



2006 Minerals Yearbook

ALASKA

ALASKA

LEGEND

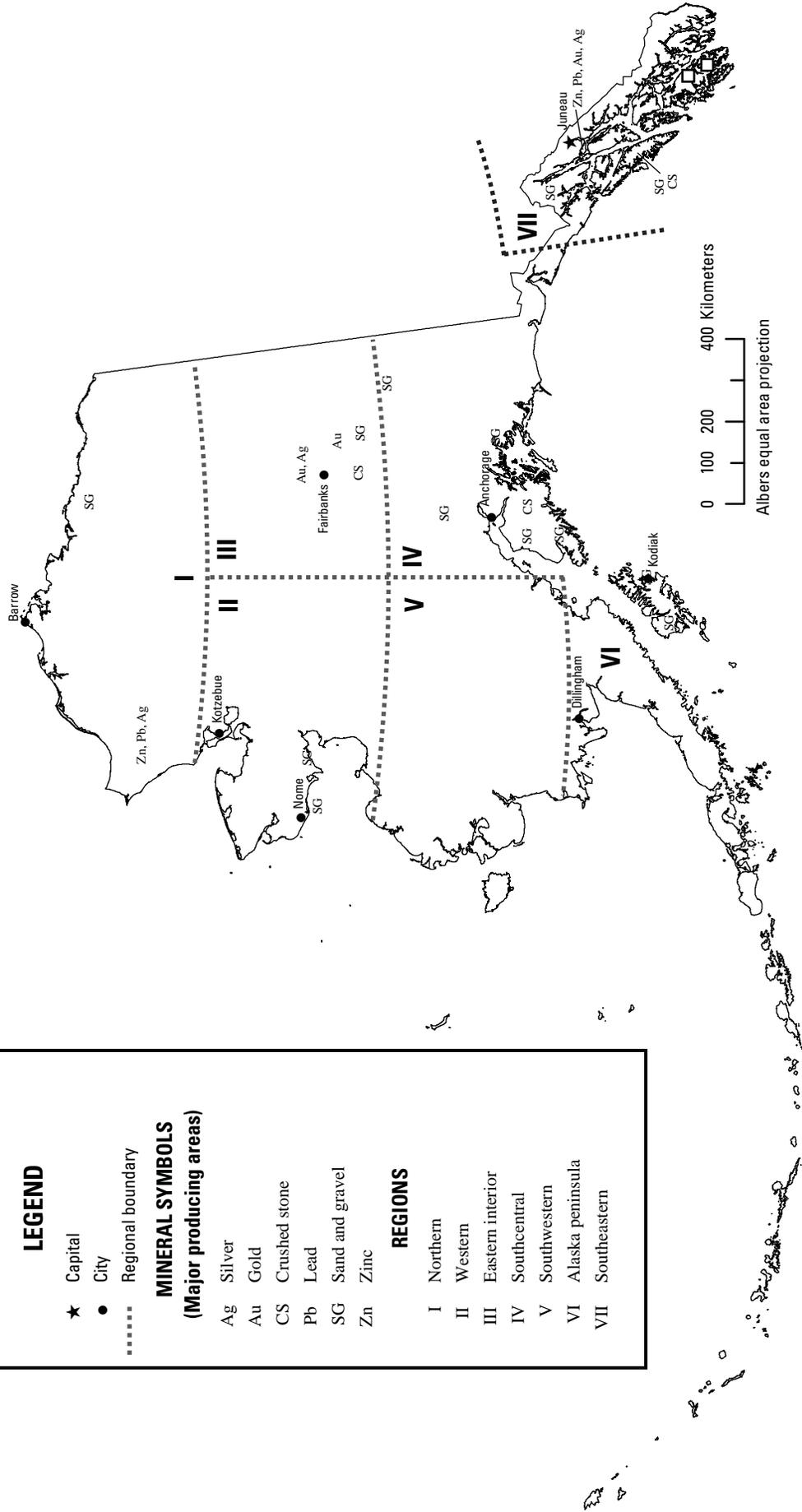
- ★ Capital
- City
- Regional boundary

MINERAL SYMBOLS
(Major producing areas)

- Ag Silver
- Au Gold
- CS Crushed stone
- Pb Lead
- SG Sand and gravel
- Zn Zinc

REGIONS

- I Northern
- II Western
- III Eastern interior
- IV Southcentral
- V Southwestern
- VI Alaska peninsula
- VII Southeastern



