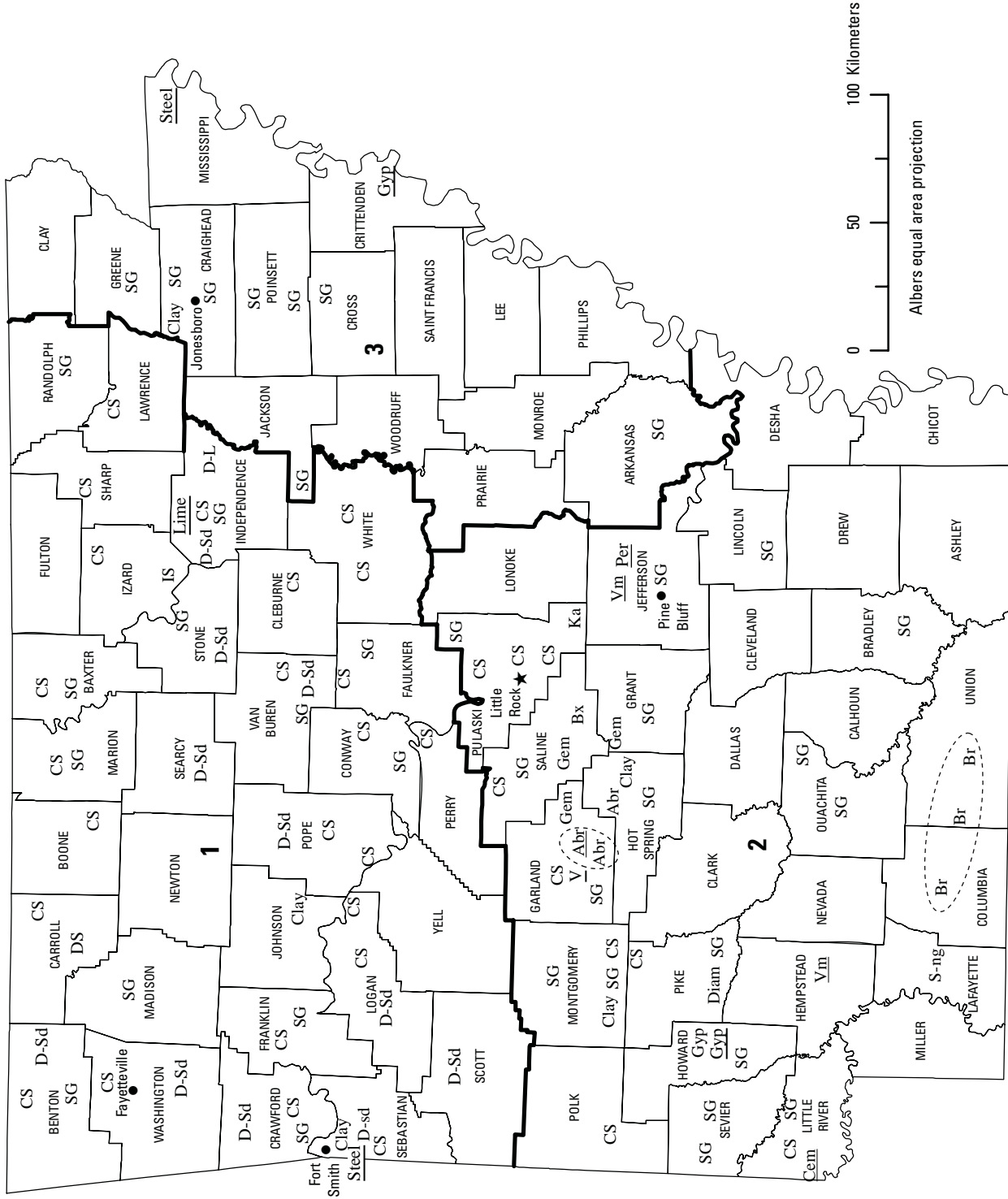




2006 Minerals Yearbook

ARKANSAS

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Source: Arkansas Geological Commission/U.S. Geological Survey (2006).

THE MINERAL INDUSTRY OF ARKANSAS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Arkansas Geological Survey for collecting information on all nonfuel minerals.

