

THE MINERAL INDUSTRY OF WASHINGTON

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Washington State Department of Natural Resources, Division of Geology and Earth Resources, for collecting information on all nonfuel minerals.

In 1998 the preliminary estimated value¹ of nonfuel mineral production for Washington was \$583 million, according to the U.S. Geological Survey (USGS). This was a 5% increase from that of 1997,² and followed a 1.8% increase from 1996 to 1997. The State dropped in rank to 26th from 24th in the Nation in total nonfuel mineral production, of which Washington accounted for more than 1% of the U.S. total.

Three mineral commodities accounted for about 68% of the State's nonfuel mineral value: construction sand and gravel, portland cement, and crushed stone, in descending order of value. In 1998, Washington's rise in value resulted mainly from a \$33 million increase in the value of construction sand and gravel and \$5.6 million increases each in portland cement and magnesium metal; these gains were offset some by a combined decrease of \$14 million in the values of gold and crushed stone (table 1). The only other decrease included a relatively small drop in the value of industrial sand and gravel and marginal decreases in olivine, dimension stone, and peat (listings are in descending magnitude of change). In 1997, the increased values of construction sand and gravel, portland cement, and crushed stone totaled more than the decreases that occurred in magnesium metal, gold, and lime, resulting in the State's \$10 million gain for the year (table 1). All other changes were small and inconsequential to the net result.

Based on USGS estimates of the quantities produced in the 50 States in 1998, Washington remained first² of 2 States that produce olivine; third of 3 magnesium metal-producing States; fourth of 4 States that produce diatomite; and ninth in gold. The State dropped from 5th to 6th in construction sand and gravel. In 1998, Washington continued to lead the Nation in the production of primary aluminum with an estimated 1.15 million metric tons, about a 2% increase from that of 1997. The State accounted for nearly 31% of the U.S. total primary

¹The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or 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 1998 USGS mineral production data published in this chapter are preliminary estimates as of February 1999 and are expected to change. For some mineral commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at <http://minerals.usgs.gov/minerals/contacts/comdir.html>; by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists); or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved over the Internet at <http://minerals.usgs.gov/minerals>; facsimile copies may be obtained from MINES FaxBack.

²Values, percentage calculations, and rankings for 1997 may vary from the *Minerals Yearbook, Area Reports: Domestic 1997, Volume II*, owing to the revision of preliminary 1997 to final 1997 data. Data for 1998 are preliminary and expected to change, while related rankings may also be subject to change.

aluminum production. Raw steel was also produced in the State, both metals being processed from materials received from foreign and non-Washington State sources.

The Washington State Division of Geology and Earth Resources³ (DGER) provided the following narrative information. Production data in the text that follows are those reported by the DGER based on the agency's own surveys and estimates. They may differ from some production figures reported to the USGS.

In the metallic mineral industry, the Kettle River Project of Echo Bay Minerals Co. was the only major gold mining operation in Washington in 1998. The company mines ore from the Lamefoot and K-2 gold deposits northeast of Republic in Ferry County. A total of about 734,000 metric tons of ore was processed at the company's mill near Republic, compared with about 771,000 tons in 1997. Total gold recovered in 1998 was 3,660 kilograms, up from the 4,040 kilograms recovered in 1997.

Echo Bay processed about 488,000 tons of ore and recovered 2,200 kilograms of gold from the Lamefoot deposit, an exhalative/replacement-type deposit in Permian rocks. The company processed more than 244,000 tons of ore and recovered 1,300 kilograms of gold from the K-2 deposit, an epithermal vein-type deposit in Eocene volcanic rocks.

At the end of 1998, Echo Bay reported proven and probable ore reserves at Lamefoot of 586,000 tons containing 3,920 kilograms of gold. Proven and probable ore reserves at K-2 are more than 476,000 tons containing 3,450 kilograms of gold. The company continued its extensive exploration drilling program on and near its operating mines and on other properties in the region.

Battle Mountain Gold Co. continued the process of obtaining permits to put the Crown Jewel gold deposit in Okanogan County into production. This process proceeded in earnest following release in 1997 of the Environmental Impact Statement (EIS) for the proposed mine. The company intends to begin construction of the mine and mill after obtaining the necessary permits.

Cominco American Inc. initiated the process of reopening its Pend Oreille zinc/lead mine in northern Pend Oreille County through preparation of an EIS commensurate with rules and regulations in effect in 1998. The anticipated release of the draft EIS was expected sometime in the summer of 1999 with the final EIS to be released sometime late in the year. Cominco announced a reserve at this Mississippi-Valley type zinc-lead deposit of 5.9 million tons with an average grade of 8.9% zinc and 1.6% lead. Cominco is planning to reopen the mine in 2002.

³Robert E. Derkey, Geologist, authored the text of mineral industry information submitted by the Washington State Division of Geology and Earth Resources.

Northwest Alloys Inc. (a subsidiary of Aluminum Co. of America) produces magnesium metal from the dolomite at its plant near Addy in Stevens County. The company mined approximately 544,000 tons of dolomite in 1998 compared with 483,000 tons in 1997. In addition to magnesium metal, Northwest Alloys produced byproduct dolomitic lime.

