



# 2007 Minerals Yearbook

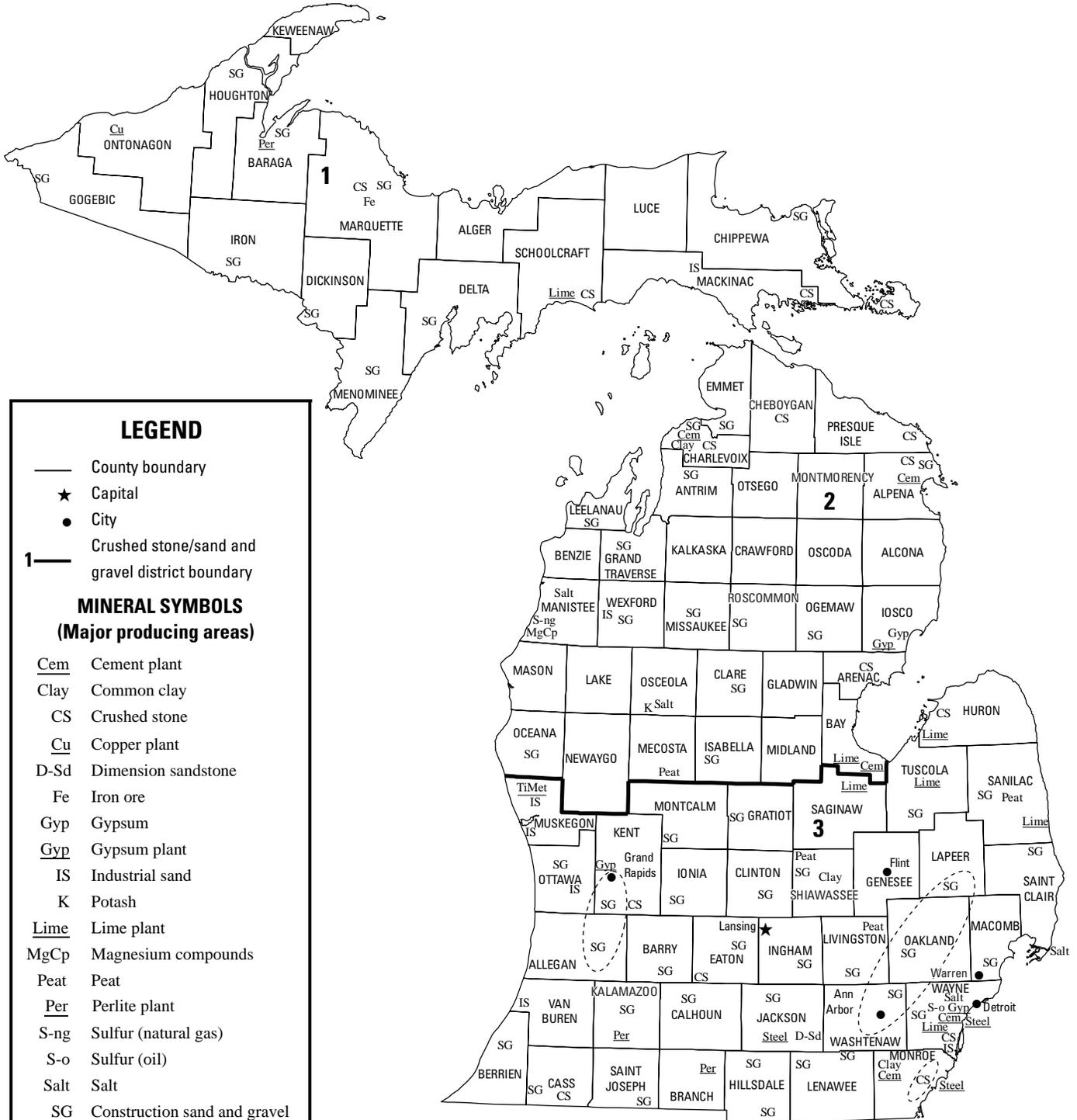
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MICHIGAN [ADVANCE RELEASE]

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# MICHIGAN

KEWEENAW



## LEGEND

- County boundary
- ★ Capital
- City
- 1— Crushed stone/sand and gravel district boundary