THE MINERAL INDUSTRY OF ALASKA

In 2006, Alaska's nonfuel raw mineral production¹ was valued at \$3.01 billion, based upon annual U.S. Geological Survey (USGS) data. This was a \$1.51 billion, or a 101% increase, from the State's total nonfuel mineral value for 2005, which increased \$230 million, or more than 18% from that of 2004. The State rose in rank to 6th from 13th among the 50 States in total nonfuel mineral production value and accounted for about 4.5% of the U.S. total value. Yet, per capita, the State led the Nation in the value of its mineral industry's nonfuel mineral production; with a population of 670,000, the value of production was about \$4,490 per capita.

During 2006, metallic minerals accounted for more than 97% of the total value of Alaska's nonfuel mineral production. Nearly all the metals value was the result of zinc, lead, gold, and silver production (in descending order of value) from Teck Cominco Alaska Inc.'s Red Dog Mine near Kotzebue in northwestern Alaska and the Greens Creek Mine (a joint venture of Kennecott Minerals Co. and Hecla Mining Co.) in southeastern Alaska southwest of Juneau; most of the State's gold was produced from Kinross Gold Corp.'s Fort Knox Mine near Fairbanks in east central Alaska, the Pogo Mine in interior Alaska near Delta, and the Greens Creek Mine. Nearly all other gold production was from placer gold resources.

Although zinc production decreased slightly from that of 2005 owing to a substantial increase in the mineral commodity's average unit value, its total value more than doubled, the increase being about \$1.2 billion. Significant increases in the production of gold and of lead resulted in increases of about \$150 million and about \$75 million, respectively. Although silver production increased only slightly, its value rose substantially. The only decreases in value took place in construction aggregates. A 13% decrease in construction sand and gravel production led to a slightly more than \$12 million, or 15%, decrease in the commodity's value and a 63% decrease in crushed stone production resulted in a nearly \$9 million, or 54%, decrease in its value (table 1).

In 2006, Alaska continued to rank first in the production of zinc and silver, while producing significantly more than 15 times and more than 2 times, respectively, the quantities of those metal mineral commodities of the next highest producing States. The State also remained second in the production of lead, third of 10 gold-producing States, and the producer of significant quantities of construction sand and gravel.

Production of peat in Alaska was not reported to the USGS, partly because of reporting difficulties associated with the seasonal, intermittent nature of peat mining in the State. The Alaska Department of Natural Resources (ADNR), Division of

¹The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals>.

Geological and Geophysical Surveys (DGGs), estimated peat production to be about 50,800 cubic meters, valued at about \$1.06 million; this was an increase from 47,800 cubic meters produced in 2005, valued at about \$810,000 (Szumigala and Hughes, 2007, p. 31).

The DGGs in cooperation with the Alaska Department of Commerce, Community and Economic Development, Office of Economic Development and Minerals, provided the following narrative information;² the data, as provided, are based on DGGs surveys and estimates and may differ from USGS production figures as reported to and estimated by the USGS.

Exploration, Development, and Drilling Activities

Exploration expenditures in Alaska during 2006 were about \$179 million, 72% more than in 2005 (Szumigala and Hughes, 2007, p. 4). Most of the exploration expenditures were directed toward porphyry copper-gold deposits (38%) and intrusion-related gold deposits (37%), with approximately 12% spent on various gold-quartz vein deposits, 11% on polymetallic massive-sulfide deposits, 1% on platinum-group-metal ultramafic deposits, and the remainder on other deposits. There were 26 projects in Alaska that had exploration expenditures of at least \$1 million, and an additional 40 projects expended \$100,000 or more. Exploration projects were conducted across the entire State, although nearly 69% of expenditures was directed toward projects in southwestern Alaska. The leading exploration project was Northern Dynasty Minerals Ltd.'s Pebble project on the north side of Lake Iliamna in southwestern Alaska. The project consists of 1,331 State mining claims over copper-gold-molybdenum porphyry mineralization containing principally chalcopyrite, molybdenite, and pyrite. Northern Dynasty completed nearly 23,000 meters (m) of drilling at Pebble in 2006. Estimated inferred mineral resources at the newly defined Pebble East deposit was 3.4 billion metric tons grading 0.57% copper, 0.36 grams per metric ton (g/t) gold, and 0.036% molybdenum. Advanced exploration was also conducted at the Donlin Creek gold project near Aniak in southwestern Alaska. Barrick Gold Corp. continued an extensive drill program at Donlin Creek in 2006, proceeding toward an anticipated completion of a feasibility study in November 2007. Joint-venture partners with Barrick were Calista Corp., Kuskokwim Corp., and NovaGold Resources Inc. Drill results released for the Acma and Lewis areas by NovaGold indicated intersection of 99 mineralized intervals totaling 1,250 m at gold levels ranging from 2.7 to 7.9 g/t (Szumigala and Hughes, 2007, p. 17–19).

