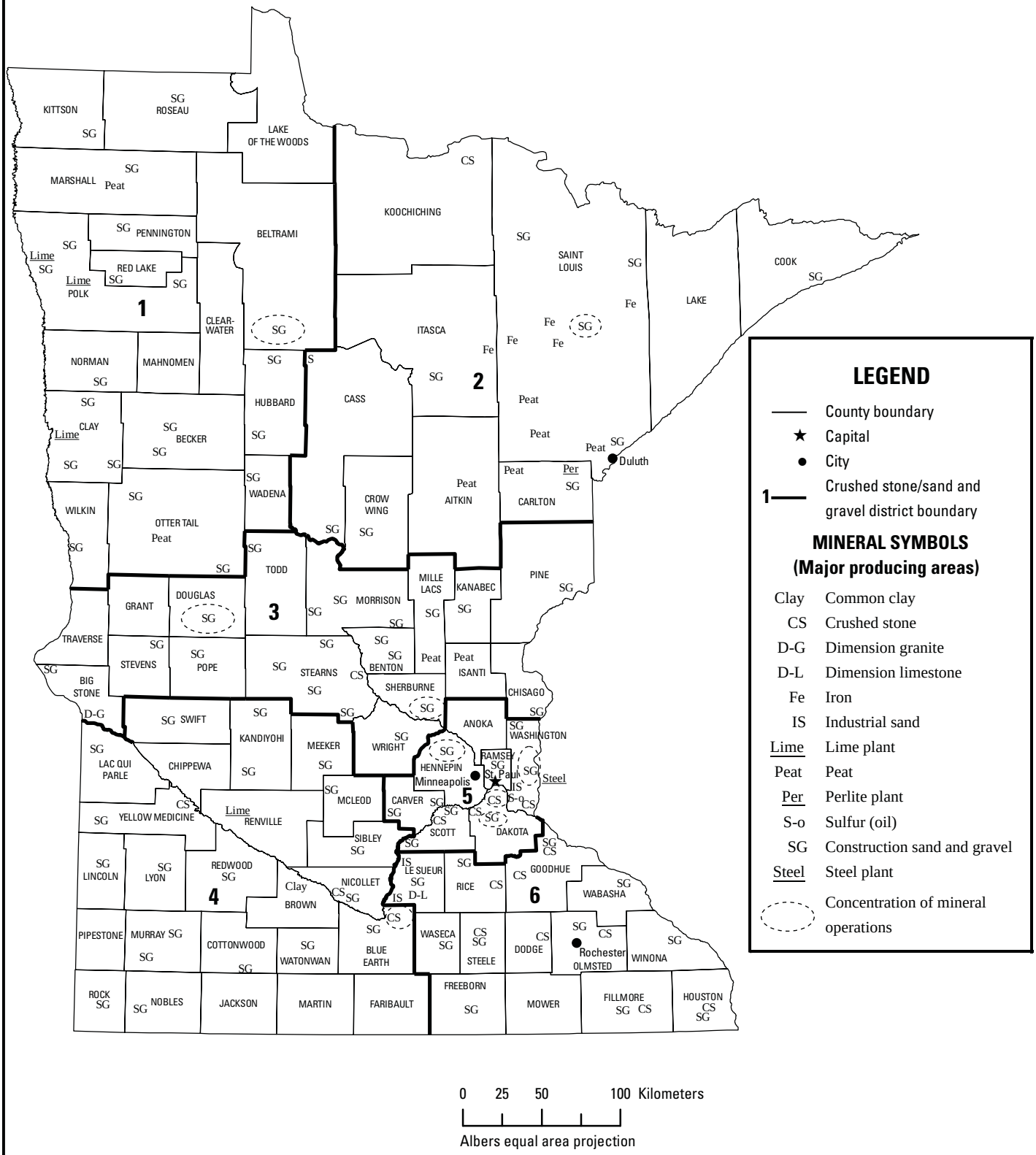
2007 Minerals Yearbook

MINNESOTA [ADVANCE RELEASE]

U.S. Department of the Interior
U.S. Geological Survey

April 2010

MINNESOTA



Source: Minnesota Department of Natural Resources, Division of Lands and Minerals/U.S. Geological Survey (2007).