In 2006 Arkansas' nonfuel raw mineral production¹ was valued at \$789 million, based upon annual U.S. Geological Survey (USGS) data. This was a 32% increase from the State's total value of \$597 million in 2005, which followed a \$66 million, or more than 12%, increase from 2004 to 2005. The State rose to 28th from 32d in rank among the 50 States in total nonfuel mineral production value in 2006 and accounted for more than 1% of the U.S. total. Yet, per capita, the State ranked 15th in the Nation in 2006 in its minerals industry's value of nonfuel mineral production; with a population of slightly more than 2.8 million, the value of production was about \$281 per capita.

In 2006, bromine followed by crushed stone, cement (portland and masonry combined), and construction sand and gravel were Arkansas' leading nonfuel minerals by value, these commodities together accounting for 92% of the State's total nonfuel mineral value. For nearly four decades, bromine and crushed stone, by value, have been the State's two leading nonfuel minerals, bromine leading in value from 1969 up to 1996 when crushed stone went from second to first. Since then the two have exchanged rank several times; crushed stone was first in 1996-98, 2001-03, and 2005, and bromine was first in 2006 and the intervening years. For more than a decade, cement has ranked third and construction sand and gravel has ranked fourth. Actual production data for bromine and cement have been withheld (company proprietary data).

In 2006, the largest increase in value took place in bromine. A relatively modest increase in bromine production resulted in a more than \$150 million rise in its value owing to a substantial rise in the mineral commodity's unit value. Increases also took place in the values of crushed stone, up by \$7 million, construction sand and gravel increased \$11.6, followed by lesser although significant increases (in descending order of change) in the values of cement, lime, and industrial sand and gravel. On a yet smaller scale, decreases took place in crude gypsum, kaolin, special silica stone, and Tripoli. The value of gemstones also was down, by about 38% (table 1).

Arkansas continued to be the leading bromine-producing State and accounted for most of the U.S. production in 2006. Michigan was the only other State that produced bromine. Mining operations in both States extracted subsurface, bromine-rich natural brines by submersible pump for subsequent processing. Arkansas continued to be the only State that produced silica stone and the State remained third

¹The 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 2006 USGS mineral production data published in this chapter are those available as of March 2008. 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>.

in the quantities of tripoli of four producing States and fifth in gemstones (gemstones based upon value). Additionally, significant quantities of construction sand and gravel, crushed stone, industrial sand and gravel, and lime were produced in the State. Metals that were produced in the State—for the most part raw steel—were processed from materials acquired from other domestic and foreign sources. The principal steel mills in the State were Quanex Corp. in Sebastian County, Nucor-Yamato Steel Co. and Nucor Corp. in Mississippi County, and Arkansas Steel Associates in Jackson County. These mills had a combined capacity of nearly 5.9 million metric tons per day. Strategic Minerals Corp., or Stratcor, continued operation of the mill facility at Potash Sulphur Springs in Garland County; the mill extracts vanadium pentoxide from recycled out-of-State vanadium-bearing feed.

The Arkansas Geological Survey² (AGS) [formerly the Arkansas Geological Commission (AGC)] provided the following narrative information.

Exploration and Development

Numerous companies were engaged in exploration, mine expansion, and facility construction activities to further the development of the minerals industry within the State. Arkhola Sand and Gravel Co. and Duffield Stone and Gravel Co. continued to explore for additional quarry sites in the Arkansas River Valley. McClinton-Anchor, Inc. explored further for new aggregate quarry sites in the limestone-bearing region of northwest Arkansas. Rogers Group, Inc. also evaluated new quarry sites in northwest Arkansas in the Boone and Pitkin geologic formations characteristic of the Mississippian period. Vulcan Materials Co. continued exploring for aggregates, with the focus on Morrowan and Atokan age sandstones in Cleburne and White Counties. Martin Marietta Co. acquired new leases east of its Hatton quarry that extended to near the Cossatot River. The company also planned to install a third crusher and processing unit at the Hatton site. Unimin Corporation and Arkhola opened a new market for its industrial sand, using the sand as a proppant in the development of the Fayetteville Shale natural gas deposit within the Arkansas Valley region of the State.

Commodity Review

Industrial Minerals

Bromine.—In 2006, Chemtura Corporation reached an agreement with TETRA Technologies, Inc. to invest in the construction of a processing facility on property adjacent to

²J. Michael Howard, Geology Supervisor/Mineralogist, authored the text of the State mineral industry information provided by the Arkansas Geological Survey.