Development investment increased to approximately \$495.7 million in 2006, a 42.5% increase compared with the \$347.9 million spent in 2005, and more than double the \$209.1

²Lisa A. Harbo, Development Specialist II, Alaska Department of Commerce, Community and Economic Development, Office of Economic Development and Minerals, authored the text of the State mineral industry information as derived from Alaska's Minerals Industry 2006 Special Report 61 (Szumigala and Hughes, 2007).

million spent in 2004. The increase was mainly the result of the continuation of construction projects at three mining sites, the initiation of construction at another site, and significant additional investments in three operating mines and a limestone quarry.

In the Eastern Interior region, construction at the Pogo Mine near Delta was the dominant project, with capital expenditures of \$190.7 million in 2006. Total development expenditure in this region was \$249.9 million, down slightly compared with that spent in 2005. The Pogo Mine, located 145 kilometers (km) southeast of Fairbanks, was commissioned in June, but capitalized expenditures continued in order to bring the operation up to its intended mining and ore treatment rates. Teck Pogo, operator of the mine, is a wholly owned subsidiary of Teck Cominco Ltd., which owns a 40% interest in the mine along with Sumitomo Metal Mining Co. (51%) and Sumitomo Corp. (9%).

Also, in the Eastern Interior region, Fairbanks Gold Mining Inc. (wholly owned subsidiary of Kinross Gold Corp.) continued advanced stripping of waste at the Fort Knox open pit gold mine. Studies were undertaken to evaluate the use of the valley heap-leaching method in the treatment of low-grade gold ores from the Fort Knox site.

In the Southeastern region, development expenditures totaled \$148.1 million, the second highest level in the State in 2006 and nearly triple the 2005 amount. Construction at Coeur Alaska Inc.'s Kensington underground gold mine in southeastern Alaska continued through 2006. Efforts included construction of the mill and supporting surface facilities and further development of the underground mining operations. Expenditures for development at the Kensington site totaled \$121.6 million in 2006.

Kennecott Greens Creek Mining Co. undertook underground development and surface facility improvements at its Greens Creek Mine on Admiralty Island, about 32 km west of Juneau. Expenditures were also made to install infrastructure to augment the mine's diesel-generated power with less expensive hydroelectric power. A project also continued to expand the tailings facility. Reserves at Greens Creek at yearend were approximately 7 million metric tons (Mt), grading 3.8 g/t gold, 494 g/t silver, 10.4% zinc, and 4.0% lead.

Select Resources Corp. (a subsidiary of Tri-Valley Corp.) began limited development at the Calder limestone deposit on Prince of Wales Island. The deposit contains 12.6 Mt of proven and probable reserves, a significant portion of which was estimated to be of high chemical grade for use in paper, plastics, paints, and other applications. The current mining area covers about 3% of the 230 hectares (ha) of patented mining area.

In the Northern region, Teck Cominco Alaska Inc. carried out capitalized maintenance and natural gas development programs at its Red Dog zinc-lead mine near Kotzebue, and spent an estimated \$31.2 million on these programs. The development of a natural gas resource was intended to replace the electric power now generated by diesel-driven internal combustion engines. Use of natural gas would provide a nearby source of environmentally clean energy resulting in significant economic returns to the operation. The natural gas development program was expected to continue in 2007. Red Dog's proven and

probable reserves at yearend were 68.7 Mt containing 17.5% zinc and 4.6% lead.

In the Western region, NovaGold Resources Inc. received permits and commenced construction in August at its Rock Creek gold project on the Seward Peninsula. NovaGold also completed a resource update for its Big Hurrah, Rock Creek, and Nome Gold projects. Completion of construction at Rock Creek was anticipated in 2007. The company planned to operate Big Hurrah and Rock Creek concurrently, but at different mining rates, to provide a blended mill feed. The development of the Rock Creek deposit was envisioned as part of an integrated operation that includes the Big Hurrah, Nome Gold, and Saddle deposits. Collectively, these four deposits contain an estimated 88,600 kilograms (kg) of gold.

