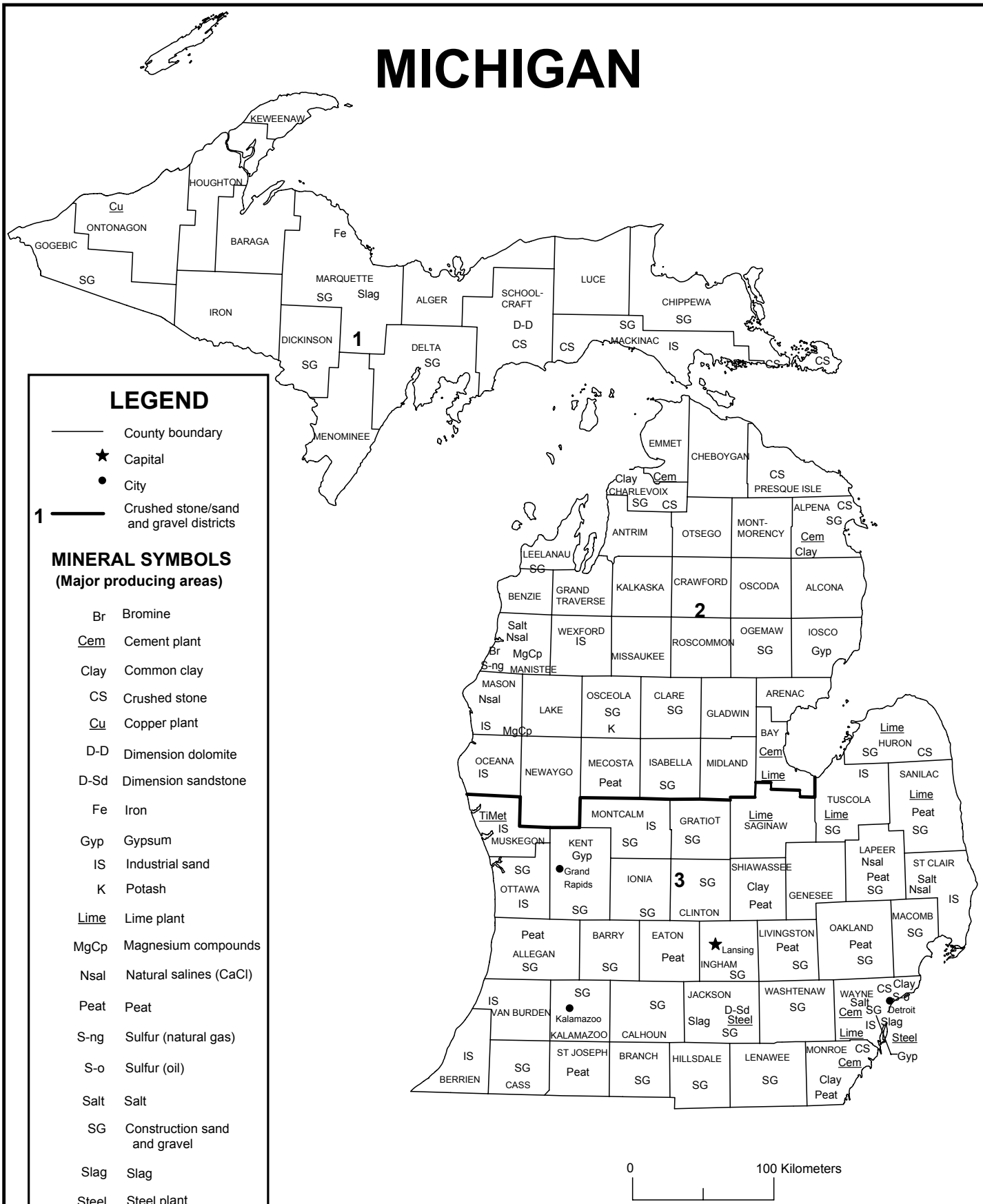
MICHIGAN



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Br	Bromine
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper plant
D-D	Dimension dolomite
D-Sd	Dimension sandstone
Fe	Iron
Gyp	Gypsum
IS	Industrial sand
K	Potash
Lime	Lime plant
MgCp	Magnesium compounds
Nsal	Natural salines (CaCl)
Peat	Peat
S-ng	Sulfur (natural gas)
S-o	Sulfur (oil)
Salt	Salt
SG	Construction sand and gravel
Slag	Slag
Steel	Steel plant
TiMet	Titanium metal plant

Source: Michigan Department of Environmental Quality, Office of the Geological Survey/U.S. Geological Survey (2003)

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 the Geological Survey, for collecting information on all nonfuel minerals.

