska Mineral Industry Research Laboratory Report 71, 105 p. [in press].
- Metals Economic Group, 1986, Eight hundred exploration properties profiled: Boulder, Colorado, Press release, January 13, 2 p.
- Metz, P.A., 1985, The Roman placer mines of the Iberian Peninsula and analogue deposits in Alaska, *in* Madonna, J.A., ed., Proceedings of the 7th Annual Conference on Alaskan Placer Mining: Fairbanks, Alaska Prospectors Publishing Company, p. 48-52.
- Morin, J.A., 1985, Yukon exploration review 1985: Whitehorse, Yukon Territory, Department of Indian and Northern Affairs Canada, Information Circular 85-8, 17 p.
- Murton, Wayne, and Bundtzen, T.K., 1982, Geologic and engineering aspects, Grant Gold Mine: Anchorage, The Alaska Miner, v. 6, no. 3, p. 11-12.
- Peterson, L.A., Todd, S.K., Weddleton, K.L., and Hanneman, K.L., 1986, The role of placer mining in the Alaska economy, 1985: Alaska Department of Commerce and Economic Development report, 22 p.
- PlanGraphics, Inc., 1983, Alaska abandoned mine land reclamation plan: Anchorage, p. 40.

- Redman, E.C., Gilbert, W.G., Jones, B.K., Rosenkranz, D., and Hickok, B.D., 1985, Preliminary bedrock-geologic map of the Skagway B-4 Quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 85-6, scale 1:40,000, 1 sheet.
- Scherkenbach, Dave, Harrison, Ed, and Crafford, Tom, 1985, Geologic update, Greens Creek deposit: Anchorage, *The Alaska Miner*, v. 13, no. 1, p. 17.
- Secretary of Transportation, 1984, The Alaska Railroad: fiscal year 1983 annual report: Anchorage, 27 p.
- Smith, T.E., 1981, Geology of the Clearwater Mountains, south-central Alaska: Alaska Division of Geological and Geophysical Surveys Geologic Report 60, 72 p., scale 1:63,360, 3 sheets.
- Still, J.C., Weir, K.R., Gilbert, W.G., and Redman, E.C., 1985, Stream sediment, float, and bedrock sampling in the Porcupine mining area, southwest Alaska: U.S. Bureau of Mines Open-file Report 173-84, 9 p.
- Suneel Alaska Corporation, 1985, Seward Coal Terminal: Seward, Information brochure, 6 p.
- Tikkanen, George, 1983, Red Dog zinc-lead potential immense: *The Northern Miner*, August 14, p. 4.
- Usibelli Coal Mine, Inc., 1984, Usibelli Coal Miner: Usibelli, v. 4, 16 p.
- Warner, D.J., 1985, Critical and strategic minerals in Alaska: tin, tantalum, and columbium: U.S. Bureau of Mines Information Circular 9037, 19 p.

APPENDIX A
Total active claims and new claims staked in 1984 and 1985¹
(listed by quadrangle)²

Quadrangle	Active claims assessment work		New claims staked				Total active claims	
	1984	1985	Federal 1984	Federal 1985	State 1984	State 1985	1984	1985
14	Sagavanirktok	0	0	2	0	0	0	2
15	Mt. Michelson	0	0	0	1	0	1	0
17	Point Hope	548	0	0	0	0	548	0
18	De Long Mts.	6,735	6,772	0	0	14	6,749	6,772
23	Philip Smith Mts.	20	6	2	11	0	22	19
26	Noatak	5,721	2,298	0	0	0	5,721	2,440
27	Baird Mts.	46	15	7	101	0	53	121
28	Ambler River	2,369	1,476	0	0	0	2,369	1,476
29	Survey Pass	584	384	0	0	0	584	384
30	Wiseman	1,616	1,505	169	160	74	1,859	1,690
31	Chandalar	736	1,111	4	105	182	922	1,335
32	Christian	1	1	0	0	0	1	1
36	Selawik	0	0	0	2	0	0	2
37	Shungnak	77	69	7	2	0	84	71
38	Hughes	11	118	0	0	0	11	122
39	Bettles	400	539	232	37	6	638	576
43	Teller	1,616	1,566	0	0	9	1,625	1,566
44	Bendeleben	1,739	1,343	16	13	72	1,827	1,397
45	Candle	330	423	0	15	0	330	457
47	Melozitna	39	108	0	0	0	39	108
48	Tanana	1,501	1,605	6	0	120	1,627	1,629
49	Livengood	2,893	2,942	0	1	370	3,263	3,305
50	Circle	3,875	3,740	0	0	217	4,092	3,845
51	Charley River	183	263	0	0	0	183	263
52	Nome	496	486	0	0	2	498	521
53	Solomon	750	1,045	0	12	152	902	1,093
54	Norton Bay	10	110	0	0	0	10	110
55	Nulato	5,203	3,213	1,065	6	0	6,268	3,219
56	Ruby	954	1,951	6	0	320	1,280	2,036
57	Kantishna River	348	318	20	0	0	368	318
58	Fairbanks	2,228	2,341	0	8	342	2,570	2,722
59	Big Delta	1,272	1,402	33	1	104	1,409	1,478
60	Eagle	5,775	2,269	5	4	429	6,209	2,513
63	Unalakleet	50	0	4	0	46	100	0
64	Ophir	578	587	1	0	63	642	649
65	Medfra	490	583	0	0	140	630	617
66	Mt. McKinley	258	382	0	0	0	258	382
67	Healy	3,037	3,579	242	127	156	3,435	3,879
68	Mt. Hayes	3,563	4,203	169	289	136	3,868	4,686
69	Tanacross	1,208	645	0	0	0	1,208	766
72	Holy Cross	0	14	0	0	0	0	14
73	Iditarod	468	524	62	3	69	599	596
74	McGrath	366	396	0	0	0	366	433
75	Talkeetna	1,649	2,899	21	62	595	2,265	3,449
76	Talkeetna Mts.	2,254	2,298	8	82	274	2,536	2,518
77	Gulkana	97	131	7	2	7	111	136
78	Nabesna	325	411	12	0	0	337	415
81	Russian Mission	31	115	0	0	0	31	115
82	Sleetmute	288	270	0	0	4	292	270
83	Lime Hills	444	360	0	0	13	457	364
84	Tyonek	5,189	5,990	0	0	121	5,310	6,244
85	Anchorage	1,063	1,300	0	2	251	1,314	1,507
86	Valdez	185	157	33	0	117	335	158
87	McCarthy	89	308	0	0	0	89	308
91	Bethel	478	371	0	0	3	481	430

¹ Data based on 1984 and 1985 assessment affidavits and location notices received by Division of Mining Information Offices by December 31, 1985.

² Quadrangle numbered northwest to southeast according to DGGS-DOM numbering and Kardex systems.

ALASKA'S MINERAL INDUSTRY, 1985

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Quadrangle	Active claims assessment work		New claims staked				Total active claims	
	1984	1985	Federal		State		1984	1985
			1984	1985	1984	1985		
92 Taylor Mts.	117	408	0	0	153	0	270	408
93 Lake Clark	113	431	0	0	236	50	349	481
94 Kenai	8	9	0	0	0	0	8	9
95 Seward	904	1,715	340	331	162	108	1,406	2,154
96 Cordova	35	23	1	0	0	0	36	23
97 Bering Glacier	303	539	0	0	38	34	341	573
101 Goodnews	48	9	0	0	0	0	48	9
102 Dillingham	18	18	0	0	0	0	18	18
103 Iliamna	127	255	0	0	102	102	229	357
104 Seldovia	108	70	0	0	0	0	108	70
105 Blying Sound	3	3	0	0	0	0	3	3
107 Icy Bay	6	6	0	0	24	0	30	6
108 Yakutat	0	0	0	0	9	0	9	0
109 Skagway	452	515	127	5	6	109	585	629
111 Mt. Fairweather	21	37	0	0	0	0	21	37
112 Juneau	1,464	1,783	31	253	24	89	1,519	2,125
113 Taku River	3	92	0	0	0	0	3	92
114 Sitka	784	739	38	40	2	0	824	779
115 Sumdum	354	350	4	4	0	2	358	356
116 Port Alexander	184	184	0	0	0	0	184	184
117 Petersburg	1,219	677	305	753	0	8	1,524	1,438
118 Bradfield Canal	51	21	105	0	0	0	156	21
119 Craig	673	575	20	49	8	24	701	648
120 Ketchikan	512	474	9	71	0	9	521	554
121 Dixon Entrance	143	512	0	1	0	0	143	513
122 Prince Rupert	8	8	0	0	0	0	8	8
123 Hagemeister Island	497	338	0	0	0	0	497	338
126 Mt. Katmai	24	0	0	0	0	0	24	0
127 Afognak	1	1	0	0	0	0	1	1
130 Karluk	0	0	0	0	12	0	12	0
133 Chignik	105	55	0	0	0	0	105	55
135 Trinity Islands	125	131	0	0	51	146	176	277
138 Port Moller	16	89	0	0	0	0	16	89
TOTAL	78,612	75,009	3,111	2,554	5,236	4,219	86,959	81,782

APPENDIX B
State, federal, and private agencies involved
in mineral-development activities, 1985

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 - Loren H. Lounsbury

Function: Promotes economic development in Alaska.

Office of Mineral Development (OMD)
 675 7th Ave., Sta. A
 Fairbanks, AK 99701
 (907) 452-7464
 Acting Director - Charles B. Green

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 mining industry.

B. Department of Environmental Conservation (DEC)
 3220 Hospital Dr.
 P.O. Box O (mailing)
 Juneau, AK 99811
 (907) 465-2600
 Public Information (907) 465-2600
 Commissioner - William R. Ross

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. K
 P.O. Box 1601 (mailing)
 Fairbanks, AK 99707
 (907) 452-1714
 Permit Information (907) 452-2340

Southcentral Regional Office
 437 E St., Ste. 200
 Anchorage, AK 99501
 (907) 274-2533
 Permit Information (907) 279-0254

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

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
 Director, Habitat Division - Norman A. Cohen

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
 565 University Ave.
 Fairbanks, AK 99709
 (907) 479-0881

Southcentral Regional Office
 Habitat Division
 333 Raspberry Rd.
 Anchorage, AK 99502
 (907) 267-2283

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

Southwestern and Western Regional Office
 Habitat Division
 333 Raspberry Rd.
 Anchorage, AK 99502
 (907) 344-0541

D. Department of Natural Resources (DNR)
 400 Willoughby Center, 5th Fl.
 P.O. Box M (mailing)
 Juneau, AK 99811
 Commissioner - Esther C. Wunnicke
 Deputy Commissioner - Robert D. Arnold
 Deputy Commissioner - James K. Barnett
 (907) 465-2400

Northern Regional Director - Jerry L. Brossia
4420 Airport Way
Fairbanks, AK 99709
(907) 479-2243

1. Division of Geological and Geophysical Surveys (DGGS)
3601 C St., Frontier Bldg., 8th Fl.
P.O. Box 7028 (mailing)
Anchorage, AK 99510
(907) 561-2020
Director and State Geologist - Ross G. Schaff
Deputy Director - William W. Barnwell

Function: Conducts investigations of Alaska mineral, fuel, and geothermal potential; geologic hazards; construction materials; underground, surface, and coastal waters of the state; archaeological and cultural resources; and general geologic inventories. Publishes Professional and Special reports, Reports of Investigations, Public-data Files, and Information Circulars that contain the results of these investigations. Advises the public and government agencies on geologic questions. Maintains a library of geologic bulletins, reports, and periodicals.

Eagle River Office
P.O. Box 772116 (mailing)
Fish Hatchery Rd.
Eagle River, AK 99577
(907) 688-3555

Fairbanks Office
794 University Ave., 2nd Fl.
794 University Ave., Basement (mailing)
Fairbanks, AK 99709
(907) 474-7147

Juneau Office
400 Willoughby Center, 3rd Fl.
P.O. Box MA (mailing)
Juneau, AK 99811
(907) 465-2520

Geologic Materials Center
Fish Hatchery Rd.
Eagle River, AK 99577

2. Division of Mining (DOM)
3601 C St., Frontier Bldg., Ste. 1360
P.O. Box 7016 (mailing)
Anchorage, AK 99510
(907) 561-2020
Director - Pedro Denton

Function: Principal agency for management of mining industry on state land in Alaska. Maintains Mining Information Offices in Anchorage and 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.

Mining Information Offices are located at the DGGS Fairbanks office (above) and at:

3601 C St., Frontier Bldg., 10th Fl.
P.O. Box 7028 (mailing)
Anchorage, AK 99510
(907) 786-2205
400 Willoughby Center, 3rd Fl.
P.O. Box M (mailing)
Juneau, AK 99811
(907) 465-3400

State Office Building, 2nd Fl.
P.O. Box 7438 (mailing)
Ketchikan, AK 99901
(907) 225-4181

3. Division of Land and Water Management (DL&WM)
555 Cordova St., Olympic 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 - Richard Thompson

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, Ste. 400
P.O. Box MA (mailing)
Juneau, AK 99801
(907) 465-3400
Regional Manager - Paula T. Burgess

4. Division of Forestry
3601 C St., Frontier Bldg., Ste. 1324
P.O. Box 7005 (mailing)
Anchorage, AK 99510
(907) 762-4465
State Forester - John L. Sturgeon

Function: Establishes guidelines to manage mining in state forests.