St. Andrew Goldfields Ltd. continued development of the underground mining operation, and initiated a mill upgrade at its Nixon Fork gold-copper mine in west central Alaska. Mill and facility upgrading were begun in May and continued to near completion at yearend. Underground access and stope construction were carried out with some ore being mined and stockpiled awaiting commissioning of the mill. The Nixon Fork operation was expected to produce about 1,240 kilograms per year of gold (Szumigala and Hughes, 2007, p. 24–31).

Major drilling programs were conducted in most areas of the State during the year. The most extensive programs were conducted by Barrick Gold Inc. at the Donlin Creek property, Northern Dynasty Minerals Ltd. at the Pebble property, TNR Gold Corp. at the Shotgun property, and Tonogold Resources Inc. in the Nyac area. Drilling programs in southeastern Alaska were conducted by Kennecott Greens Creek Mining Co. with surface and underground drilling at the Greens Creek Mine, by Coeur Alaska Inc. at the Kensington and Julian properties, and by Niblack Mining Corp. on the Niblack property. A major drilling program also was conducted in the eastern Interior region by Teck Pogo Inc. on the Pogo property in the Goodpaster mining district. Little Squaw Mining Co. conducted a large reverse-circulation drilling program in the Chandalar area. Triex Minerals Corp. drilled the Boulder Creek uranium property on the Seward Peninsula. In south central Alaska, major drilling programs were conducted by Full Metal Minerals Ltd. at the Lucky Shot property, by Kennecott Exploration Co. at the Whistler property, and by Anglo American plc on the MAN property. International Tower Hill Mines Ltd. drilled at several properties including the LMS and Terra projects. NovaGold drilled at the Arctic, Big Hurrah, Khotol, and Rock Creek properties in the northern and western regions. St. Andrew Goldfields/Mystery Creek Resources Inc. continued underground drilling at the Nixon Fork property. Total drilling length increased 31% in 2006 compared with that of 2005, consistent with the overall increases in exploration activity and expenditures (Szumigala and Hughes, 2007, p. 47–48).

Commodity Review

The production estimates in this report were compiled from DGGs questionnaires and telephone interviews of Alaskan Native corporations, agencies, and municipalities (Szumigala and Hughes, 2007, p. 2). Production data were collected

on metals (gold, lead, silver, and zinc), industrial minerals (sand and gravel and stone, crushed), and coal and peat. Total minerals industry employment in 2006 was estimated to be 3,523 full-time-equivalent positions, an increase of 702 full-time-equivalent positions compared with that estimated in 2005 (Szumigala and Hughes, 2007, p. 2).

Industrial Minerals

Sand and Gravel and Stone, Crushed.—Production of crushed stone decreased to 2.2 Mt in 2006, down 14% compared with that of production in 2005. Sand and gravel production decreased to 8.4 Mt in 2006, a decline of nearly 44% compared with that of 2005. The data reflect some shortfall in reporting, as well as curtailments or reductions in production (Szumigala and Hughes, 2007, p. 31).

Metals

Gold.—Fairbanks Gold Mining operated the Fort Knox Mine in 2006. The company produced 10,369 kg of gold during the year, up 126 kg compared with that produced in 2005. Ore production decreased by about 6% to an average of 30,800 metric tons per day (t/d) from an average of 32,800 t/d in 2005. The decrease was attributed to mining at greater depths in the open pit mine that required longer and steeper haul routes to transport the recovered ore. Total mined material for 2006 was 46.3 Mt, which included 31.7 Mt of stripped waste material. Employment at the Fort Knox Mine for the year averaged 406 persons.

The Pogo Mine was considered essentially to have been in the development phase in 2006. However, approximately 406,000 metric tons (t) of ore was mined. Treatment of about 307,000 t of the mined material resulted in the recovery of nearly 3,530 kg of gold.

Hard-rock (lode) gold production in the State totaled about 15,860 kg, an increase of nearly 27% compared with that produced in 2005. The increase in hard rock production was owing to higher output from the Fort Knox Mine and to new production from the Pogo Mine. Placer gold production increased to just under 1,880 kg in 2006, about a 140% increase compared with that produced in 2005.