## MINERAL SYMBOLS (Major producing areas)

- Cem Cement plant
- Clay Common clay
- CS Crushed stone
- Cu Copper plant
- D-Sd Dimension sandstone
- Fe Iron ore
- Gyp Gypsum
- Gyp Gypsum plant
- IS Industrial sand
- K Potash
- Lime Lime plant
- MgCp Magnesium compounds
- Peat Peat
- Per Perlite plant
- S-ng Sulfur (natural gas)
- S-o Sulfur (oil)
- Salt Salt
- SG Construction sand and gravel
- Steel Steel plant
- TiMet Titanium metal plant
- Concentration of mineral operations

0 25 50 100 Kilometers

Albers equal area projection

# THE MINERAL INDUSTRY OF MICHIGAN

**This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Michigan Department of Environmental Quality, Office of Geological Survey, for collecting information on all nonfuel minerals.**

In 2007, Michigan's nonfuel raw mineral production<sup>1</sup> was valued at \$1.97 billion, based upon annual U.S. Geological Survey (USGS) data. This was a \$27 million, or 1.4%, increase from the State's total nonfuel mineral production value for 2006, which had increased by \$200 million, or 11.5%, from 2005 to 2006. The State was 12th in rank (11th in 2006) among the 50 States in total nonfuel mineral production value, of which Michigan accounted for 2.8% of the U.S. total.

Michigan continued to be the Nation's second leading iron ore-producing State in 2007, based upon value, and iron ore remained Michigan's leading nonfuel mineral commodity followed, in descending order of value, by portland cement, construction sand and gravel, salt, crushed stone, and magnesium compounds. The combined values of these six nonfuel mineral commodities accounted for more than 94% of the State's nonfuel raw mineral production value (table 1).

In 2007, increases in the values of iron ore, construction sand and gravel, and portland cement led Michigan's increase in total nonfuel mineral production value. The production value of iron ore rose by \$39.4 million, despite a slight decrease in the quantity produced. Construction sand and gravel rose by \$19.9 million and portland cement rose by \$1 million, despite slight decreases in the unit values of each. Smaller increases took place in the values of lime, peat, and salt (values withheld—company proprietary data). The most substantial decrease took place in crushed stone, declining by \$20.6 million. Although the commodity's unit value rose by 6.6%, its total production value decreased substantially (nearly 14%), because of a 6.55 million metric ton (Mt), or more than 19%, decrease in the quantity produced. Masonry cement decreased by \$2.5 million, despite a 5.4% increase in unit value. Smaller decreases also took place in magnesium compounds and industrial sand and gravel.

Michigan remained the Nation's leading magnesium compounds-producing State and ranked second in iron ore production. The State continued to rank third in the production of potash, fourth in construction sand and gravel, fifth in portland cement, seventh in salt, eighth in crude gypsum, and ninth in masonry cement. Michigan rose in rank from fifth to third in peat sales and from ninth to eighth in industrial sand and gravel production. The State dropped in rank in crushed stone and dimension stone production.

The following narrative information was provided by the Michigan Department of Environmental Quality (MDEQ), Office of the Geological Survey (MOGS) and the Michigan

Department of Natural Resources (MDNR), Forestry, Mineral, and Fire Management Division<sup>2</sup> (FMFM). Production data and other information in the following text are those reported by the MOGS and the MDNR, based upon those agencies' research, surveys, and estimates. Mineral production data may differ from production figures reported to the USGS.

The Michigan nonmetallic mineral industry was nearly static in 2007; there was no boom or bust cycle at that time. The metallic mineral industry varied in activity. Metallic mineral mining was confined to iron ore from two large, adjacent open pit mines in Marquette County. A limited amount of copper was mined for sale as specimens to museums and private hobby collectors. Copper refining continued at White Pine, MI, where copper anodes shipped from Canada were refined. Steel production varied with the economy and Michigan's automobile industry.

## Exploration Activities

There were 12 exploration plans received by the State for work to be done on State-owned leases. Four companies drilled 189 exploration test holes totaling 45,100 meters (m) in five counties on State and private leases. Reported targets for exploration in the western Upper Peninsula were copper, gold, nickel, palladium, silver, uranium, and zinc. Prime Meridian Resources Corp. announced the commencement of its magmatic nickel-copper massive sulfide and Iron Oxide Copper Gold exploration programs in several Michigan locations (Prime Meridian Resources Corp., 2007).

