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 Division of Geology and Earth Resources for collecting information on all nonfuel minerals.

In 1997, Washington ranked 26th in the Nation in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The State was 23d in 1996. The estimated value for 1997 was $522 million, about a 2% decrease from that of 1996. This followed an 8.1% decrease from 1995 to 1996 (based on final 1996 data). The State accounted for almost 1.5% of the U.S. total nonfuel mineral production value.

Gold and magnesium metal, the only metals to be produced from Washington's natural resources, represented close to 30% of the State's nonfuel mineral value. About 65% of the State's industrial mineral value was accounted for by three commodities: construction sand and gravel, crushed stone, and portland cement, in descending order of value. In 1997, Washington's drop in value resulted mainly from the decreased value of magnesium metal, down more than $25 million, and gold, down by about $6 million. Increases in value occurred mostly in crushed stone, construction sand and gravel, and portland cement, but these were not enough to compensate for the drop in metal values, resulting in the State's net decrease (*table 1*). All other value changes were small. Only common clays, natural gemstones, crude gypsum, and industrial sand and gravel showed any decrease in value. In 1996, most of the State's drop in value resulted from decreases in portland cement, magnesium metal, and lime. Construction sand and gravel and crushed stone were the only nonfuel minerals to show any significant rise in value for the year.

Based on USGS estimates of the quantities produced in the 50 States in 1997, Washington remained second of 2 States that produce olivine; third of 3 magnesium metal-producing States; and fourth of 4 States that produce diatomite. The State rose to 9th from 10th in the production of gold and dropped from 6th to 7th in construction sand and gravel. In 1997, Washington continued to lead the Nation in the production of primary aluminum with an estimated 1.13 million metric tons, a nearly 2% increase from that of 1996. The State accounted for more than 31% of the U.S. total primary aluminum production. Raw steel was also produced in the State, both metals being processed from materials received from foreign and other domestic sources.

The following narrative information was provided by the Washington State Division of Geology and Earth Resources[2] (DGER). Production data in the following text 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 Echo Bay Minerals Co's. Kettle River Project mined and produced gold from the Lamefoot and K-2 deposits near Republic in Ferry County. Kettle River has been the only major gold mining operation in Washington for the past 2 years. In 1997, the Kettle River Project produced 4,040 kilograms of gold, up from the 3,890 kilograms produced in 1996. Recovery in 1997 was almost the same as in 1996 at about 85%. A total of more than 699,000 metric tons of ore was processed at the company's mill near Republic compared with 546,000 tons in 1996. Although tons of ore processed in 1997 was considerably higher than in 1996, the ore grade was lower.

Lamefoot, an exhalative/replacement-type deposit in Permian rocks, produced more than 494,000 tons of ore in 1997. K-2, an epithermal vein-type deposit in Eocene volcanic rocks (developed in 1996), produced 204,000 tons of ore in 1997. The remaining ore processed at the mill, 1,045 tons, was from a low-grade stockpile of ore mined prior to 1996 at the Overlook Mine. Approximately 80% of the ore mined in 1997 was replaced through discovery and confirmation of new reserves. Echo Bay Minerals also was one of the most active companies exploring in Washington in 1997. Echo Bay continued to explore at the Black Hawk property and added the Mires Creek property, both possible sites of mineralization similar to that at its Lamefoot deposit.

The environmental impact statement for Battle Mountain Gold Co.'s Crown Jewel gold deposit at Chesaw in Okanogan County was released in early February. The company was completing permit applications for the operation throughout 1997. If this process continued as smoothly as it had during 1997, Battle Mountain projected beginning construction of the mine and mill during 1998. Cominco American Inc., which had acquired the Pend Oreille Mine in 1996, continued its surface and underground exploration program at the property aimed at identifying reserves that could be shipped to its parent company's (Cominco Ltd.) smelter in Trail, British Columbia, Canada. The companies worked toward doing a feasibility study to determine how best to put the mine back into production. Startup could be sometime after closure of the parent company's Sullivan Mine in nearby British Columbia.

Northwest Alloys Inc. (a subsidiary of Aluminum Co. of

[1]The 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 1997 USGS mineral production data published in this chapter are estimates as of January 1998. For some 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. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/ contacts/comdir.html . All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved by way of MINES FaxBack or over the Internet at http://minerals.er.usgs.gov/minerals/.

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

America) continued to produce magnesium metal at its plant near Addy in Stevens County. The amount of dolomite mined adjacent to the plant that was crushed, calcined, and sent to the reactor, decreased slightly in 1997, to 483,000 tons compared with 532,000 tons in 1996.

A new company active for the first time in Washington in 1997 was Spokane-based Yamana Resources Inc. The company drilled 18 holes at the Palmer Mountain property in north central Washington for potential volcanogenic massive sulfide mineralization. Yamana also drilled for gold at the Blue Lake and Schuer Bet properties in 1997.