Northcentral Regional Office
3726 Airport Way
Fairbanks, AK 99709
(907) 479-2243
Regional Forester - Lester Fortune

Southcentral Regional Office
3601 C St., Frontier Bldg., Ste. 1008
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
Regional Forester - Paul Maki

E. Department of Public Safety

450 Whittier St.
P.O. Box N (mailing)
Juneau, AK 99811
(907) 465-4322
Commissioner - Robert J. Sundberg

1. Division of Fish and Wildlife Protection
5700 East Tudor Rd.
Anchorage, AK 99507
(907) 269-5509
Director - Col. Robert M. Henderson

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

F. Department of Revenue

11th Fl., Entrance A
State Office Bldg.
P.O. Box S (mailing)
Juneau, AK 99811
(907) 465-2300
Commissioner - Mary A. Nordale

1. Public Services Division
1111 West 8th St., Rm. 108
Juneau, AK 99811
(907) 465-2392
Director - Sally Smith

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. Audit Division
11th Fl., Entrance B
State Office Bldg.,
P.O. Box SA (mailing)
Juneau, AK 99811
(907) 465-2320
Director - Martin J. Richard
Chief of Audit Services - 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 (B.S., M.S., Ph.D.)
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 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. Publishes reports and general information concerning mining and offers assistance to miners.

Mineral Industry Research Laboratory (MIRL)
210 O'Neill Resource 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.

3. Arctic Environmental Information and Data Center (AEIDC)
707 A St.
Anchorage, AK 99501
(907) 279-4523
Director - David Hickok

Function: Engages in information management, transfer, and dissemination; applied research; and investigation into resource development and environmental problems. Provides information and data on Alaska and circumpolar arctic environments and natural resources.

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
(907) 271-5960 - Public Room

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, or 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
4700 East 72nd Ave.
Anchorage, AK 99507
(907) 267-1200
District Manager - Wayne Boden

Fairbanks District Office
North Post, Fort Wainwright
P.O. Box 1150 (mailing)
Fairbanks, AK 99703
(907) 356-5345
Acting District Manager - Donald E. Runberg

2. U.S. Bureau of Mines
Alaska Field Operations Center
201 East 9th Ave., Ste. 101
Anchorage, AK 99501
(907) 261-2455
Chief - Donald P. Blasko
Anchorage Supervisor - Robert Hoekzema

Function: The Alaska Field Operations Center programs are designed to help develop a nationally viable mineral industry in Alaska. The programs have two main thrusts. The first is to provide data on mineral reserves needed by government agencies at all levels, but particularly by Congress and land managers. The second is 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 550
Juneau, AK 99802
(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
Supervisor - James Barker

3. Fish and Wildlife Service
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.

Northern Alaska Ecological Services
Federal Bldg. and Courthouse, Rm. 266
Box No. 20 (mailing)
101 12th Ave.
Fairbanks, AK 99701
(907) 465-0203
Field Supervisor - Tony W. Booth

Southeastern Alaska Ecological Services
Federal Bldg., Rm. 417
P.O. Box 1287 (mailing)
Juneau, AK 99802
(907) 586-7240
Field Supervisor - Wayne Oien

Western Alaska Ecological Services
Sunshine Plaza
411 West 4th Ave., No. 2B
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
Director's Representative for Alaska -
Philip A. Emery

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.

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 99503-2892
(907) 261-2643
Regional Director - Boyd Evison
Chief, Mining and Minerals - 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
(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 aimed to 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 1628 (mailing)
Juneau, AK 99802
(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 99503
(907) 271-5083
Assistant Regional Administrator - Alvin L. Ewing

Regional Headquarters
1200 6th Ave.
Park Place Bldg.
Seattle, WA 98101
(206) 442-1200
Regional Administrator - Ernesta Barnes

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

Fairbanks Headquarters (mining season only)
101 12th Ave.
Federal Bldg., Box 19 (mailing)
Fairbanks, AK 99701
(907) 456-0366
Placer Mining Coordinator - Willis Ulmholtz

E. Department of the Army

U.S. Army Corps of Engineers
Regulatory Branch
Pouch 898
Anchorage, AK 99506
District Engineer - Colonel William T. Gregory, Jr.
Write: Attention: NPACO-R-S, or
Call: Carol Gorbics (907)753-2724 or (800)478-2712

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.

NONGOVERNMENTAL GROUPS AND ASSOCIATIONS

Alaska Miners Association, Inc.
 Rose Rybachek, Chairman
 Curt McVee, Executive Director
 Statewide Office
 509 West 3rd Ave., Ste. 17
 Anchorage, AK 99501
 (907) 276-0347

Anchorage Branch
 Jim Williams, Chairman
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Selected significant mineral deposits in Alaska
(locations shown in figs. 35 through 37)¹

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 Upper Devonian through Lower 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, meta-tuff, 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 CaF₂, and 0.03 percent WO₃, 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.

¹This 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.

- 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 **Omaliik** - 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.
- 42 **Flat mining district** - Major placer-Au district; produced at least 1,374,404 oz Au through 1984. Potential exists for occurrence of significant lode-Au and 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 more than 540,000 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 -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 tectite 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 U_3O_8 ; 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 900,000 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-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. Grade ranges are 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 tonnage 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 serpentized 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, 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 1911-38, 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; inferred reserves of 850 million tons ore that grade 0.3 to 0.5 percent Cu and 0.03 percent Mo reported.
- 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 Pt-group metals (refined PGM) from 1934 to 1976; largest known resource of PGM in United States. Possible reserves of 60 million yd³ 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

- amount to 453,600 tons that grade 0.30 oz/ton Au, 1.0 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.
- 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 enechelon, gold-bearing quartz veins in metamorphic rocks; produced more than 3.52 million oz Au from 88.5 million tons ore from 1893 to 1941.
- 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; probable reserves of 8,000 tons of 1.57 percent Ni and 0.88 percent Cu and inferred reserves of several million tons ore that grade 0.2 percent Ni and 0.1 percent Cu reported.
- 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; proven reserves of 4.0 million tons that grade 10 percent combined Pb-Zn-Cu, 10 oz/ton Ag, and 0.10 oz/ton Au.
- 106 **Sumдум** - 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 850,000 tons produced from 1963 to 1980; 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 15.2 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 that exceed 0.2 percent MoS₂.
- 121 **Niblack** - Volcanogenic Cu-Pb-Au-Ag massive-sulfide deposit hosted in Precambrian(?) Wales Group or Ordovician-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 U₃O₈.
- 123 **Kemuk Mountain** - Magmatic Fe-Ti deposit hosted in Cretaceous(?) pyroxenite. Inferred reserves of 2.1 billion tons that average 15 to 17 percent Fe, 2 to 3 percent TiO₂, and 0.16 percent P₂O₅.
- 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 volcanoclastic, 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.

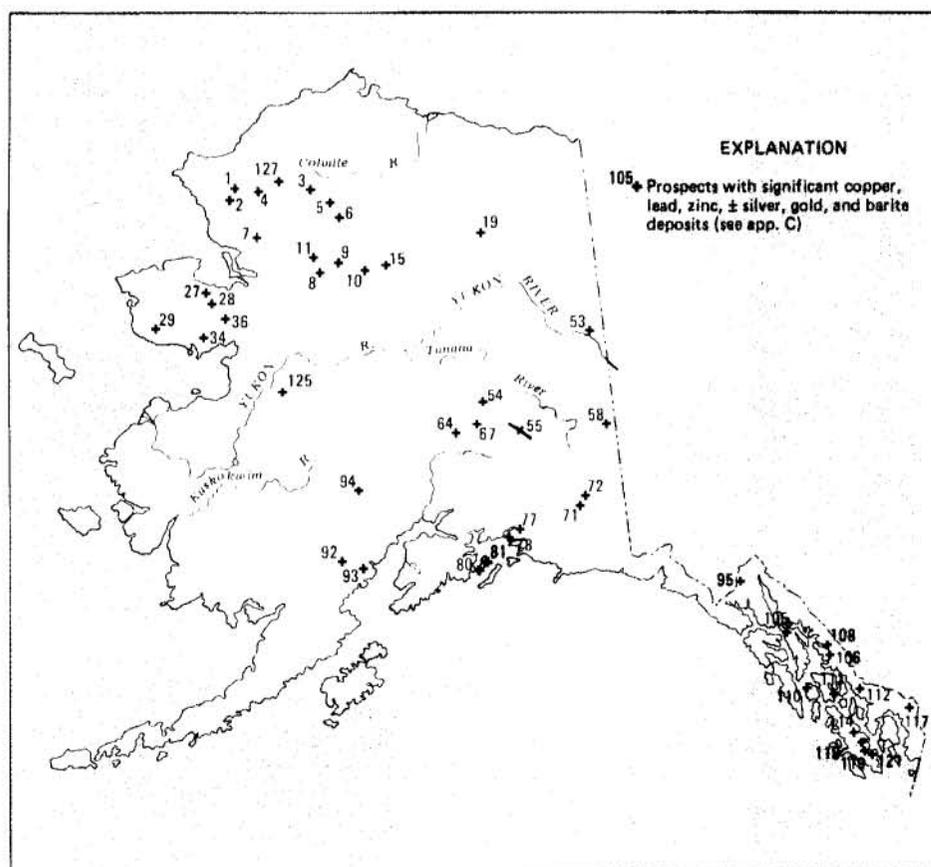


Figure 35. Significant copper, lead, zinc ± silver, gold, and barite deposits in Alaska. See appendix C for deposit descriptions.

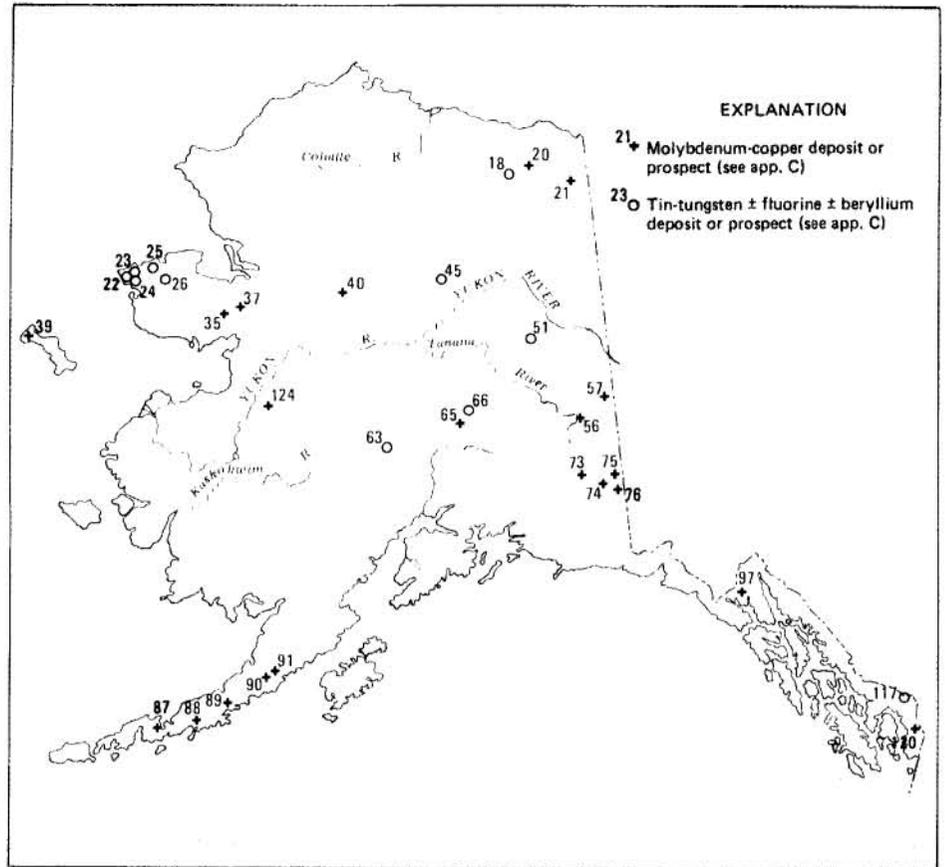


Figure 36. Significant molybdenum or copper and tin, tungsten ± fluorine, ± beryllium deposits in Alaska. See appendix C for deposit descriptions.

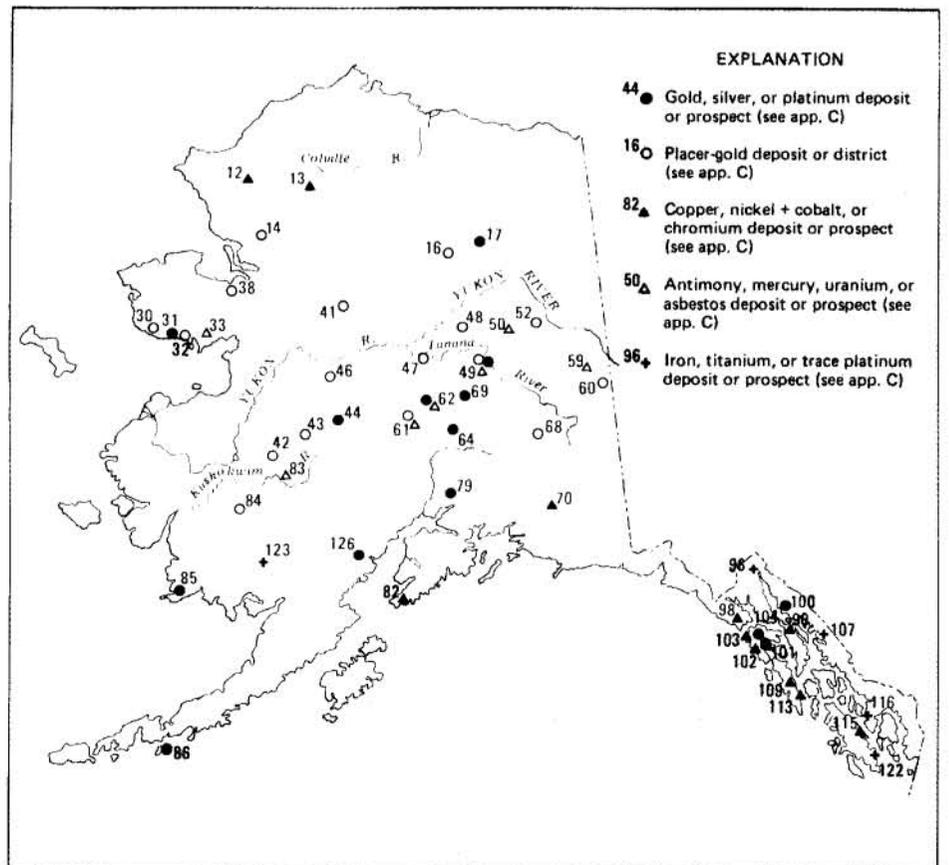


Figure 37. Significant gold, silver, platinum, and strategic-mineral deposits in Alaska. See appendix C for deposit descriptions.

