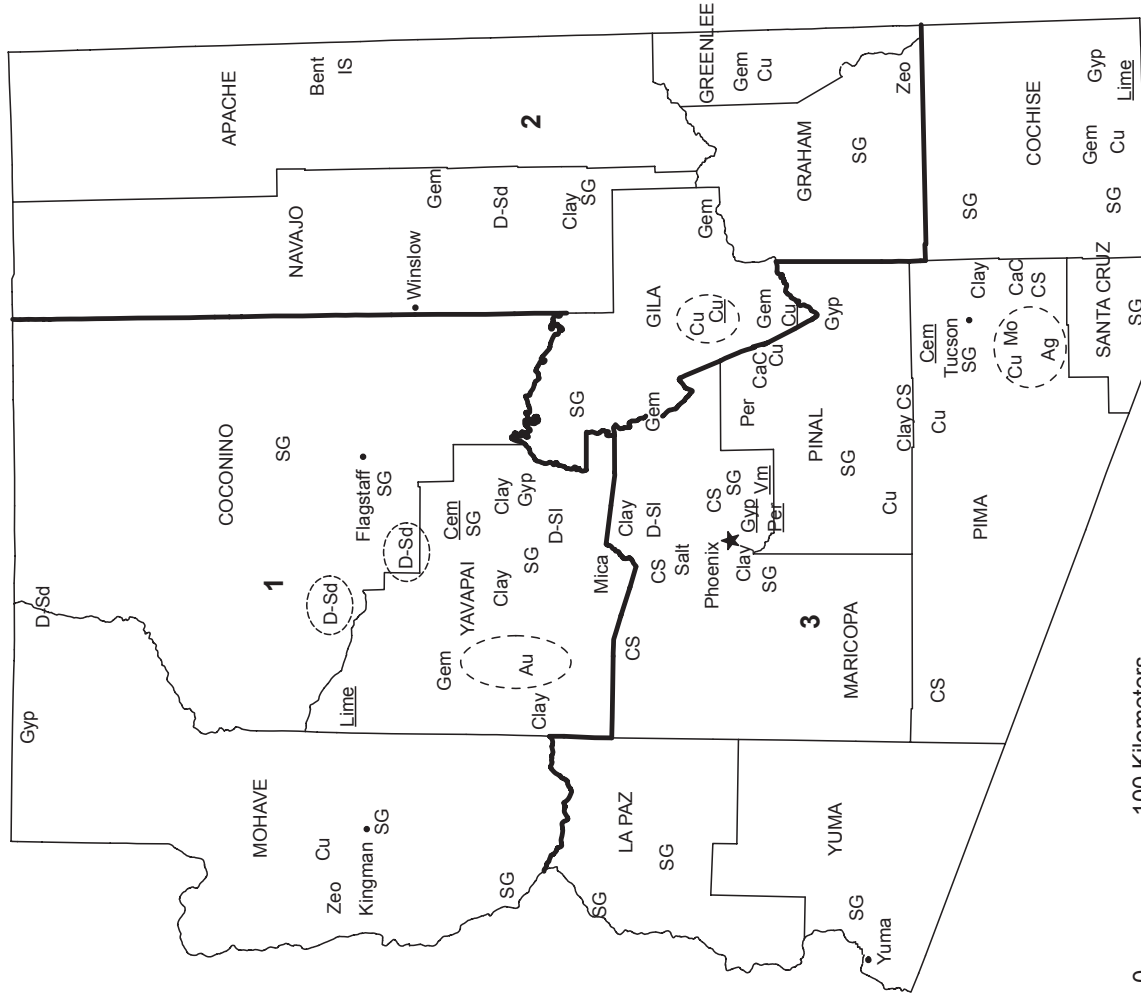


# ARIZONA



0 100 Kilometers

## LEGEND

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

## MINERAL SYMBOLS (Major producing areas)

- Ag Silver
- Au Gold
- Bent Bentonite
- CaC Calcium carbonate
- Cem Cement plant
- Clay Common clay
- CS Crushed stone
- Cu Copper
- Cu Copper plant
- D-Sd Dimension sandstone
- D-Si Dimension slate
- Gem Gemstones
- Gyp Gypsum
- Gyp Gypsum plant
- IS Industrial sand
- Lime Lime plant
- Mica Mica
- Mo Molybdenum
- Per Perlite
- Per Perlite plant
- Salt Salt
- SG Construction sand and gravel
- Vm Vermiculite plant
- Zeo Zeolites
- (---) Concentration of mineral operations