The Mineral Industry of Minnesota

In 2007, Minnesota's nonfuel raw mineral production[1] was valued at $2.69 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $150 million, or 5.9%, increase from the State's total nonfuel mineral value for 2006, which had increased by $350 million, or 16%, from 2005 to 2006. Minnesota continued to rank eighth among the 50 States in total nonfuel mineral production value, and the State accounted for nearly 4% of the U.S. total. [Because data for common clays (2006–07), industrial sand and gravel and lime have been withheld (company proprietary data), the actual total values for 2005–07 were noticeably higher than those reported in table 1.]

Minnesota continued to be the Nation's leading iron ore-producing State in 2007, and based upon value of production, iron ore continued to be the State's leading nonfuel mineral, accounting for slightly more than 86% of its total nonfuel mineral production value. Iron ore was followed by construction sand and gravel, crushed stone, industrial sand and gravel, lime, dimension stone, peat, common clays, and gemstones (in descending order of value). In 2007, for the fourth consecutive year, the State's substantial increase in nonfuel raw mineral production value largely resulted from iron ore's considerably higher average price per metric ton (t) compared with that of 2006. In 2007, despite a 4% decrease in the shipments of usable iron ore, the mineral commodity's value increased by $160 million, or by more than 7%, compared with that of 2006, following the same trend as in 2005 and 2006 (table 1). In 2005 and 2006, the commodity's value increased by $270 million (up 17%) and more than $330 million (up 18%), respectively, compared with the values for the previous year. In 2005, iron ore production shipments increased slightly and in 2006 it decreased slightly compared with the previous year's production shipments. A significant increase in value also took place in the value of industrial sand and gravel. The largest decrease in value took place in the production of crushed stone, down by $7 million, while construction sand and gravel was down by about $1 million (table 1).

In 2007, Minnesota continued to rank first among other producing States in the quantity of iron ore produced and fifth in the production of construction sand and gravel. The State rose in rank to fifth from sixth in industrial sand and gravel production, decreased to fourth from second in that of peat, and was a producer of significant quantities of crushed stone.

The following narrative information was provided by the Minnesota Department of Natural Resources' (DNR) Division of Lands and Minerals[2] (MDLM). Production data in the following text are those reported by the MDLM, based upon its own surveys and estimates. The data may differ from some production figures reported by the USGS. In 2007, mining in Minnesota continued in the traditional nonfuel mineral sectors, and a variety of new mineral-related research and mineral exploration activities took place in the State. Identified resources of base metals, construction aggregates, dimension stone, direct-shipping grade iron ore, peat, and stone (landscaping) allowed for prospective opportunities for new mineral development in the State. Minnesota geologically has potential for the occurrence of such mineral resources as base metals and precious metals, diamond, and kaolin, and for oil and gas. The level of investment in mineral exploration activity was significantly higher than in the past few years and many additional mineral development investment opportunities continued to exist in the State.

Metallic Mineral Exploration Activities

Four companies, Duluth Metals Ltd. (once a part of Wallbridge Mining Co. Ltd.), Franconia Minerals Corp., Polymet Mining Corp., and Teck-Cominco, continued mineral exploration work at an increasing pace in the Duluth Complex in 2007. Polymet Mining was actively engaged in the ongoing environmental review process for a proposed copper-nickel-platinum group metals (PGM) mine. Encampment Resources Ltd. began a geophysical program on its State leases in Lake County with plans to begin drilling in winter 2008. Kennecott Exploration Co. continued work in Aitkin and Carlton Counties of east-central Minnesota.

Exploration companies completed 162 new drill holes under the State's Exploratory Boring law in 2007 for a total of 94,700 meters (m) (about 311,000 feet) of core. The DNR performed drill-site inspections to ensure regulatory compliance for exploration laws and rules, and compliance with leasing requirements for submission of drilling operation data. The Exploratory Boring law and these data apply to exploration for iron ore, metallic minerals, and certain industrial minerals outside the borders of an active mine permit area.

Also, the MDLM performed work on three projects to promote mineral exploration and development for iron ore and gold. A reserve estimate was created for the State-owned mineral rights of the Carson Lake high-grade natural iron ore deposit, located on the south side of the active Hibbing Taconite Co. taconite mine. About 4 million metric tons (4.5 million short tons) of potential sinter feed was estimated to be in this deposit, located within Hibtac's permit-to-mine area, and it would qualify as a scram operation [a mining operation which produces natural iron ore or natural iron ore concentrates

[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 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.

