

# THE MINERAL INDUSTRY OF WISCONSIN

**This chapter has been prepared under a Memorandum of Understanding between the U.S. Bureau of Mines, U.S. Department of the Interior, and the Wisconsin Geological and Natural History Survey for collecting information on all nonfuel minerals.**

In 1996, for the 2d consecutive year, Wisconsin ranked 33d among the 50 States in total nonfuel mineral production value,<sup>1</sup> according to the U.S. Geological Survey (USGS). The estimated value for 1996 was \$399 million, a 4% decrease from that of 1995. This followed a 31% increase from 1993 to 1994 and a 1.7% increase from 1994 to 1995 (based on revised 1994 data and final 1995 data). The State accounted for more than 1% of the U.S. total nonfuel mineral production value.

Crushed stone and construction sand and gravel were, by value, Wisconsin's leading nonfuel minerals in 1996, each accounting for more than 26% of the State's total nonfuel mineral value. Copper was third; all Wisconsin metal mine production—copper, gold, and silver—together equaled about 27% of the State's total. In 1996, increases of more than \$6 million in the value of gold and \$3 million in construction sand and gravel offset, only in part, a substantial drop in the value of copper. Other nonfuel mineral commodity values that increased in 1996 included silver and peat, while those of crushed stone, lime, dimension stone, and gemstones showed a decrease.

In 1995, increases in construction sand and gravel and lime values more than offset decreased values for crushed stone and gold, while copper's production value increased slightly for the year.

Compared with USGS estimates of quantities produced in the other 49 States for 1996, Wisconsin remained second of two States that produce silica stone, third in dimension stone, fifth in industrial sand and gravel, and ninth in construction sand and gravel. The State moved up from ninth to eighth in silver and dropped from fifth to sixth in copper production. Additionally, significant quantities of crushed stone and lime were produced in the State.

The following narrative information was provided by the Wisconsin Geological and Natural History Survey.<sup>2</sup> The Flambeau Mine (a small open pit copper-gold mine) continued to operate successfully, both in economic terms and environmentally. The review of Crandon Mining Co.'s (CMC) proposal for its underground zinc-copper mine, the Crandon Mine, continued with progress on development of local agreements with affected local governmental bodies and with the permitting assessments involving the Wisconsin Department of Natural

Resources. The final release of the new nonmetallic mining reclamation rules was another highlight in 1996.

Flambeau Mining Co.'s open pit copper-gold operation near the city of Ladysmith in Rusk County continued to be Wisconsin's major producer of metallic mineral ore. During the year, production remained at near-peak levels of massive sulfide ore containing enriched levels of copper metal and minor quantities of gold and silver. According to the Wisconsin Department of Natural Resources, no environmental compliance problems were experienced during the year. Flambeau Mining Company paid in excess of \$6 million in 1996 for the occupational tax levied on the net proceeds of Wisconsin metalliferous mining operations. This special tax payment was based on net proceeds of about \$60 million and was paid in addition to all other corporate taxes required at both the Federal and State levels.

The CMC completed the development of the environmental impact report (EIR) for its proposed underground mine in Forest County; however, review of the EIR continued throughout the year. The ore deposit is a large zinc-copper-massive sulfide of about 50 million metric tons in size, with grades of zinc and copper averaging 5% and 1%, respectively, over the entire ore body. Minor quantities of lead, gold, and silver were also present and potentially recoverable. The focus of the ongoing review was on the ground water flow and contaminant transport models. All permit applications were received, and development of the draft Environmental Impact Statement (EIS) was initiated. The draft EIS was not expected until the spring of 1997.

Metallic mining projects in Wisconsin are required to comply with all local zoning and land use ordinances; local agreements are contract-based arrangements between potential mining applicants and local units of government designed to accomplish compliance and to address issues of local concern prior to initiation of mining. In 1996, CMC, a partnership between Exxon Minerals Co. and Rio Algom Ltd., signed agreements with the town of Nashville, the town of Lincoln, and Forest County.

Thirty-two drill holes were completed for the purposes of evaluating massive-sulfide targets in nine counties during the year. Three companies were involved

in the exploration: (1) BHP Minerals International focused on targets in Lincoln and Florence Counties, as well as the Bishop Lake target in Forest County, west of the Crandon deposit, (2) Sharpe Energy and Resources Ltd. drilled two primary targets, one in Price County and the other the Bend deposit in Taylor County, and (3) Flambeau Mining Co. completed 13 holes on the Eisenbrey (formerly known as the Thornapple) deposit, as well as 8 other exploratory drill holes on at least three targets in their west-central Wisconsin exploration effort in Jackson, Clark, and Trempealeau Counties.