At the Wind River Mine in Skamania County, DeLano Wind River Mining Co. was driving a drift to intercept the currently-mined vein at a lower level and was modifying the mill through the addition of a flotation circuit to recover the gold-bearing minerals. The company also continued to mine and stockpile ore from the Wind River gold deposit. DeLano hopes mill modification will allow them to obtain permits to establish the milling operation.

In industrial mineral industry activities, companies that mined limestone and dolomite for use as a soil conditioner and/or as feed lime included Pacific Calcium Inc. from its Tonasket and Brown quarries in Okanogan County; Allied Minerals, Inc. from its Gehrke quarry; and Northwest Alloys where calcium-magnesium lime is a feedstock for magnesium metal production at Addy in Stevens County. Columbia River Carbonates continued to produce high brightness calcium carbonate mined from the Wauconda quarry in Ferry County and process it for the paper industry in Longview, Cowlitz County. Northport Limestone Co. mined and shipped carbonate from its Sherve quarry in Stevens County, most of which was shipped to Trail, British Columbia, where it was used as a fluxing agent in smelting. Northwest Marble Products produced color- and site-specific carbonate products for terrazzo tile and related products.

As estimated and reported by the DGER, Olivine Corp. produced approximately 36,000 tons of olivine in 1997 from its Sven Larsen quarry in Whatcom County. The company used about 900 tons of its production for refractory materials for waste incinerators, and the remaining production was shipped as crushed olivine to Unimin Corp. to produce casting sands and other refractory products at Hamilton in Skagit County.

Holnam Inc. and Ash Grove Cement Co. mined clay and silica in western Washington for the cement industry. Holnam Inc. mined clay from the Twin River quarry in Clallam County, and Ash Grove Cement Co. mined clay from its Castle Rock quarry Cowlitz County and silica from its Superior quarry in King County. Pacific Coast Coal Co. also mined clay from the John Henry #1 coal mine in King County and shipped it to Ash Grove Cement Co.

Clay used predominantly for bricks and related products was mined by Mutual Materials in Spokane County at the Potratz Mine in King County at the Elk and Section 31 pits and from the Clay City pit in Pierce County.

The DGER also reported the estimated mineral production for several other companies. Celite Corp. mined and processed 95,300 tons of diatomite at its pits in Grant County. The company produced 65,300 tons of finished diatomite. Lane Mountain Silica Co. mined 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, most of which was used to manufacture clear glass bottles and jars. Reserve Silica Corp. mined 63,500 tons of quartz-rich Puget Group sands (industrial sand) 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	1995		1996		1997 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement, portland	W	W	1,160	78,900 e/	1,180	82,100 e/
Clays, common	220	1,040	218	1,070	207	956
Gemstones	NA	53	NA	36	NA	34
Gypsum, crude	--	--	W	W	9	63
Peat metric tons	2	87	W	W	W	W
Sand and gravel, construction	37,700	155,000	37,900	162,000	38,900	170,000
Stone, crushed	15,800 3/	76,800 3/	15,400	81,400	17,000	90,100
Combined value of cement (masonry) , diatomite, gold, lime, magnesium metal, olivine, sand and gravel (industrial), stone [crushed dolomite, limestone, and marble (1995), dimension miscellaneous], and values indicated by symbol W	XX	350,000	XX	212,000	XX	179,000
Total	XX	582,000	XX	535,000	XX	522,000

e/ Estimated. p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" 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/ Excludes certain stones; kind and value included with "Combined value" data.

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

Kind	1995 Number of quarries	1995 Quantity (thousand metric tons)	1995 Value (thousands)	1995 Unit value	1996 Number of quarries	1996 Quantity (thousand metric tons)	1996 Value (thousands)	1996 Unit value
Limestone 2/	7 3/	1,220 3/	$19,200 3/	$15.77 3/	8	2,140	$21,900	$10.24
Dolomite	5	W	W	4.14	2	W	W	4.61
Granite	8 r/	242 r/	991 r/	4.10 r/	5	257	1,310	5.10
Traprock	133	12,100	47,000	3.88	99	11,000	49,000	4.46
Sandstone	5	W	W	3.96	5	W	3,290	W
Slate	1	W	W	3.93	5	W	W	4.72
Marble	(4/)	(4/)	(4/)	(4/)	--	--	--	--
Miscellaneous stone	13	802	3,440	4.28	11	910	4,110	4.51
Total	XX	15,800	76,800	4.85	XX	15,400	81,400	5.27

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.
3/ Excludes limestone-dolomite from State total to avoid disclosing company proprietary data.
4/ Excludes marble from State total to avoid disclosing company proprietary data.

