

COVER PHOTO — Stone quarry in the Engadine Dolostone rock strata near Trout Lake, Mackinac County. Quarries like this one, usually seen idle, are often reactivated as needs demand. The large boulders, left foreground, were shipped to Mackinac Island for lake shore erosion control.

The Mineral Industry of Michigan

This chapter has been prepared under a cooperative agreement the Bureau of Mines, U.S. Department of the Interior, and the Geological Survey Division of the Michigan Department of Natural Resources, for collecting information on all minerals except fuels.

By Grace N. Broderick¹

The mineral production of Michigan in 1971 was valued at \$640.6 million, a decrease of 4.5 percent from that of 1970. The leading commodity in terms of value continued to be iron ore, followed by cement, sand and gravel, and copper.

About 58 percent of the total Michigan mineral value was contributed by production of a wide variety of nonmetallic minerals; metallic minerals accounted for 34 percent; mineral fuels made up the remainder.

¹Physical scientist, Division of Ferrous Metals.

Employment.—Preliminary data for 1971 and final data for 1970 compiled by the Federal Bureau of Mines for employment and injuries in the mineral industries, excluding the petroleum industry, are shown in table 5.

Table 1.-Mineral production in Michigan 1

	19	70	1971		
Mineral	Quantity	Value (thou- sands)	Quantity	Value (thou- sands)	
Cement:					
Portland	29,813	\$101.019	32,489	\$104,665	
Masonrythousand 280-pound barrels	1,519	5,253	1,704	5,872	
Clavsthousand short tons	2,480	2,887	2,458	3,366	
Copper (recoverable content of ores, etc.)short tons	67,543	77,945	56,005	58,245	
Gypsumthousand short tons	1,312	5,061	1,433	5,585	
Iron ore (usable) thousand long tons, gross weight	13,100	168,958	11,833	159,854	
Limethousand short tons	1,538	21,355	1,444	20,549	
Magnesium compoundsshort tons, MgO equivalent	411,911	38,050	272,918	27,777	
Natural gasmillion cubic feet	38,851	10,373	25,662	6,776	
Natural gas liquids:					
Natural gasolinethousand 42-gallon barrels	599	1,611	553	1,513	
LP gasesdo	1,176	2,764	975	2,623	
Peatthousand short tons	167	1,896	202	2,497	
Petroleum (crude)	11,693	36,246	11,893	38,859	
Saltthousand short tons	4,899	49,963	4,458	49,007	
Sand and graveldo	53,092	54,646	56,613	62,898	
Silver (recoverable content of ores, etc.)_thousand troy ounces	892	1,579	670	1,036	
Stonethousand short tons	41,687	49,501	40,705	49,240	
Value of items that cannot be disclosed: Bromine, calcium-					
magnesium chloride, gem stones, iodine, and potassium					
salts (1970)	XX	41,622	XX	40,274	
Total	XX	670,729	XX	640,636	
Total 1967 constant dollars	XX	599,967	XX	P 556,585	

P Preliminary. XX Not applicable. ¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Table 2.-Value of mineral production in Michigan, by county 1

	('I'no	usands)	
County	1970	1971	Minerals produced in 1971 in order of value
Alcona	w	\$994	Stone cand and mouth
Alger	\$39	4004 93	Stone, sand and gravel.
Allegan ²	Ŵ	924	Sand and gravel, petroleum, peat, stone, natural gas
Alpena	W	W	Cement, stone, clays, sand and gravel.
Antrim		W	Clays, sand and gravel.
Banda	1,048	1,055	Petroleum, stone, sand and gravel.
Barry	120	81	Sand and gravel.
Bay	8 738	10 805	Cement sand and gravel, petroleum, stone.
Benzie	3	18,000	Sand and gravel
Berrien	2.960	ŵ	Sand and gravel stone
Branch	855	Ŵ	Do.
Calhoun ²	Ŵ	5,061	Petroleum, sand and gravel, stone, natural
Cass	W	W	Sand and gravel, stone
Charlevoix	12,389	Ŵ	Cement, stone, sand and gravel.
Cheboygan	138	W	Stone, sand and gravel.
Chippewa	4,471	3,618	Do.
Clare ²	W	1,331	Petroleum, sand and gravel, natural gas.
Clinton	W	807	Sand and gravel, clays.
Crawlord *	W	W	Petroleum, sand and gravel, natural gas.
Diskingen	270	W and all	Stone, sand and gravel.
Dickinson	26,983	26,210	Iron ore, stone, sand and gravel.
Emmot	1,033	10 000	Sand and gravel, stone, clays, peat.
Generee	9,342	12,882	Sond and gravel.
Gladwin	W	012	Bahu anu gravei, petroleum.
Gogebic	114	w	Sand and gravel
Grand Traverse	Ŵ	ŵ	Sand and gravel, netroleum
Gratiot 2	ŵ	ŵ	Magnesium compounds calcium-magnesium
			chloride, salt, bromine, sand and gravel.
			petroleum, natural gas,
Hillsdale ²	W	W	Petroleum, sand and gravel, stone, natural
			gas.
Houghton	119	W	Sand and gravel, stone.
Huron	1,105	1,276	Stone, lime, sand and gravel.
Ingham	W	1,917	Petroleum, sand and gravel, peat.
Ionia	562	319	Sand and gravel.
Iosco	4,893	5,306	Gypsum, sand and gravel.
Iroh	1,020	0,000	fron ore, sand and gravel.
Isabena -	W	2 021	Sand and gravel, petroleum, natural gas.
Packson	**	2,021	and and gravel, stone, natural
Kalamazoo	1.809	w	Sand and gravel, stone
Kalkaska	521	21.007	Petroleum, sand and gravel, natural gas.
Kent ²	4.478	5.106	Sand and gravel, gypsum, petroleum, peat,
		,	natural gas.
Keweenaw	21	5	Sand and gravel.
Lake	685	630	Petroleum, sand and gravel.
Lapeer ²	1,340	1,231	Peat, petroleum, sand and gravel, calcium-
			magnesium chloride, natural gas.
Leelanau	222	609	Stone, sand and gravel.
Lenawee *	766	1,002	Sand and gravel, clays, petroleum, natural
Livingston	9 945	9 096	gas.
Luce	0,0%0	2,300 W	Do Do
Mackinac	W	w	Stone sand and gravel
Macomb ²	2 284	2 267	Sand and gravel netroleum natural gas
Manistee	27.573	26,701	Salt, magnesium compounds, bromine, sand
	,		and gravel.
Marquette	135,806	128,064	Iron ore, sand and gravel, stone.
Mason	W	26,747	Magnesium compounds, calcium-magnesium
			chloride, lime, bromine, sand and gravel
Nr			petroleum.
Mecosta ²	w	w	Petroleum, sand and gravel, peat, natural
Manager	117		gas.
Midland	w	ww	Lime, sand and gravel.
Midiand	w	w	Bromine, sait, calcium-magnesium chloride,
			sand and gravel
Missaukee ²	2 008	w	Petroleum sand and gravel natural gas
Monroe	2,000 W	w	Cement stone clays nest netroloum sand
		**	and gravel.
Montealm	2 543	w	Petroleum, sand and gravel.
Montmorency	54	2	Sand and gravel.
Muskegon	2,260	Ŵ	Salt, sand and gravel, petroleum.
Newaygo 2	493	ŵ	Sand and gravel, petroleum, natural gas.
Oakland	Ŵ	13,543	Sand and gravel, peat, petroleum.
		,-x0	· · · · · · · · · · · · · · · · · · ·