In 2003, the estimated value[1] of nonfuel mineral production for Michigan was $1.35 billion, based upon preliminary U.S. Geological Survey (USGS) data. This was about a 9% decrease from that of 2002[2] and followed a 9.2% decrease in 2002 from 2001. The State continued to be seventh in rank among the 50 States in total nonfuel mineral production value, of which Michigan accounted for more than 3.5% of the U.S. total.

Michigan continued to be the Nation's second leading iron-ore-producing State in 2003. Although iron ore production represented a very significant percentage of the State's nonfuel mineral economy, portland cement (for the fifth consecutive year) was Michigan's leading nonfuel mineral commodity, followed by iron ore, construction sand and gravel, crushed stone, salt, and magnesium compounds. These six mineral commodities accounted for approximately 91% of the State's nonfuel raw mineral production value (table 1).

In 2002, the production and value of iron ore decreased by about $60 million, and magnesium compounds decreased in value by about $48 million. The value of portland cement decreased significantly, and the values of salt and common clays decreased by lesser amounts. These decreases more than offset increases in the values of crushed stone, up $10 million, and smaller increases in masonry cement, industrial sand and gravel, and construction sand and gravel (descending order of change), resulting in an overall decrease for the year (table 1). All other changes were less than $1 million, having comparatively little effect on the overall total value.

Compared with USGS estimates of the quantities produced in the other 49 States in 2003, Michigan remained first in magnesium compounds; second in iron ore, industrial sand and gravel, and peat, as well as second of 2 bromine-producing States and second of 4 States that produce iron oxide pigments (mineral commodities listed in descending order of value); third in construction sand and gravel and third of 3 States that produce potash; fourth in portland cement; seventh in salt; and eighth in masonry cement. Additionally, the State was a significant producer of common clays, crushed stone, and lime. Michigan was fourth (third in 2002) in the Nation in the manufacture of raw steel with an output of nearly 6.1 million metric tons (Mt) (American Iron and Steel Institute, 2004, p. 76).

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[3] (FMFM). Production and other data and information in the following text are those reported by the MOGS and the MDNR, based upon those agencies' own research, surveys, and estimates. Mineral production data may differ from some production figures reported to the USGS.

Exploration and Development

Exploration for metallic mineral deposits continued in several counties of Michigan's western Upper Peninsula in 2003. Five companies drilled about 150 exploration holes that totaled approximately 14,000 meters (46,000 feet) in depth. Kennecott Exploration Co. opened a field office near Negaunee to handle increased exploration efforts on the company's Eagle Project. Also, Kennecott performed a detailed review of a nickel-copper discovery in Michigamme Township, Marquette County. Meanwhile, a citizen group formed to deal with concerns about mineral exploration activities in the area.

Minerals Processing Corp. and partners continued exploration activities on its discovery of zinc (principally), copper, gold, and silver mineralization in Lake Township, Menominee County. The company made plans for exploration drilling, geophysical and geochemical work, geologic mapping, and environmental studies. Another citizens group concerned about the potential impact of mining in the area became active here also.

Bitterroot Resources Ltd. (owner of Trans Superior Resources, Inc.) entered into a joint venture with Cameco Corp. to explore 1,500 square kilometers (600 square miles) of the State's Upper Peninsula. Cameco could acquire 65% of all the geologic targets in this area by spending about $15 million on exploration during the next 18 years. Trans Superior owns large tracts of mineral rights in Michigan.