Chemtura's El Dorado bromine facility. TETRA planned to produce calcium chloride and other salts using, as the feedstock, the bromine tail brines purchased from Chemtura. TETRA, in turn, planned to sell sodium chloride and magnesium hydroxide extracted from the tail brine to Chemtura for use as a feedstock in the production of chlorine. Albermarle Corporation and Chemtura continued operations at their bromine extraction and production plants in Columbia and Union Counties, respectively. Prices for bromine-based products steadily increased worldwide during the year.

Gypsum.—The Bpb Gypsum mine and wallboard manufacturing plant near Nashville, Howard County, were acquired in early January by Saint-Gobain, a France-based manufacturer and distributor of building materials. The Bpb operation continued to be the world's leading wallboard producer, with the capacity to produce 130 million square meters per year of wallboard. The principal market for the wallboard, sold under the trade name CertainTeed, was in the eastern United States.

Nepheline Syenite.—Minnesota Mining and Manufacturing Company (3M company), Maplewood, MN, mined nepheline syenite from its Big Rock Arch Street Quarry to supply material for its roofing granule plant in Sweet Home, Pulaski County. Granite Mountain Quarries, Inc. produced aggregate from nepheline syenite mined at Granite Mountain quarry near Bryant, Saline County, and at two quarries in Pulaski County.

Sand and Gravel, Construction.—At yearend, there were 109 permitted sites that produced sand and gravel. There were 34 quarries operating under authorizations issued by the Arkansas Department of Environmental Quality (ADEQ) Mining Division.

Sand and Gravel, Industrial.—Industrial sand was produced by Unimin at its mine and processing facility in Guion, Izard County. The sand was sourced from the Ordovician St. Peter Sandstone formation, found prevalent throughout midwestern United States. Markets for this sand include primarily the glass and foundry industries. Arkhola also produced industrial sand from its dredging operations on the Arkansas River, along with some sand that could be used for construction purposes.

Stone, Crushed.—Arkhola produced road aggregates and asphalt mix at the Preston Quarry near Van Buren, Crawford County and continued to mine the Hartshorne Sandstone quarry near the Jenny Lind Mine, Sebastian County. Bobby Plant Asphalt Co., based in Murfreesboro, Pike County, leased its quarry and property south of Kirby in central Pike County to Pike County Construction Company.

Duffield Stone and Gravel Co. operated two sandstone aggregate quarries (Pennsylvanian Period) in Pope County; one in the Hartshorne Sandstone at Russellville, and the other, the Gumlog Quarry, in the upper Atoka formation. Pyramid Co. produced aggregate from the middle Atoka formation (Pennsylvanian Period) north of Greenbriar, Faulkner County.

Martin Marietta actively quarried the Hatton Tuff lentil of the Stanley Group (Mississippian Period) at the Hatton Quarry in southern Polk County. The company also continued operations at the Jones Mill Quarry near Magnet Cove, Hot Spring County, and produced aggregate from both the hornfels and quartzite alteration zone in the Stanley Group adjacent to the Cretaceous

igneous intrusion and the intrusive rock. It also operated an asphalt plant at this site.

Rogers Group, Inc. continued sandstone aggregate operations at its Greenbriar Quarry in the middle Atoka formation in Faulkner County. The company also carried out mining at its Conway County Quarry in upper Atoka formation south of Solgohachia, and at its Lowell Quarry limestone deposit of the Boone formation (Mississippian Period) in southern Benton County. Texas Industries Group continued to evaluate tuff deposits on leases in southern Polk County. McGeorge Sand and Gravel Co. continued riprap construction along the Arkansas River, transporting rock by barge from its River Mountain Quarry in the Hartshorne Sandstone area north of New Blaine in eastern Logan County. Chrisman Co. mined sandstone aggregate in the Hartshorne Sandstone area near Hunt in Johnson County and from the Savanna Formation near Ratcliffe, Franklin County.

