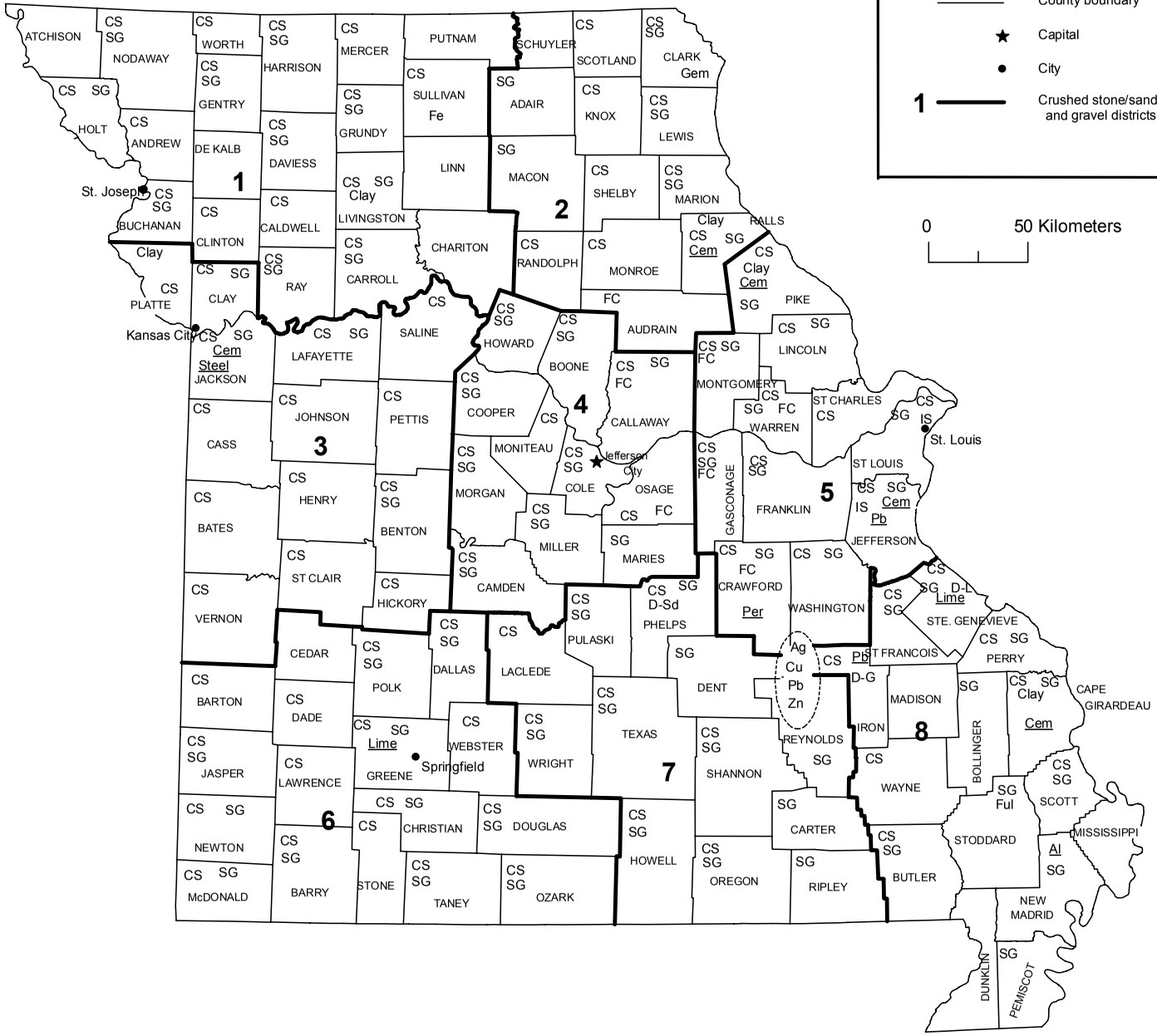
MISSOURI



LEGEND

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

MINERAL SYMBOLS

(Major producing areas)