[2]Maryanna Harstad, Senior Planner, authored the text of the State mineral industry information provided by the Minnesota Department of Natural Resources' Division of Lands and Minerals.

as defined by Minnesota Statutes from previously developed stockpiles, tailings basins, underground mine workings, or open pits, typically involving no more than 32 hectares (ha) (80 acres) of land not previously affected by mining]. The MDLM had a short report about this reserve and the State-owned parcel was available to lease for iron ore.

In the Cuyuna Range iron and manganese mining district, historical data were compiled and digitized. More than 15,600 unique drill holes were verified from the 33,500 drill holes that had been evaluated; 2,800 maps were scanned and a drill hole data table and a classification system for the iron ore data were established to serve as the foundation for future prospecting for iron ore, manganese, and other metallic minerals in the region.

A new compilation of the gold potential in the Archean greenstone bedrock in northeastern Minnesota near the city of Virginia was created from new drill core logging, new mineralogical data on pathfinder elements, new till samples, and a digital compilation of historical drilling, all performed prior to the anticipated State mineral leasing to be offered in 2008. Existing gold assays were compiled and new data were acquired where there were gaps between assays. An XRF instrument was used in the MDLM Drill Core Library to identify pathfinder element associations with gold, and microprobe work clarified the complex arsenic association with gold. Additionally, four new till samples contained anomalous gold grain counts that were worthy of further investigation.

Commodity Review

Industrial Minerals

Peat.—In 2007, Aitkin Agri-Peat–Cromwell, located on the site of the former Michigan Peat Co. operation, leased approximately 450 ha (1,100 acres) of State and county tax-forfeited lands east of Cromwell in Carlton County. Working on about 40 ha (100 acres), the company produced sphagnum peat. Aitkin Agri-Peat–McGregor, located on private land north of McGregor in Aitkin County, mined on about 97 ha, producing reed-sedge peat. Berger Horticultural Products, Ltd. leased 469 ha of State-owned peatland in the Pine Island Bog of west-central Koochiching County. In the fall, the company constructed an access road into the bog in preparation for clearing 40 ha of the site in the winter of 2009–10 and beginning harvesting in 2011. Fafard, Inc. operated on approximately 105 ha of State-leased land east of Floodwood in St. Louis County, mining sphagnum peat. Ferweda General Contracting leased 64 ha of State-owned peatland west of Cotton in St. Louis County; no mining took place during 2007, although limited sales took place from reed-sedge peat stockpiled from the previous operator. Hawkes Company, Inc., located northeast of Newfolden in Marshall County, mined on about 87 ha of private and State-leased land, producing reed-sedge peat. The company's total area then undergoing reclamation was approximately 11 ha; 60 additional hectares had been previously reclaimed and released from the State permit to mine. Peatrex, Ltd. leased more than 200 ha of State and county tax-forfeited peatland west of Cromwell in Carlton County. Mining on approximately 105 ha, the company produced sphagnum peat in 2007; restoration of approximately 5 ha of the site was initiated in early 2006 with plans for another 8 ha to be restored during 2008. Sampson Farms, located on private land east of Aitkin in Aitkin County, mined on about 32 ha, producing hyphen peat. Thompson Farms was located on 32 ha of private land northeast of Aitkin in Aitkin County from which they mined hyphen peat from 0.8 ha in 2007. Waupaca Northwoods, Inc. operated on 115 ha of county tax-forfeited land south of Toivola in St. Louis County, from which the company mined sphagnum peat in 2007.

Metals

Iron Ore.—Minnesota produced more than 76% of the usable iron ore in the United States in 2007; nearly all of the usable iron ore was pellet production. Iron ore mining in the State was conducted in open pit mines along the Biwabik Iron Formation. The Biwabik Iron Formation is a Lake Superior-type iron formation that is formed under sedimentary conditions in a shallow marine basin approximately 2 billion years ago. Magnetite and hematite are the predominant iron oxide ore minerals present, with lesser amounts of goethite and limonite. Chert is the predominant waste mineral present, with lesser amounts of carbonate and silicate minerals. Fine grinding was used to help in liberating the ore minerals from the waste minerals. Nearly all of the iron ore shipped in the United States was used in blast furnaces to make pig iron and then ultimately steel.