# THE MINERAL INDUSTRY OF ARIZONA

**This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Arizona Department of Mines and Mineral Resources for collecting information on all nonfuel minerals.**

In 2004, Arizona's nonfuel raw mineral production was valued<sup>1</sup> at \$3.3 billion, based upon annual U.S. Geological Survey (USGS) data. This was an increase of nearly 53% compared with \$2.18 billion in 2003<sup>2</sup> and followed an 11.8% increase from 2002 to 2003. Arizona accounted for nearly 7.3% of the total nonfuel mineral production value in the United States and ranked third in 2004 among the 50 States for the fifth time in the past 7 years; the State had ranked fourth in 2003, fifth in 2002, and first from 1995 through 1997.

Arizona continued to be the Nation's leading copper-producing State in 2004 and accounted for more than 62% of total U.S. copper mine production and value. Copper was the State's foremost nonfuel mineral produced; it accounted for about 64% of Arizona's total nonfuel mineral production value followed by construction sand and gravel (with more than 11% of the State's total value), molybdenum concentrates, portland cement, crushed stone (with about 2% of the value), and lime.

Arizona's substantial increases in value in 2004 and 2003 resulted mainly from the increased values of copper and molybdenum and smaller yet very significant increases in construction sand and gravel, portland cement, and crushed stone (table 1). Although copper production decreased by about 2.5% in 2004, its value increased by more than 53% because of significantly higher average copper prices. Molybdenum concentrate production rose by more than 2%, and its total production value was more than triple that of 2003 as the significant growth in molybdenum concentrate prices that began December 2002 continued on throughout 2003 and 2004. For example, the time-average price of molybdic oxide rose from \$8.27 per kilogram in 2002 to \$11.75 per kilogram in 2003 to \$36.73 per kilogram in 2004 and reached \$68.89 in December 2004. Molybdenum concentrate prices remained high and continued to increase more gradually during the early months of 2005. (Prices were reported in Platts Metals Week in dollars per kilogram of contained molybdenum.)

In 2003, copper led the State's rise in nonfuel mineral production value with an increase of \$113 million followed by molybdenum concentrates, which was up by more than \$50 million; construction sand and gravel, up by \$46 million; portland cement, up by more than \$20 million; lime, up by about \$7 million; and dimension stone, up by nearly \$2 million. Production increased for the latter five commodities, but copper production was down slightly. The largest decreases in total value for each mineral commodity were in crushed stone, industrial sand and gravel, and salt, each of which were down by about \$2 million. All other increases and decreases in value were by about \$1 million or less and did not significantly affect the State's overall nonfuel mineral production value in 2003 (table 1).

In 2004, Arizona continued to lead the Nation in the quantities of copper and molybdenum concentrates produced and remained second in gemstones (based on value) and third in perlite. The State rose in rank in three nonfuel mineral commodities: to 3d from 4th in construction sand and gravel, to 4th from 6th in zeolites, and to 6th from 7th in dimension stone; and it decreased in three: to 2d from 1st in pumice and pumicite, to 7th from 5th in silver and to 10th from 9th of 10 gold-producing States. Additionally, Arizona continued to be a significant producer of, in descending order of value, portland cement, lime, and masonry cement.

The Arizona Department of Mines and Mineral Resources<sup>3</sup> (ADMMR) provided the following narrative information. Data presented in ADMMR reports may differ somewhat from data reported by the USGS in table 1.