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[1]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 2003 USGS mineral production data published in this chapter are preliminary estimates as of July 2004 and are expected to change. For some mineral commodities, such as 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. Specialist contact information may be retrieved over the Internet at URL http://minerals.usgs.gov/ minerals/contacts/comdir.html; alternatively, specialists' names and telephone numbers may be obtained by calling USGS information at (703) 648-4000 or by calling the USGS Earth Science Information Center at 1-888-ASK-USGS (275-8747). All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2002 may differ from the Minerals Yearbook, Area Reports: Domestic 2002, Volume II, owing to the revision of preliminary 2002 to final 2002 data. Data for 2003 are preliminary and are expected to change; related rankings also may change.

[3]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, and Joseph R. Maki, Geologist, Office of the Geological Survey, Michigan Department of Environmental Quality, with further editing and review by Harold R. Fitch, Director and State Geologist, Office of the Geological Survey, Michigan Department of Environmental Quality.

Dunsmuir Ventures Ltd. entered into an agreement with BHP Mineral International Exploration, Inc. to explore BHP's North West Lake property in the Upper Peninsula.

Commodity Review

Industrial Minerals

The production of industrial minerals, or as the MOGS and the State of Michigan designates them—nonmetallic minerals—continued to play an important role in Michigan's statewide mineral production activity in fiscal year (FY) 2003 and was projected to continue through FY 2004. Michigan continued to be one of the leading States in total value of industrial minerals produced. The production of industrial minerals from State-owned land continued to be an important source of aggregate used locally for road and other construction purposes.

Construction Sand and Gravel.—Local zoning concerns continued to influence the development of aggregate resources in the State. For example, in Kent County, in the southwestern part of the Lower Peninsula, local planning commissions considered proposals for two controversial sand and gravel operations.

Rieth-Riley Construction Co. applied to extract about 1.5 million cubic meters of sand from a 44-hectare (ha) site in Ada Township (using about 38,000 cubic meters for screening berms at the pit site) and truck the mined material to a nearby company processing plant about 2.5 kilometers (km) away. A public hearing to gather residents' input was required prior to the zoning authority approval of this, a special-use request. Previously, in 1997, the township had denied a similar "nearby" request from the company.

In Plainfield Township, the planning commission approved a downsized, sand mining request, pending full Township Board approval. A developer applied to remove about 380,000 cubic meters of material from a parcel of land to develop an 81-unit condominium complex. The reduced size from the original request to develop 83 single family homes reduced the sand removal need to about 285,000 cubic meters and left nearly 8 ha for "green space" while using about 6.5 ha for the buildings.

Industrial Sand.—The Board of Trustees of Casco Township, Allegan County, approved an out-of-court settlement between the township and TechniSand, Inc. The company had wanted to mine 900,000 metric tons (t) of industrial sand (foundry sand) from about 120 ha of land during a 15-year period. The settlement allowed for about 42 ha to be mined for more than 180,000 t of sand during a 10-year period. The approval of the compromise by a judge was pending.

A 16-ha parcel of land containing a 5-ha lake will become part of the Grand Mere State Park in Berrien County. TechniSand, Inc. had mined the 16 ha for industrial sand intermittently from the 1970s until 2002. Under a 1984 consent judgment between the company and the MDNR, mining was to end by 2003 and reclamation was to be complete by 2005. The parcel was reclaimed in a cooperative effort between the company and local volunteers and school groups who collected and planted more than 50,000 native plants. The completion of the land transfer to the park was expected in 2 to 3 years when the plants will be well established. The lake, already attracting birds and other wildlife, is expected to be used as a wildlife sanctuary.

Metals

Copper.—Michigan has had a long history of being a major copper-producing State. Many mines operated after initial production in 1845, and a few operated as late as the mid-1990s. Though there was no copper ore production in 2003, the Red Metal Minerals' Caledonia Mine near Mass City in Ontonagon County produced a very limited quantity of copper, silver, and other mineral specimens for sale to mineral collectors and museums worldwide.

In early 2003, Shawn Carlson and Associates, Inc. submitted its assessment of the 2002 mineral specimen evaluation of the Indiana Mine, an old State-owned copper mine property also in Ontonagon County. The property was evaluated for possible leasing to reopen as a mineral specimen collecting mine. The MDNR-permitted 2002 evaluation project had involved the spreading out of a number of the mine's old rock piles to search for copper specimens, after which the area was restored to the satisfaction of the Department. Some of the samples collected were sold with a proper royalty being paid to the State, but it was determined that at this time, the property did not warrant reopening for specimen production.