The DGER reported that there were no known major metallic mineral exploration projects conducted in Washington State in 1998.

In the industrial minerals industry, carbonates, clays, diatomite, olivine, and silica (as well as aggregates) continued to be mined in Washington in 1998. Columbia River Carbonates continued to produce finely ground calcium carbonate of high brightness from the Wauconda quarry in Ferry County that was marketed and used to make acid-free paper. The calcium carbonate is shipped to and processed at its plant in Longview, Cowlitz County.

Several companies mined and sold limestone or dolomite as a soil conditioner and/or as feed lime in 1998. Pacific Calcium Inc. produced more than 10,400 tons of limestone from the Tonasket quarry and 4,840 tons of dolomite from the Brown quarry in Okanogan County. Allied Minerals, Inc. produced 6,350 tons of dolomite from its Gehrke quarry in Stevens County. (As previously stated, Northwest Alloys produced byproduct dolomitic lime at its magnesium metal production plant near Addy, Stevens County.) Northport Limestone Co. mined almost 45,400 tons of limestone from its Sherve quarry in Stevens County and shipped it to Trail, B.C., Canada, where it was used as a fluxing agent in smelting. Northwest Marble Products mined color- and site-specific carbonate products for terrazzo tile and related products.

Olivine Corp. mined approximately 49,900 tons of olivine of the Twin Sisters dunite in 1998 from its Swen Larsen quarry in Whatcom County. As in previous years, the majority

of the company's production was shipped as crushed olivine to Unimin Corp., a Belgian company that produces casting sands and other refractory products at Hamilton in Skagit County. The rest of Olivine Corp.'s production was used to produce refractory liners for waste incinerators.

A major ownership change occurred in Washington's cement industry when Holnam Inc. sold its Seattle operations to Lafarge Corp. Larfarge assumed control of the plant in October. During the year, Holnam Inc./Lafarge Corp. mined approximately 74,400 tons of clay from the Twin River quarry in Clallam County. Ash Grove Cement Co. mined 16,600 tons of clay from its Castle Rock quarry in Cowlitz County and nearly 118,000 tons of silica from its Superior quarry in King County. Pacific Coast Coal Co. mined 43,700 tons of clay from the John Henry #1 coal mine and shipped it to Ash Grove Cement Co. in Seattle.

Mutual Materials Co. mined clay in Spokane County at the Mica Mine, in Pend Oreille County at the Usk Mine, in King County at the Elk pit and Section 31 pit, in Pierce County at the Clay City pit, and in Thurston County from the Bucoda pit. Most of its production is used for bricks and related products.

Celite Corp. mined and processed more than 95,300 tons of diatomite at its pits in Grant County, producing more than 65,300 tons of finished diatomite.

Lane Mountain Silica Co. mined more than 272,000 tons of Addy Quartzite from the Lane Mountain quarry in Stevens County. Following processing, the company shipped 209,000 tons of high-purity quartz for manufacturing clear glass bottles and jars. Reserve Silica Corp. mined 63,500 tons of quartz-rich Puget Group sands from the Ravensdale pit in King County. Most of Reserve's production is used for the manufacture of colored bottle glass.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN WASHINGTON 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1996		1997		1998 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement: Portland	1,160	78,900 e/	1,210	92,400 e/	1,250	98,000
Clays: Common	218	1,070	165	715	168	729
Gemstones	NA	36	NA	23	NA	25
Gold 3/ kilograms	W	W	4,040	43,200	3,660	34,800
Gypsum, crude	W	W	12	549	--	--
Sand and gravel: Construction	37,900	162,000	40,500	180,000	46,500	213,000
Silver 3/ metric tons	--	--	2	285	2	312
Stone: Crushed	15,400	81,400	14,700	92,200	14,400	86,400
Combined values of cement (masonry), diatomite, lime, magnesium metal, olivine, peat, sand and gravel (industrial), stone [dimension miscellaneous], and values indicated by symbol W	XX	221,000 r/	XX	146,000	XX	150,000
Total	XX	545,000 r/	XX	555,000	XX	583,000

e/ Estimated. p/ Preliminary. r/ Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable.

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

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Recoverable content of ores, etc.

TABLE 2
WASHINGTON: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1996				1997			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	8	2,140	\$21,900	\$10.24	8	1,460	\$19,700	\$13.49
Dolomite	2	W	W	W	3	463	2,010	4.35
Granite	5	257	1,310	5.10	3	417	2,330	5.60
Traprock	100 r/	11,000	49,000	4.46	87	10,500	56,100	5.34
Sandstone	5	828 r/	3,290	3.96	4	604	5,660	9.37
Slate	5	W	W	W	1	W	W	W
Volcanic cinder and scoria	3	145	1,020	7.00	2	W	W	W
Miscellaneous stone	11	910	4,110	4.51	9	1,040	4,750	4.57
Total	XX	15,400	81,400	5.27	XX	14,700	92,200	6.25

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits, except unit value; may not add to totals shown.