## Exploration and Development Activities

**Copper.**—Early in 2004, Rio Tinto plc announced that it had earned a 55% interest in the joint-venture Resolution Copper Co. project near Superior by expending \$25 million on exploration drilling. BHP-Billiton retained a 45% stake in the joint-venture company. Although the deep mineralization could make the property difficult to develop, it may also prove to be one of the richest and largest copper discoveries in North America. On May 1, Rio Tinto, through the joint venture, officially took over the west plant site, which included the old Magma mill and smelter plant site. The company spent \$2 million on restoration and cleanup. The focus of the work was to improve erosion resistance on the dumps and spillways and to close of some of the surface openings to old underground mines. Other activities underway included a hydrological investigation of the site and land acquisition for possible exchange. An estimated \$200 million might be spent on the project prior to any production decision. Preliminary plans were to develop the deposit by block caving. Drilling to gather geotechnical information for mine development, shaft sinking, and further definition of the deposit resumed in early 2005.

Cambior Inc. announced that a study to examine the possibilities for a joint-venture operation of the Carlota and the Pinto Valley facilities was completed. BHP Copper was apparently not interested in a joint venture, but may lease or sell some facilities. The 95-million-metric-ton (Mt) copper oxide deposit remained fully permitted and could be developed.

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<sup>1</sup>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 2004 USGS mineral production data published in this chapter are those available as of December 2005. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—also can be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals>.

<sup>2</sup>Values, percentage calculations, and rankings for 2003 may differ from the Minerals Yearbook, Area Reports: Domestic 2003, Volume II, owing to the revision of preliminary 2003 to final 2003 data. Data and rankings for 2004 are considered to be final and are not likely to change significantly.

<sup>3</sup>Nyal J. Niemuth, Mining Engineer, authored the text of the State mineral industry information provided by the Arizona Department of Mines and Mineral Resources.

St. Genevieve Resources acquired the Emerald Isle and the Zonia properties from Arimetco International Inc. via bankruptcy court. This company planned to return Emerald Isle to production quickly. The copper deposit contains about 900,000 metric tons (t) of ore at a grade of 0.75% copper, and a solvent/extraction electrowinning plant is onsite.

General Minerals Corp. expanded its holdings and defined a geophysical anomaly 5 kilometers northwest of Phelps Dodge Corp.'s Dos Pobres deposit in the Safford district. The company also conducted geologic and geophysical work to define a copper target at the Monitor Mine northeast of the Ray Mine. In early 2005, General Minerals announced they had optioned the property to Teck Cominco Ltd.

The Helvetia/Rosemont property, which contained an undeveloped copper deposit, was sold by ASARCO Incorporated (Asarco) to Rosemont Ranch LLC and other parties for \$4.5 million. In January 2005, the Rosemont Ranch partners offered the property to Pima County for purchase as open space for \$11.5 million and noted they had received an offer from mining group Augusta Capital Corp. for a similar amount. No sale was announced.

**Gold.**—American Bonanza Gold Corp. executed the most significant gold program in Arizona during 2004. At yearend, the company's 40,000-meter (m) drilling program at Copperstone in La Paz County was 50% finished; six rigs were being used to drill from the surface and underground (American Bonanza Gold Corp., 2004<sup>4</sup>). The high-grade D zone was drilled from an underground drill bay. Additional targets included the Footwall target, which is about 120 m below the main Copperstone Fault in the central part of the open pit and the High Wall area, which is located north of the open pit to the southeast of the D zone and the C zone. Data from approximately 100 holes have been released with assay results that include many with high-grade intercepts. Announcement of a minable reserve and a production decision was expected in 2005. Bonanza also initiated metallurgical and environmental baseline programs to support a feasibility study and permitting of the project.

During the first quarter of 2004, Bema Gold Corp. announced a write-down of \$8.5 million in the carrying value of the Yarnell gold property in Yavapai County, which was reported to contain up to 10 Mt of mineralization (Bema Gold Corp., 2004§). On April 30, 2004, Bema entered into a letter of intent to sell the Yarnell gold property for cash and a net smelter royalty of approximately \$2.2 million. During the fourth quarter, another company, Gold Spring, reported that it was evaluating the property.

Among other gold exploration projects in Arizona, five companies announced drilling activities. These included Capital Hill at the Mexican Hat working on the Victoria and 16 zones in Cochise County; Galaxy Minerals Inc. at the Yellow Jacket property in Santa Cruz county; Patriot Gold Corp., which put in 30 holes at the Moss Mine and planned more drilling; and Abington Ventures Inc. and Hellix Ventures Inc. at the Oakland and adjacent Verdstone gold mines.