Vulcan produced aggregate from its upper Morrowan age sandstone operations at Judsonia and middle Atokan age sandstones at Floyd in White County. Vulcan also produced dolomitic limestone from lower Ordovician units near Black Rock, Lawrence County. Webco Mining, Inc. produced crushed stone from its quarry in the middle Atoka formation near El Paso, White County. Quality Stone Co. produced sandstone aggregate from the Atoka formation (Pennsylvanian Period) at its Lonestar quarry in south Cleburne County, north of the Rosebud community. Midwest Lime Company produced aggregate from middle and upper Ordovician-Period limestone near Batesville, Independence County. Limestone Specialties, Inc. produced aggregate from upper Ordovician units in Independence County.

Stone, Dimension.—Oran McBride Stone Co., Batesville, Independence County continued production of interior and exterior structural and architectural stone at its plant in Bethesda. Polished, cut, and rough surface marble, limestone, and sandstone were produced by the company from Ordovician and Mississippian-Period formations. Broken dimension stone (Cotter formation) of various tones was produced by Johnson Landscaping from its quarry north of Eureka Springs in Carroll County. The Eureka Stone Co. stone-shaping operation near the quarry produced a variety of architectural pieces. Bennett Brothers Stone Co., Inc. obtained building stone materials from deposits in Franklin, Garland, Logan, and other counties, principally from Pennsylvanian-Period formations. Schwartz Stone Co. quarried sandstone from the Hartshorne Sandstone quarry north of Midway, Logan County, for use as dimension stone as well as aggregate.

Other Industrial Minerals.—Ash Grove Cement Co., the sole producer of cement in the State, operated the Foreman plant in Little River County. Ash Grove used limestone obtained from the Annona formation and silica obtained from the Marlbrook formation (Cretaceous Period) as cement ingredients. Acme Brick Co., Malvern, Hot Spring County, operated its Wilcox Group clay mines at Perla, AR, to acquire the raw material for its brick production operations. United States Lime & Minerals, Inc. of Batesville, Independence County, produced hydrated lime, pulverized limestone, and quick lime for agricultural use and glass manufacturing. Its quarry is located in a region

of high-purity, Ordovician-Period limestone containing a low concentration of silica (chert).

Seven companies mined and processed whetstones in the Hot Springs, Garland County, area during the year. These included B & C Abrasives, Blue Mountain Whetstone, Dan's Whetstone Co., Eagle Mountain Whetstones, Halls Arkansas Oilstones, Inc., Saint Gobain (Norton), and Smiths Abrasives, Inc. Interest in the Mississippian-Devonian Arkansas Novaculite as oilstones continued to increase, as a result of it being viewed as a more preferable grinding and sharpening abrasive than synthetic alternatives. Martin Marietta produced aggregate and high-silica novaculite from a quarry near Glen Rose, Hot Spring County. Malvern Minerals Co. recovered tripoli from its mine in the Bigfork chert region east of Hot Springs in Garland County. The raw material was then processed for commercial use, as a polishing powder or for other purposes, at the company's plant in Hot Springs.

Environmental Issues and Mine Reclamation

Near the end of 2006, three proposed in-stream mine permits were denied. The denials were based on the designation of the creeks to be mined as impaired water bodies under the U.S. Environmental Protection Agency's Clean Water Act, section 303(d), listing for the State. Two of the permit applications subsequently were appealed to the Arkansas Pollution Control and Ecology Commission for further consideration. An administrative hearing on the appeals was to be held in 2007.

There were 97 hectares (ha) of reclaimed land released from 14 permitted sites during 2006. Umetco, Inc. continued reclamation of the LeCroy area at the Wilson Springs vanadium mines in Garland County that began in 1997.

Government Legislation, Programs, and Activities

During 2006, 236 noncoal mine sites were permitted, or authorized in Arkansas. The total noncoal area under permit was nearly 6,180 ha with 4,700 ha under surety bond.

The ADEQ received the authority to develop and issue general permits under its Non-Coal Program as a result of the passage of Act 855 by the State legislature in 2005. The Arkansas Open Cut Mining and Land Reclamation Code (Regulation 15) subsequently was modified in May 2006 to incorporate this new legislation. Regulation 15 provides the noncoal mining operations with a set of performance standards that must be followed during mining and during the process of reclaiming the land to beneficial use.

Operators of 21 quartz contracts and three leases with the U.S. Department of Agriculture's Forest Service on the Ouachita National Forest generated about \$10,000 in revenue. Approximately \$20,000 in revenue was generated from 32 sand and gravel and stone operations.