Three companies—ArcelorMittal Steel USA, Cliffs Natural Resources Inc., and United States Steel Corp. (U.S. Steel)—operated a total of six mines or mine areas, in Minnesota. The State also had three additional ferrous operations under various stages of development.

ArcelorMittal Steel USA operated the Minorca Mine as a wholly owned subsidiary. Mining took place in two pit areas. The Laurentian Pit was located less than 2 kilometers (km) (about 1.3 miles) northeast of Gilbert, MN, and the East Pit area was located about the same distance west of Biwabik, MN. Crude ore was transported from the two pit areas by way of haul trucks to the Minorca plant facility, located about 3 km northeast of Virginia, MN, for processing.

Cliffs Natural Resources operated the Hibbing Mine, the Northshore Mine, and the United Taconite Mine. The Hibbing Mine was located about 16 km north of Hibbing and 8 km west of Chisholm. Mining took place in four separate pit areas, and subsequently the ore was fed to a plant facility with three processing lines. Cliffs Natural Resources owned 23% of Hibtac, ArcelorMittal USA had a more than 62% interest, and U.S. Steel Canada has a nearly 15% interest.

Cliffs' Northshore Mine was located 3 km south of Babbitt on the northeastern end of the Mesabi Iron Range. Crude ore was hauled by a captive railroad to Northshore's processing facilities in Silver Bay, MN, near Lake Superior. Northshore's annual capacity in 2007 was about 4.8 million metric tons (Mt) and in 2008 was expected to reach between 5.5 Mt and 6 Mt of iron ore pellet production capacity through reactivation and upgrading of previously idled concentrating and pelletizing plant sections. Cliffs Natural Resources owned 100% of the Northshore Mine.

Cliffs' United Taconite Mine was located on Minnesota's Mesabi Iron Range in and around Eveleth, MN. Crude ore was hauled 16 km south of the mine by rail to United Taconite's concentrator and pelletizing facilities located near Forbes. Cliffs owned a 70% interest in United Taconite and the Chinese steel company, Laiwu Steel Corp., the remaining 30%.

U.S. Steel's Keewatin Taconite, or Keetac Mine, and plant facilities were located near Keewatin. U.S. Steel has operated the Keewatin Taconite facility since May 2003, when the company purchased National Steel Corp.'s assets and acquired 100% of the former National Steel Pellet Co. U.S. Steel was planning to expand Keetac's production capacity from 5.4 million metric tons per year (Mt/yr) to 9 Mt/yr, the plans of which were undergoing regulatory environmental review.

The Minntac Mine and plant facilities, wholly owned and operated by U.S. Steel, was located near Mountain Iron, MN. Minntac was the largest taconite mine and plant in North America, with a pit extending 16 km and a processing plant rated at a capacity of 14.6 Mt/yr of pellets.

Other Ferrous Projects and Technological Developments.—Steel Dynamics Inc. and Kobe Steel Ltd. partnered in the construction and operation at Hoyt Lakes of the Mesabi Nugget plant, the world's first full-scale demonstration plant using the pioneering ITmk3® process developed by Kobe Steel (Bending Lake Iron Group Ltd., 2008). Steel Dynamics expected that the plant would very cost-effectively be able to produce high volumes of nuggets containing 97% iron. Construction of the Mesabi Nugget facility began in 2007 and proceeded on schedule. The scheduled commission of the plant was for the third quarter of 2009 using iron concentrate obtained from other suppliers with annual production capacity expected to reach 500,000 t.

Essar Steel Minnesota LLC, on a site west of Nashwauk, MN, had access to iron ore resources of more than 1.4 billion metric tons. The company planned to build an integrated steel plant on the site with an annual capacity of 2.5 Mt upon completion at an estimated project cost of about $1.65 billion. The company's strategy included the development of a high-quality ore body, modern commercially proven processing technologies, and a vertically integrated steel mill. This will be the first facility in North America to include iron ore mining, ore processing, direct reduction of iron, and steelmaking at a single site.