## Commodity Review

### *Industrial Minerals*

Growth in the production and value of industrial minerals by Arizona producers continued. The Phoenix metropolitan area surpassed Atlanta to become the largest new market in the United States. A number of sales included the purchase by Western Power and Equipment Corp. of Arizona Pacific Materials LLC, which produced specialty basalt aggregate at the Queen Creek quarry in the southeastern corner of metropolitan Phoenix and cinders from the Apple pit near Flagstaff. Kildare Enterprises LLC purchased all American Sandstone's flagstone operations near Drake. Cemex S.A. purchased the RMC Group, which was the world's leading ready-mixed concrete maker, for \$4.15 billion to expand its markets in Europe and in the United States. The purchase would have the opposite effect in one local market, Tucson, because the U.S. Federal Trade Commission was expected to require Cemex to divest the former holdings of RMC in Tucson during 2005 to reduce Cemex's market share. Some of the large publicly traded companies (for example, Rinker Materials Corp.) reported that they were benefiting from the construction boom in Arizona and the consequent increased prices for sand and gravel and cement block.

### *Metals*

**Copper.**—The average U.S. producer cathode price for copper rose by 57% to \$1.34 per pound in 2004 from \$0.85 per pound in 2003, which accounted for the increase in the value of Arizona's copper production (table 1; Edelstein, 2005, p. 8).

Asarco's three operating mines produced about 154,000 t in 2004. Production fell by 14,000 t at the Ray Mine, increased slightly at the Mission Mine, and remained stable at the Silver Bell Mine. In April 2004, Asarco increased stripping to take advantage of the higher revenues and to achieve a long-term cash break-even point below \$.75 per pound of copper. As a result, waste removal in 2004 increased by about 65% compared with that of 2003, while ore mined declined slightly. Increased costs were associated with the increased tonnage moved and with upgrading equipment maintenance to raise equipment availability levels to the industry standard levels. After Asarco completed 80% of its stripping objective at the Ray Mine, the mine returned to normal operations during the first quarter of 2005. The Mission Mine completed more than one-half of its stripping goal and was forecast to return to normal operations in mid-2005. Both mines were projected to achieve production increases of 40%.

Santa Cruz, which was an in situ leach research project and pilot producer that had been supported by the Federal Government, was sold by Asarco and its joint-venture partner Freeport-McMoRan Copper & Gold Inc. to one of the Nation's leading real estate developers. Freeport-McMoRan reported \$21.3 million in income from the sale of the land, which included the deposit west of Casa Grande.

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<sup>4</sup>References that include a section mark (§) are found in the Internet References Cited section.

Phelps Dodge produced more than 75% of Arizona's copper production in 2004 and posted a record annual net income of more than \$1 billion for 2004. Morenci produced 381,000 t that was recovered solely by leaching followed by solvent extraction (four plants) and electrowinning (three tank houses). In 2004, Morenci added reserves from the American Mountain, the Garfield, and the Shannon areas of Morenci.

Phelps Dodge's Bagdad Mine returned to full capacity during the second quarter of 2004 and produced 100,000 t of copper via concentration and leaching. The demonstration concentrate pressure-leach plant, which was in its second year of operation, processed 53,000 t of chalcopyrite concentrate and recovered 16,000 t of copper cathode, which was its design capacity. The plant averaged 98.9% extraction of copper from concentrate, which was slightly more than anticipated; the plant's availability averaged 83% in 2004. In March 2004, Phelps Dodge converted the facility to the medium-temperature mode of operation because this mode of operation generates significantly less sulfuric acid and requires less oxygen than the high-temperature process. The plant was shut down in December for the conversion, which will also include the adoption of new proprietary direct-electrowinning technology. The new configuration was scheduled for an 8-month test run.