In 2006, 488 diamonds were recovered at the Crater of Diamonds State Park, Pike County, the world's only diamond-

bearing site that is open to the general public. The total weight of the stones was 117.51 carats, with an average weight of 0.24 carat. Of these 488 diamonds, 15 weighed more than 1 carat. Diamonds recovered included 295 white, 106 brown, and 87 yellow. In 2006, the largest stone recovered was a brown diamond that weighed 6.35 carats. More than 27,000 diamonds have been recovered since this property became a State Park in 1972. A new facility at the Park, the Diamond Discovery Center, had its first full year of operation in 2006. Additional plans for the Park include a new museum.

The AGS (AGC) Web site at URL <http://www.state.ar.us/ags/ags.htm> hosted more than 169,000 visitors in 2006, which was its 8th year of online operation. The number of visitors to the site represented a 25.8% increase, compared with that of 2005. Information posted on the Web site included agency services; news items; online geologic maps; publications and map-ordering information; State resource data; State stratigraphic, geologic, and geohazard data; and USGS annual nonfuel mineral production data. The site has links to State agency services, Federal agencies, geology Web sites, organizations, and universities.

The AGS (AGC) staff continued preparation of a spreadsheet database that contains all identified sites of mineral extraction in the State, excluding petroleum and natural gas. By the close of 2006, more than 7,400 entries had been made. Sites are located by latitude and longitude and by general land office survey techniques. Fieldwork began in October 2005 to check data on a county-by-county basis. Approximately 40% of those entries remained to be field checked at yearend.

The AGS (AGC) has been an active participant in the STATEMAP program since 1995. STATEMAP is a component of the congressionally mandated National Cooperative Geological Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. During 2006, three digitized 7.5-minute USGS topographic geologic maps and one 1:100,000 digital compilation map were completed under the STATEMAP cooperative agreement. Three additional 7.5-minute geologic maps were started in July, as well as another 1:100,000 compilation map. Additional information about the STATEMAP geologic mapping program in Arkansas can be found on the AGS (AGC) Web site.

Staff cartographers completed the digitization of 16 additional USGS 7.5-minute topographic-based geologic maps across Arkansas, with legends. Digitized 7.5-minute geologic maps are available for download as free .pdf files on the AGS (AGC) Web site.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ARKANSAS^{1,2}

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	1,150	1,510	1,210	1,900	1,140	2,550
Gemstones, natural	NA	590	NA	711	NA	439
Sand and gravel, construction	9,370	53,500	10,600	62,000	11,100	73,600
Silica stone ³ metric tons	655	3,660	576	2,290	227	992
Stone, crushed	34,100 ⁴	173,000 ⁴	37,200 ^{r,4}	229,000 ^{r,4}	34,800 ⁴	236,000 ⁴
Combined values of bromine, cement, clays (kaolin), gypsum (crude), lime, sand and gravel (industrial), stone (crushed slate, dimension limestone, and sandstone), tripoli	XX	299,000	XX	302,000	XX	475,000
Total	XX	531,000	XX	597,000 ^r	XX	789,000

^rRevised. NA Not available. XX Not applicable.

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

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

³Grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.

⁴Excludes certain types of crushed stones; kind and value included with "Combined values" data.

TABLE 2
ARKANSAS: CRUSHED STONE SOLD OR USED, BY KIND¹

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	28 ^r	13,800 ^r	\$84,600 ^r	30	12,800	\$87,700
Dolomite	1	1,370	9,830	1	572	4,100
Granite	4	10,000 ^r	57,400 ^r	5	7,290	47,100
Sandstone and quartzite	19 ^r	10,800 ^r	69,500 ^r	21	12,900	90,300
Slate	1	W	W	1	W	W
Miscellaneous stone	5 ^r	1,110 ^r	7,330 ^r	9	1,150	6,930
Total	XX	37,200 ^r	229,000 ^r	XX	34,800	236,000

^rRevised. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

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

TABLE 3
 ARKANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS
 IN 2006, BY USE¹