APPENDIX D
Mining licenses issued by the Alaska Department of Revenue, 1985¹
(placer gold = silver unless otherwise noted)

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

ACHMAN, GARLAND H. (2)²
 P.O. Box 1411
 Fairbanks, AK 99707

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

ACKELS, DELMER M.
 Box 2151
 Fairbanks, AK 99707

ADAMS, JAMES
 2534 Riverview Dr.
 Fairbanks, AK 99701

ADAMS, JON S.
 4201 Pinnacle Cir.
 Anchorage, AK 99502

AK PLACK MINING-EXPLORA-
 TION-CONSULTATION CO.
 P.O. Box 2325
 Palmer, AK 99645

AKAU, INC.
 Jack F. McQuat
 Box 100059
 Anchorage, AK 99510

ALAMIN MINING CORP.
 P.O. Box 93
 International Falls, MN 56649

ALASKA APEX & MINING
 James P. Conway
 SR Box 7660
 Palmer, AK 99645
 (sand, gravel, heavy metals)

ALASKA FOSSILITE ROCK CO.
 Eva L. Roberts
 P.O. Box 874771
 Wasilla, AK 99687
 (decorator rock)

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

ALASKA MINERAL RESOURCES
 CO. (2)
 George S. Cochetas
 P.O. Box 60750
 Fairbanks, AK 99706

ALASKA MINING & EXPLORATION
 Stephen F. Wells
 P.O. Box 100844
 Anchorage, AK 99510

ALASKA PLACER DEVELOPMENT,
 INC.
 P.O. Box 81467
 Fairbanks, AK 99708

ALASKA SILVEINIA MINES
 Joseph C. Manga
 P.O. Box 844
 Fairbanks, AK 99707
 (silver, lead)

ALASKA STANDARD MINING,
 CONSOLIDATED
 Old Nash Rd.
 Seward, AK 99664

ALASKA TUNNEL & MINING
 Karl B. Cameron
 P.O. Box 10-4926
 Anchorage, AK 99510
 (lode gold, silver)

ALDRICH, JAMES W., II
 3500 Greenland Dr.
 Anchorage, AK 99503

ALEUTIAN AGGREGATE
 VENTURES
 Beverly H. Walsh
 P.O. Box 4-D
 Anchorage, AK 99509-6004
 (sand, gravel)

ALEXANDER, CLIFFORD D. (2)
 Box 602
 Fairbanks, AK 99707

ALKAM CORP. (2)
 Allen B. Marsh
 3874 Caravelle Dr.
 Anchorage, AK 99502

ALLEMAN, STEPHEN & KATHLEEN
 Kevin & Constance McFarlane
 2001 Spenard Rd.
 Anchorage, AK 99503

AL-VON MINING CO., INC. (2)
 Box 4-1214
 Anchorage, AK 99509

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

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

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

ANDERSON, RICHARD J. &
 WALTER T. NIELSEN
 P.O. Box 74896
 Fairbanks, AK 99707

ANDERSON, WAYNE S. & RANDI M.
 SR Box 20013
 1901 Cheechako Dr.
 Fairbanks, AK 99701

ANPAS, J.C., INC.
 Charles A. Paskvan
 SR Box 50248
 Fairbanks, AK 99701

ARCTIC ALLUVIAL CO.
 Robert Flounders
 2090 Innes
 Anchorage, AK 99515

ARCTIC KNIGHT MINING CO.
 4579 Woodriver Dr.
 Fairbanks, AK 99701

ARCTIC MINING CORP.
 P.O. Box 2019
 Anchorage, AK 99510

ARNETT, LESLIE A.
 P.O. Box 1886
 Fairbanks, AK 99707

ASPEN EXPLORATION CORP. (2)
 1625 Broadway, No. 380
 Denver, CO 80202

AU MINING, INC. (2)
 5441 Camelot Dr., No. D
 Anchorage, AK 99808

AULT ENTERPRISES (2)
 Robert W. and Lynda L. Ault
 P.O. Box 82330
 Fairbanks, AK 99708

AUSTIN, CALFB
 SRA Box 6631-A
 Wasilla, AK 99687

AUSTIN, JEFFERY MICHAEL (3)
 W.C. Casey & Frank Armstrong
 219 2nd Ave., Box 1303
 Seward, AK 99664

B CO.
 Basil S. Bolstridge
 1211 East 80th
 Anchorage, AK 99502

BMS, INC.
 Clifford H. Driskell
 235 East 9th Ave.
 Anchorage, AK 99501

BPS, INC.-CONSOLIDATED
 MINERALS (2)
 1433 Denali St., No. 4
 Anchorage, AK 99501

BTW MINING & EXPLORATION
 CORP. (5)
 4640 East 113th Ave.
 Anchorage, AK 99516

¹Only licenses received by the Division of Mining, Fairbanks, as of January 15, 1986, are listed.

²Numbers in parentheses indicate number of separate mining licenses issued to a single individual, partnership, or company, if more than one. In 1985, 848 licenses were issued to 638 different licensees; in 1984, there were 804 licenses and 621 licensees. Usually one mining license is issued for every Annual Placer Mining Application submitted, which accounts for most of the multiple licenses.

BAILEY, GEORGE D.
Box 2052
Fairbanks, AK 99707

BALDWIN, FRANK
1061 Chenewith Loop West
The Dalles, OR 97558

BARELKA, PAUL I. (3)
1215 9th Ave.
Fairbanks, AK 99701

BARTLING, ROGER
P.O. Box 82970
Fairbanks, AK 99708

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

BECKDAHL, JOSEPH CHRISTIAN
305 Bentley Dr. East
Fairbanks, AK 99701

BEERMAN, WILLIAM J.
2416 South 1st St.
Yakima, WA 98901

BEISTLINE, EARL H. (4)
P.O. Box 80148
Fairbanks, AK 99708

BELFIELD, JAMES W. &
ROBERT HENDRICKS
P.O. Box 1934
Fairbanks, AK 99707

BELL, ALBERT LEE
P.O. Box 353
Sterling, AK 99672

BELL PLACER (3)
Billy Lee Bell
Box 5011
Kenai, AK 99611

BELL, ROCKY JOE
Box 353
Sterling, AK 99672

BEN CREEK PLACERS (5)
James Robert Layman
Box 44
Eagle, AK 99738

BERG, RHINEHART
Candle, AK 99728

BETTISWORTH, ROBERT H.
924 Kellum, No. 303
Fairbanks, AK 99701

BEVARD, KEITH EUGENE
P.O. Box 912
Delta Junction, AK 99737

BEYERS, DAVID WESLEY
P.O. Box 103874
Anchorage, AK 99510

BICKFORD, SHERMAN DALE
1458 Noble St.
Fairbanks, AK 99701

BIG LAKE SAND & GRAVEL, INC.
P.O. Box 17-304
Big Lake, AK 99652
(gravel)

BIRDSELL, RUSSELL L.
P.O. Box 1908
Cave Creek, AK 85331

BITTLINGMAIER, KURT (2)
3900 Arctic Blvd.
Anchorage, AK 99503

BLACK SANDS MINING CO. (2)
Phillip D. Strange
P.O. Box 1478
Wasilla, AK 99687

BLACKWELL, GREGORY B. &
JOHN F. KNUE
1811 Greendale Dr.
Anchorage, AK 99504

BLAKELY, DONALD BRUCE &
AMY ALICE (2)
1725 University Ave., No. 7-D
Fairbanks, AK 99701

BLISS, PATRICK J. (2)
715 L St., No. 8
Anchorage, AK 99501

BLONDEAU, ROBERT WAYNE
Box 602
Valdez, AK 99686

BLUEBIRD ASSOC., INC.
6661 South 300 East
Midvale, UT 84047

BOULDER CREEK MINING CO.
Les & Dorothy Fickes
P.O. Box 2618
Fairbanks, AK 99707

BOUTON, GLENN D. &
LELA M. (4)
665 Farmers Loop Rd.
SR Box 30608
Fairbanks, AK 99701

BOWEN, CHARLES R.
SR Box 119-A
Copper Center, AK 99573

BOWLAND, JOE S.
Box 670883
Chugiak, AK 99567

BOWMAN, HOWARD N.
Box 7
Iliamna, AK 99606

BOYLE, VALE E. (4)
629 West 13th Ave.
Anchorage, AK 99501

BRADLEY, BILLY
289 Marydale Ct.
Soldotna, AK 99669

BRAMLETT, LARRY B.
3605 Arctic Blvd., No. 1576
Anchorage, AK 99503

BRANDL, PHILIP A. (2)
14251 Sabine St.
Anchorage, AK 99516

BRODIS, ROGER F.
SRB Box 7543
Palmer, AK 99645

BROOKS CO.
Clyde Holbrook
P.O. Box 534
Cooper Landing, AK 99572

BROWN, LAWRENCE E.
1170 Farmers Loop Rd.
Fairbanks, AK 99701

BRUCE, F.L.
Chicken, AK 99732
(lode gold)

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

BUGLI, JOHN P. (2)
P.O. Box 21
Soldotna, AK 99669

BURGESS, RANDOLPH E.
P.O. Box 55440
North Pole, AK 99705

BURGESS, ROBERT F. &
J.B. WORD
3721 Silver Leaf Ave.
North Pole, AK 99705

BURGIN, ROBERT A.
P.O. Box 343
Sutton, AK 99674

BURKE ENTERPRISES
Alan T. Chaffin
P.O. Box 10531
Fairbanks, AK 99710-0531

BURLEIGH, ROGER ERIC
P.O. Box 83141
College, AK 99708
(lode gold)

BURNS, DAVID &
JACK D. JOHNSON
P.O. Box 265
Gakona, AK 99586

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

BURNS, ROBERT
P.O. Box 73992
Fairbanks, AK 99707

BURTON, RICHARD D.
P.O. Box 1
Chicken, AK 99732

BUZBY, RICHARD J. &
SAUNDRA L.
8807 Honeysuckle, No. A
Anchorage, AK 99502

BYRD, DICKIE L. (2)
P.O. Box 10084
Fairbanks, AK 99710

CJ'S EQUIPMENT SERVICES
Cal J. Schertenleib
2833 Newby Rd.
North Pole, AK 99705
(gravel)

C & S MINING
Thomas L. Cornwall & June Baird
P.O. Box 80789
College, AK 99708

CACY, ROBERT J., JR. (2)
Box 106
Central, AK 99730

CALIFORNIA OIL INDEPEN-
DENTS, INC.
777 South Main St.
Orange, CA 92668

CAMERON, KARL B.
P.O. Box 10-429
Anchorage, AK 99504

CORPORATE 10
John A. Campbell
1902 Mercier St., Apt. 22
Fairbanks, AK 99701

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

CARLSON, ROBERT D.
6655 Holly Ln.
Anchorage, AK 99502

CARNELL, DON H. &
LARRY K. WIKE (3)
P.O. Box 60435
Fairbanks, AK 99706

CASE, HARVEY, JOHN TURNER,
& RONALD WAY
22 Glacier, No. 7
Fairbanks, AK 99701

CASTLE CREEK MINES
Fred R. & Patricia L. Hall
P.O. Box 83557
Fairbanks, AK 99708

CASWELL, JAMES WALLIS &
JOHN MARTIN (2)
8550 Greenhill Way
Anchorage, AK 99502

CAVANAUGH, DAVID L. &
JOHN G. MCCARTHY
Box 689
Girdwood, AK 99587

CENTRAL ROCK & SAND
William L. Melton & Joddy French
SR Box 3136
Wasilla, AK 99687
(gravel)

CENTRAL SAND & GRAVEL
Kathryn M. Thomas &
William A. Joyce
P.O. Box 1594
Soldotna, AK 99669
(gravel, sand)

CEREPA, AL & FAYE (2)
P.O. Box 1
Kenai, AK 99611

CHANDALAR ENTERPRISES
SR Box 20218-A
Fairbanks, AK 99701

CHARAPUTA, BRIAN E.
1610 Southern
Fairbanks, AK 99701

CHARLEY GRAVEL CO.
Ernie Charley
SR Box 225
Gakona, AK 99586
(gravel)

