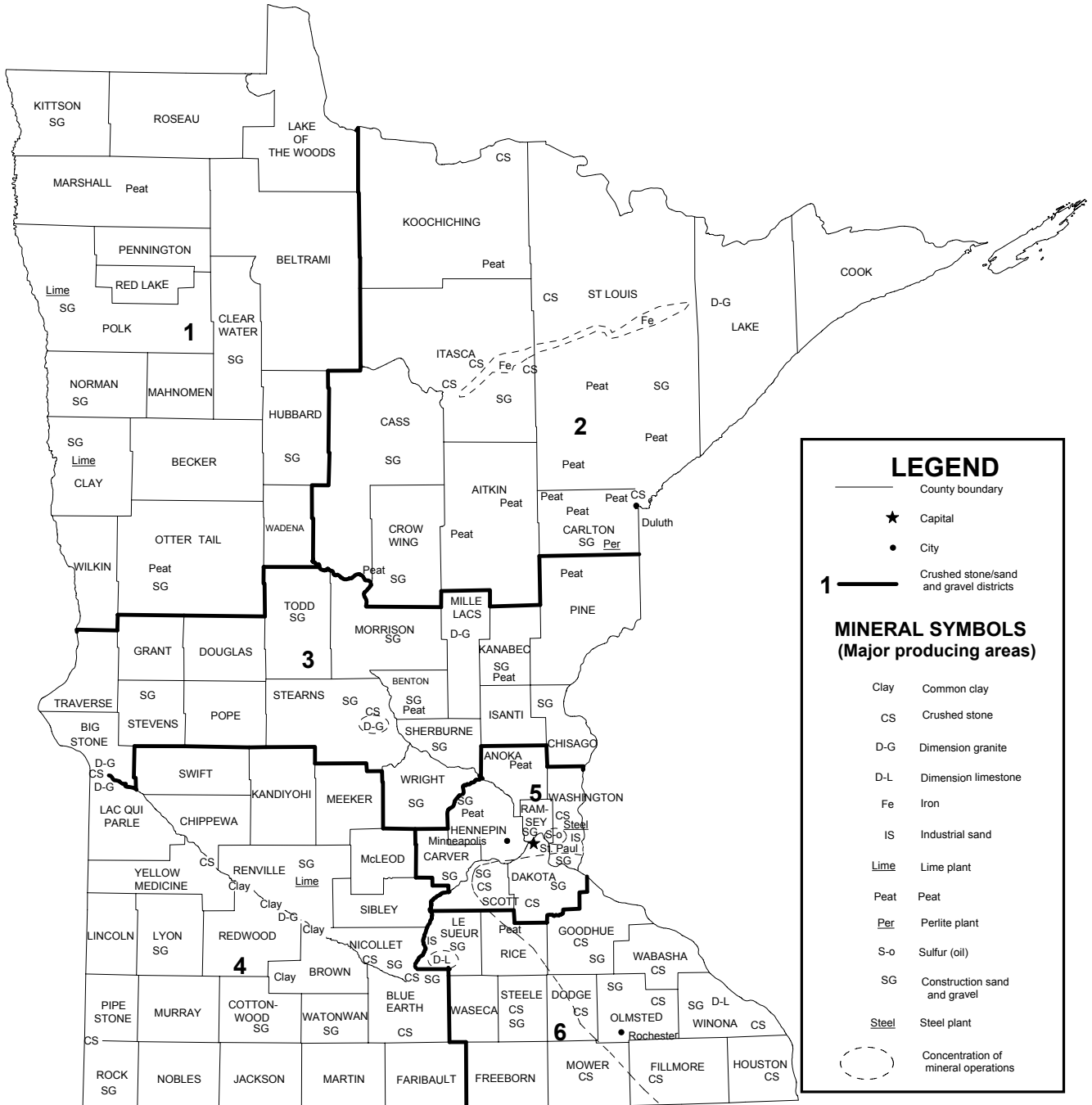


MINNESOTA



LEGEND

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

MINERAL SYMBOLS (Major producing areas)

- Clay Common clay
- CS Crushed stone
- D-G Dimension granite
- D-L Dimension limestone
- Fe Iron
- IS Industrial sand
- Lime Lime plant
- Peat Peat
- Per Perlite plant
- S-o Sulfur (oil)
- SG Construction sand and gravel
- Steel Steel plant

○ Concentration of mineral operations



THE MINERAL INDUSTRY OF MINNESOTA

In 2001, the estimated value¹ of nonfuel mineral production for Minnesota was \$1.44 billion, based on preliminary U.S. Geological Survey (USGS) data. This was a decrease from that of 2000² and followed a 3.5% increase from 1999 to 2000. The State continued to be eighth in rank among the 50 States in total nonfuel mineral production value, of which Minnesota accounted for about 3% of the U.S. total.