Lead, Silver, and Zinc.—The Red Dog Mine accounted for nearly 59% of the annual production value of Alaska's mineral industry in 2006. Milling of ore from the Red Dog Mine totaled 3.24 Mt in 2006, a 5% increase compared with that milled in 2005. Ore grade for 2006 was 20.6% zinc and 6.1% lead compared with an ore grade of 21.7% zinc and 5.6% lead in 2005. As a result, production of zinc in concentrate declined by about 2% to 557,500 t in 2006, and production of lead in concentrate increased by nearly 21% to 123,500 t in 2006 compared with production in 2005. Silver production from the Red Dog Mine was 237,000 kg in 2006. The mine is 100% owned and operated by Teck Cominco Alaska Inc. under a development agreement with NANA Regional Corporation, Inc. (an Alaskan Native corporation) and is located in the DeLong Mountains of Alaska's Brooks Range, a remote site that lies approximately 144 km north of Kotzebue and 88 km from the

Chukchi Sea.

The Greens Creek Mine produced a silver-gold dore and sulfide concentrates that contained zinc and lead. In 2006, about 664,000 t of ore was milled compared with 651,000 t in 2005. Metal production from the milled ore totaled approximately 1,960 kg of gold, 19,000 t of lead, 276,000 kg of silver, and 53,900 t of zinc (Szumigala and Hughes, 2007, p. 31–46).

Government Programs, Activities, Awards

The Alaska DGGs continued to be an active participant in the STATEMAP program. STATEMAP is a component of the congressionally mandated National Cooperative Geological Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. Geologists from the DGGs mapped and sampled 798 square kilometers (km²) of the Bear River, Bluff, and Casadepaga River areas of the southern Seward Peninsula. A 1:50,000-scale geologic map of the area was expected to be available in spring 2008.

The State of Alaska, through DGGs, funded and acquired airborne magnetic and electromagnetic geophysical surveys for 1,588 km² in a highly prospective area for base-metal and gold deposits in the Bonfield mining district. In January 2006, DGGs released the geophysical data and maps for four areas of Interior Alaska that included Black Mountain, East Richardson, Liscum, and Northeast Fairbanks.

DGGs also released airborne geophysical survey data for a 7,886-km² area along the Alaska Highway from Delta Junction to the Canada border. This area may include future development such as a natural gas pipeline, a railroad extension, or other infrastructure. The digital and paper copy release includes total field aeromagnetic and electromagnetic data. The DGGs Geologic Materials Center also received samples and data during the year, including geologic logs and assays from drill holes completed in 1981 and 1982 at the Coal Creek tin property in the Talkeetna Mountains Quadrangle.

The U.S. Bureau of Land Management (BLM) and DGGs made preparations for conducting aeromagnetic and electromagnetic surveys for federal lands in the Fortymile mining district of east central Alaska. The survey is funded by BLM through a cooperative agreement with DGGs in support of DGGs's statewide airborne geophysical survey program.

The USGS contracted for an aeromagnetic survey of the Dillingham Quadrangle and released the data in mid-2006. The USGS continued fieldwork in the Taylor Mountains Quadrangle of southwestern Alaska, with geologic mapping conducted in the southeastern corner of the quadrangle and stream-sediment sampling concentrated in the western quarter of the quadrangle.

The ADNR's abandoned mine land program completed

a \$3.5 million-phase 2 reclamation project at the Jonesville Mine. Coal fires burning as much as 21 m underground were extinguished, a clay cap was installed, and a 10.5-hectare parcel was landscaped.

In June, the State formally applied to the U.S. Environmental Protection Agency (EPA) for authority to administer the National Pollutant Discharge Elimination System (NPDES) program for wastewater discharges in Alaska. The EPA provided an extensive list of comments on the Alaska Department of Environmental Conservation's (DEC)'s application in October and met with DEC staff in November. DEC planned to resubmit the NPDES program authorization application to EPA by June 15, 2007.

The BLM 2006 Hardrock Mineral Community Outreach and Economic Security Award was presented to Coeur Alaska for its work on the Kensington Project. GeoQuest and Chicken Gold Co. representatives received the Small Operator Award. State reclamation awards for 2006 were presented to EarthMovers of Fairbanks Inc., Golderado Mining Co., Nyac Mining Co., and Usibelli Coal Mine Inc. by the ADNRR. Anchorage Sand & Gravel Co. Inc. (AS&G) was awarded the 15th annual Made in Alaska Manufacturer of the Year Award. AS&G is one of the oldest companies in Alaska, getting its start along the banks of Ship Creek in Anchorage in 1938.