CHASE MINING CO. (2)
Leonard G. Chase
220 Kody Dr.
Fairbanks, AK 99701

CHENA MINING CO.
8540 Williwa Ave.
Anchorage, AK 99504

CHRISTIE, KNOX N. &
LORENA N.
413 Rezanof Dr. East
Kodiak, AK 99615

CIRCLE MINING CO.
Frank R. Warren
P.O. Box 11
Central, AK 99730

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

CLARA BEA, INC. (3)
David B. Vial
P.O. Box 853
Kotzebue, AK 99752

CLAY, BARRY LLOYD
P.O. Box 25
Ruby, AK 99768

CLARK, J.D.
Boundary, AK 99790

CLEVELAND, CHARLES W.
Old Highway 99
Box 8
Glendale, OR 97442

COASTAL EXPLORATION
James L. Lawler
Box 386
Kasilof, AK 99610

COLBETH, PERLEY
Box 77
Palmer, AK 99645

COLDFOOT EXPLORATION
1170 Farmers Loop Rd.
Fairbanks, AK 99701

COLE, JOHN H.
P.O. Box 10139
Fairbanks, AK 99770

COLLINS, JESSE T.
P.O. Box 74760
Fairbanks, AK 99707

COLLINSVILLE-TWIN CREEKS,
INC.
CJC Assoc. & James A. Holman
717 M St.
Anchorage, AK 99501

COMPASS MINING CO.
John B. Hall
P.O. Box 2700
Fairbanks, AK 99707

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

CONLIN, MICHAEL M. (2)
P.O. Box 102976
Anchorage, AK 99510

COOK, ALFRED GLENN
Box 64
Central, AK 99730

COOK'S MINING (2)
John & Mary Cook
P.O. Box 393
Fairbanks, AK 99707

COPPER VALLEY CONSTRUC-
TION CO.
P.O. Box 165
Glennallen, AK 99588
(gravel)

CORK, DENNIS
P.O. Box 871001
Wasilla, AK 99687

COYLE, WALDO E. OR
RUBY S.
1412 Barbara Dr.
Kenai, AK 99611
(gravel)

CRAIG GRAVEL CO.
Jack Craig
Box 133
Gakona, AK 99582
(sand, gravel)

CRAIGEN, ALBERTON W. (2)
633 Pleasure Dr.
North Pole, AK 99705

CRAZY HORSE MINING CO.
Bryan L. Stoll
P.O. Box 10426
Fairbanks, AK 99710

CRENSHAW, DENNIS GENE &
GEORGE ZELLER
2205 East 3rd, No. 11-F
Anchorage, AK 99501

CROLEY, BILL
Box 191
Tok, AK 99780

CRUM, CONNIE
2440 East Tudor Rd., No. 419
Anchorage, AK 99504

CURTIS, EDGAR J.
7716 Island Dr.
Anchorage, AK 99504
(placer & lode gold, silver)

DAHL, KENNETH C.
P.O. Box 681
Bethel, AK 99559

DAN CREEK VENTURES
P.O. Box 401
Gig Harbor, WA 98335

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

DELONG, THOMAS & DAVID
P.O. Box 83058
Fairbanks, AK 99708
(lode & placer, precious &
base metals)

DENALI MINING, LTD.
6421 Winchester
Anchorage, AK 99507

DENARDO, ROBERT MICHAEL
6776 Gage Ave.
Bell Gardens, CA 90201

DEWANE, DENNIS
P.O. Box 91
Moose Pass, AK 99631

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

DINGMAN, CLIFFORD CARL
3401 Kachemak Cir.
Anchorage, AK 99515

DIONNE, PAUL HENRY
Wiseman, AK 99726

DIPPLE, DONALD E. (6)
1211 F St.
Anchorage, AK 99501

DISCOVERY MINING
James W. Belfield
P.O. Box 1934
Fairbanks, AK 99707

D'LONG END, INC.
Ferrel L. Woods
P.O. Box 81410
College, AK 99708

DOBNIK, ALDOLPH, RUDOLPH, &
SARAH (6)
P.O. Box 341
Bethel, AK 99559

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

DOMRES, ELLSWORTH E.
4507 Crescent Beach Rd.
Onkama, MI 49675

DOWDY, ASA, JR. (2)
1051 Eastwood Ln.
Fairbanks, AK 99701

DUGAS, EDMOND
Box 132
Central, AK 99730

DUGGER, MICHAEL B. (2)
P.O. Box 94
Central, AK 99730

DUNHAM, JOHN H.
Box 615
Palmer, AK 99645

DUVAL CORP. (3)
600 West 58th Ave., No. J
Anchorage, AK 99502

EAGLE DOME AGGREGATE, INC.
P.O. Box 4-D
Anchorage, AK 99506
(sand, gravel)

EBERHARDT, DAVID (2)
551 Eberhardt Rd.
Fairbanks, AK 99701

ECHO BAY EXPLORATION, INC.
3300 Manulife Pl.
10180-101 St.
Edmonton, Alberta,
Canada T54 3S4
(various)

ECHOLA, ARNOLD H. & SALLY J.
SRA Box 258
Willow, AK 99688

EFP'S EQUIPMENT RENTAL &
MINING
Allan G. Anderson
General Delivery
Taktotna, AK 99675

EL DORADO MINING
O.H. Phillips
Box 278
Soldotna, AK 99669

ELDORADO MINING CORP.
3512 Campbell Airstrip Rd.
Anchorage, AK 99504
(various)

ELLIS, EDWARD E. (2)
Box 824
Cooper Landing, AK 99572

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

ENSERCH EXPLORATION,
INC. (2)
G.R. Brvan
1817 Wood St.
Dallas, TX 75201
(lode & placer gold, silver)

ERIKSON, FRED & MARTY EVANS
P.O. Box 871312
Wasilla, AK 99687

ESPERANZA RESOURCES CO.,
INC.
P.O. Box 83607
Fairbanks, AK 99708

EVECO MINING (2)
Alice C. Ebenal
1818 Old Steese Hwy. North
Fairbanks, AK 99701

EXPLORATION GEO.
CONSULTANTS
Dennis M. Shepard
P.O. Box 82504
Fairbanks, AK 99708

FAA, THOMAS E.
General Delivery
Healy, AK 99743

FAIRBANKS MINING CO.
P.O. Box 83024
Fairbanks, AK 99708

FAIRBANKS SAND & GRAVEL,
INC.
P.O. Box 686
Fairbanks, AK 99707
(gravel)

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

FAUTEAUX, JEFF &
ROGER A. MATHIES
SR 1, Box 205
Kenai, AK 99611

FERN DEVELOPMENT CO., INC.
G.F. Kalmbach
5950 Kincaid Rd.
Anchorage, AK 99502
(lode gold)

FINNBEAR MINING & EXPLORA-
TION CO., INC.
Arne W. Murto
P.O. Box 150
Anchor Point, AK 99556
(gold, silver, uranium, platinum)

FLAT CREEK MINING CO., INC.
James P. Haggland
P.O. Box 81464
Fairbanks, AK 99708

FLAT CREEK PLACERS (2)
John E. & Richard S. Fullerton
General Delivery
Flat, AK 99584

FLETCHER, DOUGLAS C.
44509 McKenzie Hwy.
Leaburg, OR 97489

FORREST, JAMES CLIFFORD
P.O. Box 61106
Fairbanks, AK 99706

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

FORTY MILE MINING
William H. Morris
Virginia Bench, No. 1
Chicken, AK 99732

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

FOUR BROTHERS MINING
P.O. Box 91117
College, AK 99708

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

FRALEY EQUIPMENT, INC.
7011 Old Seward Hwy.
Anchorage, AK 99502

FRANKLIN, PATRICIA S.
1213 Coppet
Fairbanks, AK 99701

FREDETTE, RICHARD H.
SR 1, Box 91
Eastsound, WA 98245

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

FRY, CLARENCE
P.O. Box 905
Homer, AK 99603

FULTON, GORDON DAVID (2)
P.O. Box 118
Central City, AK 99730

GCO MINFRALS CO.
Noranda Exploration, Inc.
139 East 51st Ave.
Anchorage, AK 99503

GHD RESOURCES PARTNERS,
LTD.
P.O. Box 10499
Fairbanks, AK 99710

GAEDE, MARK ANTHONY (2)
P.O. Box 2192
Soldotna, AK 99669

GARDNER, LAYNE
284 Cindy Dr.
Fairbanks, AK 99701

GELVIN, STANLEY M. &
EDWIN C.
Box 18
Central, AK 99730

GEOPRIZE, LTD. (4)
Richard C. Swainbank
Box 81315
Fairbanks, AK 99708
(exploration, various)

GERAGHTY MINING
Richard W. Geraghty
405 Juneau St.
Fairbanks, AK 99701

GIBSON, WAYNE E. & ELLEN R.
1610 Southern
Fairbanks, AK 99701

GLENN, DAVID L. &
FRED FRANK ENSIGN
656 7th Ave.
Fairbanks, AK 99701

GO FUR MINING &
EXPLORATION, INC.
1031 West 4th Ave., No. 500
Anchorage, AK 99501
(lode exploration, gold, silver)

GODBAY, WILL & WILLIAM (2)
P.O. Box 141
Skagway, AK 99840

GODFREY/TOLLEFSON
PARTNERSHIP (2)
Rogers & Babler
1301 East 64th Ave.
Anchorage, AK 99502
(gravel)

GOLD HILL
Joseph L. Mutnansky
6.5 Mile Old Richardson Hwy.
North Pole, AK 99705

GOLDEN EAGLE MINES
Henry A. Thicke
1002 Grove St., R1
Bangor, WI 54614

GOLDEN EARTH ENTERPRISES,
INC.
8620 Jade St.
Anchorage, AK 99502

GOLDENSTEIN, MICHAEL R.
3605 Arctic Blvd., No. 1018
Anchorage, AK 99503

GOODWIN, ROBERT E.
908 Smythe
Fairbanks, AK 99701

GORDON, WALLACE E. &
BONNIE L.
General Delivery
Bettles, AK 99726

GORESEN, EDMUND J. (2)
P.O. Box 91
Seward, AK 99664

GRAHAM EXPLORATION
1329 S St.
Anchorage, AK 99501

GRANITE CREEK MINING CO.
John C. Jones
Box 74603
Fairbanks, AK 99707

GRANTHAN, MARGARET
P.O. Box 1666
Fairbanks, AK 99707

GRATEFUL DOG CLAIMS
Roger B. McPherson
SR Box 20155
Fairbanks, AK 99701
(placer, lode gold)

GREAT LAND NORTH
Dennis Wilfer
P.O. Box 192
Fairbanks, AK 99707

GREATLAND EXPLORATION,
LTD. (3)
3512 Campbell Airstrip Rd.
Anchorage, AK 99504
(various)

GREEN MINING & EXPLORATION
P.O. Box 61455
Fairbanks, AK 99706

GREER, RICHARD &
BARBARA (2)
4400 Menytell Ave.
Anchorage, AK 99516

GULLYCAT ENTERPRISES
Box 80163
College, AK 99708

GUMAER, A. MARK
Box 1673
Fairbanks, AK 99707

GUTHERT, DAVID
2085 Van Horn Rd.
Fairbanks, AK 99701

GUTHRIE, HOWARD PAUL
P.O. Box 61367
Fairbanks, AK 99701

HME, INC.
Elmo Hamilton
P.O. Box 670155
Chugiak, AK 99567

HAAS, FREDERICK W. (2)
2957 Yale Dr.
Anchorage, AK 99508

HALE, CHARLES
P.O. Box 60750
Fairbanks, AK 99706

HALL, DIANE MARIE (2)
14200 Hancock Dr.
Anchorage, AK 99515

HALL, FRANK M.
P.O. Box 1073
Juneau, AK 99802

HALL, LEE
P.O. Box 1484
Kailua-Kona, HI 96740

HALLORAN, JIM
6725 Blackberry
Anchorage, AK 99502

HALVERSON, VINCENT E. &
MORRIS WOLTER
3307 81st Ave. West
Anchorage, AK 99502

HAMBY, EUGENE A.
P.O. Box 519
Hillsboro, OR 97123

HAMMOND, CHARLES R. (2)
General Delivery
Chicken, AK 99732

HANKS, G.A. & SONS
Box 2533, Highway 16
West Sacramento, CA 95691-298

HANNAH, JOHN E.
3243 College Rd., No. H-5
Fairbanks, AK 99701

HANSEN, JAMES H. &
KATHLEEN L. (2)
Box 246
Nome, AK 99762

HANSON PROPERTIES, INC.
P.O. Box 7310
Spokane, WA 99207

HARLING, VICTOR R.
Box 86
Mile 128 Steese Hwy.
Central, AK 99730

HARRIS SAND & GRAVEL, INC.
P.O. Box 1347
Valdez, AK 99686
(gravel)

HARTLEY, A.E. (2)
13211 Mountain Pl.
Anchorage, AK 99516

HARTT, JOHN & JUDITH D. (2)
156½ 2nd Ave.
Fairbanks, AK 99701

HASKINS, GEORGE R. (2)
P.O. Box 1777
Fairbanks, AK 99707

HASSON, PETER & RINDA
Box 13171
Trapper Creek, AK 99683

HATCH, EDWIN L.
Box 1801
Nome, AK 99762

HAYDEN EXPLORATION &
MINING (2)
Forest A. Hayden
3400 Rabbit Creek Rd.
Anchorage, AK 99516