White Pine Copper Refinery, Inc., a toll refinery in White Pine, Ontonagon County, continued to refine copper for other producers. The refinery was originally established to process copper from the former White Pine Copper Mine. The company continued to use an electrolytic process to refine copper anodes from other sources into purer copper cathodes and then ship them to customers, mostly wire and brass mills in the Midwest. In 2003, White Pine Copper produced more than 66,000 t of copper cathodes.

Peninsula Copper Industries Inc. at Hubbell, Houghton County, used byproduct and scrap copper metal and wire materials to make copper chemicals. The company dissolved the copper and produced copper oxide for industrial uses and copper carbonate for use in non-arsenic-based wood preservatives.

Iron Ore.—Many iron mines, both small and large, on three iron ranges, have operated in the past 160 years in the western Upper Peninsula. Former iron mine sites are in Baraga, Dickinson, Gogebic, Iron, and Marquette Counties. The only iron mines active were two large open pit mines near Ishpeming in Marquette County, the Empire Mine and the Tilden Mine, which were operated by Cleveland Cliffs Iron Company (CCI). These two modern mines alone produced as much or more iron ore per year as did the many smaller mines on Michigan's three iron ranges in past years combined. In 2003, these two large open pit mines were expected to produce about 12.4 Mt of iron ore pellets. CCI produces acid and fluxed pellets and a small amount of siliceous iron ore that is shipped to steel mills in the United States and Canada for processing. Michigan's iron production industry faced significant challenges resulting from changes and uncertainties in the steel market and the lifting of the import tariff on steel imports. Some steelmakers went into bankruptcy, changed or eliminated product lines, and divested

their interests in mining operations.

In February 2003, CCI reported that the Tilden Mine, of which it owned 85%, set a production record in 2002 by producing 7.1 Mt of iron pellets. This was the fourth time in 28 years that the mine had produced more than 6 Mt. The Tilden Mine had more than 750 employees and an annual payroll of more than $60 million (Skillings Mining Review, 2003a). An internal team building and problem solving project at the mine led to more efficient working operations and cost savings. The project had been ongoing for several years and involved all employees on teams studying ways to improve production. Thus far, meetings and skills training have resulted in improvements in work and production. Nevertheless, production for 2003 was expected to be somewhat lower partly because mining had extended into a part of the ore body with different mineralogy, with resulting impacts on reserves and production costs (Webster, 2003).

Both mines were affected by the consequences of spring storms. In early May, heavy rains washed out an earthen dam at Silver Lake about 48 km upstream from Wisconsin Energy Corp.'s Presque Isle Powerplant in Marquette. The floodwaters, debris, and silt forced the Powerplant to be shut down. Downstream, the Hoist and McClure dams were also damaged. The Empire and Tilden iron mines were forced to close for about a month due to lack of adequate electric power, with some workers of both mines temporarily laid off. To help alleviate the shortage of electrical power in the Upper Peninsula, the long-idled generating plant owned by White Pine Copper Refinery Inc. was reactivated. The iron mines were expected to lose a combined production of about 225,000 t of pellets for each week that the Presque Isle Powerplant remained closed. Also in May, Weirton Steel Inc., one of CCI's largest iron ore pellet customers, filed for Chapter 11 bankruptcy protection.

In July, CCI more than doubled its ownership share of the Empire Mine to 79% by acquiring a 25% interest owned by LTV and a 19% interest from Ispat Inland Steel Co. Ispat retained the remaining 21% ownership in the mine. Later in the year, CCI increased its share of ownership of the Tilden Mine and consolidated the Empire Mine and Tilden Mine operations under Cliffs Michigan Mining Co. The combined operation capacity was about 14 million metric tons per year and employed about 1,400 people. The consolidation was expected to result in some streamlining and cost savings. The August 2003 power outage that struck much of the northeastern United States and Canada also had a temporary adverse affect on mining and steel production. U.S. Steel Corp.'s second largest steelmaking plant, Great Lakes Works, near Detroit, and Stelco Inc.'s (part owner of the Tilden Mine) steelmaking plant in Hamilton, Ontario, Canada, temporarily were out of operation. The Great Lakes Works was shut down for about 4 days until power was restored to normal levels (Skillings Mining Review, 2003c).