See footnotes at end of table

REVIEW BY MINERAL COMMODITIES

NONMETALS

Bromine.—Two areas were productive of bromine from well brines in Michigan: Manistee and Mason Counties, which border Lake Michigan on the western edge of the State, and Midland and Gratiot Counties in central Michigan. Companies producing bromine were The Dow Chemical Co. at its Ludington and Midland plants, Morton Chemical Co. at its Manistee plant, and the Michigan Chemical Corp. at its St. Louis and East Lake plants. The latter plant discontinued operations at midyear. Bromine output decreased both in quantity and value in 1971. Nationally, Michigan continued to rank second to Arkansas in bromine production.

Table 2.-Value of mineral production in Michigan, by county 1-Continued

	(The	ousands)	
County	1970	1971	Minerals produced in 1971 in order of value
Oceana	\$507	\$401	Petroleum, sand and gravel.
Ogemaw ²	1,736	1,628	Petroleum, sand and gravel, stone, natural
Ontonagon Osceola ² Oscoda Otsego ² Ottawa ²	79,618 2,261 50 911 W	59,282 W 40 W 3,763	Copper, silver, sand and gravel. Petroleum, sand and gravel, hatural gas. Sand and gravel, petroleum. Petroleum, sand and gravel, natural gas. Sand and gravel, clays, petroleum, natural gas.
Presque Isle	W	W	Stone, sand and gravel, petroleum.
Roscommon ²	W	W	Petroleum, sand and gravel, natural gas.
Saginaw	513	809	Sand and gravel, lime, clays, petroleum.
St. Clair ²	19,293	18,923	Salt, petroleum, cement, clays, sand and
St. Joseph	266	198	Sand and gravel, peat, stone.
Sanilac	1,158	1,935	Peat, sand and gravel, lime.
Schoolcraft	W	W	Stone.
Shiawasee	682	486	Sand and gravel, peat, clays, petroleum.
Tuscola	W	$W \\ 138 \\ 2,503 \\ 54,028$	Sand and gravel, petroleum, lime.
Van Buren	174		Sand and gravel, petroleum.
Washtenaw	1,354		Do.
Wayne	57,189		Cement, lime, salt, sand and gravel, stone,
Wexford Undistributed ³ Total	$\tfrac{121}{\tfrac{238,321}{\tfrac{4}{670,729}}}$	W 202,467 640,636	Sand and gravel.

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed." ¹ Values for natural gas and natural gas liquids are not available on a county basis; included with "Undistributed." ² Evolutions values of natural case

tributed.'' = Excludes value of natural gas. = Includes values for natural gas. natural gas liquids, gem stones, some sand and gravel that cannot be assigned to specific counties, and values indicated by symbol W. = Oata does not add to total shown because of independent rounding.

Table 3.-Indicators of Michigan business activity

	1970	1971 Þ	Change, percent
Employment and labor force annual average:			
Total labor force, annual average. thousands	3.618.7	3.618.2	-0.2
Unemployment	253.7	295.4	+16.4
Employment.			
Manufacturing do	r 1.072.7	1.049.3	-2.2
Contract construction do	108.9	106.2	-2.5
Mining	12.3	11.7	-4.9
Transportation and public utilities do	r 149.6	149.2	3
Wholesale and retail trade	594.5	596.2	+.3
Finance insurance and real estate do	118.6	120.0	+1.2
Sarviges do	r 422.4	425.9	+.8
Government do	r 506.0	516.1	+2.0
Personal income:			
Tetsonat model millions	r \$36.124	\$38.821	+7.5
Por agnita	r \$4,058	\$4,317	+6.4
Construction activity:	41,000	4-1	
Valuation of nonresidential construction millions	r \$478.1	\$508.5	+6.4
Number of private and public residential units authorized	r 51,059	74,229	+45.4
State highway department: Contracts awarded millions	\$187.1	NA	NA
Portland coment shipments to and within Michigan	+10111		
thousand 376-pound barrels	14 663	17.815	+21.5
Form marketing receipts millions	\$900.2	NA	NA
Mineral production value	\$670.7	\$640.6	-4.5

Preliminary. Revised. NA Not available.

Sources: Survey of Current Business, Construction Review, Employment and Earnings, Farm Income Situation, U.S. Bureau of Mines, Area Trends in Employment and Unemployment.

Table 4.-Worktime and injury experience in the mineral industries

	Average		Man- days	Man- hours	Number of injuries		Injury rates per million man-hours	
Year and industry	men Days working active daily		(thou- sands)	(thou- sands)	Fatal	Nonfatal	Fre- quency	Severity
1970:								
Peat	173	195	43	311		5	16.10	280
Metal	4,640	303	1,406	11,251	3	314	28.18	2,565
Nonmetal	1,719	296	508	4,147	2	87	21.46	3,409
Sand and gravel	2,651	215	571	4,835	1	117	24.41	1,988
Stone	2,976	294	876	7,122		57	8.00	251
Total 1	12,159	279	3,396	27,665	6	580	21.18	1,969
1971: P			desired and and	10 10 10 10 10 10 10 10 10 10 10 10 10 1				
Metal	4.015	311	1.247	9,976		251	25.16	1,517
Nonmetal ²	910	247	224	1,855		52	28.04	561
Sand and gravel	2.470	225	555	4,786	1	125	26.33	3,178
Stone	3,090	275	850	7,001	1	82	11.86	1,23
Total 1	10,485	274	2,877	23,617	2	510	21.68	1,696

P reliminary.
1 Data may not add to totals shown because of independent rounding.
2 Beginning in 1971, data concerning peat operations are included in the nonmetals industry.