HEAVY METALS MINING
Valerie M. Therrien
779 8th Ave.
Fairbanks, AK 99701

HEFLINGER, CARL F.
665 10th Ave., No. 307
Fairbanks, AK 99701

HEFLINGER MINING &
EQUIPMENT CO.
Box 74304
Fairbanks, AK 99707

HELCA MINING CO.
P.O. Box 320
Wallace, ID 83873

HENDRICKSON EXPLORATION &
MINING
Bernhardt S. Hendrickson
3549 Dunkirk Dr.
Anchorage, AK 99502
(lode gold, silver)

HENNUM, S., H. SMITH, &
B. LEWIS
4030 Lore Rd.
Anchorage, AK 99507

HERNING EXPLORATION &
MINING
Bruce G. Hering
P.O. Box 73846
Fairbanks, AK 99707

HERZOG, MARTIN & JEAN
14250 Sabine St.
Anchorage, AK 99516

HILL, KENNETH EARL
2682 Gold Hill Rd.
SR Box 10683
Fairbanks, AK 99701

HODGES, RONALD D. &
REGINALD D. KRKOVICH
Box 557
Juneau, AK 99801

HOFFMAN, RUSSELL
SR Box 153
Copper Center, AK 99573

HOLLAND, HOWARD R.
P.O. Box 55877
North Pole, AK 99705

HOLLYWOOD ROAD SAND &
GRAVEL
William E. & Grace T. Elkins
SR Box 12860
Wasilla, AK 99687
(sand, gravel)

HOMAN, RANDOLPH WILLIAM
Mile 260, Parks Hwy.
Healy, AK 99743

HOOGENDORN, HOMER E.
P.O. Box 84
Nome, AK 99762

HOPE MINING CO.
P.O. Box 101827
Anchorage, AK 99510

HOPEN, ALF
Box 74246
Fairbanks, AK 99707

HORCHLER, ROBERT DALE
P.O. Box 97
Central, AK 99730

HOUSE, CONRAD H.
3911 Tilleson Way.
SR Box 80384
North Pole, AK 99705

HOUSE, LEE & RUDY KRIZAK
General Delivery
Nome, AK 99762

HOWELL, FLOYD
12521 Hace St.
Anchorage, AK 99515

HUBBARD, LLOYD DEWEY
General Delivery
Manley Hot Springs, AK 99756

HUNT OIL CO.
1125 17th St., No. 2400
Denver, CO 80202

IIS CO. MACHINE, INC. (3)
Gene A. Granath
Box 574
Kenai, AK 99611

INTERIOR ALASKANA ASSOC.
Richard L. Loud
742 Bennet Rd.
Fairbanks, AK 99701

INTERIOR MINERALS INC. (2)
T. Vraniak or Elsworth Domres
1668 Market
Fairbanks, AK 99701

IVY MINING CO. (2)
Joseph V. Strunka
Box 550
Fairbanks, AK 99707-0550

JBK MINING
Keith Higley
Box 8 Wildwood Ln.
Eagle River, AK 99577

J & D MINING
Jim Dale
3644 Eddie Rd.
Fairbanks, AK 99705

JFM & ASSOC. (2)
John F. Malone
Box 1032
Bethel, AK 99559

J & S MINING (2)
Jesse G. Smith
Box 11
Cantwell, AK 99729

JACKSON, CHARLES T.
SR Box 2893GG
Wasilla, AK 99687

JAQUE, DARRELL E.
308 6th Ave.
Fairbanks, AK 99701

JENSEN, DANIEL D. (3)
Box 12
Delta Junction, AK 99737

JENSEN, ROBERT L.
Box 364
Nenana, AK 99760

JIM-MAR MINING VENTURES (2)
James Luhrs, Jr. & Marva Dejong
3333 Lake Shore Dr., No. 8
Anchorage, AK 99503

JOHNSON, DELL EUGENE
Box 61537
Fairbanks, AK 99706

JOHNSON MINING
Brian C. Johnson
Box 104
Central, AK 99730

JONES & CO. (2)
West Deering Jones
Mile 49 3/4
Anchorage & Seward Hwy.
Moose Pass, AK 99631

JONES, MURRAY
4430 East 4th Ave.
Anchorage, AK 99504

JORGENSEN, MARK TORRE
2332 Cordes Way
Fairbanks, AK 99701

JULIAN CREEK MINING (3)
Richard C. Wilmarth
Red Devil, AK 99656

JUNEAU MINING CO., INC.
Rollin J. Peters
Box 1007
Juneau, AK 99802

JUNG, HENRY
P.O. Box 506
Bethel, AK 99559

K & K MINING CO.
Keith R. Mitchell
4850 Alpha Cir.
Anchorage, AK 99516

KLK, INC.
SRD Box 9070
Palmer, AK 99645

KACHEMAK MINING CORP. (2)
Robert C. Busby
SRA Box 50-D
Homer, AK 99603

KALBERG, PETER (2)
Box 1067
Willow, AK 99688

KANTISHNA MINES, LTD.
Leo Mark Anthony
2020 Lake Otis Pkwy.
Anchorage, AK 99504
(lode gold, silver)
OR

2622 Lovejoy Dr.
Anchorage, AK 99508

KANTISHNA MINING CO.
Leonard Kragness
Box 100466
Anchorage, AK 99510

KELLIHER, MAURICE (2)
Box 216
Nome, AK 99762

KELLY, TIMOTHY J., &
FRED ERIKSON
116 H St.
Anchorage, AK 99501

KENDRICK BAY MINING CO.
c/o Standard Metals Corp.
645 5th Ave.
New York, NY 10922
(uranium exploration)

KENNECOTT CORP. (3)
Brian K. Jones
1111 East Dowling Rd.
Anchorage, AK 99502

KILE, ALVIN L. & ERICA E.
Box 8424
Anchorage, AK 99508

KIMBALL, JAMES ROBERT
2440 South Fairway Dr.
Coeur D'Alene, ID 83814

KIMSHAN CORP.
234 Seward St.
Juneau, AK 99802

KINARD, DON
Box 60702
Fairbanks, AK 99706

KINTBLADE, STANLEY JOE
General Delivery
Central, AK 99730

KNOWLTON, CLIFFORDE E.
SR Box 20591
11 Mile Steese Hwy.
Fairbanks, AK 99701

KOITZSCH, BILL LEE
845 Crazy Horse Way
Fairbanks, AK 99701

KOUTCHAK, DOROTHY NORMA
P.O. Box 137
Kotzebue, AK 99752

KRAGER, WILLIAM R. (2)
3612 Northpoint Dr.
Anchorage, AK 99515

KREMER, ROBERT G.
381 Pauling St.
Anchorage, AK 99504

KRIZMAN, HENRY E. (2)
16500 Chasewood Ln.
Anchorage, AK 99516

KROSHUS, GLEN O.
P.O. Box 60948
Fairbanks, AK 99706

LAB MINING
1204 Holmes
North Pole, AK 99705-9608

L & B MINING (2)
D.B. Parent, M. Dozette, D.A. Young
1015 10th Ave.
Fairbanks, AK 99701

L & M MINING CO.
Dale Lanz & F.D. McGuire
654 Canord Rd.
North Pole, AK 99705

LaBROSSE, MICHAEL G.
8477-62 Thunder Mountain Rd.
Juneau, AK 99801

LAKE OTIS GRAVEL SALES, INC.
Box 102774
Anchorage, AK 99510
(sand, gravel)

LAKLOEY, INC. (3)
Allen Vezey
106 Rangeview Rd.
North Pole, AK 99705
(gold, sand, gravel)

LAMB, EUGENE K.
P.O. Box 10171
Fairbanks, AK 99710

LANGLOE, MONE L.
Box 870463
Wasilla, AK 99687

LA-ROWE MINING &
DEVELOPMENT
1011 Aurora
Fairbanks, AK 99701

LARSON, MARVIN A. & EDNA O.
P.O. Box 328/Anne Ave.
Trinity Center, CA 96091

LASPESA, JOSEPH S.
90 Dorchester Rd.
Buffalo, NY 14213

LAYLAND FAMILY, INC., &
GRAVEST, INC. (3)
James R. Moody
4300 East 3rd
Anchorage, AK 99504

LEACH, JAMES BERNARD
Box 520682
Big Lake, AK 99652

LEIBEG, GARY L. (2)
SRA Box 323F
Anchorage, AK 99507

LEONARD & CO. (2)
Henry Leonard
Wiseman, AK 99726

LEPKE, DANIEL EDWARD
Box 1410
Palmer, AK 99645

LESTER MINES (3)
Ray & Michael Lester
Mile 99 Steese Hwy., Box 56
Central, AK 99730

LEVINSKI, STEVE (3)
415 East Morton
Tacoma, WA 98404

LEWIS, JOHN D., JR.
3605 Arctic Blvd., No. 941
Anchorage, AK 99503

LILLIAN CREEK MINE, INC.
Ronald K. Tucker
P.O. Box 60334
Fairbanks, AK 99706

LINDFORS/READER CO.
C.M. Reader/Hugo Lindfors
Box 355
Nome, AK 99762

LINDSTEN, RICHARD
Box 23
Central, AK 99730

LITTLE FALLS MINING CO.
Judith A. Alinen
Box 874772
Wasilla, AK 99687

LONDON MINING CO. (2)
John R. & Lucille A. London
1801 State St.
Anchorage, AK 99504

LOPETRONE, ROBERT J.
Lewis B. Wyman
10601 Makushin Bay
Anchorage, AK 99502

LORD, WALLACE JOHN
P.O. Box 8296
Anchorage, AK 99508

LORZ, CAMERON
Box 1106
Oroville, WA 98844

LOSONSKY, STEVE M.
Box 80321
College, AK 99708

LUCAS, DONALD L.
1803 Kepner St.
Anchorage, AK 99504

LUCKY SEVEN MINING CO.
Walter Roman & Family
Box 141
Fairbanks, AK 99707

LUKE'S MINING CO.
Tony Neal
2396 Kachemak Dr.
Homer, AK 99603
(gravel)

LUND, FRED (2)
SRA Box 390
Willow, AK 99688

LUNDHEIM, PETER B. (4)
233½ East Manor
Anchorage, AK 99501

LYMAN RESOURCES IN ALASKA,
INC.
P.O. Box 34
McGrath, AK 99627

M & M MINING (3)
Daryl Galipeau & Lee Merritt Carter
120 Crestview Dr.
Colville, WA 98114

OR
Rodney D. Mitchell
3133 Chena Hot Springs Rd.
Fairbanks, AK 99701
OR
Wayne G. Mitchell
1731 Bridgewater Dr.
Fairbanks, AK 99701

MACKLIN PLACER MINERS (2)
P.O. Box 331
Nome, AK 99762
OR
P.O. Box 1643
Nome, AK 99762

MAGIC CIRCLE, INC. (2)
Phil Menges, Jr., & Stephen R. Weber
2678 Old Richardson Hwy.
North Pole, AK 99705

MAGNUSON MINING CO.
Warren E. Magnuson
Box 55
McGrath, AK 99627

MALL MINING
Michael Alan Larrabee
274.5 Richardson Hwy., Box 353
Delta Junction, AK 99737

MALONEY, JON N. (2)
Box 774591
Eagle River, AK 99577

MANNS FAMILY
Albert (Mick) & Cecilia
General Delivery
Bettles, AK 99726

MANUEL, PAUL
Box 287
Copper Center, AK 99523

MARCY, ROBERT CLAYTON
2598 Chena Hot Springs Rd.
Fairbanks, AK 99701

MARENCO
Franklin J. Arriaga
P.O. Box 466
Dutch Harbor, AK 99692
(sand, gravel)

MARTIN, DON
P.O. Box 1741
Payson, AZ 85547

MASCOTT MINING
T.L. Bryant
P.O. Box 264
Ridgway, CO 81432

MASON, RONALD IVAN
1911 Spenard Rd., No. 3
Anchorage, AK 99503

MASSIE, GEORGE T.
P.O. Box 1042
Nome, AK 99762

MATHEWS, RAY E.
General Delivery
Tok, AK 99780

MATHISEN, CLIFFORD &
MARILYN (3)
Richard & Helen Hunt
12540 Furrow Creek Rd.
Anchorage, AK 99516

MATSKO, JOHN MICHAEL
2895 Mendenhall Loop Rd., No 61
Juneau, AK 99801

MAXWELL MINE &
EXPLORATION
Leslie L. Maxwell
3910 Loc-Sault Ave.
Anchorage, AK 99516

McCALLUM, RICHARD J.
Box 138
Fairbanks, AK 99707

McCARTHY-REYNOLDS-McLINN
3605 Arctic Blvd., No. 476
Anchorage, AK 99503

McCLAIN, JOHN E.
Box 436
Soldotna, AK 99669

McCRARY, WAYNE
2020 Wetmore
Everett, WA 98201

McDANIEL, MICHAEL W.
P.O. Box 2442
Palmer, AK 99645

McHENRY, EDWARD T. &
DOUG MCRAE, SR.
Box 1333 or Box 464
Seward, AK 99664

McINTOSH MINING
Richard Lee McIntosh
SR 2 Box 22139
Fairbanks, AK 99701

McKINNEY, RANDY R., KAREN
DICKSON, & JOE CIZEK (2)
Box 1707
Nome, AK 99762

McNEES, DONALD D., JR.
P.O. Box 82764
Fairbanks, AK 99708

McWILLIAMS, HOWARD F.
Box 1317
Anchorage, AK 99510

MENDENHALL, KEITH
308 Kody Dr.
Fairbanks, AK 99701

MESPELT & ALMASY MINING CO.
Theodore J. Almasy &
Margaret L. Mespelt
Nixon Fork Mine
McGrath, AK 99627
(lode & placer, gold, silver,
base metals)