TABLE 3
WASHINGTON: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 1996, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	W	W	$7.23
Riprap and jetty stone	707	$4,230	5.98
Filter stone	74	460	6.22
Other coarse aggregate	W	W	6.18
Coarse aggregate, graded:			
Bituminous aggregate, coarse	212	1,030	4.87
Bituminous surface-treatment aggregate	150	765	5.10
Railroad ballast	73	432	5.92
Fine aggregate (-3/8 inch):			
Stone sand, concrete	W	W	3.48
Stone sand, bituminous mix or seal	W	W	3.60
Screening, undesignated	36	142	3.94
Coarse and fine aggregates:			
Graded road base or subbase	927	2,940	3.17
Unpaved road surfacing	944	3,040	3.22
Terrazzo and exposed aggregate	W	W	7.87
Crusher run or fill or waste	57	167	2.93
Other construction materials	261	1,840	7.07
Agricultural:			
Agricultural limestone	22	267	12.14
Poultry grit and mineral food	(3/)	(3/)	3.83
Chemical and metallurgical:			
Cement manufacture	(3/)	(3/)	5.09
Lime manufacture	(3/)	(3/)	15.00
Dead-burned dolomite manufacture	145	557	3.84
Special:			
Whiting or whiting substitute	(3/)	(3/)	126.57
Other fillers or extenders	(3/)	(3/)	88.50
Paper manufacture	(3/)	(3/)	194.50
Unspecified: 4/			
Actual	4,560	23,600	5.19
Estimated	7,100	29,900	4.21
Total	15,400	81,400	5.27

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."
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 shown.
3/ Withheld to avoid disclosing company proprietary data; included in "Total."
4/ Includes production reported without a breakdown by end use and with estimates for nonrespondents.

TABLE 4
WASHINGTON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1996, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District unspecified	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 2/	868	5,330	W	W	W	W	–	–
Coarse aggregate, graded 3/	W	W	W	W	189	774	–	--
Fine aggregate (-3/8 inch) 4/	W	W	W	W	W	W	--	--
Coarse and fine aggregate 5/	1,660	5,150	W	W	W	W	–	--
Other construction materials	282	1,680	226	1,320	222	798	--	--
Agricultural 6/	--	--	(7/)	(7/)	(7/)	(7/)	--	--
Chemical and metallurgical 8/	(7/)	(7/)	--	--	(7/)	(7/)	--	--
Special 9/	--	--	(7/)	(7/)	--	--	–	--
Unspecified: 10/								
Actual	(7/)	(7/)	1,190	3,630	(7/)	(7/)	--	--
Estimated	5,230	21,800	515	2,340	1,160	4,540	195	1,170
Total	9,930	47,600	2,020	18,900	3,290	13,700	195	1,170

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."
1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.
3/ Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, and railroad ballast.
4/ Includes stone sand (concrete), stone sand (bituminous mix or seal), and screening (undesignated).
5/ Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and crusher run (select material or fill).
6/ Includes agricultural limestone and poultry grit and mineral food.
7/ Withheld to avoid disclosing company proprietary data; included in "Total."
8/ Includes cement manufacture, dead-burned dolomite manufacture, and lime manufacture.
9/ Includes other fillers or extenders, paper manufacture,and whiting or whiting substitute.
10/ Includes production reported without a breakdown by end use and with estimates for nonrespondents.

TABLE 5
WASHINGTON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1996,
BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	10,200	$50,900	$5.00
Plaster and gunite sands	14	117	8.36
Concrete products (blocks, bricks, pipe, decorative, etc.)	114	804	7.05
Asphaltic concrete aggregates and other bituminous mixtures	1,860	8,030	4.31
Road base and coverings 2/	5,790	25,200	4.35
Fill	5,190	16,500	3.18
Snow and ice control	199	786	3.95
Railroad ballast	93	498	5.35
Other miscellaneous uses	792	2,730	3.45
Unspecified: 3/			
Actual	4,950	19,200	3.89
Estimated	8,710	37,200	4.27
Total or average	37,900	162,000	4.27

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 production reported without a breakdown by end use and with estimates for nonrespondents.

TABLE 6
WASHINGTON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1996,
BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	7,400	43,200	W	W	W	W
Asphaltic bituminous mixtures	1,540	6,950	217	712	104	363
Road base and coverings 3/	4,790	21,500	337	1,410	666	2,300
Fill	5,110	16,200	63	210	19	73
Snow and ice control	156	625	W	W	W	W
Railroad ballast	81	472	2	5	11	21
Other miscellaneous uses	710	2,490	911	3,230	2,120	5,870
Unspecified: 4/						
Actual	2,850	11,400	556	2,330	1,540 5/	5,470 5/
Estimated	6,070	27,800	1,960	7,340	683	1,990
Total	28,700	131,000	4,040	15,200	5,150 5/	16,100 5/

W Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous uses."
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 production reported without a breakdown by end use and with estimates for nonrespondents.
5/ Includes production within State with no district reported.