Kennecott Eagle Minerals Co. in Marquette received State approval on December 14 for its principal environmental permits to start constructing the Eagle nickel and copper mine. The Michigan DNR recommended on December 6 that the Natural Resources Commission approve Kennecott's reclamation plan for the State portion of the Eagle Mine and that a land surface agreement for the surface operation be approved. Aquila Resources Inc. announced the results for additional drill holes on its Back-Forty project in Menominee County. About 6.6 Mt of copper, gold, lead, silver, and zinc resources were reported (Aquila Resources Inc., 2007).

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<sup>1</sup>The 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 2007 USGS mineral production data published in this chapter are those available as of June 2009. 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>.

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<sup>2</sup>The text of the State mineral industry information was compiled and edited by Milton A. Gere, Jr., Geologist and Supervisor, Metallic and Nonmetallic Minerals and Underground Gas Storage Leasing Unit, Minerals and Land Management Section, Forest, Mineral, and Fire Management Division, Michigan Department of Natural Resources.

## Commodity Review

### Industrial Minerals

**Limestone/Lime.**—Burroughs Materials North's Wallace stone quarry, near Bay Port in Huron County, is owned by the Edw. C. Levy Co. in Detroit. The company estimated that it could produce for about 280 more years. In 2007, the Burroughs quarry produced limestone for road construction, concrete stone, decorative stone, and agricultural uses.

Carmeuse North America announced the purchase of the Oglebay Norton Co. The purchase included a number of properties, including three large Michigan limestone and dolomite quarry locations—the Calcite operations at Rogers City, Cedarville operations at Cedarville, and Port Inland operations at Gulliver (Carmeuse Group S.A., 2007).

Western Lime Corp. commissioned a new 230,000 metric tons per year (t/y) lime plant at Port Inland. The plant will produce high calcium lime from limestone supplied by the nearby Carmeuse Port Inland quarry (Ferenc, 2007).

**Sand and Gravel, Construction.**—Aggregate Industries Ltd. continued to have a zoning dispute over a 66.8-ha sand and gravel operation site with the township board of trustees in Alamo Township, Kalamazoo County. In June, the Alamo Township zoning board denied the request permit to mine at 10th Street and G Avenue (Alamo Township Newsletter, 2007). The zoning dispute was discussed and delayed over several months. In response, Aggregate Industries sued Alamo Township for the right to operate. A judge ruled in mid-October that the court had jurisdiction to sign a September settlement.

Rieth-Riley Construction Co. will stop mining sand and gravel at a site located in Ada Township, Kent County within 5 years per a township board approved settlement. This will end the 40-year sand and gravel pit operation. The company and township board have opposed each other on the life of the operation since 2003.

### Metals

**Iron Ore.**—Cleveland-Cliffs Inc (Cleveland, OH) operated two iron ore mines that were managed by Cleveland-Cliffs Iron Co. (CCI). The Empire Mine was 79% owned by CCI and 21% owned by Mittal Steel USA, which in 2007 changed its name to ArcelorMittal USA. The Tilden Mine is 85% owned by CCI and 15% owned by Stelco Inc. (renamed U.S. Steel Canada in October 2007 when the company was acquired by U.S. Steel Corporation). Both iron mines were located in Marquette County on the Marquette Iron Range and produced standard and fluxed iron ore pellets. The 2007 production was estimated to be about 5.1 Mt for the Empire Mine and 7.8 Mt for the Tilden Mine (Cleveland-Cliffs Inc, 2007a). Cleveland-Cliffs, predicted that the Empire Mine would not operate past 2009 unless methods to extend the life of the mine were employed. An on-site iron nugget plant was one proposal being considered. The company sold its former Republic mine site, property, etc. to an undisclosed buyer.

**Steel.**—Stelco, Inc. (partial owner of the Tilden Mine) announced the closing of its Hamilton Steel mill in Hamilton,

Ontario, Canada, and shifted operations to its Lake Erie Mill in Nanticoke, Ontario. U.S. Steel also announced its acquisition of Stelco in a \$1.1 billion purchase (U.S. Steel Corp., 2007). Cleveland-Cliffs announced that it and its joint-venture partner (Kobe Steel, Ltd., of Japan) planned to build a commercial-scale iron nugget production facility. The site would be at Cliff's Empire Mine in Palmer, MI (Cleveland-Cliffs Inc, 2007b).