METCALF, J. CLYDE
P.O. Box 72933
Fairbanks, AK 99707

METCO, INC.
Frank Dieckgraef
Box 895
Seward, AK 99664

MIDNITE MINING ASSOC.
Robert Aumiller
871 Faultline Dr.
North Pole, AK 99705

MIEHUVEN, ROY J. &
CLARENCE WOODALL
Box 58
Eagle, AK 99738

MIKNICH, CHARLES MARVIN
SRA Box 1550G
3600 Taiga Dr.
Anchorage, AK 99507

MILLER, DOUGLAS L.
P.O. Box 1587
Fairbanks, AK 99707

MILLER, HERSHEL D.
289 Marydale Ct.
Soldotna, AK 99669

MILLER MINING CO.
c/o J. Halloran
6725 Blackberry Rd.
Anchorage, AK 99502

MINERS MAGIC-CUNN
ENTERPRIZE
Erickson, Robert & Linda
P.O. Box 113
Fairbanks, AK 99707

MISCOVICH MINING CO.
Howard P. Miscovich
P.O. Box 262
Galena, AK 99741

MORRIS, CLAUDE H., JR.
Box 547
Girdwood, AK 99587

MORRISON, GLENDA &
WILLIAM L. SMITH
906 Cunningham
Anchorage, AK 99501

MOSQUITO FORK MINING CO.
R.S. McCombe
Chicken, AK 99732

MRAK PLACER MINE
Mrak, Aklestad, Herman & Herman
Box 1963
Palmer, AK 99645

MT MINERAL EXPLORATION
Michael J. Tietz
P.O. Box 103451
Anchorage, AK 99510

MULLIKIN, DONALD E.
P.O. Box 790
Homer, AK 99603

MUNJAR, SAMUEL L. (4)
750 Fox Tail Dr.
Fairbanks, AK 99701

MURNIONS UNITED MINING
Tim Murnion
c/o Miner Ed's Trading Post
SR Box 22100
42 Mile Steese Hwy.
Fairbanks, AK 99701

MURPHY, KEITH E. (2)
112 East Aspinwall
Winslow, AZ 86047

MURPHY, WAYNE ARTHUR
1526 Ismailor
Kodiak, AK 99615

N-R ENTERPRISES
Douglas W. & Carol R. Neeley
Box 165
Glennallen, AK 99588

NAUMAN, CLYNTON R. (5)
(+ Resource Associates of Alaska,
Inc.)
P.O. Box 80933
College, AK 99708

NELCHINA MINES
Anson L. Renshaw, Jr.
1850 Wickersham Dr.
Anchorage, AK 99507

NELSON, JOEL V.
3605 Arctic Blvd., No. 1382
Anchorage, AK 99503

NELSON, LARRY CRAIG
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

NEWMONT EXPLORATIONS
LIMITED
200 Park Ave., 36th Fl.
New York, NY 10166
(Exploration)

NIELSEN, DANIEL C.
Pioneer Acres
Central, AK 99730

NORANDA MINING, INC. (2)
Peter W. Richardson
P.O. Box 2277
Juneau, AK 99803
(lode, various)

NORCROSS-STONEBURG MINING
CO.
James H. Norcross
SR 1, Box 2332
Chugiak, AK 99567

NORDEEN, WILLIAM H.
Emma Creek Mine
Wiseman, AK 99726

NORTH CREEK MINING (2)
Arnold J. Mason
203 F St.
Fairbanks, AK 99701

NORTHERN BONANZA
Richard Busk
Box 100971
Anchorage, AK 99510

NORTHLAND GOLD DREDGING,
J/V
Joseph F. Fisher
139 East 51st
Anchorage, AK 99503

NORTHRAIN MINING INC.
3901 Dinimuir Ct.
Anchorage, AK 99508

NORTHWEST EXPLORATION, INC.
Box 81978
Fairbanks, AK 99708

NUGGET ESTATE MINING CO.
Edward W. & Grace J. Montgomery
Box 60430
Fairbanks, AK 99706

OESAU, DONALD B. &
ERIC KAUFMAN
P.O. Box 770827
Eagle River, AK 99577

OFFICER, CASEY
2615 SE. Courtney, No. 75
Milwaukie, OR 97222

OLD MAN PLACER MINING, LTD.
SR Box 5433
Wasilla, AK 99687

OLD YELLER MINING
260 Mile Parks Hwy.
Healy, AK 99743

OLDAY, WILLIAM E. &
WILLIAM J. (2)
P.O. Box 4-807
Anchorage, AK 99509-0807

OLSON, ALAN G. &
VICTOR E. LOYER
Box 165
Palmer, AK 99645

OLSON, RICHARD & LILY
Box 199
Central, AK 99730

OMEGA MINING CO., INC.
332 North Boundary St.
Fairbanks, AK 99701

OTTER DREDGING CO.
Miscovich Brothers
General Delivery
Flat, AK 99584

OUTLOOK INVESTMENTS
5331 Arctic Blvd.
Anchorage, AK 99502

P & G MINING (2)
Pete Pasqual III
Wiseman, AK 99726
(placer antimony, gold)

PMX MINES (2)
David E. & Mavis E. McClurg
4312 Zodiac St.
Anchorage, AK 99507

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

FALMER, ROSE A. (3)
Pan Alaskan Gold Mines;
Pan Central Alaska, Inc.;
Pan Central Explorations Ltd.
301-67 Richmond St. West
Toronto, Ontario
Canada M5H 1J5
(various)

PARADISE PEEK MINE (3)
John B. Ritter
c/o 1750 Engineers Cutoff Spur Rd.
Juneau, AK 99801
(lode & placer, various)

PARKER, CURTIS C. (2)
Box 246
Mojave, CA 93501

PARRY, JAMES MARVIN (2)
P.O. Box 1656
Fairbanks, AK 99707

PAVEY MINING CO. (2)
Marion A. Pavey
3293-B
Fairbanks, AK 99701

PAXTON, DAVID E.
SR Box 20264
Fairbanks, AK 99701

PAYCHECK MINING
Stella Darlene Lavender
General Delivery
Boundary, AK 99790

PAYTON PLACER INC.
Payton, W.C., P.E., C.J., & G.L.
Box 334
Healy, AK 99743

PECKENPAUGH, JON M. (2)
3605 Arctic Blvd., No. 342
Anchorage, AK 99503

PEET, LEE & JAMES MARIOTTE
P.O. Box 93
Central, AK 99730

PENN JERSEY DRILLING
Lawrence A. Schachle
SR Box 2201
Wasilla, AK 99687
(gravel)

PENZ, DAVID
Kako Mine
Russian Mission, AK 99657

PETERS CREEK MINING CO.
Floyd H. Howell
12521 Hack St.
Anchorage, AK 99515

PHILLIPS, WALTER T. &
STANLEY LINDSKOOG
P.O. Box 3304
Homer, AK 99603

PICKUS, NORMAN FRED
1819 Endicott
Fairbanks, AK 99705

PIERCE, ALBERT H.
Box 529
Haines, AK 99827

PLACER, LTD. (2)
Box 81978
Fairbanks, AK 99708

PLACID OIL CO.
3900 Thanksgiving Tower
Dallas, TX 74201
(petroleum & natural gas)
OR
John Graham
550 West 7th, No. 1100
Anchorage, AK 99501

POKER CREEK MINING
William Joseph Aldridge
Box 1334
Palmer, AK 99645

POLAR MINING, INC. (5)
Donald J. May
4545 Wood River Dr.
Fairbanks, AK 99701

PORTER, RALPH JAMES
P.O. Box 72
Soldotna, AK 99669

POSEIDON, INC.
James F. Martin
Icy Bay
Cordova, AK 99574

PRINGLE, A.W.
General Delivery
Manley Hot Springs, AK 99756

PRITCHETT, JERRY LEE
P.O. Box 145
Central, AK 99730

PROSPECTING GEOPHYSICS CO.
Robert G. Reinhardt
Box 79
Amak, AK 99557

QUALLEY, RUSSELL NEAL
General Delivery
Chicken, AK 99732

QUARTZ CREEK EXPLORATION
CO.
Milo Ellsworth Flothe
SR 2, Box 242
Sterling, AK 99672

R & R MINING (4)
Fred W. Negus
General Delivery
Talkeetna, AK 99676

R & S MINING CO.
Ronald W. Whitton
Box 411
Bethel, AK 99559

RT & J MINING (2)
Rodney D. Jackson
3953 James Dr.
Anchorage, AK 99504

RADON CO.
Branson, Purche, Schmider
P.O. Box 871053
Wasilla, AK 99687

RATHBURN, ROBERT
Box 167
Central, AK 99730

RAY'S EQUIPMENT
Ray G. Farrar
Box 11-1628
Anchorage, AK 99511

RAY WOLF MINING, INC.
Ray D. Wolf
Box 625
Cave Jct., OR 97523

RED HAT MINE
Milton C. Jauhola
Box 245
Nenana, AK 99760

RED TAPE MINING (2)
Milan M. Martinek
SRB Box 7459
Palmer, AK 99645

REMINGTON, GERALD
P.O. Box 520385
Big Lake, AK 99652

RESOURCE ASSOCIATES OF
ALASKA, INC. (2)
Gary Andersen
122 1st Ave.
Fairbanks, AK 99701

RIFE McMILLAN CO.
SRT 50726
Fairbanks, AK 99701

ROBERTS, ELLIS & BOB
Box 225
Tok, AK 99780

ROBESON, VICKI &
FRANK H. KNAPP (2)
Box 13148
Trapper Creek, AK 99683

ROCK 'N OTHER FELLERS
Warren Jackson
2347 Loussac Dr.
Anchorage, AK 99503

ROSANDER MINING CO.
Ronald Rosander
Box 129
McGrath, AK 99627

ROSS, EDWARD T.
Box 61017
Fairbanks, AK 99706

ROUGHTOP MINING CO., INC.
Albert M. Hagen
General Delivery
Manley Hot Springs, AK 99756

ROYANN MINING (2)
Edward R. Stugart
SR Box 70241
Fairbanks, AK 99701

RUBEL, JOHN D. (2)
8183 Richardson Hwy.
North Pole, AK 99705

RUBY MINING CO. (2)
Al Kangas
Box 1
Ruby, AK 99768

RUSSELL MINING CO.
Gene Russell
1695 West Bakerview
Bellingham, WA 98226

RYBACHEK, STANLEY C.
Box 55698
North Pole, AK 99705

SMK 2 MINING
Michael Allen Sweetsir
Box 28
Ruby, AK 99768

SACKETT, LLOYD
10 Mile Fishhook Willow Rd.
6820 A-1
Palmer, AK 99645

SALTER ASSOC.
Edward Salter
General Delivery
Manley Hot Springs, AK 99756

SAUNDERS, DONALD
2831 Baxter, No. 20
Anchorage, AK 99504

SAVAGE, DWAYNE
P.O. Box 10613
Fairbanks, AK 99710

SAVAGE MINING
Floyd D. Savage
Box 10615
Fairbanks, AK 99710

SAVAGE MINING CO.
Bruce D. Savage
General Delivery
Manley Hot Springs, AK 99756

SAYER, PHILIP & PAUL
Box 10
Homer, AK 99603

SCHENE, EARL L.
Box 66
Chicken, AK 99732

SCHIMMEL, PATRICK E. &
MARIE C. MEAD
Bettles Field
Wiseman, AK 99726

SCHMUCK, ARTHUR J.
P.O. Box 343
Nenana, AK 99760

SCHNABEL LUMBER & MINING
CO. (2)
John Joseph Schnabel
Box 149
Haines, AK 99827

SCHURR, JOHN &
ANDRE SANDERS
1905 Persinger Dr.
Fairbanks, AK 99701

SCYMANSKI, PETE &
TOM WILLIAMS
SR 3, Box 3904
Prosser, WA 99350

SELF, MARVIN D.
P.O. Box 728
Cooper Landing, AK 99572

SEPA MINING CO. (2)
Sidney R. Reed
3100 Seawind Dr.
Anchorage, AK 99516

SEWARD PENINSULA MINING CO.
Edwin L. Hatch
Box 1801
Nome, AK 99762

SHEIRE, SHAWN
4935 Dartmouth
Fairbanks, AK 99701

SHEPHERD, RICHARD D.
P.O. Box 6-304
Anchorage, AK 99502

SHOPE, HAROLD W.
300 2nd Ave.
Fairbanks, AK 99701

SILENT ISLAND MINING (2)
Adam Arnariak
Box 95
Togiak, AK 99678

SILVER STAR MINING CO.
Melvin N. Barry
323 West Harvard Ave.
Anchorage, AK 99501
(lode silver, zinc, copper,
antimony)