2/ Includes "limestone-dolomite" reported with no distinction between the two.

TABLE 3
WASHINGTON: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 1997, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jettv stone	526	\$4,560	\$8.67
Filter stone	61	257	4.21
Other coarse aggregate	583	3,200	5.49
Coarse aggregate, graded:			
Bituminous aggregate, coarse	85	326	3.84
Bituminous surface-treatment aggregate	31	107	3.45
Railroad ballast	43	253	5.88
Other graded coarse aggregate 3/	117	987	8.44
Fine aggregate (-3/8 inch):			
Stone sand, concrete	276	1,590	5.75
Screening, undesignated	94	384	4.09
Other fine aggregate	(4/)	(4/)	6.51
Coarse and fine aggregates:			
Graded road base or subbase	639	2,740	4.28
Unpaved road surfacing	557	1,670	3.00
Crusher run or fill or waste	991	5,120	5.17
Other coarse and fine aggregates	869	4,390	5.06
Other construction materials 5/	187	1,660	8.86
Agricultural:			
Agricultural limestone	W	W	29.50
Poultry grit and mineral food	W	W	24.25
Chemical and metallurgical:			
Lime manufacture	W	W	5.22
Flux stone	W	W	16.77
Glass manufacture	W	W	20.30
Special:			
Asphalt fillers or extenders	10	31	3.10
Other fillers or extenders	W	W	W
Roofing granules	W	W	19.04
Unspecified: 6/			
Actual	5,450	31,600	5.79
Estimated	3,760	16,400	4.37
Total	14,700	92,200	6.25

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

1/ Includes dolomite, granite, limestone, limestone-dolomite, miscellaneous stone, sandstone, slate, traprock, and volcanic cinder and scoria.

2/ Data are rounded to three significant digits, except unit value; may not add to totals

3/ Includes concrete aggregate (coarse).

4/ Less than 1/2 unit.

5/ Includes terrazzo and exposed aggregate.

6/ Includes reported and estimated production without a breakdown by end use.

TABLE 4
WASHINGTON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1997,
BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 2/	1,100	7,750	--	--	W	W
Coarse aggregate, graded 3/	160	1,240	W	W	103	383
Fine aggregate (-3/8 inch) 4/	285	1,620	76	315	9	35
Coarse and fine aggregate 5/	2,450	11,500	237	1,310	482	1,970
Other construction materials	W	W	W	W	--	--
Agricultural 6/	--	--	W	W	W	W
Chemical and metallurgical 7/	W	W	--	--	W	W
Special 8/	--	--	W	W	W	W
Unspecified: 9/						
Actual	2,830	20,600	726	1,980	1,900	9,030
Estimated	2,990	12,900	278	1,470	491	2,040
Total	10,000	56,900	1,470	18,100	3,240	17,200

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

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes filter stone, riprap and jetty stone, and other coarse aggregate.

3/ Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

4/ Includes stone sand (concrete), screening (undesignated), and other fine aggregate.

5/ Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

6/ Includes agricultural limestone, poultry grit, and mineral food.

7/ Includes flux stone, glass manufacture, and lime manufacture.

8/ Includes asphalt fillers or extenders, other fillers or extenders, and roofing granules.

9/ Includes reported and estimated production without a breakdown by end use.

TABLE 5
WASHINGTON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1997,
BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	8,980	\$47,300	\$5.26
Plaster and guniting sands	19	177	9.32
Concrete products (blocks, bricks, pipe, decorative, etc.)	460	1,120	2.43
Asphaltic concrete aggregates and other bituminous mixtures	3,080	15,300	4.97
Road base and coverings 2/	6,690	32,400	4.85
Fill	6,400	19,400	3.04
Snow and ice control	120	520	4.33
Railroad ballast	240	785	3.27
Other miscellaneous uses 3/	212	1,130	5.32
Unspecified: 4/			
Actual	3,370	12,500	3.71
Estimated	11,000	49,700	4.53
Total or average	40,500	180,000	4.45

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement and lime).

3/ Includes filtration.

4/ Includes reported and estimated production without a breakdown by end use.

TABLE 6
WASHINGTON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1997,
BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	6,700	40,000	W	W	W	W	--	--
Asphaltic concrete aggregates and other bituminous mixtures	2,430	13,300	387	1,230	260	794	--	--
Road base and coverings 3/	4,890	25,600	839	3,600	962	3,270	--	--
Fill	6,250	19,000	104	342	40	126	--	--
Other miscellaneous uses 4/	422	1,900	W	W	W	W	--	--
Unspecified: 5/								
Actual	1,460	5,300	W	W	W	W	115	503
Estimated	8,940	42,300	1,900	6,940	137	548	--	--
Total	31,100	147,000	4,520	17,700	4,830	15,000	115	503

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

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement and lime).

4/ Includes fill, railroad ballast, and snow and ice control.

5/ Includes reported and estimated production without a breakdown by end use.