Based upon U.S. Army Corps of Engineers surveys, Great Lakes water levels dropped from 1 to 8 inches in 2002 from the 35-year low recorded in 2001. Iron ore cargo loads had to be reduced because of the shallower channel and port depths. In August 2003, the U.S. flag Great Lakes carriers had one of their lowest monthly iron ore shipment totals in many years. The fleet moved about 30% less tonnage compared with August 2002. Downlake demand for iron ore decreased in large part because the steel industry operations were operating at less than 75% of capacity.

EVTAC Mining Co. in Forbes, MN, filed for Chapter 11 bankruptcy on May 1. Rouge Steel Inc. owned 45% of EVTAC Mining Co. Rouge Industries (owner of Rouge Steel Co.) and its subsidiaries filed for Chapter 11 protection on October 23. Rouge Steel Co. was an 80-year old steel plant at Dearborn that had in recent years shipped about 2.3 Mt of steel annually to Ford Motor Co., Daimler-Chrysler A.G., General Motors Corp., and others. On December 22, Rouge Industries announced that the U.S. Bankruptcy Court had approved the sale of nearly all of its assets to the highest bidder—OAO Severstzal—a Russian steelmaker. The sale, with a purchase price of $285.5 million, was completed in January 2004 (Bennett, 2004§[4]).

U.S. Steel purchased the assets of National Steel Corp. in Mishawaka, IN, for $1.05 billion at the April 2003 sale of the company; the sale subsequently was approved by the U.S Bankruptcy Court. National Steel's facilities sold to U.S. Steel included its Great Lakes Steel Division in Ecorse and River Rouge, MI, and ProCoil Corp. in Canton, MI.

Government Activities and Programs

As a result of increased mineral exploration in the Upper Peninsula and growing public concern about future mining of metallic sulfide minerals, the MDEQ began an intensive review of the State's mining-related regulations to ensure that the State has adequate regulatory tools to protect the environment and public health.

MDNR's FMFM issued two direct Metallic Mineral Leases in FY 2003 covering about 230 ha of State-owned minerals in the western part of the Upper Peninsula where there are surface exposures or near-surface occurrences of rocks of Precambrian age. An additional group of leases were nearing final approval and were expected to be issued in FY 2004. A total of 12 applications for direct metallic mineral leases, which covered nearly 10,500 ha, were received in FY 2003. Field reviews and further processing of these lease requests were to continue in FY 2004. The total income from the Metallic Minerals activities on State lands totaled more than $110,000. Four exploration plans for the purpose of mineral exploration on lands under State Metallic Mineral Leases were submitted to the MDNR by two companies, and all were approved in FY 2003. A third company requested and received extensions for five plans originally approved in FY 2001. Normally, Upper Peninsula field staff from MDNR and MDEQ review all plans received. Following field staff review, FMFM is responsible for the approval or disapproval of any field-approved exploration plans.

At the end of FY 2003, the MDNR had 22 active State Nonmetallic Mineral Leases with nearly 1,100 ha under lease. Twenty-two nominations for sand and gravel leases were received in FY 2003 primarily from a number of the State's County Road Commissions to replace previous permits. All but one of the sealed-bid sand and gravel leases that were

[4]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

to be issued in FY 2002 and FY 2003 were never completed by the lessee. A few of these were leased to County Road Commissions later in FY 2003. One older limestone lease, a royalty interest, expired during FY 2003. Thirteen direct leases, at a fixed agreed-upon rate, were issued during FY 2003. Twelve of these leases were issued to County Road Commissions as part of the conversion from permits to leases. Sixteen additional leases were in process and were expected to be issued in FY 2004. The total income from Nonmetallic Mineral Lease activities on State lands was nearly $992,000. The income from Forest Management Division Nonmetallic Mineral Permit activities on State lands was about $222,000. The total Nonmetallic Minerals royalty income was $770,000.