Calcium-Magnesium Chloride.—The Dow Chemical Co., Michigan Chemical Corp., and Wilkinson Chemical Corp. produced calcium-magnesium chloride from brine, in Gratiot, Lapeer, Mason, and Midland Counties. Output decreased 2 percent. Wyandotte Chemicals Corp. discontinued production of calcium chloride at Wyandotte in December 1970. The Dow Chemical Co. plans to increase capacity of its Ludington calcium chloride plant by about 25 percent in 1972. Process changes and other modifications will cost more than \$1 million.



Figure 1.—Value of iron ore, petroleum, cement, and total value of all minerals produced in Michigan.

Cement.—Portland cement shipments increased 9 percent, and value of shipments increased 3.6 percent over those of 1970. Masonry cement shipments increased 12 percent. Portland cement was produced at nine plants in seven counties (Alpena, Bay, Charlevoix, Emmet, Monroe, St. Clair, and Wayne); masonry cement was shipped from four of these plants. Average mill value of portland cement was \$3.22 per barrel; average mill value of masonry cement was \$3.44 per barrel. Yearend stocks of portland cement at mills were 3.3 million barrels, compared with 4.0 million barrels in 1970. Ninety-five percent of the portland cement shipped was types I and II (general use and moderate heat); the remainder was type III (high-early strength), type V (high-sulfate resistance), and expansive. Portland and masonry cement consumed in the State totaled 17,815,000 376-pound barrels and 1,271,000 280-pound barrels, respectively. Portland cement was consumed for ready-mix concrete (64 percent), concrete products (13 percent), building materials (6 percent), contractors (12 percent), and other uses.

Michigan is the fourth largest cement-producing State in the country, outranked only by California, Pennsylvania, and Texas. The leading producers in Michigan were National Gypsum Co., Huron Cement Div.; Peerless Cement Co., Div. of American Cement Corp.; and Dundee Cement Co.

In December Peerless Cement Co.'s new \$45 million cement plant in Detroit became operational. The plant, which opened in May, has an annual capacity of 4.0 million barrels. In 1971 Huron Cement Div. was improving the dust collecting system at its plant at Alpena, and Dundee Cement Co. was installing two electrostatic precipitators at its plant in Dundee.

St. Lawrence Cement Co. acquired the cement production facilities of BASF Wyandotte Corp. in the Detroit area. Operations were conducted by Wyandotte Cement Inc., a subsidiary of St. Lawrence Cement Co., and clinker was furnished from the company's plant at Mississauga, a suburb of Toronto, Canada. Wyandotte was replacing the 94-pound bag with a new 80-pound bag.

Table 5.—Portland cement salient statistics

(include of point out to include a contact)		
	1970	1971
Number of active plants	19	29
Rated clinker capacity, Dec. 31	29,539	33,024
Production	129,655	31,995
Shipments from mills:		
Quantity	29,813	32,489
Value	\$101,019	\$104,665
Stocks at mills. Dec. 31	3,959	3.297

¹ One plant ceased kiln and grinding operations; another plant ceased kiln operations, but continued as a grinding plant on imported clinker. ² A new (kiln and grinding) plant started operating in May 1971.

Clays.—Miscellaneous clays and shale were mined at 15 pits in 11 counties. Output of clay and shale was about 1 percent less than in 1970. Seventy-eight percent of the clay or shale was used in cement manufacture in 1971, compared with 82 percent used for this purpose in 1970. The remainder was used for lightweight aggregate and heavy clay products. The largest production was reported from Alpena, Monroe, Wayne, Antrim, Ottawa, St. Clair, and Saginaw Counties.

Gem Stones.—Agate, native copper specimens, Petoskey stone, selenite, brown calcite, pyrite, and chert were among the small quantities of semiprecious stones and minerals collected in the State in 1971. Estimated value of material found in 1971 increased over the 1970 estimate, but gem stones continued to contribute only a very minor amount of the State's total mineral value.

Gypsum.—Gypsum output and value in 1971 were 1,433 thousand short tons and \$5.6 million, respectively. The State continued to be the leading gypsum-producer. Crude gypsum was produced in Kent County from underground mines and processed at plants in Grand Rapids for plaster, lath, and wallboard. In losco County, gypsum was quarried at Whittemore for portland cement retarder. Quarries at Tawas City and Alabaster supplied crude gypsum for building material plants at National City, Detroit, and in other States. Gypsum materials were shipped by lake transport from deepwater ports at National City and Alabaster.

Iodine.—The Dow Chemical Co., the sole domestic producer, continued to recover crude iodine from natural well brines at Midland. Production decreased 4.9 percent from that of 1970; value increased by 48.5 percent. Lime.—Seven companies produced lime at 10 plants in eight counties. Leading counties were Wayne, Mason, and Menominee. Leading companies were BASF Wyandotte Corp., Marblehead Lime Co., and Detroit Lime Co. Output decreased 6 percent and was 19 percent below the 1967 record. The lime was used for steel furnaces, alkalies, water purification, and other uses. The lime was consumed in Michigan, Ohio, Wisconsin, Indiana, and Canada.

Magnesium Compounds.—Output of magnesium compounds, recovered from natural well brines, declined nearly 34 percent in quantity and 27 percent in value in 1971. The State, nonetheless, continued to lead the Nation in production of refractory magnesia.

The Midland plant of Kaiser Aluminum & Chemical Corp., which produced magnesium oxide from magnesium hydroxide supplied by The Dow Chemical Co., was inactive in 1971. Morton Chemical Co. is completing an expansion of production facilities for magnesium carbonate and magnesium oxide at Manistee. Harbison-Walker Refractories Co. continued to produce refractory magnesia from purchased magnesium hydroxide.

Perlite.—Crude perlite, mined in Western States, was expanded at plants in losco and Wayne Counties. The material was used for roof insulation and plaster aggregate.

Salt.—Salt was produced from an underground mine in Wayne County, and from natural and artificial brines at plants in Gratiot, Manistee, Midland, Muskegon, St. Clair, and Wayne Counties. Output was 9 percent less than in 1970 and Value 1.9 percent less. Michigan continued to rank fifth among the States in production of salt, outranked only by Louisiana, Texas, Ohio, and New York.

Sand and Gravel.—Michigan continued to be a leading source of sand and gravel production, the second highest in the Nation (after California). Tonnage increased 6.6 percent and was valued at \$62.9 million, an increase of more than 15 percent over 1970. The amount of sand and gravel sold or used by producers in 1971 for building, molding, and paving increased, and that sold or used for fill material declined. Nearly every county in Michigan reported sand and gravel production. In each of nine counties, output exceeded 1 million tons. These counties provided almost 51 percent of the State production. Five of these counties make up metropolitan Detroit and produced nearly 21 million tons. About 92 percent of the sand and gravel was moved by truck, and the remainder was shipped by rail or water. Production was reported from 330 commercial and 58 Governmentand-contractor operations.