Phelps Dodge's Sierrita Mine reached full capacity during the fourth quarter of 2004 and produced 70,000 t of copper, mostly from concentration. A new plant capable of producing approximately 18,000 metric tons per year of copper sulfate pentahydrate, which is an alternative to copper cathodes, was completed in late 2004. Phelps Dodge's byproduct 13,600 t of molybdenum production came largely from the Bagdad and Sierrita Mines. Both mines benefited from the threefold increase in the price of molybdenum oxide to more than \$16 per pound.

Phelps Dodge began construction of a central analytical service center in Safford to provide services for the company's operations in Arizona and New Mexico. The center was expected to be completed in late 2005 and to replace the existing analytical facilities at most mine sites. A process technology center that employed approximately 96 engineers, scientists, and technical support staff was also at Safford. The activities at the technology center were directed at the development of new cost-competitive "step change" technologies and the continuous improvement of existing processes.

With no mining being done at Phelps Dodge's Miami Mine, production from existing leach dumps fell by 45% to less than 9,070 t of copper. With concentrate production up at Bagdad and Sierrita, the Miami smelter resumed operating at full capacity during the second quarter of 2004.

Phelps Dodge's Tohono Mine restarted operations to recover copper from existing leach piles during the fourth quarter of 2004 and resumed cathode production in January 2005. Mining had ceased in mid-1997, but leaching continued until early 1999. Mineralization reported for the Tohono deposit included 250 Mt milling material at a grade of 0.70% copper and 367 Mt leachable material at a grade of 0.63% copper.

In October 2004, Phelps Dodge and BioteQ Environmental Technologies Inc. formed the joint-venture company Copreco LLC and commissioned a new plant at Bisbee to recover copper. The plant incorporated a bioreactor to precipitate copper sulfide selectively from low-grade stockpile solutions that are then thickened and shipped to the Miami smelter. Through this process, the sludge is converted into a marketable product (rather than a material that requires disposal) and helps offset the cost of operating the plant.

Mercator Minerals Ltd. hired N.A. Degerstrom as the mining contractor and resumed mining and placing ore on a leach pad at Mineral Park in late July 2004. Despite heavy rainfall in early winter, production increased by 230 t to 1,700 t of copper. Expansion of the solvent extraction plant and piping was completed, and a drilling program to confirm/expand reserves and to define higher grade areas was started. Increased molybdenum prices caused Mercator to reevaluate the mine for the potential to once again recover molybdenum as well as copper.

## **Government Programs**

In July, the U.S. Bureau of Land Management (BLM) issued its Record of Decision supporting a land exchange for a proposed copper mining operation at Safford. Two parties filed appeals to the decision. The BLM was expected to provide a response in early 2005. The planned operations for two deposits, Dos Pobres and San Juan, contain an estimated 488 Mt of leachable reserves at a grade of 0.37% copper.

More details about the geology and distribution of metallic commodities in Arizona can be found in Arizona Department of Mines and Mineral Resources OFR22-05 (Niemuth, 2005§).

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TABLE 1  
NONFUEL RAW MINERAL PRODUCTION IN ARIZONA<sup>1,2</sup>

(Thousand metric tons and thousand dollars)

Mineral	2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value
Copper <sup>3</sup>	767	1,280,000	741	1,390,000	723	2,130,000
Gemstones	NA	1,670	NA	1,440	NA	1,450
Sand and gravel:						
Construction	53,800	294,000	62,600	340,000	79,600	430,000
Industrial	W	W	W	W	W	792
Stone, crushed	8,450	51,500 <sup>r</sup>	9,950	49,100	11,100	57,200
Combined values of cement, clays (bentonite, common), gold, gypsum, (crude), lime, mica (2002), molybdenum concentrates, perlite (crude), pumice and pumicite, salt, silver, stone (dimension sandstone), zeolites (2004), and values indicated by symbol W	XX	318,000	XX	394,000	XX	709,000
Total	XX	1,950,000 <sup>r</sup>	XX	2,180,000	XX	3,330,000

<sup>r</sup>Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data.  
XX Not applicable.

<sup>1</sup>Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

<sup>2</sup>Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>3</sup>Recoverable content of ores, etc.