In 2001, iron ore, by value, remained Minnesota's leading nonfuel raw mineral, followed by construction sand and gravel, crushed stone, industrial sand and gravel, dimension stone, and lime. In 2000, Minnesota's increase in value resulted mostly from the increased values of iron ore, up \$30 million, construction sand and gravel, up \$16 million, and crushed stone and lime, up more than \$5 million and \$1 million each, respectively; the only significant decrease was a more than \$8 million drop in the value of industrial sand and gravel (table 1).

Compared with USGS estimates of the quantities produced in the other 49 States in 2001, Minnesota remained first in the Nation in iron ore and third in peat. Additionally, the State produced significant quantities of construction and industrial sand and gravel and dimension stone.

The following narrative information was provided by the Minnesota Department of Natural Resources' Division of Lands and Minerals (DLM).³ Production data in the following text are those reported by the DLM, based upon its own surveys and estimates. The data may differ from some production figures reported by the USGS. Minnesota continued to rank first in the Nation in iron ore production, accounting for 70% of 2001 domestic iron ore shipments to the U.S. steel industry. Although the uncertain market and financial situation of the Nation's integrated steel mills had a significant effect on Minnesota's iron ore production, iron ore mining continued to rank among the State's largest industries, contributing more than \$1 billion annually to Minnesota's economy.

¹The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2001 USGS mineral production data published in this chapter are preliminary estimates as of August 2002 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 Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals>.

²Values, percentage calculations, and rankings for 2000 may differ from the Minerals Yearbook, Area Reports: Domestic 2000, Volume II, owing to the revision of preliminary 2000 to final 2000 data. Data for 2001 are preliminary and are expected to change; related rankings may also change.

³Maryanna Harstad, Senior Planner, and Paul Purman, Information and Education Specialist, coauthored the text of State mineral industry information provided by the DLM.

Iron ore production in Minnesota dropped to 34 million metric tons (Mt) in 2001 from 48 Mt in 2000, a decrease of 14 Mt. About half that reduction was due to the permanent closure of LTV Steel Mining Co. Inc. on January 5, 2001. The remaining reduction was due to production cutbacks at five of the six remaining taconite operations.

Because of economic losses of Minnesota's taconite companies and competition from imported subsidized steel, the State responded with several initiatives. It lowered production taxes for all Minnesota taconite companies, it reduced royalty rates for those companies mining State of Minnesota owned ore, and it created a new grant program to encourage capital investment in the taconite industry.

Minnesota has recorded some success in a long-term effort to promote value-added iron production. Kobe Steel, Cleveland-Cliffs Inc., Steel Dynamics, Inc., and the State made a commitment in November 2001 for the construction of a pilot plant and subsequent commercial demonstration of Kobe Steel's ITmk3 iron nugget technology. This project has the potential to bring commercial pig iron production to northeastern Minnesota.

Minnesota's aggregate industry produces three types of materials—sand and gravel mined from glacial or alluvial deposits, crushed carbonate from quarries in southeastern Minnesota where natural gravel is scarce, and high-quality crushed rock from quarries in granite, quartzite, or traprock elsewhere in the State.

Aggregate has been or is currently being mined in all of the State's 87 counties. In addition to the production reported by the USGS, some of the same quarries that produce crushed carbonate rock also produce granular carbonate (limestone or dolomite) rock, which is used for soil amendment or for cement. The Minnesota Department of Agriculture (MDA) analyzes the granular carbonate soil amendment commonly called ag-lime to report the neutralization potential. The MDA compilation lists total sales of ag-lime for 2001 on the Internet at URL <http://www.mda.state.mn.us/lime/tonnagestats.pdf> as 692,000 metric tons (t). Of that, 411,000 t (59%) was primary production from Minnesota quarries.