Table 6.-Sand and gravel sold or used by producers, by class of operation and use

and the sector of the sector o	197	0	1971	
Class of operation and use -	Quantity	Value	Quantity	Value
Commercial operations: Sand:				
Building Engine	6,971 W	\$6,181 W	8,568	\$7,952 104
Fill	3,655	1,783	3,184	1,619
Molding	3,188	5,994	3,435	7,068
Other user I	4,884	4,720	6,773	3,608
oniei uses	2,101	3,105	1,400	0,000
Total ²	20,829	22,444	23,405	26,954
Gravel:		and a second second second second		
Building	6,201	10,006	6,359	10,59
Fill	383	229	463	26
Paving.	17,116	16,245	19,103	19,09
Miscellaneous	213	136	1.206	1.47
Other uses	354	522	799	624
Total ²	24,405	27,324	27,950	32,09
Government-and-contractor operations:				
Sand: Building			34	1
Fill	677	291	1.091	30
Paving	2,055	1,163	886	46
Other uses	132	77	183	75
Total ²	2,865	1,531	2,195	84
Gravel:				
Building	38	24	163	14
Fill Deving	446	201	248	2 76
Other uses	34	19	2,650	(3) 10
Total ²	4,992	3,346	3,062	3,00
	,			

W Withheld to avoid disclosing individual company confidential data; included with other uses. ¹ Includes abrasives, railroad ballast, blast, enamel, foundry (1971), glass, grinding and polishing, pottery, ta may not add to totals shown because of independent rounding. s than 14 unit.

Table 7.-Sand and gravel sold or used by producers, by county

		1970		1971			
County	Number of mines	Quantity	Value	Number of mines	Quantity	Value	
Alcona	2	W	w	2	272	\$135	
Alger	2	68	\$39	ī	85	69	
Allegan	8	933	601	7	755	497	
Alpena	ä	102	W	3	W	W	
Antrim	ĭ	78	62	1	84	73	
Baraga	2	Ŵ	120	2	168	81	
Barry	8	1.034	991	7	582	707	
Benzie	1	- , 8	3	1	18	18	
Berrien	8	1.647	2.957	7	1.438	2.558	
Branch	2	219	354	• 2	W	Ŵ	
Calhoun	7	390	262	5	ŵ	ŵ	
Cass	ż	823	521	6	349	319	
Charlevoix	6	132	68	6	66	50	
Clare	ž	w	W	3	82	44	
Clinton	15	801	675	8	764	783	
Delta	4	299	Ŵ	3	Ŵ	W	
Dickinson	4	128	151	2	ŵ	ŵ	
Eaton	8	919	702	10	652	512	
Emmet	ă	131	77	2	74	55	
Genesee	17	534	548	9	816	753	
Gogehic	- 3	120	114	3	w	W	

See footnotes at end of table.

Table 7.-Sand and gravel sold or used by producers, by county-Continued

		1970		1971			
County	Number of mines	Quantity	Value	Number of mines	Quantity	Value	
Grand Traverse	1	270	w	2	w	W	
Gratiot	4	428	373	6	293	262	
Hillsdale	7	507	591	4	107	56	
Houghton	3	153	94	2	w	w	
Huron	6	319	W	4	W	W	
ngham	10	1.285	1.087	8	774	778	
onia	8	679	562	3	338	319	
Fon	3	232	246	ä	w	W	
Kalamazoo	10	W	W	11	1.003	1.459	
Kalkaska	· 1	21	11	- 1	22	20	
Aanaona	24	2 723	3 439	19	2 525	3 968	
Nent		2,120	91	10	16	0,500	
xeweenaw	1	40	50	1	10		
Jake	2	5.47	994	÷	900	107	
Lapeer	0	041	004		810	104	
Lenawee	0	0 007	9 9 4 9	11	9 576	0 090	
Avingston	3	2,821	0,040	8	2,576	2,930	
Auce	3	52	- 33	2	w		
Aackinac	4	212	104	5	w	W	
acomb	9	2,525	2,268	10	2,147	2,254	
Marquette	12	325	283	9	545	577	
decosta	4	279	281	2	161	126	
Menominee	3	397	230	3	95	90	
Missaukee	2	284	276	2	w	w	
Montealm	4	435	193	3	w	W	
Montmorency	2	93	54	1	49	2	
Muskegon	5	476	w	4	461	1.095	
Vewaygo	ğ	754	439	4	W	W	
Jakland	29	9 895	10 597	24	11.274	13.494	
Jasana	5	412	300	2	271	159	
Joeana	6	808	809	5	Ŵ	- W	
/gemaw		155	94	ĭ	84		
Ontonagon	5	695	688	î	w	w	
Jsceola	1	102	46	1	69		
Jscoda	-	49	20	ô	w	w	
Jtsego	10	90	0 760	16	9 975	9 100	
Jttawa	12	2,019	2,109	10	2,010	0,100	
resque Isle	4	077	170	8	w		
aginaw	3	200	179	4	w		
Sanilac	10	681	329	5	w		
Schoolcraft	3	259	178	- 2	0.55	0.00	
Shiawassee	11	440	405	b	289	239	
l'uscola	13	936	1,178	8	712	95	
Van Buren	5	194	156	3	155	122	
Washtenaw	12	1,360	1,342	9	2,188	2,487	
Wayne	8	2,352	3,953	8	2,769	4,600	
Wexford	5	158	121	1	W	W	
Various				25	8,934	7,544	
Undistributed 1	49	6,881	7,607	46	8,502	8,272	
Total ²	453	53,092	54,646	388	56,613	62,898	

winnesd to avoid disclosing individual company confidential data; included with "Undistributed." cludes Arenes, Bay, Cheboygan, Chippewa, Crawford, Gladwin (1970), Josco, Isabella, Jackson, Lee Manistee, Mason, Midland, Monroe, Roscommon, St. Clair, and St. Joseph Counties. Is may not add to totals shown because of indenendent roundines. Inc

Stone.—Michigan, with a production of 40.7 million tons, ranked eighth in the Nation's output of stone. Production (principally crushed limestone and dolomite) decreased more than 2 percent from that of 1970. Over 92 percent of the production was reported from seven counties: Alpena, Chippewa, Emmet, Mackinac, Monroe, Presque Isle, and Wayne. Much of the material (66 percent) was shipped by boat from company-owned ports on Lakes Huron and Michigan to steel mills, cement and lime plants, and other consumers.