Ag	Silver
Al	Aluminum plant
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper
D-G	Dimension granite
D-L	Dimension limestone
D-Sd	Dimension sandstone
FC	Fire clay
Fe	Iron
Ful	Fuller's earth
Gem	Gemstones
IS	Industrial sand
Lime	Lime plant
Pb	Lead
Pb	Lead plant
Per	Perlite plant
SG	Construction sand and gravel
Steel	Steel plant
Zn	Zinc
⬭	Concentration of mineral operations

Source: Missouri Department of Natural Resources, Geological Survey and Resource Assessment Division/U.S. Geological Survey (2003)

The Mineral Industry of Missouri

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Missouri Department of Natural Resources, Geological Survey and Resource Assessment Division, for collecting information on all nonfuel minerals.

In 2003, the estimated value[1] of nonfuel mineral production for Missouri was $1.29 billion, based upon preliminary U.S. Geological Survey (USGS) data. This was about a 2% increase from that of 2002[2] and followed a 4.5% decrease from 2001 to 2002. The State rose to eighth from tenth in rank among the 50 States in total nonfuel mineral production value, of which Missouri accounted for nearly 3.5% of the U.S. total.

Crushed stone, cement (portland and masonry), lead, and lime, in descending order of value, accounted for nearly 90% of Missouri's total nonfuel mineral production value in 2003. Missouri continued to be the top lead-producing State in the Nation, producing significantly more than one-half of the Nation's output. Both crushed stone and portland cement, by value, remained the State's leading nonfuel minerals in 2003, having surpassed lead in 1997 and 1999, respectively. Prior to 1997, lead had been Missouri's leading nonfuel mineral since 1969, except for several years in the mid-1980s and during 1993-95, when crushed stone was ranked first.

In 2002, the production of lime and fire clays increased and the values were up by about $12 million and nearly $4 million, respectively. These increases were more than offset by decreases in the production and the values of crushed stone (the value of which was down by about $30 million), silver, portland cement (down by $13 million, although production was up slightly), lead, construction sand and gravel (down by $3.5 million), zinc (the production of which was up), and copper (in descending order of change), which resulted in the State's overall decrease in total value for the year. All other changes were significantly smaller and inconsequential to the net result (table 1).

Based upon preliminary USGS production estimates in the 50 States during 2003, Missouri remained first in the production of lead and lime, and first in fire clay of the three fire-clay-producing States, third in zinc and fuller's earth (listed in descending order of value), fifth in crushed stone and portland cement, and sixth in silver. The State's ranking decreased to sixth from fourth in silver and to ninth from seventh in common clays. Additionally, Missouri was a significant producer of construction sand and gravel, industrial sand and gravel, masonry cement, common clays, and gemstones (gemstones based upon value).

The Missouri Department of Natural Resources, Geological Survey and Resource Assessment Division[3] (GSRAD), provided the following narrative information. Some data or information as reported by the GSRAD may differ from USGS preliminary estimates and production figures.

Commodity Review

Industrial Minerals

Cement.—Cement production in Missouri has increased slowly since 2001. Annual production in 2003 was about 5 million metric tons (Mt). Production was from five cement plants. From north to south along the Mississippi River, Continental Cement Co. LLC operated the Hannibal plant in Ralls County; Holcim (US) Inc. operated the Clarksville plant in Pike County; River Cement Co. (owned by RC Cement Co., Inc.) operated the Selma plant in Jefferson County; and Lone Star Industries, Inc. operated the Cape Girardeau plant in Cape Girardeau County. On January 1, 2004, RC Cement Co. and Lone Star Industries were merged into a new company named Buzzi Unicem USA Inc. (Cement Americas, 2004§[4]). On the opposite (west) side of the State in Jackson County, Lafarge North America Inc. operated the Sugar Creek plant with its associated underground limestone mine.