SIMONSON, RALPH E. &
MICHAEL A. SHORT (2)
P.O. Box 608
Elgin, OR 97827

SINCLAIR, DANNY J.
P.O. Box 12
Hope, AK 99605

SIPES, JOHN
Box 55254
North Pole, AK 99705

SMITH BENCH MINING
PARTNERS, LTD.
1615 9th St. NW.
Grand Rapids, MN 55744

SMITH, PHILIP N. (2)
356 Louise Ln.
Fairbanks, AK 99701

SMITH, RONALD E.
Box 772
Haines, AK 99827

SNEED, STEVEN, ERIC & GENE
3700 Rabbit Creek Rd.
Anchorage, AK 99516

SONSHINE MINING &
EXPLORATION
Mike A. Conner
SRB Box 7343-A
Palmer, AK 99645

SOULE, BETTY M. & HAROLD L.
2840 East 142nd
Anchorage, AK 99516

SOURANT, JAMES D.
420 Oceanview Dr.
Anchorage, AK 99515

SOUTHWELL, JOSEPH HOWARD
Box 511
Glennallen, AK 99588

SPAULDING, SAMUEL J. (2)
Canyon Creek
1036 East 7th Ave.
Anchorage, AK 99501

SPEERSTRA, HARRY FRED &
JEAN D.
P.O. Box 186
Glennallen, AK 99588

SPENST, DORAN J.
Box 74351
Fairbanks, AK 99707

SPRINKLE, DAVID L. & DELIGHT
8123 Hartzell Rd.
Anchorage, AK 99503

SPRUCE CREEK MINING CO.
John Joseph O'Carroll
Ophir
McGrath, AK 99627

STEFANOWSKI, JAMES W.
P.O. Box 161
Talkeetna, AK 99676

STEIN, DONALD
105 Dunbar Ave.
Fairbanks, AK 99701

STEPHENS, JAMES ERNEST
809 O Pl.
Anchorage, AK 99501

STERNIK, DAVID (2)
P.O. Box 485
Clear, AK 99704

STEWART, HERBERT IVAN
531 West 4th Ave.
Anchorage, AK 99501

STEWART, JACK J.
2420 Jack Warren Rd.
Delta Junction, AK 99737

STICKMAN, DONALD J. &
SONS & DAUGHTERS (2)
Box 114
Galena, AK 99714
(lode gold, silver)

STOWELL, CHARLES WARNER
308 Haines Ave.
Fairbanks, AK 99701

STRANGE, ROBERT T.
5838 Rowan St.
Anchorage, AK 99507

STRICKLER, WILLIAM R. &
GEORGE R.
16730 Stoneridge Rd.
Anchorage, AK 99516

STUBBLEFIELD, Y.R. & JOHN
Box 570
Soldotna, AK 99669

STURE, MARK J.
3630 Clay Products Dr.
Anchorage, AK 99503

SUNRISE EXPLORATION
Box 54
Hope, AK 99605

SUPERDOCK, GEORGE G. &
DEAN L. WILLIS
Box 77
Central, AK 99730

SURPRISE BAY MINING CO. (2)
John M. Kinney
Box 858
Seward, AK 99664
(placer & lode gold, silver)

SWEET, DAVID
General Delivery
Chicken, AK 99732

SWENSON, LLOYD D.
1843 Bridgewater
Fairbanks, AK 99701

TJ MINING
T.J. Koppenburg
SRD Box 9068
Palmer, AK 99645

TWSS
Fred Swingle & John Whitley
7436 Hennings Way
Anchorage, AK 99504

TACHICK, WAYNE H.
Box 3503
Soldotna, AK 99669

TALLMAN CONSTRUCTION &
MINING CO.
Gerald M. Tallman
Box 5615
Ketchikan, AK 99901

TAYLOR, JUNE M.
Box 101
Eagle, AK 99738

TEDDY FORK MINING
Charlie R. Biederman
330 3rd Ave., Apt. 304
Fairbanks, AK 99701

TERRA FLEX MINERALS, INC. (2)
Dan A. Berkshire
1200 East 70th Ave.
Anchorage, AK 99502

THISTLE CREEK MINING
Hallougl Corp.
1341 Silverberry Dr.
Fairbanks, AK 99701

THOENNES, MARK R.
2068 Bridgewater
Fairbanks, AK 99701
(lode gold & others)

THORALL, IVAN
Chisana Airport
Glennallen, AK 99588

THORNGREN, SCOTT BLAIR
236 Farewell
Fairbanks, AK 99701

THREE C MINE
Jack LaCross
SR 1, Mile 260 Parks Hwy.
Healy, AK 99743

THREE CHANNEL MINING CO.
SR Box 20135
2752 Goldstream Rd.
Fairbanks, AK 99701

THREE VIRTUES, INC.
4721 Kupreanof St.
Anchorage, AK 99507

THURMAN OIL & MINING (3)
Wally Simmons
925 Aurora Dr.
Fairbanks, AK 99701

THURNEAU, NEIL
Box 107
Eagle, AK 99738

TILICUM RESOURCES, INC. (2)
Larry J. Crouse
2398 Elliott Hwy.
Fairbanks, AK 99701

TIMBER CREEK MINING CO.
5914 Highway 30 West
The Dalles, OR 97508

TITCHENAL, ROBERT L. &
SHIRLEY J.
7808 honeysuckle Dr.
Anchorage, AK 99502

TOK EXPLORATION & MINING
CO., INC.
Jim Seward
SR Box 71185
Fairbanks, AK 99701

TOOHEY, CYNTHIA D. &
W. CANDEN (3)
P.O. Box 113
Girdwood, AK 99587

TOWSE, COLIN W.
P.O. Box 871594
Wasilla, AK 99687

TRAUTNER, JOHN JAMES
Cortina R Box 593
Girdwood, AK 99587

TRIBBLE, HOMER DON
2301 Peger Rd.
Fairbanks, AK 99701

TRICO MINING
S. & Clanton R. Sprague
P.O. Box 74158
Fairbanks, AK 99707

TRI-CON MINING, INC. (3)
P.O. Box 83730
Fairbanks, AK 99708

TRI-LAKE SAND & GRAVEL
Roger E. Barklow
P.O. Box 874774
Wasilla, AK 99687
(sand, gravel)

TRYCK, KEITH E.
P.O. Box 9
Ruby, AK 99768

TUCKER, ROBERT &
JAMES LEGGETT
3101 Rose St.
Anchorage, AK 99508

TULUKSAK DREDGING (2)
737 E St.
Anchorage, AK 99501

TUNGSTEN MINING (4)
John C. Thomas
P.O. Box 98
Central, AK 99730

TURNER, WALLACE O. II
2564 State St.
Fairbanks, AK 99701

TWEET, N.B. & SONS
Box 503
Teller, AK 99778

TWEET-JONG, CHERYL
2701 Raspberry Rd.
Anchorage, AK 99502

TWEITEN, OSCAR
P.O. Box 162
Fairbanks, AK 99707

TWO BEARS MINING/LONSBURY
MINING, JV
P.O. Box 2222
Fairbanks, AK 99707

TWOGOOD, RON R., ALEX S. &
ARTHUR S.
P.O. Box 60203
Fairbanks, AK 99706

UNDERWOOD, DAVID H. &
LESLIE H. (2)
P.O. Box 53
Central, AK 99730

UNSDERFER, TONY
Tonsina Ct., Box 30
Eagle River, AK 99577

URBON, BOB & KATHY, &
DAN BAUMILLER (2)
301 Freceg
Fairbanks, AK 99701

VAN OSTRAND, TOM C. (2)
P.O. Box 314
Healy, AK 99743

VAN ZELST, THEODORE W.
1213 Wagner Rd.
Glenview, IL 60025
(lode copper)

VELIKANJE, BETTY K. (2)
2600 Draper Dr.
Anchorage, AK 99503

VIDAL, ANGEL
4357 Spenard Rd., No. C
Anchorage, AK 99503

VOYTILLA, EARL W.
P.O. Box 58211
Fairbanks, AK 99711-0211

W & H GRAVEL
Bob E. Wortham
P.O. Box 403
Soldotna, AK 99669
(gravel, sand)

WALKER, G.T.
P.O. Box 6385
Wetaskiwin, Alberta
Canada T9A 2G3

WALKER, TOM & JOE CARIE
3034 Riverview Dr.
Fairbanks, AK 99701

WARNER, DAREN H.
SR 4, Box 4
Franklin, WV 26807

WASILLA AGGREGATE, INC.
Dave Smith
Box 110
Wasilla, AK 99687
(sand, gravel)

WATERFIELD, HENRY W.
P.O. Box 4-1A
Anchorage, AK 99509

WATTS, DONALD L. (4)
P.O. Box 81515
College, AK 99708

WAYSON, MARK N.
1148 Sunset Dr.
Fairbanks, AK 99701

WEAVER, VERNON
General Delivery
Chicken, AK 99732

WENTZ, JAMES GARY &
JOHN BRUCE (2)
4048 Teal Ave.
Fairbanks, AK 99701

WESCOTT, ANDREW G.
1132 Lakeview Terrace
Fairbanks, AK 99701

WESTERN CONSTRUCTION &
MINING
P.O. Box 56047
North Pole, AK 99705

WESTLAKE, LAWRENCE
Kiana, AK 99749

WEST'S SAND & GRAVEL
William W. West
SRB Box 7672
Palmer, AK 99645
(sand, gravel)

WHEELER, JAMES P.
6801 Mink Ave.
Anchorage, AK 99504

WHEELOCK, HAROLD L. &
JIM A. GRUBB (2)
Box 55145
North Pole, AK 99705

WHITE, HARRY ORR &
CARL F. THOMAS
Box 67-1404
Chugiak, AK 99567

WHITE MINING CO. (2)
Michael P. White
P.O. Box 2744
Fairbanks, AK 99707

WIETCHY, DANIEL MATTHEW &
JIM MINSSELL
Box 81155
College, AK 99708

WILDE, JAMES
P.O. Box 503
Fairbanks, AK 99707

WILKES, FRED
1013 East Dimond Blvd.
Anchorage, AK 99515

WILKINSON, FRED D. (5)
P.O. Box 2702
Fairbanks, AK 99707

WILLIAMS, BILL R.
P.O. Box 10324
Fairbanks, AK 99710

WILLIAMS, RUSSELL H.
P.O. Box 1505
Fairbanks, AK 99707

WILLIAMS, W.A. & ANN J.
Flat, AK 99584

WILMOTH, MICHAEL ROBERT
821 N St., No. 202
Anchorage, AK 99501

WILSON, DONALD LEWIS
General Delivery
Bettles, AK 99726

WILSON, HARRY H. (2)
P.O. Box 47
Chicken, AK 99732

WINDFALL GOLD MINING CORP.
P.O. Box 1958
Nome, AK 99762

WINDY CREEK TIMBERLINE
MINING
Roy J. Tansy
P.O. Box 231
Copper Center, AK 99573

WITHROW, ALFRED L.
General Delivery
Bettles, AK 99726

WOLFF, ROBERT V.
General Delivery
Boundary, AK 99790

WOLVERINE MINING CO.
2440 East Tudor Rd., No. 288
Anchorage, AK 99507

WOODS, FERREL L.
P.O. Box 81410
College, AK 99708

WORD, J.B.
SR 1, Box 83
Iredell, TX 76649

WREDE, RON
P.O. Box 71
Central, AK 99730

WRIGHT, BERNARD D. &
BETTY D.
137 Gold Rush Estates
Fairbanks, AK 99701

WRIGHT P.M., INC.
P.O. Box 60793
Fairbanks, AK 99706

WYLIE, JAMES R.
P.O. Box 208
Aptos, CA 95001-0208
(mercury)

WYRICK, L.E. & MARILYN
General Delivery
Red Devil, AK 99656

YATSKO, THOMAS DANIEL (3)
733 23rd Ave., No. 2
Fairbanks, AK 99701

YOUNG, ROBERT V. (2)
P.O. Box 211
Talkeetna, AK 99676

YUKON MINING CO., INC. (2)
Phillip J. & Joel S. Ramstad
P.O. Box 101454
Anchorage, AK 99510

YUKON MINING CO. OF
ALASKA (2)
Ken Manning & George Seuffert, Jr.
P.O. Box 80325
Fairbanks, AK 99708

ZIMMER, GEORGE W. (2)
2009 East 3rd, No. 18E
Anchorage, AK 99501

ZIMMERMAN, JOSEPH DWIGHT
General Delivery
Manley Hot Springs, AK 99756

APPENDIX E

Metals production in Alaska, 1880-1985.¹

Year	Gold		Silver		Mercury		Antimony		Tin		Lead		Platinum		Copper		Chromium	
	(oz)	(md)	(oz)	(td)	(flask ²)	(td)	(lb)	(td)	(lb)	(td)	(tons)	(td)	(oz)	(td)	(lb)	(md)	(tons)	(td)
1880-1899	1,153,889	23.85	196,101	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	2.5			360,000	0.04		
1903	420,069	8.68	113,600	77.8					30,000	8.0	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	81	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 ³	44.1 ³	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	9.7	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	453,984	9.12	629,708	705.3					112,000	73.4	687	72.1	569	73.7	47,229,771	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	814,849	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	350,130	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					29,490	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 ³	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	2,724	130.8	39,267,000	3.72		
1937	582,085	20.37	494,340	382.0			962,000	147.6	372,000 ³	202.3 ³	823	97.1	9,823	313.4	36,007,000	1.71		
1938	662,000	23.17	479,853	310.0	8	0.6	444,000	54.8	210,000	89.1	991	91.5	11,000	2,160.0	29,769,000	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 ⁴	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	24.25	199,700	142.0	W	W	774,000	87.5	95,600 ³	61.0 ³	742	58.0	22,650	815.0	344,000	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 ³	1.0 ³	200	22.0	27,900	1,020.0	54,000	0.01	5,564	186.3
1944	49,296	1.73	15,249	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		

¹References are listed in DGGG Public-data File 86-19.

²76-lb flask.

³When state and federal figures differ significantly, state figures are used.

⁴Not traceable by year.

⁵Crude platinum; total production of refined metal is about 575,000 oz.

W = Withheld.

-- = Not reported.

td = Thousand dollars.

md = Million dollars.