TABLE 2  
ARIZONA: CRUSHED STONE SOLD OR USED, BY KIND<sup>1</sup>

Kind	2002				2003				2004			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	5	4,590	\$22,900	\$5.00	5	5,570	\$21,900	\$3.93	6	5,630	\$22,900	\$4.07
Marble	1	W	W	5.85	(2)	W	W	4.96	(2)	W	W	4.97
Granite	15 <sup>r</sup>	2,200 <sup>r</sup>	17,300 <sup>r</sup>	7.85 <sup>r</sup>	17	2,590	15,600	6.03	16	3,030	17,700	5.84
Traprock	1	W	W	5.51	2	W	W	4.83	3	W	W	7.56
Sandstone and quartzite	5 <sup>r</sup>	W	W	9.50 <sup>r</sup>	4	W	W	11.53	3	W	W	12.20
Volcanic cinder and scoria	6	117	620	5.30	6	180	923	5.13	6	166	857	5.16
Miscellaneous stone	7	955	5,940	6.22 <sup>r</sup>	6	968	4,810	4.96	5	1,310	6,480	4.96
Total or average	XX	8,450	51,500 <sup>r</sup>	6.09 <sup>r</sup>	XX	9,950	49,100	4.94	XX	11,100	57,200	5.16

<sup>r</sup>Revised. W Withheld to avoid disclosing company proprietary data; included in "Total or average." XX Not applicable.

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

<sup>2</sup>Sales/distribution yards.

TABLE 3a  
ARIZONA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE<sup>1</sup>

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
<b>Construction:</b>			
Coarse aggregate (+1½ inch), riprap and jetty stone	W	W	\$10.87
<b>Coarse and fine aggregates:</b>			
Graded road base or subbase	(2)	(2)	3.98
Terrazzo and exposed aggregate	(2)	(2)	13.39
Crusher run (select material or fill)	(2)	(2)	1.10
Other coarse and fine aggregates	815	\$2,470	3.03
Total or average	1,480	11,200	7.60
Other construction materials	235	1,330	5.67
<b>Chemical and metallurgical:</b>			
Cement manufacture	(2)	(2)	4.03
Lime manufacture	(2)	(2)	3.08
Sulfur oxide removal	(2)	(2)	3.08
Total or average	4,680	17,500	3.74
Other miscellaneous uses and specified uses not listed	226	2,590	11.46
<b>Unspecified:<sup>3</sup></b>			
Reported	1,070	5,500	5.16
Estimated	2,300	11,000	4.83
Total or average	3,330	16,400	4.93
Grand total or average	9,950	49,100	4.94

W Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

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

<sup>2</sup>Withheld to avoid disclosing company proprietary data, included in "Total or average."

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

TABLE 3b  
ARIZONA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE<sup>1</sup>

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
<b>Construction:</b>			
<b>Coarse aggregate (+1½ inch):</b>			
Riprap and jetty stone	W	W	\$11.94
Other coarse aggregate	W	W	9.38
Total or average	17	\$178	10.47
<b>Coarse aggregate, graded:</b>			
Bituminous aggregate, coarse	W	W	3.25
Railroad ballast	W	W	6.61
Other graded coarse aggregate	7	62	8.86
Total or average	956	3,170	3.32
Fine aggregate (-¾ inch), other fine aggregate	132	1,170	8.82
<b>Coarse and fine aggregates:</b>			
Graded road base or subbase	193	1,230	6.37
Unpaved road surfacing	W	W	4.69
Terrazzo and exposed aggregate	W	W	12.23
Other coarse and fine aggregates	309	1,650	5.33
Total or average	1,480	14,600	9.87
Other construction materials	10	108	10.80
Agricultural, poultry grit and mineral food	(2)	(2)	4.68
<b>Chemical and metallurgical:</b>			
Cement manufacture	W	W	4.08
Lime manufacture	W	W	10.92
Total or average	3,150	13,300	4.23
Special, other fillers or extenders	(3)	(3)	4.69
Other miscellaneous uses and specified uses not listed	171	1,890	11.04
<b>Unspecified:<sup>4</sup></b>			
Reported	1,410	7,130	5.05
Estimated	3,700	16,000	4.17
Total or average	5,160	22,800	4.41
Grand total or average	11,100	57,200	5.16

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

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

<sup>2</sup>Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

<sup>3</sup>Less than ½ unit.