Most of the rentals and royalties received from the State of Michigan's Metallic and Nonmetallic Mineral Leases was used to purchase the property involved. Property that was tax reverted or purchased with Michigan Natural Resources Trust Fund (MNRTF) dollars, which accounts for the bulk of State-owned lands, receives most of the income. State and local governmental agencies may apply to the MNRTF for grants to purchase and develop property for public recreation purposes.

The FMFM continued to update the Abandoned Underground Mine Inventory and identified State-owned mine sites that required repair for public safety. A grant request for additional funds for safety repair was pending.

Mining Education and Museums

Michigan Technological University (MTU) (originally Michigan College of Mines) in Houghton, MI, began preparation to lead a dozen industrial partners, including CCI, in developing a Total Ore Processing Integration and Management System. The system allows mine and mill workers to respond quickly to changes in the processing stream. It was designed to optimize processing by 10%. The U.S. Department of Energy was to be part of the project and was to contribute more than $620,000 to the proposed $2.6 million, 3-year project.

Owing to a 10% reduction in State funding, MTU explored ways to reduce costs. One planned reduction was the elimination of the mining program that had 20 undergraduate students and 4 faculty members. The mining program had earlier been combined with geological programs into the Department of Geological and Mining Engineering and Sciences. As of June, the MTU Board of Control had not decided the fate of the mining program. However, new students were not being accepted into the program (Skillings Mining Review, 2003b).

The Marquette Range Iron Mining Heritage Theme Park reopened in spring 2003 in Ishpeming, Michigan. It is beside the Cliffs Shaft Mine headframe and buildings and includes mining, mineral, and historical displays.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MICHIGAN[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2001		2002		2003[p]	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	290	28,900 [e]	292	30,000 [e]	290	30,200 [e]
Portland	5,920	456,000 [e]	W	W	W	W
Clays, common	595	2,280	499	884	499	884
Gemstones	NA	1	NA	1	NA	1
Gypsum, crude	929	10,600	1,020	10,800	1,120	11,100
Peat	208	4,750	188	4,670	124	3,520
Salt	W	W	W	W	1,530	105,000
Sand and gravel:						
Construction	76,300	266,000	77,300	267,000	70,000	245,000
Industrial	2,530	30,000	2,210	31,000	2,210	31,000
Stone, crushed[3]	43,200	160,000	41,100	170,000	41,200	173,000
Combined values of bromine, iron ore (usable), iron oxide pigments (crude), lime, magnesium compounds, potash, stone (crushed marl and miscellaneous, dimension dolomite and sandstone) and values indicated by symbol W	XX	669,000	XX	962,000	XX	754,000
Total	XX	1,630,000	XX	1,480,000	XX	1,350,000

[e]Estimated. [p]Preliminary. 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 no more than three significant digits; may not add to totals shown.
[3]Excludes certain types of stone; kind and value included with "Combined values" data.

TABLE 2
MICHIGAN: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2001				2002			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	22	35,100	$129,000	$3.67	23	32,900	$138,000	$4.20
Dolomite	6	8,110	31,300	3.86	6	8,200	32,200	3.93
Calcareous marl	1	W	W	3.58	1	W	W	4.41
Sandstone	1	9	153	17.00	1	11	178	16.18
Miscellaneous stone	1	W	W	3.36	1	W	W	3.41
Total or average	XX	43,200	160,000	3.71	XX	41,100	170,000	4.14

W Withheld from total to avoid disclosing company proprietary data. XX Not applicable.
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