Holcim announced plans to spend $600 million to build a new world-class cement manufacturing facility along the Mississippi River in extreme northern Ste. Genevieve County. Construction was anticipated to begin in 2005. The facility will comprise a cement plant, limestone quarry, coal preparation plant, and materials handling harbor. The cement plant will be capable of producing more than 4 Mt of cement annually. The proposed 1,600-hectare quarry contains reserves of Ordovician (Mohawkian) limestone that was expected to last at least 100 years. About 200 people will be employed full time, and the

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

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

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

[3]Patrick S. Mulvany, Geologist and Chief, Geologic Data Acquisition and Management Section, authored the text of the State mineral industry information provided by the Missouri Department of Natural Resources, Geological Survey and Resource Assessment Division.

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

annual payroll was expected to be $10 million. The facility will be the largest cement plant in North America and one of the largest in the world. The new Holcim plant should raise annual cement production in Missouri to about 9 Mt.

Clays.—Total clay production in Missouri during 2003 was about 1.4 Mt. The three types of clay produced were common, fire, and fuller's earth.

About 1.05 Mt of common clay in the form of shale and claystone was mined at nine locations in Cape Girardeau, Gasconade, Livingston, Pike, Platte, and Ralls Counties. The majority of it was used in the manufacture of portland cement. The remainder was used in the manufacture of bricks and flower pots. Production of common clay may increase significantly when the new Holcim cement plant goes into operation.

About 340,000 metric tons (t) of fire clay was mined from 15 open pits at various locations in the Northern and Southern Fire Clay Districts of east-central Missouri.

Fuller's earth was mined by Nestle Purina Petcare Co. from Paleocene Porters Creek Clay in Stoddard County and was used to make absorbent pet litter.

Construction Sand and Gravel.—Construction sand and gravel was produced by 63 operators in 49 counties in Missouri. Annual production ranged from 10 Mt to 11 Mt in recent years.

Crushed Stone.—Crushed and broken limestone and dolomite was produced by 188 quarries scattered across Missouri. Annual production in recent years has declined from 80.2 Mt in 2001 to 72.5 Mt in 2002 and down to an estimated 71.7 Mt in 2003 (USGS data shown in table 1 vary slightly from those reported by the State).

Crushed and broken Precambrian rhyolite was quarried by CertainTeed Corp., Fred Weber, Inc., and ISP Minerals Inc. at three locations in the St. Francois Mountains area of southeastern Missouri. The crushed rock was used in the manufacture of roofing granules and as landscaping material.

Dimension Stone.—Missouri Red Quarries, Inc. produced dimension granite from the Graniteville Quarry in Iron County.

Gemstones.—Quartz geodes were dug from Mississippian Warsaw Formation in extreme northeastern Missouri by one business concern. Others were collected and sold by hobbyists.

Industrial (Silica) Sand.—High-purity quartz (silica) sand was mined from the Ordovician St. Peter Sandstone in St. Louis and Jefferson Counties by Unimin Corp. and U.S. Silica Co. Annual production has remained relatively steady for the past 3 years.

Lime.—Quicklime and hydrated lime were manufactured in Greene and Ste. Genevieve Counties by the Chemical Lime Co. and the Mississippi Lime Co.

Metals

Copper, Lead, Silver, and Zinc.—All production of metals in Missouri in 2003 came from Doe Run Co.'s underground mines in the Viburnum trend on the west side of the St. Francois Mountains in southeastern Missouri. About 4.6 Mt of ore was produced. Ore minerals were galena, sphalerite, chalcopyrite, and bornite, listed in order of decreasing abundance. Small amounts of silver were associated with the galena. Mined ore yielded about 255,000 t of recoverable lead metal. Of the total metal produced, about 85% was lead, 13% was zinc, 1% was copper, and less than 1% was silver.

At the beginning of 2003, there were eight active mines: No. 28 Mine, Casteel, Magmont, Buick, Brushy Creek, West Fork, Fletcher, and Sweetwater, listed from north to south. Magmont was operated as part of Buick because the two mines were in communication underground. Similarly, West Fork was operated as part of Fletcher. Operations at No. 28 Mine were stopped in fall 2003 when the last load of ore was hoisted out of the mine. Plans were being made to close the mine permanently because reserves (based on depressed prices) were considered depleted. No. 28 Mine had been in operation since 1960. The mills at Buick, Brushy Creek, Fletcher, and Sweetwater were in operation. The West Fork mill was put on care-and-maintenance status. The Herculaneum smelter was in operation, but the Glover smelter was put on care-and-maintenance status on December 1, 2003.