On July 17, 2001, the 25th sale of State metallic mineral leases was held in St. Paul. Areas within Aitkin, Lake, and St. Louis Counties were offered in the lease sale that totaled more than 179,000 hectares (ha). During the sale, 10 parties submitted 133 bids on 126 mining units, with 55 mining units bid upon in Lake County and 71 mining units bid upon in St. Louis County. The lease sale resulted in the issuance of 126 metallic mineral leases to eight parties. The leases cover 11,275 ha.

In addition, one company requested and received 17 preference rights leases in 2001, covering 3,014 ha in St. Louis County. Eight negotiated leases were issued to one party for 571 ha in Carlton County, and another party received one negotiated lease covering 65 ha in St. Louis County. There were also eight leases, owned by two parties, that terminated in 2001. The terminated leases covered about 1,390 ha.

The interest in metallic mineral leases for 2001 brought the total active State-issued leases of this type to 267, covering 33,703 ha, as of January 1, 2002. Metallic mineral leases brought in a total of \$19,013 for calendar year 2001, of which \$12,380 went to the State's School Trust Fund, and \$6,633 went to the University Fund.

Lehmann Exploration Management is managing the project at Birch Lake (Babbitt, MN) for the Beaver Bay Joint Venture. This joint venture includes North Central Mining Venture, Powell Production Co., and Conner Management. The Beaver Bay Joint Venture has entered into an agreement with Impala Platinum Holdings Ltd. to explore and evaluate the Birch Lake project for the following mineral commodities: copper, gold, nickel, palladium, platinum, and rhodium. Eight borings were completed in 2001 and are now being evaluated. The deposit lies between 490 meters (m) and 850 m below the surface.

Wallbridge Mining Co. drilled one core hole near the Spruce Road in March 2001. The hole was 700 m deep. It is currently exploring the downhole plunge extension of the Maturi deposit, which could add significantly to the 47 Mt in the current estimate for the Maturi.

A total of 8,179 m of core was drilled in 2001, a slight decrease from the total depth drilled in 2000.

A significant Web-based tool for nonferrous research and exploration in Minnesota was made available in 2001. Public Access to Minerals Information at URL <http://minarchive.dnr.state.mn.us> provides map and attribute screens for searching more than 12,000 unpublished mineral exploration documents collected during a period of 100 years. These public documents provide a rich source of information for future exploration, environmental research, and historic mineral research. For many areas of the State, they contain the only view of bedrock terrain deeply buried by glacial material.

The documents in the index cover an extremely wide range of information from large regional surveys to data on individual drill holes. Documents may be maps or other drawings and may include text or tabular information on geophysics, geochemistry, or other subjects. Each document has been individually catalogued and, where possible, placed in the context of other related documents from the same exploration program. For each document, cataloging staff noted when the work was done, by whom, where, and the type and method of work.

The Environmental Cooperative Research Program addresses environmental and land-use impacts associated with mining. Typical research projects are cosponsored by industry, Federal agencies, and other units of Government on a cost-share or in-kind service basis. Projects undertaken in 2001 include characterization and modeling of acid rock drainage, dissolution of greenstones, mercury volatilization in taconite tailings, mercury removal from induration off gas by

wet scrubbers, dissolution of individual silicate minerals of the Duluth Complex, and use of biosolids to reclaim coarse taconite tailings. Biennial appropriation (July 2001 to June 2003) for minerals cooperative environmental research is \$100,000 in the first fiscal year and \$101,000 in the second. Only a portion (\$50,000 and \$50,500) is available if matching non-State funds are not provided.

The Minerals Diversification Program funds research supporting the long-term health of the State's mining economy. This is achieved through improvements to existing industry and by encouraging environmentally sound exploration and development of new mineral resources. Biennial appropriation (July 2001 to June 2003) for minerals diversification is \$370,000 in the first fiscal year and \$372,000 in the second. Current (2001) research includes delineation of potential platinum-group metal mineral resources, mapping of county aggregate resources, mercury investigations, and evaluation of known but undeveloped resources, such as copper and nickel.

The Iron Ore Cooperative Research Program funds research supporting rapid improvements in iron ore/taconite processing. Biennial appropriation (July 2001 to June 2003) is \$307,000 in the first fiscal year and \$273,000 in the second. Only \$200,000 each year is available if Federal matching funds are not provided. Current research includes borehole geophysical investigations supporting improved ore blending, magnetic studies that may lead to reduced need for flotation chemicals in final stage processing, and online chemical analysis that may lead to increased taconite pellet quality and processing efficiency through better information on iron, silica, calcium, and magnesium in taconite ore.