Magnetation, Inc., formed in December 2006, based its business on the Magnetation Process™. The process was designed to produce iron ore concentrate by recovering weakly magnetic iron oxide particles from natural iron ore and taconite tailings basins and from already-mined iron formation stockpiles. The novel aspect of the process was to be in its ability to efficiently separate hematite from silica. The initial focus was on exploitation of the hematite and magnetite contained in natural ore tailings basins created during the past 100 years of mining operations on the Mesabi Iron Range. The plants were planned to have an annual production capacity of iron ore concentrate of 150,000 t with provisions in the design to increase plant capacity to 250,000 metric tons per year.

Government Programs

Aggregate Resources Mapping and Mineral Resources Research

DNR Construction Aggregate Resources Mapping Program.—The DNR launched a Web-based map server, Aggregate Mapper, providing improved public access to aggregate resource information (Martin, 2010). Users can view Geographic Information Systems (GIS) data without having to download additional software. Data includes locations and tabular data of gravel pits, field observations, sand and gravel potential, and crushed stone potential. As of January 2008, work on 20 counties was completed, and four counties—Carlton, Mille Lacs, Olmsted, and Stearns—were in progress. Additionally, nine other counties via county board resolution had requested construction aggregate resource maps with data. The DNR was also coordinating its project schedule and data with the Minnesota Geological Survey (MGS) in overlapping mapping areas. The DNR and MGS worked together to efficiently gather geologic and mineral-resource information.

The cost of construction aggregate supplies rose as fuel costs for delivery to project sites increased. During the previous 3 years diesel fuel costs doubled, from $1.50 per gallon to more than $3.00 per gallon. With increased costs such as this, the need to minimize shipping and fuel consumption grew stressing the need to locate more local supplies of building materials. The severe flood damage to roads in Winona County served as one example of the growing need for local aggregate supplies in various parts of the State. The DNR projected that probably 30 additional counties would benefit directly from this DNR/MGS collaboration of aggregate resource work, based upon common factors including the projected population growth with concomitant increase in demand, urban expansion of many cities, anticipated Twin Cities aggregate import needs, a high rate of depletion of natural gravel deposits owing to the need for coarse crushed aggregates for use in the SuperPave (Superior Performing Asphalt Pavements) asphalt system being used in the State (as encouraged to by the Federal Highway Administration), many competitive land uses, the need for quality sources of aggregate, natural aggregate scarcity areas or poor quality aggregate, and zoning that prohibits mining.

Iron Ore Cooperative Research Program.—The Iron Ore Cooperative Research Program, previously created by the Minnesota Legislature, was used to assist the Minnesota taconite industry by providing funds for taconite research projects. The program was appropriated $550,000 for fiscal years 2006–07 to be matched by $275,000 from taconite mining companies' money and $950,000 for fiscal year 2008–09, which was to be matched by $475,000 also from taconite mining companies. A committee consisting of taconite mining company metallurgists, research scientists, and Minnesota DNR engineers determined the research priorities. The funded research projects were usually performed in Minnesota research laboratories and pilot-plant facilities. The program was considered very

successful, with many of the funded research projects resulting in improved product quality and reduced production costs.

Minerals Coordinating Committee.—The Minerals Coordinating Committee (MCC) was established by the Minnesota legislature as part of the minerals diversification plan. The MCC was composed of representatives from the minerals industry, labor, State agencies, and university research organizations. The committee was apportioned $344,000 for fiscal years 2006–07 and $350,000 for fiscal year 2008–09 for funding mineral research projects. The goal was to fund research projects that increase the knowledge of the State's mineral potential, stimulate the development of mineral resources in the State, and promote basic mineral research. The program's success resulted in increased interest in exploration and development of Minnesota's copper-nickel resources by mining companies such as Duluth Metals, Encampment Minerals, Franconia Minerals Co., Kennecott Minerals, PolyMet Mining, Prime Meridian Resources Corp., and Teck-Cominco Ltd. Funding from this program was also used to identify Minnesota aggregate resources, which aided county planning agencies in determining zoning regulations.

DNR Minerals Research.—The DNR conducted research into helping the State maintain and increase income from the mining of State-owned mineral deposits and in the promotion and marketing of State-owned mineral deposits. This included a variety of projects such as in the examination of selected bedrock drill core for evidence of deposits of diamonds, gold, platinum, or other metals and the compilation of mineral data including copper-nickel, dimension stone, landscape stone, ilmenite, and iron ore for a number of Minnesota sites. Mineral ownership title work was gathered focusing on priority areas on the Mesabi Range and other areas of the State that had nonferrous metallic mineral potential. Other projects included coordinating and conducting research in support of the taconite companies in search of ways to reduce mercury emissions and to help conduct baseline research and environmental review for new mineral projects.