Internet Reference Cited

Cement Americas, 2004 (January 1), Lone Star, RC Cement renamed Buzzi Unicem USA, accessed December 20, 2004, at URL http://cementamericas.com/mag/cement_lone_star_rc.

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

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2001		2002		2003[p]	
		Quantity	Value	Quantity	Value	Quantity	Value
Cement:							
Masonry		111	9,680 [e]	W	W	W	W
Portland		4,720	346,000 [e]	4,820	333,000	5,000	350,000
Clays:							
Common		1,030	3,420	1,050	3,930	1,050	3,930
Fire		289	3,610	340	7,360	340	7,360
Copper[3]		4	7,490	W	W	W	W
Lead[3]	metric tons	281,000	270,000	W	W	W	W
Sand and gravel, construction		10,900	45,800	10,000	42,300	10,200	43,400
Silver[3]	kilograms	144,000	20,300	W	W	W	W
Stone, crushed		81,700 [r]	410,000 [r]	74,100	380,000	73,300	381,000
Zinc[3]	metric tons	43,600	42,300	W	W	W	W
Combined values of clays (fuller's earth), gemstones, iron oxide pigments [crude (2000-01)], lime, sand and gravel (industrial), stone (dimension granite), and values indicated by symbol W		XX	165,000	XX	494,000	XX	504,000
Total		XX	1,320,000 [r]	XX	1,260,000	XX	1,290,000

[e]Estimated. [p]Preliminary. [r]Revised. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data.
XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Recoverable content of ores, etc.

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

Kind	2001				2002			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone[2]	171 [r]	76,200 [r]	$379,000 [r]	$4.97	166	68,600	$348,000	$5.08
Dolomite	23	3,950	19,200	4.87	22	3,940	20,200	5.14
Granite	2	W	W	7.22	2	W	W	7.54
Traprock	2	W	W	8.17	2	W	W	7.81
Total or average	XX	81,700 [r]	410,000 [r]	5.01	XX	74,100	380,000	5.14

[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, except unit value; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

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

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1 1/2 inch):			
Macadam	175	$982	$5.61
Riprap and jetty stone	2,750	13,900	5.04
Filter stone	206	1,100	5.33
Other coarse aggregates	1,150	6,890	5.98
Total or average	4,280	22,800	5.33
Coarse aggregate, graded:			
Concrete aggregate, coarse	2,420	13,600	5.63
Bituminous aggregate, coarse	799	4,730	5.91
Bituminous surface-treatment aggregate	421	2,550	6.05
Railroad ballast	W	W	4.85
Other graded coarse aggregates	3,630	25,500	7.02
Total or average	7,270	46,400	6.38
Fine aggregate (-3/8 inch):			
Stone sand, concrete	W	W	5.26
Stone sand, bituminous mix or seal	13	74	5.69
Screening, undesignated	286	1,340	4.67
Other fine aggregates	1,570	7,950	5.06
Total or average	1,870	9,360	5.00
Coarse and fine aggregates:			
Graded road base or subbase	4,470	20,600	4.60
Unpaved road surfacing	967	5,710	5.91
Crusher run or fill or waste	131	823	6.28
Roofing granules	499	5,680	11.38
Other coarse and fine aggregates	2,840	13,600	4.80
Total or average	8,910	46,400	5.21
Other construction materials[2]	297	2,050	6.89
Agricultural, limestone	696	3,330	4.79
Chemical and metallurgical:			
Cement manufacture	4,390	18,100	4.13
Lime manufacture	1,650	6,540	3.95
Flux stone	W	W	5.54
Chemical stone	W	W	5.13
Total or average	6,050	24,700	4.08
Other miscellaneous uses and specified uses not listed	41	204	4.98
Unspecified:[3]			
Reported	15,800	83,300	5.26
Estimated	28,000	136,000	4.92
Total or average	43,500	220,000	5.04
Grand total or average	74,100	380,000	5.14