Statewide nonmetallic mining reclamation rules were extensively redrafted in 1996 following several hearings around the State during the previous year. Chapter NR 135 was mandated by the passage of 1993 Wisconsin Act 464 and established minimum standards for the reclamation of nonmetallic mining operations throughout the State. The department had postponed promulgation of NR 135 pending revisions to the proposed rule and potential statutory language modifications, as well as the

appointment of an advisory group known as the Nonmetallic Mining Council. Formal action is expected in 1997 on the proposed rules and statutory modifications.

<sup>1</sup>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 1996 USGS mineral production data published in this chapter are estimates as of February 1997. 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>

<sup>2</sup>Thomas Evans, Geologist with the WGNHS, authored the text of information submitted by that agency. James Robertson is the Director and State Geologist of the WGNHS.

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

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones	NA	53	NA	65	NA	W
Lime	507	30,300	568	33,900	552	33,000
Peat	2	61	W	W	W	W
<u>Sand and gravel:</u>						
Construction	29,200	91,500	32,200	102,000	32,900	105,000
Industrial	1,630	32,400	1,670	33,300	1,670	33,300
Silica stone <sup>3/</sup> metric tons	45	80	W	W	W	W
<u>Stone:</u>						
Crushed	28,600	115,000 <sup>4/</sup>	26,000	108,000	25,000	106,000
Dimension metric tons	125,000	14,100	128,000	14,500	143,000	14,400
<u>Combined value of copper, gold, silver, stone</u>						
<u>[crushed quartzite (1994)], and values indicated</u>						
by symbol W	XX	126,000	XX	124,000	XX	107,000
Total	XX	409,000	XX	416,000	XX	399,000

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/ Grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.

4/ Excludes certain stones; value included with "Combined value" data.

TABLE 2  
WISCONSIN: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity		
	(thousand metric tons)	Value (thousands)	Unit value
<b>Coarse aggregate (+1 1/2 inch):</b>			
Riprap and jetty stone	122	\$690	\$5.66
Filter stone	148	655	4.43
Other coarse aggregate 3/	622	2,620	4.21
<b>Coarse aggregate, graded:</b>			
Concrete aggregate, coarse	1,590	7,100	4.47
Bituminous aggregate, coarse	748	3,540	4.73
Bituminous surface-treatment aggregate	292	966	3.31
Other graded coarse aggregate 4/	82	298	3.63
<b>Fine aggregate (-3/8 inch):</b>			
Stone sand, concrete	31	123	3.97
Stone sand, bituminous mix or seal	31	125	4.03
Screening, undesignated	469	1,520	3.24
<b>Coarse and fine aggregates:</b>			
Graded road base or subbase	7,090	26,100	3.68
Unpaved road surfacing	1,030	2,230	2.16
Crusher run or fill or waste	420	1,380	3.28
Other construction materials 5/	536	2,950	5.50
Agricultural: Agricultural limestone	444	4,940	11.11
<b>Chemical and metallurgical:</b>			
Lime manufacture	(6/)	(6/)	3.98
Flux stone	31	152	4.90
Other specified uses not listed	(6/)	(6/)	3.36
<b>Unspecified: 7/</b>			
Actual	5,970	26,800	4.49
Estimated	6,120	25,000	4.09
<b>Total</b>	<b>26,000</b>	<b>108,000</b>	<b>4.16</b>

1/ Includes dolomite, granite, limestone, limestone-dolomite, sandstone and quartzite, and traprock.

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

3/ Includes macadam.

4/ Includes railroad ballast.

5/ Includes roofing granules and terrazzo and exposed aggregate.

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

7/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3  
WISCONSIN: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1994				1995			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	203 r/	22,400 r/	\$91,100 r/	\$4.07	170	20,100	\$84,300	\$4.19
Dolomite	7	1,370 r/	5,620 r/	4.11 r/	3	1,110	4,790	4.30
Granite	9	1,200	2,340	1.96	9	1,210	3,110	2.58
Traprock	4	1,850	7,870	4.27	3	1,970	8,980	4.56
Sandstone and quartzite	4	1,770	7,660 3/	4.33 3/	3	1,560	6,800	4.35
<b>Total</b>	<b>XX</b>	<b>28,600 r/</b>	<b>115,000 r/</b>	<b>4.01</b>	<b>XX</b>	<b>26,000</b>	<b>108,000</b>	<b>4.16</b>

r/ Revised. XX Not applicable.

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

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

3/ Excludes quartzite from State total to avoid disclosing company proprietary data.