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



TABLE 4a  
ARIZONA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2003, BY USE AND DISTRICT<sup>1</sup>

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch) <sup>2</sup>	W	W	--	--	W	W	--	--
Coarse and fine aggregate <sup>3</sup>	(4)	(4)	--	--	(4)	(4)	--	--
Other construction materials	17	129	--	--	218	1,200	--	--
Chemical and metallurgical <sup>5</sup>	(4)	(4)	--	--	(4)	(4)	--	--
Other miscellaneous use	--	--	--	--	226	2,590	--	--
Unspecified: <sup>6</sup>								
Reported	54	365	74	451	3	30	935	4,620
Estimated	220	1,100	220	1,100	1,800	8,900	--	--
Total	3,470	17,400	297	1,500	5,260	25,600	935	4,620

W Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported." -- Zero.

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

<sup>2</sup>Includes riprap and jetty stone.

<sup>3</sup>Includes graded road base or subbase, terrazzo and exposed aggregate, crusher run (select material or fill), and other coarse and fine aggregates.

<sup>4</sup>Withheld to avoid disclosing company proprietary data; included in "Total."

<sup>5</sup>Includes cement and lime manufacture, and sulfur oxide removal.

<sup>6</sup>Reported and estimated production without a breakdown by end use.

TABLE 4b  
ARIZONA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2004, BY USE AND DISTRICT<sup>1</sup>

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
<b>Construction:</b>								
Coarse aggregate (+1½ inch) <sup>2</sup>	W	W	W	W	--	--	--	--
Coarse aggregate, graded <sup>3</sup>	--	--	W	W	W	W	--	--
Fine aggregate (-¾ inch) <sup>4</sup>	--	--	132	1,170	--	--	--	--
Coarse and fine aggregate <sup>5</sup>	616	6,880	170	1,130	691	6,570	--	--
Other construction materials	10	108	--	--	--	--	--	--
Agricultural <sup>6</sup>	--	--	--	--	W	W	--	--
Chemical and metallurgical <sup>7</sup>	W	W	--	--	W	W	--	--
Special <sup>8</sup>	--	--	--	--	(9)	(9)	--	--
Other miscellaneous use	--	--	--	--	171	1,890	--	--
<b>Unspecified:<sup>10</sup></b>								
Reported	46	281	74	451	--	--	1,290	6,380
Estimated	1,800	6,200	80	360	1,800	9,000	--	--
<b>Total</b>	<b>3,760</b>	<b>19,100</b>	<b>510</b>	<b>3,600</b>	<b>5,510</b>	<b>28,100</b>	<b>1,290</b>	<b>6,380</b>

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

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

<sup>2</sup>Includes riprap and jetty stone and other coarse aggregate.

<sup>3</sup>Includes bituminous aggregate (coarse), railroad ballast, and other graded coarse aggregate.

<sup>4</sup>Includes other fine aggregate.

<sup>5</sup>Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

<sup>6</sup>Includes poultry grit and mineral food.

<sup>7</sup>Includes cement and lime manufacture.

<sup>8</sup>Includes other fillers or extenders.

<sup>9</sup>Less than ½ unit.

<sup>10</sup>Reported and estimated production without a breakdown by end use.

TABLE 5a  
 ARIZONA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,  
 BY MAJOR USE CATEGORY<sup>1</sup>

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	6,120	\$35,900	\$5.87
Plaster and gunitite sands	144	1,180	8.19
Concrete products (blocks, bricks, pipe, decorative, etc.)	113	935	8.26
Asphaltic concrete aggregates and other bituminous mixtures	3,620	19,200	5.31
Road base and coverings <sup>2</sup>	8,450	41,600	4.92
Fill	847	3,270	3.85
Railroad ballast	11	106	10.06
Other miscellaneous uses <sup>3</sup>	146	1,420	9.76
Unspecified: <sup>4</sup>			
Reported	29,600	162,000	5.48
Estimated	14,000	75,000	5.51
Total or average	62,600	340,000	5.44

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

<sup>2</sup>Includes road and other stabilization (cement).