In the 2001 session, the Minnesota Legislature created two taconite mining grant programs to fund industry improvements. A factsheet with more information on these programs is available on the DLM's publication page at URL <http://www.dnr.state.mn.us>.

Other legislative action amended the statute relating to the aggregate material tax by making some borrow material taxable, by specifying how additional counties could become eligible to collect the tax, and by allowing counties to impose a lower tax rate than previously permitted. Local governments in the Twin Cities metropolitan area now must consider aggregate resources when conducting land-use plans.

In addition to the Public Access to Minerals Information site described earlier, the following information is available on the DNR Web site at URL <http://www.dnr.state.mn.us>: monthly data releases, information on mineral lease availability, aggregate resource maps for seven counties, a seven-county Minneapolis-St. Paul metropolitan area aggregate resource map, and many online documents pertaining to mineral and mining research and exploration.

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

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1999		2000		2001 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	W	W	14	15	14	15
Gemstones	NA	6	NA	6	NA	6
Iron ore, usable	43,800 r/	1,150,000	46,700	1,180,000	45,900	1,160,000
Peat	W	W	75	5,100	70	3,850
Sand and gravel, construction	37,300	142,000	39,500	158,000	35,500	144,000
Stone:						
Crushed	13,100 r/	62,700 r/	12,400	68,100	15,000	85,000
Dimension metric tons	42,700	20,700	W	W	W	W
Combined values of lime, sand and gravel (industrial), stone [dimension granite and limestone (2000-01)], and values indicated by symbol W	XX	35,200	XX	44,100	XX	43,300
Total	XX	1,410,000 r/	XX	1,460,000	XX	1,440,000

p/ Preliminary. r/ Revised. 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.

TABLE 2
MINNESOTA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1999				2000			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	49	7,050	\$28,600	\$4.05	49	6,400	\$30,300	\$4.73
Granite	4	W	W	W	4	W	W	6.43
Dolomite	7	3,300	20,500	6.19	8	3,370	20,400	6.06
Quartzite	1 r/	W	W	W	1	W	W	9.60
Total or average	XX	13,100 r/	62,700 r/	4.80 r/	XX	12,400	68,100	5.50

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." 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 2000,
BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1 1/2 inch):			
Macadam	W	W	\$5.00
Riprap and jetty stone	68	\$768	11.29
Filter stone	W	W	3.20
Other coarse aggregate	41	674	16.44
Coarse aggregate, graded:			
Concrete aggregate, coarse	581	3,890	6.70
Bituminous aggregate, coarse	411	2,740	6.67
Bituminous surface-treatment aggregate	W	W	8.03
Railroad ballast	W	W	7.35
Other graded coarse aggregate	928	6,780	7.31
Fine aggregate (-3/8 inch):			
Stone sand, concrete	W	W	6.55
Stone sand, bituminous mix or seal	W	W	6.41
Screening, undesignated	W	W	3.63
Other fine aggregate	110	675	6.14
Coarse and fine aggregates:			
Graded road base or subbase	1,030	5,570	5.42
Unpaved road surfacing	505	1,830	3.62
Terrazzo and exposed aggregate	W	W	11.90
Crusher run or fill or waste	68	358	5.26
Roofing granules	W	W	6.07
Other coarse and fine aggregates	1,130	6,000	5.27
Agricultural:			
Agricultural limestone	313	1,630	5.21
Poultry grit and mineral food	W	W	33.50
Unspecified: 3/			
Reported	4,210	20,200	4.80
Estimated	1,900	9,200	4.85
Total or average	12,400	68,100	5.50

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

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

2/ Includes dolomite, granite, limestone, and quartzite.