In addition to the "Public Access to Minerals Information" at the Web site http://minarchive.dnr.state.mn.us, monthly data releases, aggregate resource maps, and many online documents pertaining to mineral and mining research and exploration are available on the DNR Web site www.dnr.state.mn.us.

Permanent University Trust Fund.—The Minnesota legislature created the Permanent University Trust Fund (PUTF) to be used for Minnesota taconite and mineral research. The fund was formed using mining royalties paid by mining companies that mine on University Trust Land. Each year the interest from the fund is used to provide grants to perform taconite and mineral research at the University of Minnesota's Coleraine Minerals Research Laboratory. Disbursements from the fund for research during FY 2007 were about $1 million. Several successful projects developed at the Coleraine Laboratory have been installed at Minnesota taconite facilities.

Environmental Research

Cooperative Environmental Research.—The Minnesota legislature established a Cooperative Environmental Research Fund to address environmental issues resulting from mining. The fund is administered by the DNR and was appropriated $172,000 for fiscal year 2008–09. Research or demonstration projects are done in each of the State's mining sectors (ferrous, industrial minerals, and nonferrous), and projects require a match by nonstate funds. The overall goal of the program is to develop and demonstrate new and cost efficient reclamation techniques applicable to Minnesota's mining industry. Results and techniques developed from this program have been implemented by the mining industry to improve mine development and closure techniques, to improve reclamation procedures, and to control environmental impacts.

References Cited

Bending Lake Iron Group Ltd., 2008, Industry—Kobe Steel ITmk3 process. (Accessed January 7, 2010, at http://www.bendinglakeiron.com/Industry.htm.)

Martin, Dennis, 2010, Aggregate resource mapping—Aggregate mapper. (Accessed January 12, 2010, at http://www.dnr.state.mn.us/lands_minerals/aggregate_maps/index.html.)

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN MINNESOTA[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2005		2006		2007	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	20	22	W	W	W	W
Gemstones, natural	NA	6	NA	6	NA	6
Iron ore, usable shipped	40,600	1,830,000	40,400	2,160,000	38,800	2,320,000
Lime	W	W	W	W	W	W
Peat	68	5,670	69	5,280	41	4,350
Sand and gravel:						
Construction	54,400 r	255,000 r	50,300	240,000	46,100	239,000
Industrial	W	W	W	W	W	W
Stone:						
Crushed	10,500	87,400	11,900 r	116,000 r	10,200	109,000
Dimension	19	13,400	22	12,400	22	12,400
Total	XX	2,190,000	XX	2,540,000	XX	2,690,000

[r]Revised. NA Not available.W Withheld to avoid disclosing company proprietary 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.

TABLE 2

MINNESOTA: CRUSHED STONE SOLD OR USED, BY TYPE[1]

Type	2006			2007		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	39	4,900 r	$47,400 r	37	3,780	$41,000
Dolomite	6	3,210 r	32,000 r	4	2,770	32,600
Granite	5	3,180	30,700	5	3,050	30,800
Miscellaneous stone	3 r	580 r	5,980 r	8	588	5,010
Total	XX	11,900 r	116,000 r	XX	10,200	109,000

[r]Revised. XX Not applicable.

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

TABLE 3

MINNESOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2007, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	81	1,880
Filter stone	W	W
Other coarse aggregate	119	2,510
Coarse aggregate, graded:		
Concrete aggregate, coarse	W	W
Bituminous aggregate, coarse	W	W
Bituminous surface-treatment aggregate	W	W
Railroad ballast	94	891
Other graded coarse aggregate	783	12,800
Fine aggregate (-⅜ inch):		
Stone sand, concrete	W	W
Stone sand, bituminous mix or seal	W	W
Screening, undesignated	W	W
Other fine aggregate	298	3,960
Coarse and fine aggregates:		
Graded road base or subbase	630	5,770
Unpaved road surfacing	W	W
Terrazzo and exposed aggregate	W	W
Crusher run or fill or waste	55	450
Other coarse and fine aggregates	814	7,320
Other construction materials	6	35
Agricultural:		
Limestone	124	1,150
Poultry grit and mineral food	W	W
Unspecified:[2]		
Reported	5,520	55,200
Estimated	1,100	12,000
Total	10,200	109,000