Changes in steelmaking practices (increased use of pellets in the blast furnace and increased use of basic oxygen furnaces) have changed demand for flux stone. Steel mills are specifying smaller product sizes; crushing and screening plants are being revised to produce a different product mix. More crushing is required to produce the top size, which is now smaller, without producing fines in excess of market demands. As shown in table 9, crushed and broken stone sold or used by producers for use as flux decreased from 12,973 thousand short tons in 1970 to 10,740 thousand short tons in 1971.

Fable	8Stone	sold	or	used	by	producers,	by	kind
	(11)	1 . 1			1.41			

Win to find the	197	70	1971		
Kind of stone	Quantity	Value	Quantity	Value	
Dimension: Limestone and dolomite Marble Sandstone	(1) 4 3	(1) \$91 47	1	\$26 	
Total ²	6	138	1	26	
Crushed and broken: Diomite. Mari * Traprock. Other 4	$35,390 \\ 6,124 \\ 156 \\ 10 \\$	39,768 9,356 221 18	$32,229 \\ 7,275 \\ 119 \\ 9 \\ 1,072$	$35,077 \\ 11,267 \\ 111 \\ 14 \\ 2,745$	
Total 2	41,681	49,363	40,704	49,214	
Grand total	41,687	49,501	40,705	49,240	

Withheld to avoid disclosing individual company confidential data; included with "Sandstone" for 1970.
³ Data may not add to totals shown because of independent rounding.
³ Combined with granite for 1970 to avoid disclosing individual company confidential data.
⁴ Includes granite, sandstone, quartz and miscellaneous stone.

Table 9.-Crushed and broken stone sold or used by producers, by use (Thousand short tons and thousand dollars)

**	197	70	1971		
Use	Quantity	Value	Quantity	Value	
Bituminous aggregate	w	w	736	\$921	
Concrete aggregate	2,803	\$3,161	3,048	3,261	
Dense graded road base stone	502	607	805	954	
Surface treatment aggregate	W	220	342	494	
Unspecified aggregate and roadstone	4,163	6,233	3,676	5,491	
Agricultural limestone	564	666	495	529	
Cement	8,467	7,638	8,637	7,250	
Flux	12,973	17,121	10,740	14,392	
Lime	7,775	8,593	7,845	8,117	
Other soil conditioners	142	140	69	61	
Riprap and jetty stone	W	w	595	696	
Terrazzo			3	61	
Other 1	4,290	4,985	4,212	6,980	
Total ²	41,681	49,363	40,704	49,214	

¹ Includes stone used for chemical uses, paper manufacturing, poultry grit, macadam aggregate, railroad llast, stone sand, sugar refining and other uses not listed; also, dead-burned dolomite (1970) and drain fields (1971). ² Data may not add to totals shown because of independent rounding.

Sulfur.—Byproduct sulfur was recovered from crude petroleum by Total Leonard, Inc. (Alma), Marathon Oil Co. (Detroit), and Mobil Oil Co., Inc. (Woodhaven). Shipments remained about the same as in 1970, but value of output declined by more than 12 percent.

Vermiculite.—Crude vermiculite, mined outside the State, was exfoliated at a plant in the Detroit area. It was sold for use in loose fill insulation, plaster aggregate, concrete aggregate, and for agricultural and other uses.

METALS

Copper.—Production of copper, in terms of recoverable metal, was 17 percent less than in 1970, and its value was 25 percent lower. The White Pine Copper Co., a subsidiary of the Copper Range Co., continued to be the only producer of primary copper in Michigan. A strike at the mine, which started August 1, was terminated on September 24. The White Pine mill has a total concentrating capacity of 25,000 tons of ore per day, and adequate smelter capacity to process the output of the concentrating plant. Early in 1971, a small plant to recover copper from slag, a smelter waste product, was completed.

Table 10.-Mine production (recoverable) of silver and copper

	1969	1970	1971
Mines producing: Lode Material sold or treated: Copper orethousand short tons Production (recoverable):	$\begin{smallmatrix}&&1\\8,200\end{smallmatrix}$	7,638 1	6,891
Quantity: Silvertroy ounces Coppershort tons	$1,009,022 \\ 75,226$	$891,579 \\ 67,543$	670,052 56,005
Value: Silverthousands Copperdo	\$1,807 71,516	\$1,579 77,945	\$1,036 58,245
Totaldo	73,323	79,524	59,281

Iron Ore.—Iron ore shipments in 1971 were 11.8 million long tons, a decrease of 9.7 percent from the 13.1 million long tons shipped in 1970. The average weighted mine value for Michigan usable iron ore shipments in 1971 was \$13.51, compared with \$12.90 in 1970. Iron ore continued to be the leading commodity in the State in terms of total mineral value.

About 90 percent of the crude ore production in 1971 came from four open pit mines: The Empire, Republic, and Tilden mines in Marquette County, and the Groveland mine in Dickinson County. The remaining production came from two underground mines: The Mather mine in Marquette County and the Sherwood mine in Iron County. The Tracy underground mine of Jones & Laughlin Steel Corp., near Negaunee in Marquette County, ceased mining in January and completed shipments from stockpile in July. Other closed mines still shipping from stockpiles were the Cliffs Shaft mine and Humboldt mines in Marquette County, and the Homer and Wauseca mines in Iron County.

Cleveland-Cliffs Iron Co. plans to develop a hematite taconite mine and pellet plant near Ishpeming in the Upper Peninsula. The Tilden Project, as it is called, would double the company's domestic iron ore pellet output by mid-1974.

Table 11.-Usable iron ore 1 produced (direct-shipping and all forms of concentrates), by range

Year N		Menominee arquette range	Gogebic	Total			
	Marquette			Gross v	Iron		
	range	(Michigan part)	(Michigan - part)	Ore	Iron content	(percent)	
1854–1966 1967	$349,369 \\ 10,231$	279,729 3,750	$249,576 \\ 49$	878,675 14,030	NA 8,453	N/ 60.2	
1968 1969	10,086 10,048	$3,684 \\ 3,369 \\ 2,304$		13,770 13,417 12,757	8,339 8,183 7,950	60.5 60.9 62.3	
1971	9,495	2,424		11,919	7,384	61.9	
Total ²	399,592	a 295,350	3249,625	944,568	NA	NA	

¹ Exclusive, after 1905, of iron ore containing 5 percent or more manga ² Data may not add to totals shown because of independent rounding. ³ Distribution by range partly estimated before 1906. Table 12.—Iron ore shipped from mines (Thousand long tons)

Year	Direct- shipping ore ¹	Total concentrates and agglomerates	Total usable ore	Proportion of beneficiated ore to total usable ore (percent)
1967	3,011 2,353 1,972 1,512 1,439	$11,119 \\ 10,346 \\ 12,086 \\ 11,588 \\ 10,393$	14,130 12,699 14,058 13,100 211,833	78.7 81.5 86.0 88.5 87.8

¹ Includes crushed, screened, and sized ore not further treated. ² Data does not add to total shown because of independent rounding

Pig Iron and Steel.—Pig iron and steel were manufactured in the Detroit area. Pig iron shipments and value decreased 2.5 percent but increased 6.7 percent, as compared with 1970. According to the American Iron & Steel Institute, Michigan produced 9,069 thousand short tons of steel in 1971, compared with 9,547 thousand short tons of steel in 1970.