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

TABLE 4

MISSOURI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2002, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1 1/2 inch) [2]	W	W	W	W	145	958	W	W
Coarse aggregate, graded [3]	W	W	W	W	814	5,070	W	W
Fine aggregate (-3/8 inch) [4]	1	5	W	W	96	499	W	W
Coarse and fine aggregates [5]	W	W	W	W	815	4,270	W	W
Other construction materials [6]	--	--	--	--	--	--	--	--
Agricultural [7]	W	W	W	W	W	W	21	87
Chemical and metallurgical [8]	--	--	--	--	W	W	--	--
Other miscellaneous uses	--	--	--	--	--	--	--	--
Unspecified: [9]								
Reported	3,270	16,700	186	904	5,140	27,000	572	3,030
Estimated	690	3,300	3,300	16,000	3,100	14,000	1,700	8,500
Total	4,510	24,200	4,190	20,300	11,600	59,000	3,580	19,000

	District 5		District 6		District 7		District 8	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1 1/2 inch)[2]	1,040	5,990	W	W	W	W	W	W
Coarse aggregate, graded[3]	3,310	21,300	949	6,820	W	W	1,560	8,300
Fine aggregate (-3/8 inch)[4]	1,400	6,650	392	2,350	--	--	133	643
Coarse and fine aggregates[5]	2,590	11,900	1,290	7,640	W	W	3,080	16,000
Other construction materials[6]	--	--	272	1,920	15	83	10	46
Agricultural[7]	W	W	135	906	W	W	W	W
Chemical and metallurgical[8]	W	W	W	W	--	--	W	W
Other miscellaneous uses	--	--	--	--	--	--	41	204
Unspecified:[9]								
Reported	3,380	16,900	2,570	15,200	--	--	714	3,510
Estimated	6,700	33,000	3,500	17,000	1,200	5,800	7,600	38,000
Total	19,900	102,000	9,330	53,300	1,720	8,850	19,200	94,300

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

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

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

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

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

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

[6]Includes pipe bedding.

[7]Includes agricultural limestone.

[8]Includes cement manufacture, chemical stone for alkali works, flux stone, and lime manufacture.

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

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

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	5,320	$20,200	$3.79
Plaster and gunite sands	121	649	5.36
Concrete products (blocks, bricks, pipe, decorative, etc.)	237	1,520	6.40
Asphaltic concrete aggregates and other bituminous mixtures	246	1,210	4.92
Road base and coverings	122	563	4.61
Road stabilization (cement)	9	48	5.33
Fill	133	572	4.30
Snow and ice control	40	187	4.68
Other miscellaneous uses[2]	136	1,240	9.14
Unspecified:[3]			
Reported	446	2,670	5.99
Estimated	3,200	13,000	4.18
Total or average	10,000	42,300	4.22

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes roofing granules.
[3]Reported and estimated production without a breakdown by end use.

TABLE 6
MISSOURI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2002, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

	District 1 and 2		District 3		District 4 and 5	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[3]	118	543	--	--	5,100	19,500
Asphaltic concrete aggregates and road base materials	W	W	--	--	W	W
Fill	W	W	--	--	W	W
Other miscellaneous uses[4]	40	170	--	--	502	2,800
Unspecified:[5]						
Reported	34	178	--	--	398	2,410
Estimated	610	2,500	370	1,700	1,400	5,800
Total	799	3,360	370	1,700	7,390	30,500

	District 6		District 7 and 8	
Use	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[3]	--	--	460	2,260
Asphaltic concrete aggregates and road base materials	--	--	98	552
Fill	7	56	12	47
Other miscellaneous uses[4]	22	177	5	23
Unspecified:[5]				
Reported	14	83	--	--
Estimated	120	490	730	3,000
Total	163	805	1,300	5,870

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]Districts 1 and 2, 4 and 5, and 7 and 8 are combined to avoid disclosing company proprietary data.
[3]Includes plaster and gunite sands.
[4]Includes roofing granules and snow and ice control.
[5]Reported and estimated production without a breakdown by end use.