TABLE 3
MICHIGAN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2002, BY USE[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	27	$311	$11.52
Filter stone	W	W	5.68
Other coarse aggregates	82	546	6.66
Total or average	109	857	7.86
Coarse aggregate, graded:			
Concrete aggregate, coarse	4,550	25,600	5.62
Bituminous aggregate, coarse	446	2,280	5.11
Bituminous surface-treatment aggregate	(2)	(2)	7.41
Railroad ballast	(2)	(2)	4.96
Total or average	5,010	28,000	5.58
Fine aggregate (-3/8 inch):			
Stone sand, concrete	(2)	(2)	3.86
Stone sand, bituminous mix or seal	(2)	(2)	5.88
Screening, undesignated	778	3,690	4.74
Total or average	1,460	6,510	4.45
Coarse and fine aggregates:			
Graded road base or subbase	1,490	7,420	4.97
Unpaved road surfacing	293	1,570	5.37
Crusher run or fill or waste	W	W	5.42
Other coarse and fine aggregates	1,200	5,290	4.42
Total or average	2,980	14,300	4.79
Agricultural limestone	82	747	9.11
Chemical and metallurgical:			
Cement manufacture	6,210	19,300	3.11
Lime manufacture	(3)	(3)	4.47
Flux stone	1,100	4,850	4.40
Special, other fillers or extenders	(3)	(3)	6.61
Other miscellaneous uses and specified uses not listed	324	1,610	4.96
Unspecified:[4]			
Reported	11,800	45,000	3.81
Estimated	8,300	33,000	3.94
Total or average	20,100	77,600	3.86
Grand total or average	41,100	170,000	4.14

W Withheld to avoid disclosing company proprietary data.
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Total."
[3]Withheld to avoid disclosing company proprietary data; included in "Grand total."
[4]Reported and estimated production without a breakdown by end use.

TABLE 4
MICHIGAN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2002, 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:						
Coarse aggregate (+1 1/2 inch)[2]	10	129	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-3/8 inch)[4]	W	W	W	W	--	--
Coarse and fine aggregate[5]	W	W	W	W	W	W
Agricultural[6]	W	W	W	W	77	709
Chemical and metallurgical[7]	W	W	W	W	W	W
Special[8]	--	--	W	W	--	--
Other miscellaneous uses	--	--	324	1,610	--	--
Unspecified:[9]						
Reported	3,310	12,400	7,260	27,200	1,250	5,370
Estimated	580	2,000	610	2,100	7,100	29,000
Total	10,100	44,700	20,500	82,000	10,500	43,800

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

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

[2]Includes filter stone, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), and railroad ballast.

[4]Includes stone sand (concrete), stone sand bituminous mix or seal, and screening (undesignated).

[5]Includes crusher run (select material or fill), graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone.

[7]Includes cement manufacture, flux stone, and lime manufacture.

[8]Includes other fillers or extenders.

[9]Reported and estimated production without a breakdown by end use.

TABLE 5
MICHIGAN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2002,
BY MAJOR USE CATEGORY [1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	10,500	$42,900	$4.07
Plaster and gunite sands	14	57	4.07
Concrete products (blocks, bricks, pipe, decorative, etc.)	397	2,010	5.06
Asphaltic concrete aggregates and other bituminous mixtures	3,770	15,200	4.02
Road base and coverings	7,320	25,000	3.42
Road stabilization (cement)	230	892	3.88
Road stabilization (lime)	403	1,410	3.50
Fill	9,340	18,700	2.00
Snow and ice control	465	1,580	3.40
Other miscellaneous uses [2]	1,970	8,510	4.32
Filtration	69	421	6.10
Unspecified: [3]			
Reported	22,300	79,100	3.54
Estimated	20,000	71,000	3.55
Total or average	77,300	267,000	3.45

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

[2]Includes railroad ballast.

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

TABLE 6

MICHIGAN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2002, BY USE AND DISTRICT [1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products [2]	231	1,800	1,130	5,670
Asphaltic concrete aggregates and road base materials [3]	797	2,480	2,260	9,870
Fill	762	1,290	327	724
Other miscellaneous uses [4]	26	64	220	907
Unspecified: [5]				
Reported	62	186	1,630	5,750
Estimated	1,300	5,100	3,500	12,000
Total	3,160	10,900	9,320	35,100

	District 3		Unspecified districts	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products [2]	9,570	37,500	--	--
Asphaltic concrete aggregates and road base materials [3]	7,410	27,400	970	2,800
Fill	8,250	16,700	--	--
Other miscellaneous uses [4]	2,260	9,540	--	--
Unspecified: [5]			--	--
Reported	20,600	73,200	--	--
Estimated	16,000	54,000	--	--
Total	63,800	218,000	970	2,800

-- Zero.

[1]Data are rounded to no more than 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, railroad ballast, and snow and ice control.

[5]Reported and estimated production without a breakdown by end use.