Silver.—Silver was recovered from copper ore mined at the White Pine mine. Concentrates from a silverrecovery circuit in the White Pine mill were shipped to an outside smelter for silver recovery. Output of silver in 1971 was 25 percent less than in 1970, and value was 34 percent less than in 1970.

MINERAL FUELS

Natural Gas and Natural Gas Products.—Natural gas was produced in 22 counties from both gas and oil wells; about 89 percent came from six counties—Calhoun, Hillsdale, Jackson, Macomb, Otsego, and St. Clair. Marketed production of natural gas decreased nearly 34 percent from that of the previous year. Proved natural gas reserve estimates of the American Gas Association, Inc. (AGA), for 1971 list 1,016,482 million cubic feet for Michigan, a gain of 76,811 million cubic feet. Gas-liquid reserves, according to AGA, increased from 9,903 thousand barrels in 1970 to 12,584 thousand barrels, a gain of 2,681 thousand barrels.

Peat.—Michigan again led the Nation in peat production accounting for about one-third of the U.S. total. Production, which increased from 156,699 short tons in 1970 to 209,835 short tons in 1971, was obtained from 11 counties. Seventy-nine percent of the State total came from Lapeer and Sanilac Counties; other peatproducing counties were Allegan, Eaton, Ingham, Kent, Mecosta, Monroe, Oakland, St. Joseph, and Shiawassee.

Sales totaled 202,189 short tons in 1971, compared with 166,950 short tons in 1970, and the average value of peat produced in Michigan increased from \$11.36 per ton in 1970 to \$12.35 per ton in 1971. Ninety-three percent of the total output was used for general soil improvement; the remainder was used as an ingredient for potting soils, for mushroom beds, and packing flowers, etc. Slightly over 80 percent of the peat sold was in packaged form. Reed-sedge peat accounted for 77 percent of the total sales; humus peat, 15 percent; and moss peat, 8 percent.

Petroleum.—Petroleum was produced in 46 counties, and more than half of this production came from five counties—Calhoun, Jackson, Hillsdale, Otsego, and St. Clair. Production of 11,893 thousand barrels represented a gain of 1.7 percent over the 1970 figure. Reserves of crude oil, according to the American Petroleum Institute, were 58,765,000 barrels on December 31, 1971, an increase of 13,150,000 barrels over that of the previous year.

Total Leonard, Inc. began constructing a \$6 million hydrocarbon platforming unit at Alma, Mich. The plant capacity is expected to be 20,000 barrels of gasoline per day. The crude oil comes from northern Michigan and Canadian oilfields.

When new gas line connections are completed in the northern Michigan gasfields, it is expected that the northern part of the Lower Peninsula will change from a gas-importing area to an area exporting gas to the southern Michigan industrial areas.

Table 13.-Crude oil production, by county (Thousand 42-gallon barrels and thousand dollars) 1970 1971 County Value ² Quantity 3 Value ² Quantity 1 $130 \\ 226 \\ 10 \\ 249 \\ 1,828 \\ 462 \\ 496 \\ 27 \\ 299$ \$404 701 32 772 5,666 1,432 1,537 $122 \\ 231 \\ 12 \\ 234 \\ 1,533 \\ 394 \\ 524 \\ 68 \\ 279 \\ 279 \\ 122$ Allegan Arenac Bary Bay Calhoun \$399 755 39 765 5,009 1,287 1,712 222 912 10 23 7,698 Clare____ Crawford_ ladwin rand Traverse 85 928 11 2,602 Gratiot_____ Hillsdale_____ 2.356

See footnotes at end of table.

Table 13.-Crude oil production, by county-Continued (Thousand 42-gallon barrels and thousand dollars)

Country	197	0	1971		
County	Quantity 1	Value ²	Quantity 1	Value ²	
Huron	1	4	(3)	1	
Ingham	6	20	348	1,137	
Isabella	201	622	187	611	
Jackson	1,048	3,247	849	2.774	
Kalkaska	165	510	302	987	
Kent	63	194	58	190	
Lake	212	657	186	608	
Lapeer	62	192	81	265	
Lenawee	(3)		(3)		
Livingston	¥ 1	2		-	
Macomb	5	16	4	13	
Mason	37	115	29	<u> </u>	
Mecosta	172	535	101	330	
Midland	184	571	185	604	
Missankee	559	1 799	545	1 781	
Monroe	2	7,102	2	1,101	
Montealm	119	950	199	402	
Muskeron	29	350	20	402	
Mawayao	17	33	10	60	
Newaygo	(1)		10	52	
Jakiand	(*)	007	74	3	
Jceana	01	207	14	242	
Ogemaw	299	927	346	1,130	
Osceola	507	1,573	622	2,032	
Uscoda	1	4	2	0 00	
Otsego	285	883	815	2,663	
Uttawa	59	184	51	167	
Presque Isle	1	5	(*)	1	
Koscommon	167	517	209	683	
Saginaw	21	67	21	69	
St. Clair	977	3,028	873	2,852	
Shiawassee	9	28	7	23	
l'uscola	63	196	60	196	
Van Buren	6	18	5	16	
Washtenaw	4	12	5	16	
Wayne	5	16	4	13	
Total 4	11,693	36,246	11,893	38,859	

Source: State of Michigan, Department of Natural Resources.
County values calculated by using State average value per barrel: \$3.10 for 1970 and \$3.27 for 1971.
Jess than 1/2 unit.
Data may not add to totals shown because of independent rounding.