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

TABLE 4
MINNESOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2000, BY USE AND DISTRICT 1/ 2/ 3/

(Thousand metric tons and thousand dollars)

Use	District 2		District 3		District 4		District 5	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1 1/2 inch) 4/	--	--	--	--	W	W	89	1,260
Coarse aggregate, graded 5/	--	--	W	W	W	W	928	6,780
Fine aggregate (-3/8 inch) 6/	--	--	W	W	W	W	W	W
Coarse and fine aggregate 7/	--	--	W	W	W	W	1,920	10,300
Agricultural 8/	--	--	--	--	W	W	W	W
Unspecified: 9/								
Reported	--	--	--	--	382	1,810	1,470	6,960
Estimated	6	29	300	1,400	860	4,200	36	180
Total	6	29	1,750	11,300	2,030	11,700	4,780	27,500
District 6								
	Quantity	Value						
Construction:								
Coarse aggregate (+1 1/2 inch) 4/	W	W						
Coarse aggregate, graded 5/	W	W						
Fine aggregate (-3/8 inch) 6/	W	W						
Coarse and fine aggregate 7/	565	2,000						
Agricultural 8/	W	W						
Unspecified: 9/								
Reported	2,360	11,500						
Estimated	700	3,400						
Total	3,810	17,500						

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 dolomite, granite, limestone, and quartzite.

3/ No production reported in District 1.

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

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

6/ Includes screening (undesigned), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregate.

7/ Includes crusher run (select material or fill), graded road base or subbase, roofing granules, terrazzo and exposed aggregate, unpaved road surfacing and other surfacing, and other coarse and fine aggregates.

8/ Includes agricultural limestone and poultry grit and mineral food.

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

TABLE 5
MINNESOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2000,
BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	10,900	\$58,500	\$5.39
Plaster and gunit sands	208	1,220	5.88
Concrete products (blocks, bricks, pipe, decorative, etc.)	363	2,470	6.79
Asphaltic concrete aggregates and other bituminous mixtures	4,690	21,300	4.53
Road base and coverings 2/	9,300	30,600	3.29
Fill	3,220	6,010	1.87
Snow and ice control	552	1,910	3.45
Other miscellaneous uses 3/	332	1,380	4.14
Unspecified: 4/			
Reported	2,380	7,900	3.32
Estimated	7,600	27,000	3.55
Total or average	39,500	158,000	4.00

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

2/ Includes road and other stabilization (cement and lime).

3/ Includes filtration and roofing granules.

4/ Reported and estimated production without a breakdown by end use.

TABLE 6
MINNESOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2000, 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 (including concrete sand)	1,170	6,590	533	2,900	3,760	15,400
Plaster and gunite sands	--	--	114	747	W	W
Concrete products (blocks, bricks, pipe, decorative, etc.)	W	W	13	55	W	W
Asphaltic concrete aggregates and other bituminous mixtures	313	918	W	W	3,360	13,800
Road base and coverings 2/	1,180	2,700	1,060	3,750	5,230	17,600
Fill	W	W	168	455	173	438
Snow and ice control	--	--	W	W	39	162
Other miscellaneous uses 3/	385	863	650	1,850	429	1,620
Unspecified: 4/						
Reported	288	503	664	1,550	1	13
Estimated	1,600	4,900	1,800	6,000	730	2,400
Total	4,970	16,400	4,980	17,300	13,700	51,500
Use	District 4		Districts 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	468	2,020	4,180	27,200	672	4,210
Plaster and gunite sands	17	80	W	W	W	W
Concrete products (blocks, bricks, pipe, decorative, etc.)	W	W	W	W	--	--
Asphaltic concrete aggregates and other bituminous mixtures	435	3,940	W	W	--	--
Road base and coverings 2/	W	W	659	3,520	W	W
Fill	W	W	2,200	3,160	165	696
Snow and ice control	42	129	W	W	35	87
Other miscellaneous uses 3/	928	2,860	650	4,600	157	363
Unspecified: 4/						
Reported	8	77	654	2,760	767	3,000
Estimated	1,800	7,800	880	3,000	820	3,000
Total	3,670	16,900	9,220	44,200	2,610	11,300
Use	Unspecified districts					
	Quantity	Value				
Concrete aggregate (including concrete sand)	83	183				
Plaster and gunite sands	--	--				
Concrete products (blocks, bricks, pipe, decorative, etc.)	--	--				
Asphaltic concrete aggregates and other bituminous mixtures	--	--				
Road base and coverings 2/	263	435				
Fill	--	--				
Snow and ice control	--	--				
Other miscellaneous uses 3/	--	--				
Unspecified: 4/						
Reported	--	--				
Estimated	--	--				
Total	346	618				

W Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous uses." -- Zero.

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

2/ Includes road and other stabilization (cement and lime).

3/ Includes filtration and roofing granules.

4/ Reported and estimated production without a breakdown by end use.