The Alaska Industrial Development and Export Authority

(AIDEA) conducted negotiations with Sherwood Copper Corp. for the use of the Skagway Ore Terminal to handle shipments of Sherwood's production from a proposed copper-gold mine near Minto in the Yukon Territory. AIDEA and the U.S. Army Corps of Engineers (USACE) investigated the feasibility of the USACE participation in dredging and maintenance of the DeLong Mountain Terminal Port in northwestern Alaska as a regional deepwater port.

The State Governor officially opened the new Glacier Creek Road near Nome in July. The 6-km road was the first project in the Alaska Department of Transportation and Public Facilities' "Roads to Resources" initiative. The road will allow access to the Rock Creek gold project from the Nome-Teller Highway eliminating the need to use the antiquated, winding Anvil Creek Road (Szumigala and Hughes, 2007, p. 49–54).

Reference Cited

Szumigala, D.J., and Hughes, R.A., 2007, Alaska's mineral industry 2006: Alaska Division of Geological & Geophysical Surveys Special Report 61, 83 p. (Accessed March 11, 2009, at <http://www.dggs.dnr.state.ak.us/pubs/pubs?reqtype=citation&ID=15860>.)

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ALASKA^{1,2}

(Thousand metric tons and thousand dollars)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones, natural	NA	12	NA	12	NA	13
Sand and gravel, construction	9,430	51,600	15,100 ^r	80,600 ^r	13,200	68,400
Stone, crushed	2,270	14,200	2,430 ^r	16,000 ^r	893 ³	7,330 ³
Combined values of cadmium (byproduct of zinc concentrates) ⁴ gold, lead, silver, stone [crushed limestone (2006)], zinc	XX	1,200,000	XX	1,410,000	XX	2,930,000
Total	XX	1,270,000	XX	1,500,000	XX	3,010,000

^rRevised. NA Not available. XX Not applicable.

¹Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

²Data are rounded to no more than three significant digits; may not add to totals shown.

³Excludes certain stones; kind and value included with "Combined values" data.

⁴Data not available for 2006.

TABLE 2
ALASKA: CRUSHED STONE SOLD OR USED, BY KIND^{1,2}

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	--	--	--	1	W	W
Granite	3	120	\$1,100	4	136	\$1,400
Traprock	2	(3)	(3)	1	53	525
Shell	1	(3)	(3)	--	--	--
Miscellaneous stone	10 ^r	2,210 ^r	14,000 ^r	9	705	5,400
Total	XX	2,430 ^r	16,000 ^r	XX	894	7,330

^rRevised. W Withheld to avoid disclosing company proprietary data. XX Not applicable. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Data derived, in part, from information obtained from the Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys.

³Withheld to avoid disclosing company proprietary data; included in "Total."

TABLE 3
ALASKA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE^{1,2}

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	21	277
Filter stone	W	W
Coarse aggregate, graded, concrete aggregate (coarse)	W	W
Fine aggregate (-¾ inch), other	10	130
Coarse and fine aggregates:		
Graded road base or subbase	(3)	(3)
Unpaved road surfacing	(3)	(3)
Terrazzo and exposed aggregate	(3)	(3)
Crusher run or fill or waste	(3)	(3)
Other coarse and fine aggregates	94	800
Total	144	1,297
Unspecified: ⁴		
Reported	396	2,610
Estimated	320	3,000
Total	715	5,580
Grand total	893	7,330

W Withheld to avoid disclosing company proprietary data; included in "Grand total."

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Data derived, in part, from information obtained from the Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys.

³Withheld to avoid disclosing company proprietary data; included in "Total."

⁴Reported and estimated production without a breakdown by end use.

TABLE 4
ALASKA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006,
BY MAJOR USE CATEGORY¹

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	1,430	\$9,700	\$6.81
Asphaltic concrete aggregates and other bituminous mixtures	366	3,600	9.84
Road base and coverings	1,130	5,400	4.78
Fill	1,250	3,110	2.48
Snow and ice control ²	54	639	11.74
Unspecified: ³			
Reported	6,700	32,800	4.90
Estimated	2,300	13,200	5.73
Total or average	13,200	68,400	5.18

¹Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

²Includes railroad ballast and filtration.

³Reported and estimated production without a breakdown by end use.