Table 14.-Oil and gas well drilling completions, by county

County	Proved field wells ¹			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Number of wells	Footage
Allegan				1		2	3	7,54
lpena						1	1	5,26
ntrim						1	1	6.57
renac.			1			2	3	9.46
arry						3	3	14.05
av			1			2	3	9.70
enzie						ī	ĩ	5.44
ranch						ĩ	ĩ	3 5
alhoun		-1	- 6		- 1	5	13	52.7
harlevoix		-			-	2	2	8.9
are	- 1					-	ĩ	4.0
inton						1	î	2 6
randord				- 1			î	7 3
aton			- 9	1		- 9	7	30'2
aton			1			1	i.	29 5
adwin	1	1	5				6	22,50
adwin-			1	1	-0	1		05,0
rand Traverse			1		4		40	20,0
Wadala	- 2		11			1		
madale			11	-		0	22	140,0
gnam	16		8	- 4	1	6	35	148,7
abena			1			Z	10	11,5
ackson			2			8	10	46,73

Table 14.-Oil and gas well drilling completions, by county-Continued

0	Prove	d field w	ells 1	Exploratory wells			To	tal
County -	Oil	Gas	Dry	Oil	Gas	Dry	Number of wells	Footage
Kalkaska	6			8	5	4	23	159.854
Lake	ĭ				-	1	2	6,912
Lapeer	5	1					6	17,018
Lenawee	-	-	1			4	5	15,471
Livingston		- 8	ĩ			2	11	43,556
Macomb			_			1	1	3,705
Manistee						2	2	9,901
Mason			1			. 1	2	5,122
Mecosta						4	4	11,830
Midland						1	1	3,518
Monroe						1	1	2,575
Montealm	1		7	1		1	10	34,719
Montmorency						1	1	4,833
Newaygo						3	3	6,376
Oakland		4	2				6	26,036
Oceana	2		1	2	1	5	11	24,125
Ogemaw	1					1	2	12,923
Osceola	1	2	1		1	1	6	14,400
Oscoda						2	2	16,396
Otsego	6		5	5		8	24	149,967
Ottawa						2	2	4,373
Presque Isle						1	1	3,153
St. Clair	3	3	10	1	1	17	35	101,958
Tuscola						3	3	10,104
Van Buren						2	2	4,599
Washtenaw					1	2	3	11,002
Wexford						1	1	8,306
Total	55	20	66	26	13	122	302	1,254,097

¹ Development wells as defined by American Petroleum Institute

Source: American Petroleum Institute.

ENGADINE DOLOSTONE

Large tonnages of high-purity low-silica dolostone of the Engadine Group (Silurian Niagaran Series) are present near the shores of Lake Michigan and Lake Huron in Schoolcraft, Mackinac, and Chippewa Counties of the Upper Peninsula of Michigan. Reserves of 100 to more than 300 million tons are located at Engadine, Rexton, Ozark, and Kenneth, southeast of Gould City, and northwest of Hessel in Mackinac County. Similar reserves are found south of Stalwart and on eastern Drummond Island in Chippewa County. Lesser reserves are located near Gulliver in Schoolcraft County and at Gatzville and DeTour Village in Chippewa County.

The dolostone is quarried extensively by three major corporations for use as flux stone in the manufacture of high quality steel at steel centers in the Lower Great Lakes region and by a fourth firm for fill and riprap material. Large tonnages of the dolostone are produced for concrete aggregate for highway construction as well as for magnesium lime burning. Quarry operations are located near Gulliver, Rexton, and Cedarville and on eastern Drummond Island. In addition, several small abandoned quarries were located throughout The Engadine outcrop belt in the Eastern Upper Peninsula. These were formerly worked for lime, foundation stone, and road metal.

The lower 100 feet and upper 50 feet of the Engadine Dolostone is characterized by very massive bedding. Maximum thickness of the formation is about 225 feet at a point six miles east of Cedarville where the strata dips southward under the waters of Lake Huron. The dolostone is characterized by its distinctive white or light gray color and its uniform crystallinity. Chemically, it is almost pure dolomite with silica content less than one percent in many places.

The Engadine Dolostone is stratigraphically equivalent, at least in part, to the Racine dolomite of Wisconsin and the Amabel and Guelph formations of Ontario. The hardness and weather resistant nature of the Engadine has often left it as the cap rock of a very prominent escarpment extending from the Door Peninsula in Wisconsin, across the Upper Peninsula of Michigan, traversing Cockburn and Manitoulin Islands, and forming a very conspicuous landscape feature throughout the Bruce Peninsula of Ontario.

Table 15.—Principal producers 1

Commodity and company	Address	Type of activity	County
Cement:			
Aetna Portland Cement Co., div.	Box 8	Portland and ma-	Bay.
of Martin Marietta Corp.	Bay City, Mich. 48706	sonry, wet process.	
Dundee Cement Co	Box 317	do	Monroe.
National Cunsum Co. Huron	17515 West 0 Mile Pd	Portland and ma-	Alpana
Cement Div.	Honeywell Center	sonry dry process.	mpena.
Cement D11	Southfield, Mich. 48075	comy my process	
Medusa Portland Cement Co	Box 5668	Portland, wet	Charlevoix.
	Cleveland, Ohio 44101	process.	
Peerless Cement Co., div. of	900 The Executive Plaza		
American Cement Corp.: Port Huron Plant	Detroit, Mich. 48226	do	St. Clair.
Brennan Ave. Plant		do	Wayne.
Penn-Dixie Cement Corp	Box 152	Portland and ma-	Emmet.
	Nazareth, Pa. 18064	sonry, wet process.	
Wyandotte Cement Inc.	3505 Biddle Ave.	do	Wayne.
diama and abola	Wyandotte, Mich. 48192		
Clays and shale:			a
Aetna Portland Cement Co., div.	Box 8	Pit	Saginaw.
of Martin Marietta Corp.	Bay City, Mich. 48706 Box 217	Die	Monroe
Dundee Cement Commenter	Dundee, Mich. 48131	1 10	monroe.
National Gypsum Co., Huron	17515 West 9 Mile Rd.	Pit	Alpena.
Cement Div.	Honeywell Center		
	Southfield, Mich. 48075	PH 1 1 1	
Light Weight Aggregate Corp	12720 Farmington Rd.	Pit and plant	wayne.
Meduse Portland Coment Co	Box 5668	Pit	Antrim
medusa i ortiand Cement Co	Cleveland, Ohio 44101		28110111111
Peerless Cement Co., div. of	900 The Executive Plaza	Pits	St. Clair,
American Cement Corp.	Detroit, Mich. 48226		Wayne.
Penn-Dixie Cement Corp	Box 307	Pit	Emmet.
	Petuskey, Mich. 49770		

See footnote at end of table.