Year	Gold		Silver		Mercury		Antimony		Tin		Lead		Platinum		Copper		Chromium	
	(oz)	(mt)	(oz)	(td)	(flask ²)	(td)	(lb)	(td)	(lb)	(td)	(tons)	(td)	(oz)	(td)	(lb)	(mt)	(tons)	(td)
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
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	--	--	7,209	711.5
1957	215,467	7.34	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	69.3	--	--	--	--	W	W	22,000	0.01	--	--
1965	43,000	1.51	5,000	6.0	180	104.0	46,400	60.4	--	--	14	4.0	W	W	64,000	0.03	--	--
1966	27,325	9.96	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 ³	0.56	1,000	2.0	125	44.0	160,000	185.0	W	W	--	--	W	W	--	--	--	--
1973	15,000 ³	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 ³	2.56	1,500	3.5	70	52.5	80,000	95.0	W	W	--	--	W	W	--	--	--	--
1975	14,980 ³	3.35	6,000	25.0	--	--	120,000	145.0	22,000	69.0	--	--	W	W	--	--	--	--
1976	22,887 ³	6.90	6,500	24.0	--	--	160,000	165.0	W	W	13	6.0	W	W	--	--	8,000 ³	1,200.0 ³
1977	50,000 ³	7.80	8,000	20.0	--	--	W	W	W	W	--	--	--	--	--	--	--	--
1978	60,000 ³	12.00	6,000	50.0	--	--	W	W	W	W	--	--	--	--	--	--	--	--
1979	65,000 ³	18.00	6,500	93.0	--	--	100,000	125.0	100,000	830.0	--	--	--	--	--	--	--	--
1980	75,000 ³	32.00	7,500	111.0	--	--	--	--	120,000	984.0	31	29.0	--	--	--	--	--	--
1981	134,200 ³	55.20	13,420	111.3	W	W	--	--	106,000	709.0	--	--	900	200.0	--	--	--	--
1982	175,000 ³	69.90	22,000	198.0	--	--	--	--	198,000	1,365.0	--	--	W	W	--	--	--	--
1983	169,000 ³	67.60	33,200	332.0	--	--	22,400	45.0	215,000	1,100.0	--	--	W	W	--	--	--	--
1984	175,000 ³	62.13	20,000	159.0	5	1.5	135,000	225.8	225,000	409.0	--	--	W	W	--	--	--	--
1985	190,000	61.18	28,500	171.0	27	10.0	65,000	98.0	300,000	650.0	--	--	--	--	--	--	--	--
Other ⁴	--	--	--	--	1,438	W	--	--	--	--	--	--	333,936	46,940.3	--	--	--	--
TOTAL	31,310,905	1,156.14	19,891,595	15,243.9	40,933	9,907.7	11,025,800	6,587.6	6,079,400	9,272.9	26,300	3,014.8	665,567 ⁵	65,681.0	1,373,793,932	228.04	39,051	3,426.7

APPENDIX F

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Production of industrial minerals, coal, and other commodities in Alaska, 1880-1985.¹

Year	Coal		Sand and gravel		Building stone ²		Barite		Other ³ (dollars)
	(s. tons)	(md)	(s. tons)	(md)	(s. tons)	(md)	(s. tons)	(td)	
1880-1899	19,429 ⁴	0.14 ⁴	--	--	7,510	0.04	--	--	--
1900	1,200 ⁴	0.20 ⁴	--	--	510	0.01	--	--	--
1901	1,300 ⁴	0.02 ⁴	--	--	700	0.01	--	--	500
1902	2,212 ⁴	0.02 ⁴	--	--	800	0.01	--	--	255
1903	1,447	0.01	--	--	920	0.01	--	--	389
1904	1,694	0.01	--	--	1,080	0.02	--	--	2,710
1905	3,774	0.02	--	--	970	0.02	--	--	740
1906	5,541	0.02	--	--	2,863	0.03	--	--	19,965
1907	10,139	0.05	--	--	3,899	0.03	--	--	54,512
1908	3,107 ⁴	0.01 ⁴	--	--	2,176	0.03	--	--	81,305
1909	2,800	0.02	--	--	1,400	0.01	--	--	86,027
1910	1,000 ⁴	0.01 ⁴	--	--	W	W	--	--	96,408
1911	900 ⁴	0.01 ⁴	--	--	W	W	--	--	145,739
1912	355 ⁴	0.01 ⁴	--	--	W	W	--	--	165,342
1913	2,300	0.01	--	--	W	W	--	--	286,277
1914	1,190	0.01	--	--	W	W	--	--	199,767
1915	1,400	0.03	--	--	W	W	--	--	205,061
1916	12,676	0.05	--	--	W	W	--	--	326,731
1917	54,275	0.27	--	--	W	W	--	--	203,971
1918	75,816	0.41	--	--	W	W	--	--	171,452
1919	60,894	0.35	--	--	50,014	0.29	--	--	214,040
1920	61,111	0.36	--	--	37,044	0.27	--	--	372,599
1921	76,817	0.49	--	--	59,229	0.31	--	--	235,438
1922	79,275	0.43	--	--	54,251	0.30	--	--	266,296
1923	119,826	0.76	--	--	83,586	0.41	--	--	229,486
1924	99,663	0.56	--	--	35,294	0.26	--	--	348,728
1925	82,868	0.40	--	--	32,193	0.19	--	--	454,207
1926	87,300	0.46	--	--	33,283	0.20	--	--	423,000
1927	104,300	0.55	--	--	41,424	0.22	--	--	--
1928	126,100	0.66	--	--	63,347	0.31	--	--	--
1929	100,600	0.53	--	--	54,766	0.26	--	--	194,000
1930	120,100	0.63	--	--	66,234	0.33	--	--	157,300
1931	105,900	0.56	--	--	59,175	0.29	--	--	108,000
1932	102,700	0.53	--	--	54,167	0.27	--	--	223,400
1933	96,200	0.48	--	--	56,291	0.28	--	--	--
1934	107,500	0.45	--	--	64,234	0.36	--	--	46,155
1935	119,425	0.50	--	--	74,049	0.38	--	--	46,755
1936	136,593	0.57	--	--	76,379	0.38	--	--	45,807
1937	131,600	0.55	--	--	50,057	0.25	--	--	147,048
1938	159,230	0.62	--	--	189,090	0.21	--	--	125,302
1939	143,549	0.60	42,332	0.02	--	--	--	--	--
1940	170,174	0.88	515,011	0.10	--	--	--	--	--
1941	241,250	0.97	530,997	0.09	--	--	--	--	1,367,000
1942	246,600	0.99	W	W	--	--	--	--	1,124,000
1943	289,232	1.84	W	W	--	--	--	--	--
1944	352,000	2.37	712,496	0.50	--	--	--	--	2,350,309
1945	297,644	1.87	W	W	--	--	--	--	5,910,704

¹References are listed in DGGS Public-data File 86-19. Production histories for most commodities are summarized in Bundtzen (1982), Bundtzen and Smith (1982), and Bundtzen and others (1982).

²Building-stone-production figures for 1880-1937 are for the southcentral and interior regions of Alaska only.

³Includes 2.4 million lb U₃O₈ (1955-71); 505,000 tons gypsum (1905-26); 286,000 lb WO₃ (intermittently 1916-80); 94,000 lb asbestos (1942-44); 540,000 lb graphite (1917-18; and 1942-50); and undistributed amounts of zinc, jade, peat, clay, soapstone, miscellaneous gemstones, and other commodities (1880-1985).

⁴When state (territorial) and federal figures differ significantly, state figures are used. Figures for sand-and-gravel production in 1974 show state estimates (118,740,000 s. tons; 240.94 md) and federal (42,614,000 s. tons; 88.96 md). The federal estimate was not added to total production.

⁵Production not traceable by year.

⁶Marble quarried on Prince of Wales Island, southeastern Alaska (1900-41).

W = Withheld.

-- = Not reported.

td = Thousand dollars.

md = Million dollars.

Year	Coal		Sand and gravel		Building stone ²		Barite		Other ³
	(s. tons)	(md)	(s. tons)	(md)	(s. tons)	(md)	(s. tons)	(td)	(dollars)
1946	368,000	2.36	W	W	--	--	--	--	2,005,241
1947	361,220	2.55	W	W	--	--	--	--	5,927,319
1948	407,906	2.79	W	W	67,341	0.33	--	--	1,257,699
1949	455,000	3.60	W	W	W	W	--	--	7,181,886
1950	421,455	3.03	3,050,020	2.38	W	W	--	--	2,100,000
1951	494,333	3.77	6,818,000	3.54	W	W	--	--	3,600,000
1952	648,000	5.77	6,817,800	3.54	W	W	--	--	9,052,000
1953	861,471	8.45	7,689,014	5.08	47,086	0.17	--	--	1,231,350
1954	666,618	6.44	6,639,638	6.30	283,734	0.47	--	--	1,572,150
1955	639,696	5.76	9,739,214	8.24	265,740	0.29	--	--	1,552,427
1956	697,730	6.37	9,100,000	8.30	50,000	0.02	--	--	1,551,500
1957	842,338	7.30	6,096,000	8.79	528,000	1.95	--	--	2,751,000
1958	759,000	6.93	4,255,000	3.87	615,000	2.07	--	--	695,000
1959	602,000 ⁴	5.88 ⁴	5,600,000	5.10	54,000	0.20	--	--	1,338,000
1960	669,000 ⁴	5.95 ⁴	5,892,000	5.35	80,000	0.30	--	--	975,000
1961	650,000 ⁴	5.87 ⁴	5,241,000	4.19	--	--	--	--	--
1962	675,000 ⁴	6.41 ⁴	5,731,000	5.36	--	--	--	--	--
1963	853,000	5.91	16,926,000	22.01	W	W	W	W	2,589,000
1964	745,000	5.01	26,089,000	18.49	W	W	W	W	4,912,000
1965	860,000 ⁴	5.88 ⁴	29,959,000	33.93	W	W	W	W	5,296,000
1966	927,000	6.95	17,457,000	21.79	W	W	44,000	350.0	6,167,000
1967	930,000	7.18	22,300,000	26.25	W	W	W	W	4,924,000
1968	812,000 ⁴	5.03 ⁴	17,515,000	20.73	W	W	91,000	W	4,117,000
1969	728,000 ⁴	4.65 ⁴	16,205,000	18.62	1,954,000	3.90	90,000	850.0	5,163,000
1970	786,000 ⁴	5.28 ⁴	20,375,000 ⁴	26.07 ⁴	6,470,000	10.01	134,000 ⁴	1,875.0	7,994,000
1971	748,000 ⁴	5.05 ⁴	26,391,000	41.99	2,658,000	5.07	102,000 ⁴	1,075.0	--
1972	720,000 ⁴	6.26 ⁴	14,187,000	15.21	652,000	3.01	W	W	--
1973	700,000 ⁴	6.23 ⁴	19,350,000	19.01	5,967,000	12.00	112,000	1,792.0	12,846,000
1974	700,000	7.34	118,740,000 ⁴	240.94 ⁴	5,484,000	12.95	110,000	1,895.0	14,495,000
			43,614,000	88.96					
1975	766,000	7.81	48,145,000	95.78	8,877,000	26.65	2,000 ⁴	30.0	12,731,000
1976	705,000	8.00	74,208,000 ⁴	204.73 ⁴	6,727,000	20.09	W	W	14,019,000
1977	780,000 ⁴	12.00 ⁴	66,126,000	134.25	4,008,000	17.47	--	--	14,486,000
1978	750,000	15.00	51,100,000	122.00	3,437,000	14.65	22,000	750.0	--
1979	750,000	16.00	50,900,000	104.90	3,650,000	15.45	20,000	800.0	930,000
1980	800,000	16.00	40,000,000	86.00	3,700,000	15.40	50,000	2,000.0	97,500
1981	800,000	17.60	46,000,000	88.20	4,200,000	19.30	--	--	256,000
1982	830,000	18.00	45,000,000	91.00	3,400,000	15.60	--	--	150,000
1983	803,000	18.00	50,000,000	105.00	5,270,000	25.00	--	--	242,000
1984	849,161	23.75	27,000,000	95.00	2,700,000	16.0	--	--	875,875
1985	1,370,000	39.73	28,600,000	112.06	2,500,000	12.00	--	--	559,000
Other ⁵	--	--	--	--	2,300,000 ⁶	W	79,000	W	--
TOTAL	32,951,934	373.18	957,042,522	1,814.71	77,201,836	256.35	856,000	11,417.0	172,076,672

Back cover: *Upper left - The 'Big Dipper' coal stacker - reclaimer at the Suneel Alaska, Inc., ship-loading facility, Seward, Alaska. Photograph by C.B. Green, 1985.*

Upper right - Placer miner John Miscovich at the Misco-Walsh placer mine, Flat, Alaska. Photograph by M.L. Miller, U.S. Geological Survey, 1985.

Center - AIC-Martin J.V., Inc., dump trucks haul gravel from a materials site on the flood plain of the Sagavanirktok River to oil-field development sites at Prudhoe Bay, Alaska. Photograph by Photo Pros, courtesy of Enserch-Alaska Services, Inc., 1985.

Lower left - Clynt Nauman (Exploration Manager, Resource Associates of Alaska) works on a geologic map at the Delta project base camp. Photograph by Bruce Forster, courtesy of Nerco Minerals Company, 1985.

Lower right - Unit-train emerges from loading facility at the Usibelli Coal Mine, Healy, Alaska. Photograph by Malcolm Roberts, 1984.