### Mineral Fuels and Related Materials

**Uranium.**—Bitterroot Resources Ltd. (Trans Superior Resources Inc., Michigan) was reported among a number of companies looking for uranium worldwide (Stakiw, 2007). Bitterroot announced an occurrence of uranium was found in a Michigan drill hole in the Jacobsville Basin (Bitterroot Resources Ltd., 2007).

### Government Activities

There were 45 nonmetallic mineral leases on 1,431 hectares (ha) of State-owned lands which brought in \$451,526 in fiscal year 2007. Most of the income went to the Michigan Natural Resources Trust Fund (MNRTF). The existing three types of leases were for the production of boulders and clay, cobbles, gravel, limestone/dolomite, salt, and sand.

Information about activities on State-owned leases indicated that 119 direct metallic mineral leases covering 11,100 ha were issued in fiscal year 2007, totaling 228 leases for 21,700 ha under lease in 2007. Leases for another 162 ha were in the final approval stage and applications for an additional 680 ha were received. These State-leasing activities yielded \$396,901 primarily to the MNRTF, which grants money to State and local governments to purchase and develop public recreational properties.

Kennecott Eagle Minerals Company was awarded a State mining permit in January 2007, but it was withdrawn by the Michigan Department of Environmental Quality (DEQ) for review in March because some reports were not made publically available on time (Anderson, 2007).

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TABLE 1  
NONFUEL RAW MINERAL PRODUCTION IN MICHIGAN<sup>1,2</sup>

(Thousand metric tons and thousand dollars)

Mineral	2005		2006		2007	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	228	27,500 <sup>e</sup>	176	22,700 <sup>e</sup>	149	20,200 <sup>e</sup>
Portland	W	W	5,440	536,000 <sup>e</sup>	5,490	537,000 <sup>e</sup>
Clays, common	334	514	405	1,010	533	1,270
Gemstones, natural	NA	1	NA	2	NA	2
Gypsum, crude	1,000 <sup>r</sup>	8,690 <sup>r</sup>	932 <sup>r</sup>	8,220 <sup>r</sup>	809	8,030
Peat	117	3,300	32	1,020	W	W
Sand and gravel:						
Construction	64,800	243,000	50,500	215,000	57,600	235,000
Industrial	1,610	24,500	1,460	30,400	1,360	30,000
Stone, crushed	36,000	139,000	34,200 <sup>r</sup>	150,000 <sup>r</sup>	27,600	129,000
Combined values of bromine (2005–06), iron ore (usable shipped), iron oxide pigments [crude (2005)], lime, magnesium compounds, potash, salt, stone (dimension dolomite and sandstone), and values indicated by symbol W	XX	1,300,000	XX	981,000 <sup>r</sup>	XX	1,010,000
Total	XX	1,740,000 <sup>r</sup>	XX	1,940,000 <sup>r</sup>	XX	1,970,000

<sup>e</sup>Estimated. <sup>r</sup>Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined value" data. XX Not applicable.

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

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

TABLE 2  
MICHIGAN: CRUSHED STONE SOLD OR USED, BY TYPE<sup>1</sup>

Type	2006			2007		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	27 <sup>r</sup>	26,900 <sup>r</sup>	\$115,000 <sup>r</sup>	24	19,800	\$84,600
Dolomite	5	6,620	30,300	5	7,120	40,800
Miscellaneous stone	5 <sup>r</sup>	716 <sup>r</sup>	4,440 <sup>r</sup>	4	680	3,730
Total	XX	34,200 <sup>r</sup>	150,000 <sup>r</sup>	XX	27,600	129,000

<sup>r</sup>Revised. XX Not applicable.