TABLE 4  
WISCONSIN CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 2/

(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) 3/	23	75	W	W	W	W
Coarse aggregate, graded 4/	W	W	1,060	5,010	730	2,750
Fine aggregate (-3/8 inch) 5/	62	246	W	W	W	W
Coarse and fine aggregate 6/	W	W	2,020	7,460	2,830	10,200
Other construction materials 7/	3,350	14,600	853	3,610	370	1,120
Agricultural 8/	165	1,070	(9/)	(9/)	(9/)	(9/)
Chemical and metallurgical 10/	--	--	(9/)	(9/)	(9/)	(9/)
Other miscellaneous uses 11/	--	--	--	--	(9/)	(9/)
Unspecified: 12/						
Actual	561	2,600	781	3,680	68	279
Estimated	1,490	6,340	527	1,910	2,390	8,880
Total	5,650	24,900	5,450	25,000	6,600	24,100
Use	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	W	W	76	552	6	34
Coarse aggregate, graded 4/	--	--	W	W	1	7
Fine aggregate (-3/8 inch) 5/	W	W	W	W	--	--
Coarse and fine aggregate 6/	1,090	1,840	W	W	72	314
Other construction materials 7/	19	62	663	2,450	--	--
Agricultural 8/	--	--	25	177	37	293
Chemical and metallurgical 10/	--	--	--	--	--	--
Other miscellaneous uses 11/	--	--	--	--	--	--
Unspecified: 12/						
Actual	1,340	5,650	2,310	10,500	911	4,140
Estimated	149	1,360	39	186	1,530	6,360
Total	2,600	8,910	3,110	13,900	2,560	11,100

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Production reported in District 8 was included with "District 6" to avoid disclosing company proprietary data; no crushed stone was produced in District 7.

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

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

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

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), and screening (undesignated).

6/ Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and crusher run select material or fill).

7/ Includes roofing granules.

8/ Includes agricultural limestone.

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

10/ Includes flux stone and lime manufacture.

11/ Includes other specified uses not listed.

12/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5  
WISCONSIN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995,  
BY MAJOR USE CATEGORY 1/

Use	Quantity		
	(thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	7,680	\$28,100	\$3.66
Plaster and gunitite sands	25	159	6.36
Concrete products (blocks, bricks, pipe, decorative, etc.)	271	1,610	5.94
Asphaltic concrete aggregates and other bituminous mixtures	1,880	6,090	3.24
Road base and coverings 2/	5,630	15,100	2.68
Fill	1,420	2,370	1.67
Snow and ice control	199	761	3.82
Railroad ballast	4	16	4.00
Roofing granules	9	60	6.67
Filtration	8	60	7.50
Other	362	1,290	3.57
Unspecified: 3/			
Actual	8,680	27,300	3.14
Estimated	6,040	19,000	3.14
Total or average	32,200	102,000	3.16

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 estimates for nonrespondents.

TABLE 6  
WISCONSIN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995,  
BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	1,450	4,930	3,370	12,400	1,510	5,420	W	W
Asphaltic bituminous mixtures	464	1,640	599	1,780	201	618	W	W
Road base and coverings 3/	205	564	2,700	7,740	966	2,180	155	481
Fill	140	288	582	841	237	588	303	379
Snow and ice control	26	57	82	372	10	84	W	W
Railroad ballast	--	--	--	--	--	--	--	--
Other miscellaneous uses 4/	121	523	36	132	--	--	193	1,020
Unspecified: 5/								
Actual	1,320	4,340	5,790	18,200	42	69	399	880
Estimated	577	1,790	1,360	4,300	935	2,380	413	1,240
Total	4,300	14,100	14,500	45,800	3,900	11,300	1,460	4,000
Use	District 5		District 6		District 7		District 8	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	W	W	857	3,590	191	795	319	1,360
Asphaltic bituminous mixtures	W	W	215	577	71	190	263 6/	1,110 6/
Road base and coverings 3/	--	--	730	1,840	410	888	470	1,390
Fill	W	W	59	133	45	56	W	W
Snow and ice control	8	13	43	119	5	12	W	W
Railroad ballast	--	--	--	--	--	--	4	16
Other miscellaneous uses 4/	167	572	212	682	--	--	80	236
Unspecified: 5/								
Actual	214	685	--	--	52	147	867 6/	2,920 6/
Estimated	--	--	1,530	5,500	680	1,700	540	2,050
Total	388	1,270	3,640	12,400	1,450	3,790	2,540 6/	9,080 6/

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 filtration and roofing granules.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

6/ Includes unspecified within all districts.