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

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

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

TABLE 4

MINNESOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2007, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Districts 3 and 4[2]		Districts 5 and 6[2]	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[3]	--	--	--	--	11	169	261	5,350
Coarse aggregate, graded[4]	--	--	--	--	W	W	W	W
Fine aggregate (-⅜ inch)[5]	--	--	--	--	175	1,240	311	4,040
Coarse and fine aggregates[6]	--	--	--	--	142	768	1,440	13,300
Other construction materials	--	--	--	--	--	--	6	35
Agricultural[7]	--	--	--	--	W	W	W	W
Unspecified:[8]								
Reported	--	--	--	--	3,550	36,400	1,530	15,400
Estimated	42	446	4	43	380	4,100	691	7,400
Total	42	446	4	43	4,480	45,100	5,230	60,500

	Unspecified districts	
	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch)[3]	--	--
Coarse aggregate, graded[4]	--	--
Fine aggregate (-⅜ inch)[5]	--	--
Coarse and fine aggregates[6]	--	--
Other construction materials	--	--
Agricultural[7]	--	--
Unspecified:[8]		
Reported	437	3,370
Estimated	--	--
Total	437	3,370

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]Districts 3 and 4 and 5 and 6 are combined to avoid disclosing company proprietary data.

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

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

[5]Includes screening (undesignated), stone sand (concrete), stone sand (bituminous mix or seal), and other fine aggregate.

[6]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, terrazzo and exposed aggregate, and other coarse and fine aggregates.

[7]Includes agricultural limestone and poultry grit and mineral food.

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

TABLE 5
MINNESOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2007,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	2,920	$15,800	$5.40
Plaster and gunite sands	72	701	9.74
Concrete products (blocks, bricks, pipe, decorative, etc.)	88	1,460	16.55
Asphaltic concrete aggregates and other bituminous mixtures	2,840	21,400	7.53
Road base and coverings	8,960	25,400	2.84
Road stabilization (cement and lime)	59	505	8.56
Fill	1,900	6,280	3.30
Snow and ice control	142	734	5.17
Filtration	21	204	9.71
Other miscellaneous uses[2]	216	2,200	10.18
Unspecified:[3]			
Reported	14,600	102,000	7.00
Estimated	14,000	62,000	4.31
Total or average	46,100	239,000	5.17

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

[2]Includes railroad ballast and golf course.

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

TABLE 6

MINNESOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2007, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	370	2,300	610	2,390	609	3,180
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	1,490	6,360
Road base and coverings[3]	637	2,270	914	2,530	3,960	11,700
Fill	133	473	200	617	483	1,370
Snow and ice control	W	W	W	W	21	177
Other miscellaneous uses[4]	243	1,230	114	612	61	537
Unspecified:[5]						
Reported	4,330	29,300	375	762	2,180	15,100
Estimated	3,100	13,000	3,000	13,000	2,300	9,100
Total	8,760	48,600	5,180	19,900	11,100	47,500
	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	531	3,120	450	3,490	263	2,130
Asphaltic concrete aggregates and other bituminous mixtures	605	9,060	339	3,710	W	W
Road base and coverings[3]	588	2,000	1,300	4,010	219	1,020
Fill	147	436	727	2,550	198	815
Snow and ice control	7	32	W	W	46	130
Other miscellaneous uses[4]	24	303	37	479	145	1,040
Unspecified:[5]						
Reported	951	6,950	3,280	31,500	1,380	7,280
Estimated	1,700	7,700	2,100	9,100	2,200	9,800
Total	4,600	29,600	8,200	54,800	4,480	22,200
	Unspecified districts					
	Quantity	Value				
Concrete aggregate and concrete products[2]	245	1,310				
Asphaltic concrete aggregates and other bituminous mixtures	--	--				
Road base and coverings[3]	1,400	2,460				
Fill	14	25				
Snow and ice control	--	--				
Railroad ballast	--	--				
Roofing granules	--	--				
Other miscellaneous uses[4]	--	--				
Unspecified:[5]						
Reported	2,120	11,500				
Estimated	--	--				
Total	3,780	15,300				

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- 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, golf course, and railroad ballast.

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