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

TABLE 3  
MICHIGAN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2007, BY USE<sup>1</sup>

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
<b>Construction:</b>		
<b>Coarse aggregate (+1½ inch):</b>		
Macadam	W	W
Riprap and jetty stone	124	1,290
Filter stone	W	W
Other coarse aggregate	1,380	6,970
<b>Coarse aggregate, graded:</b>		
Concrete aggregate, coarse	2,800	17,500
Bituminous aggregate, coarse	W	W
Railroad ballast	W	W
Other graded coarse aggregate	673	3,270
<b>Fine aggregate (<sup>3</sup>/<sub>8</sub> inch):</b>		
Stone sand, concrete	W	W
Stone sand, bituminous mix or seal	514	2,900
Screening, undesignated	W	W
Other fine aggregate	514	2,280
<b>Coarse and fine aggregates:</b>		
Graded road base or subbase	1,960	11,100
Unpaved road surfacing	W	W
Crusher run or fill or waste	W	W
Other coarse and fine aggregates	34	244
<b>Agricultural:</b>		
Limestone	120	1,100
Other agricultural uses	4	26
<b>Chemical and metallurgical:</b>		
Cement manufacture	5,710	6,300
Lime manufacture	W	W
Flux stone	W	W
Special, other fillers or extenders	(2)	(2)
Other miscellaneous uses and specified uses not listed	6	22
<b>Unspecified:<sup>3</sup></b>		
Reported	3,220	22,900
Estimated	6,400	30,000
Total	27,600	129,000

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

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

<sup>2</sup>Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."

<sup>3</sup>Reported and estimated production without a breakdown by end use.

TABLE 4  
MICHIGAN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2007,  
BY USE AND DISTRICT<sup>1</sup>

(Thousand metric tons and thousand dollars)

Use	Districts 1, 2 and 3 <sup>2</sup>	
	Quantity	Value
<b>Construction:</b>		
Coarse aggregate (+1½ inch) <sup>3</sup>	1,550	8,640
Coarse aggregate, graded <sup>4</sup>	3,960	24,900
Fine aggregate (-¾ inch) <sup>5</sup>	1,390	6,790
Coarse and fine aggregate <sup>6</sup>	2,090	12,000
Agricultural <sup>7</sup>	124	1,130
Chemical and metallurgical <sup>8</sup>	8,950	23,100
Special <sup>9</sup>	W	W
Other miscellaneous uses	6	22
Unspecified: <sup>10</sup>		
Reported	3,220	22,900
Estimated	6,400	30,000
Total	27,600	129,000

W Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."

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

<sup>2</sup>Districts 1, 2, and 3 are combined to avoid disclosing company proprietary data.

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

<sup>4</sup>Includes bituminous aggregate (coarse), concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

<sup>5</sup>Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregates.

<sup>6</sup>Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

<sup>7</sup>Includes agricultural limestone and other agricultural uses.

<sup>8</sup>Includes cement and lime manufacture and flux stone.

<sup>9</sup>Includes other fillers or extenders.

<sup>10</sup>Reported and estimated production without a breakdown by end use.

TABLE 5  
MICHIGAN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2007,  
BY MAJOR USE CATEGORY<sup>1</sup>

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	5,680	\$26,100	\$4.60
Plaster and gunite sands	43	230	5.30
Concrete products (blocks, bricks, pipe, decorative, etc.)	36	270	7.42
Asphaltic concrete aggregates and other bituminous mixtures	4,140	21,000	5.06
Road base and coverings	6,370	28,500	4.47
Road and other stabilization (cement and lime)	356	2,500	7.02
Fill	6,580	11,900	1.81
Snow and ice control	360	1,640	4.54
Other miscellaneous uses <sup>2</sup>	323	1,990	6.17
Unspecified: <sup>3</sup>			
Reported	7,550	39,900	5.28
Estimated	26,100	101,000	3.86
Total or average	57,600	235,000	4.08

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

<sup>2</sup>Includes filtration.

<sup>3</sup>Reported and estimated production without a breakdown by end use.

TABLE 6  
MICHIGAN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2007, BY USE AND DISTRICT<sup>1</sup>

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products <sup>2</sup>	295	2,080	454	2,000	5,010	22,500
Asphaltic concrete aggregates and road base materials <sup>3</sup>	1,700	8,280	2,030	8,950	7,130	34,700
Fill	169	301	415	945	6,000	10,600
Snow and ice control	32	199	190	504	138	931
Other miscellaneous uses <sup>4</sup>	3	29	26	194	294	1,770
Unspecified: <sup>5</sup>						
Reported	55	207	53	565	7,440	39,100
Estimated	1,730	6,890	3,970	15,300	20,400	78,500
Total	3,990	18,000	7,140	28,500	46,400	188,000

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

<sup>2</sup>Includes plaster and gunite sands.

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

<sup>4</sup>Includes filtration.

<sup>5</sup>Reported and estimated production without a breakdown by end use.