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	48	390
Filter stone	139	819
Other coarse aggregate	195	1,300
Total	382	2,510
Coarse aggregate, graded:		
Concrete aggregate, coarse	884	7,040
Bituminous aggregate, coarse	225	1,930
Bituminous surface-treatment aggregate	(2)	(2)
Railroad ballast	4	20
Other graded coarse aggregate	523	4,340
Total	1,640	13,300
Fine aggregate (-¾ inch):		
Stone sand, bituminous mix or seal	(3)	(3)
Screening, undesignated	378	1,210
Other fine aggregate	206	2,070
Total	584	3,290
Coarse and fine aggregates:		
Graded road base or subbase	2,220	14,200
Unpaved road surfacing	60	285
Crusher run or fill or waste	(4)	(4)
Roofing granules	(4)	(4)
Other coarse and fine aggregates	2,520	14,400
Total	5,040	29,900
Other construction materials	53	298
Agricultural:		
Limestone	(5)	(5)
Poultry grit and mineral food	(5)	(5)
Other agricultural uses	(5)	(5)
Chemical and metallurgical:		
Lime manufacture	(5)	(5)
Glass manufacture	(5)	(5)
Special:		
Asphalt fillers or extenders	(5)	(5)
Other fillers or extenders	(5)	(5)
Other miscellaneous uses:		
Abrasives	(5)	(5)
Other specified uses not listed	(5)	(5)
Unspecified: ⁶		
Reported	16,000	107,000
Estimated	10,000	73,000
Total	26,300	180,000
Grand total	34,800	236,000

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregate."

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

²Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregate."

³Withheld to avoid disclosing company proprietary data; included with "Other fine aggregate."

⁴Withheld to avoid disclosing company proprietary data; included in "Total."

⁵Withheld to avoid disclosing company proprietary data; included in "Grand total."

⁶Reported and estimated production without a breakdown by end use.

TABLE 4
 ARKANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006,
 BY USE AND DISTRICT¹

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch) ²	317	2,130	W	W	W	W
Coarse aggregate, graded ³	W	W	--	--	W	W
Fine aggregate (-¾ inch) ⁴	536	3,170	W	W	W	W
Coarse and fine aggregates ⁵	4,280	25,700	W	W	W	W
Other construction materials	53	298	--	--	--	--
Agricultural ⁶	W	W	--	--	--	--
Chemical and metallurgical ⁷	W	W	--	--	--	--
Special ⁸	W	W	W	W	--	--
Other miscellaneous uses ⁹	--	--	W	W	--	--
Unspecified: ¹⁰						
Reported	8,470	58,200	7,560	49,100	--	--
Estimated	5,100	36,000	5,100	37,000	--	--
Total	21,400	146,000	13,400	89,200	40	537

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

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

²Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

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

⁴Includes screening (undesigned), stone sand (bituminous mix or seal), and other fine aggregate.

⁵Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, roofing granules, and other coarse and fine aggregates.

⁶Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

⁷Includes lime and glass manufacture.

⁸Includes asphalt fillers or extenders and other fillers or extenders.

⁹Includes abrasives and other specified uses not listed.

¹⁰Reported and estimated production without a breakdown by end use.

TABLE 5
 ARKANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006,
 BY MAJOR USE CATEGORY¹

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products ²	2,470	\$17,600	\$7.12
Asphaltic concrete aggregates and other bituminous mixtures	488	4,170	8.56
Road base and coverings	450	2,010	4.46
Fill	164	988	6.02
Other miscellaneous uses ³	26	574	5.42
Unspecified: ⁴			
Reported	4,610	29,100	6.32
Estimated	2,910	19,100	6.56
Total or average	11,100	73,600	6.61

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

²Includes plaster and gunite sand.

³Includes snow and ice control, filtration, and golf course.

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

TABLE 6
 ARKANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT¹

(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	364	2,760	1,090	6,780	1,020	8,050
Asphaltic concrete aggregates and other bituminous mixtures	--	--	404	3,260	84	910
Road base and coverings	W	W	281	1,220	W	W
Fill	28	214	132	745	4	30
Other miscellaneous uses ³	20	174	14	455	161	730
Unspecified: ⁴						
Reported	2,300	14,800	804	4,620	1,510	9,740
Estimated	1,100	7,210	1,500	9,830	315	2,070
Total	3,810	25,100	4,230	26,900	3,090	21,500

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

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

²Includes plaster and gunite sands.

³Includes snow and ice control, filtration, and golf course.

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