<sup>3</sup>Includes snow and ice control.

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

TABLE 5b  
 ARIZONA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,  
 BY MAJOR USE CATEGORY<sup>1</sup>

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	10,000	\$50,800	\$5.08
Concrete products (blocks, bricks, pipe, decorative, etc.) <sup>2</sup>	179	1,480	8.26
Asphaltic concrete aggregates and other bituminous mixtures	2,910	17,600	6.04
Road base and coverings <sup>3</sup>	12,100	58,300	4.82
Fill	969	3,970	4.10
Snow and ice control	37	81	2.20
Railroad ballast	16	197	12.01
Filtration	680	3,880	5.71
Other miscellaneous uses	1,610	18,500	11.48
Unspecified: <sup>4</sup>			
Reported	42,200	229,000	5.42
Estimated	8,900	46,000	5.19
Total or average	79,600	430,000	5.40

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

<sup>2</sup>Includes plaster and gunite sands.

<sup>3</sup>Includes road and other stabilization (cement).

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

TABLE 6a  
ARIZONA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2003,  
BY USE AND DISTRICT<sup>1</sup>

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	313	2,380	200	1,890	5,610	31,600
Plaster and gunitite sands	W	W	W	W	81	482
Concrete products (blocks, bricks, pipe, decorative, etc.)	--	--	--	--	113	934
Asphaltic concrete aggregates and other bituminous mixtures	149	1,370	W	W	2,660	14,600
Road base materials	290	1,740	W	W	7,920	37,900
Fill	82	307	36	188	729	2,770
Snow and ice control	--	--	1	19	--	--
Other miscellaneous uses <sup>2</sup>	67	575	349	2,870	117	1,220
Unspecified: <sup>3</sup>						
Reported	3,940	21,400	820	2,750	24,400	137,000
Estimated	2,000	12,000	1,200	6,600	10,000	57,000
Total	6,880	39,400	2,600	14,300	51,900	283,000
	Unspecified district					
	Quantity	Value				
Concrete aggregate (including concrete sand)	--	--				
Plaster and gunitite sands	--	--				
Concrete products (blocks, bricks, pipe, decorative, etc.)	--	--				
Asphaltic concrete aggregates and other bituminous mixtures	740	2,720				
Road base materials	-4	-4				
Fill	--	--				
Snow and ice control	--	--				
Other miscellaneous uses <sup>2</sup>	--	--				
Unspecified: <sup>3</sup>						
Reported	452	748				
Estimated	--	--				
Total	1,190	3,470				

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

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

<sup>2</sup>Includes railroad ballast.

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

<sup>4</sup>Less than 1/2 unit.

TABLE 6b  
ARIZONA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2004,  
BY USE AND DISTRICT<sup>1</sup>

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products <sup>2</sup>	W	W	W	W	9,350	43,800
Asphaltic concrete aggregates and other bituminous mixtures	W	W	50	311	2,430	15,400
Road base materials <sup>3</sup>	317	1,560	595	3,360	9,430	44,700
Fill	57	259	56	255	856	3,460
Other miscellaneous uses <sup>4</sup>	424	4,440	548	5,080	2,260	22,000
Unspecified: <sup>5</sup>						
Reported	6,260	33,700	554	3,040	34,600	191,000
Estimated	2,100	11,000	1,100	4,100	5,700	31,000
Total	9,180	51,300	2,860	16,200	64,700	351,000
	Unspecified district					
	Quantity	Value				
Concrete aggregate and concrete products <sup>2</sup>	--	--				
Asphaltic concrete aggregates and other bituminous mixtures	W	W				
Road base materials <sup>3</sup>	1,760	8,660				
Fill	--	--				
Other miscellaneous uses <sup>4</sup>	373	1,520				
Unspecified: <sup>5</sup>						
Reported	781	1,290				
Estimated	5	8				
Total	2,920	11,500				

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

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

<sup>2</sup>Includes plaster and gunite sands.

<sup>3</sup>Includes road and other stabilization (cement).

<sup>4</sup>Includes filtration, railroad ballast, and snow and ice control.

<sup>5</sup>Reported and estimated production without a breakdown by end use.