Table 15.—Principal producers 1—Continued

Commodity and company	Address	Type of activity	County
Coke: Industrial Chemicals Div. Allied	Box 70 Morristown, N.J. 07960	Coke ovens	Wayne.
Ford Motor Co	The American Rd.	do	Do.
National Steel Corp. (Great Lakes Steel Div.)	2800 Grant Bldg. Pittsburgh, Pa. 15219	do	Do.
White Pine Copper Co., subsid- iary of Copper Range Co.	Box 427 White Pine, Mich. 49971	Mine and mill	Ontonagon.
Georgia-Pacific Corp. Gypsum Division.	900 SW. 5th Portland, Oreg. 97204	Underground mine, and calcining and board plant.	Kent.
Grand Rapids Gypsum Co	Box 1674 Grand Bapids Mich 49501	do	Do.
Michigan Gypsum Co	2840 Bay Rd.	Open pit mine	Iosco.
National Gypsum Co	Saginaw, Mich. 48601 325 Delaware Ave. Buffalo, N.Y. 14202	Open pit mine and calcining and board	Do.
United States Gypsum Co	101 South Wacker Dr. Chicago, Ill. 60606	plant. Open pit mine Calcining and board plant.	Do. Wayne.
Iron ore:			
Cleveland-Cliffs Iron Co.:	Bldg.		
Empire	Cleveland, Ohio 44115	Open pit mine, con- centrator, and	Marquette.
Mather		Underground mine. Ore treated at the Ore Improvement Plant and Pioneer Pollet Plant	Do.
Ore improvement plant Pioneer pellet plant		Processes Mather ore Pelletizes ore from	Do. Do.
Republic		Open pit mine, con- centrator, and agglomerator. Part of the concentrates pelletized at the Humbeldt plant	Do.
Tilden		Open pit mine and stockpile ship- ments.	Do.
The Hanna Mining Co.: Groveland	100 Erieview Plaza Cleveland, Ohio 44114	Open pit mine, con- centrator, and ag- glomerator.	Dickinson.
Inland Steel Co.: Sherwood	30 West Monroe St. Chicago, Ill. 60603	Underground mine	Iron.
Iron and steel: Ford Motor Co	The American Rd. Dearborn, Mich. 48121	Iron blast furnaces and open-hearth	Wayne.
McLouth Steel Corp	300 South Livernois Ave. Detroit, Mich. 48217	steel lurnaces.	Do.
National Steel Corp., Great Lakes Steel Div. Lime:	2800 Grant Bldg. Pittsburgh, Pa. 15219	do	Do.
Detroit Lime Co., subsidiary of	8800 Dix Ave.	Quicklime, shaft and	Do.
Edward C. Levy Co. The Dow Chemical Co	Detroit, Mich. 48209 Midland, Mich. 48640	Quicklime, 3 rotary kilns, continuous	Mason.
Marblehead Lime Co	300 West Washington St. Chicago, Ill, 60606	Quicklime, 2 rotary kilns.	Wayne.
BASF Wyandotte Corp	1609 Biddle Ave. Wyandotte, Mich. 48192	Quicklime, 9 shaft kilns.	Do.
Anderson Peat Co	2562 Graham Rd.	Bog, processing	Lapeer.
Fletcher & Rickard	Imlay City, Mich. 48444 54001 Grand River Rd. New Hudson, Mich. 48165	plant. do	Oakland.

See footnote at end of table.

Table 15.-Principal producers 1-Continued

Commodity and company	Address	Type of activity	County
Peat—Continued J. M. Huber Corp	(Peat Department) P.O. Box 312	Bog, processing plant.	Sanilac.
Michigan Peat	Sandusky, Mich. 48471 Eight Executive Mall Valley Forge Pa 19481	Bogs, processing	Do.
Scenic Lakes, Inc	Box 926 East Lansing, Mich. 48823	Bog, processing plant.	Shiawassee.
Expanded Perlite: National Gypsum Co	325 Delaware Ave.	Processing plant	Iosco.
United States Gypsum Co	Buffalo, N.Y. 14202 101 South Wacker Dr.	do	Wayne.
Petroleum refineries:	Chicago, Ill. 60606		
Bay Refining Division, The Dow Chemical Co.	4868 Wilder Rd. Bay City, Mich. 48709		Bay. Montaolm
Lakeside Refining Co	Carson City, Mich. 48811 2705 East Cork		Kalamazoo.
Total Leonard, Inc.:	Kalamazoo, Mich. 49001		a
Alma Division	East Superior St. Alma, Mich. 48801		Gratiot.
Marathon Oil Co	Detroit, Mich. 48217		wayne.
Mobil Oil Co., Inc.	Box 477 Trenton, Mich. 48183		Do.
Osceola Kenning Co	Reed City, Mich. 49677		Ogeniaw.
Salt and salines: American Salt Corp	3142 Broadway	Processing plant:	Midland.
Diamond Crystal Salt Co	Kansas City, Mo. 64111 916 South Riverside	Salt. Brine wells and proc-	St. Clair.
The Dow Chemical Co.:	St. Clair, Mich. 48079	essing plant: Salt.	Maaaa
Midland Plant		essing plant: Bro- mine, calcium-mag- nesium compounds, magnesium com- pounds. Brine wells and proc- essing plant: Bro- mine, calcium mag- nesium compounds, iodine, magnesium	Midland.
${\bf Harbison}\hbox{-}{\bf Walker} \; {\bf Refractories} \; {\bf Co}$	2 Gateway Center Pittsburgh, Pa. 15222	Processing plant: Magnesium com-	Mason.
Hardy Salt Co	P.O. Drawer 449 St. Louis, Mo. 61366	Processing plant: Salt.	Manistee.
Hooker Chemical Corp	Box 295 Montague, Mich. 49437	Brine wells and proc- essing plant: Salt.	Muskegon.
International Salt Co	Clarks Summit, Pa. 18411	Underground salt mine.	Wayne.
Kaiser Aluminum & Chemical Corp.	900 17th St., N.W. Washington, D.C. 20006	Processing plant: Magnesium com- nounds.	Midland.
Michigan Chemical Corp:	351 East Ohio St. Chicago, Ill, 60611	Possion	
East Lake Plant		Processing plant: Bromine.	Manistee.
St. Louis Plant		Brine wells and proc- essing plant: Bro- mine, calcium mag- nesium compounds, magnesium com- pounds, salt.	Gratiot.
Morton Chemical Co., div. of Morton-Norwich Products, Inc. Morton Salt Co., div. of Morton-	110 North Wacker Dr. Chicago, Ill. 60606	Brine wells and proc- essing plant: Bro- mine, magnesium compounds.	Manistee.
Norwich Products, Inc. Manistee Plant		Brine wells and proc- essing plant: Salt.	Do.

See footnote at end of table.

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PHOTO: Quarry at Ozark, Mackinac County. SW NE 8, T43N, R5W. Reprap production by Howes & Howes, Kalena, Michigan for pier construction on Mackinac Island. September 1967. STATE OF MICHIGAN WILLIAM G. MILLIKEN, *Governor*

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... the State Geological Survey, shall make an annual report to the Governor, setting forth in detail the mineral statistics for the year; with the progress and development of ... mining and smelting industries.

Compiled Laws Mich. 1948 s.319.202

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