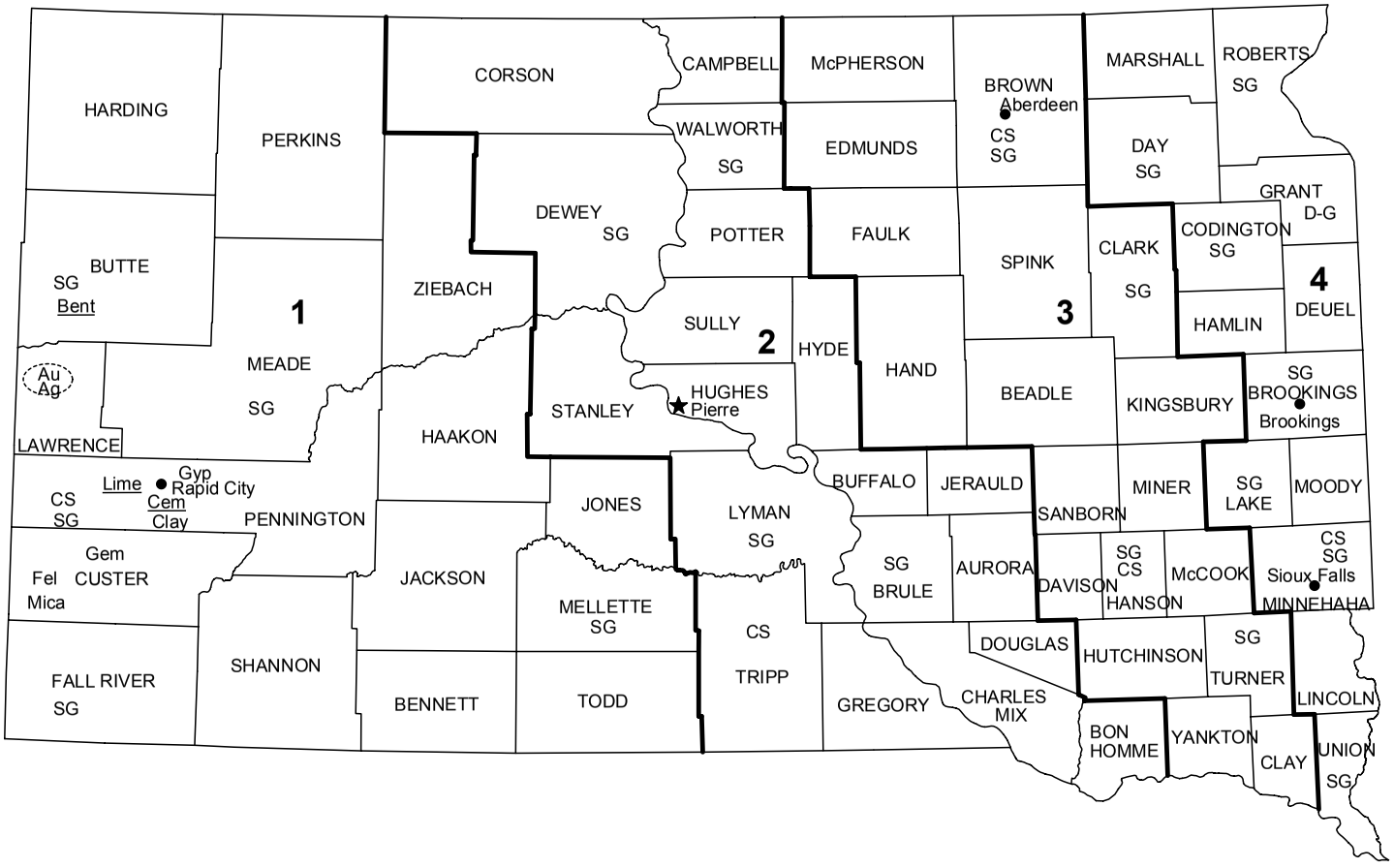
SOUTH DAKOTA



LEGEND

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

MINERAL SYMBOLS (Major producing areas)

Ag	Silver
Au	Gold
Bent	Bentonite mill
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-G	Dimension granite
Fel	Feldspar
Gem	Gemstones
Gyp	Gypsum
Lime	Lime plant
Mica	Mica
SG	Construction sand and gravel

Concentration of mineral operations

0 50 Kilometers

Source: South Dakota Geological Survey/U.S. Geological Survey (2003)

The Mineral Industry Of South Dakota

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

In 2003, the estimated value[1] of nonfuel mineral production for South Dakota was $206 million, based upon preliminary U.S. Geological Survey (USGS) data. This was a decrease of approximately 4.5% compared with that of 2002[2] and followed a 19.4% decrease from 2001 to 2002.

In 2003, portland cement was, by value, South Dakota's leading nonfuel mineral commodity, having, in 2002, overtaken gold, which had been the leading commodity for more than four decades. The State's production of construction materials, which included, in descending order of value, portland cement, construction sand and gravel, crushed stone, granite dimension stone, gypsum, and common clays, accounted for about 81% of the State's total nonfuel mineral production value. A significant decrease in the production and value of gold—the value was down about 20%—accounted for most of the State's decrease in total nonfuel mineral value. The largest increases in production and value were in construction sand and gravel and lime, the values of which were up by about $5 million each (table 1).

In 2002, a substantial decrease in the production and value of gold, which dropped by more than $60 million, and a smaller decrease in the value of portland cement, which fell by about $3 million, accounted for most of the State's drop in nonfuel mineral value. The sizable decrease in gold output resulted from the 2001 closing of Barrick Gold Corp.'s historic 124-year old Homestake Mine, which was located at Lead, SD. The most significant increases in production and value for 2002 took place in crushed stone, which increased in value by nearly $7 million, and construction sand and gravel, by $6 million. All other changes in value were relatively small and had little effect on the overall value of nonfuel mineral production for the State in 2002 (table 1).

Based upon USGS estimates of the quantities produced in the 50 States during 2003, South Dakota continued to be the 2d leading State in the production of granite dimension stone, 4th in mica, 7th in gold and feldspar, and 10th in dimension stone. Additionally, South Dakota was a significant producer of construction sand and gravel.

The following narrative information was provided by the South Dakota Department of Environment and Natural Resources' (DENR) Minerals and Mining Program[3] (MMP) in association with DENR's South Dakota Geological Survey (South Dakota Department of Environment and Natural Resources, 2004§[4]). Production data in the text that follows are those reported by the MMP based upon the agency's own surveys and estimates. Data may differ from some production figures reported to the USGS.

Exploration

Gold exploration activities in South Dakota continued to be limited despite higher gold prices. One large-scale gold mine conducted exploration activities in 2003. Wharf Resources (USA), Inc. completed 36 exploration drill holes in the vicinity of its existing operation in Lawrence County. WMC Explorations conducted nickel and copper exploration in southeast South Dakota in November and December. The company evaluated its drilling results.

Two exploration permits were issued to a prospecting club and an individual, respectively, for placer claims in the Black Hills. Exploration activities began shortly after the permits were granted.

Commodity Review

Industrial Minerals

In 2003, 501 companies and individuals had active industrial mineral mine licenses in South Dakota. An operator must obtain a license to mine for sand, gravel, pegmatite minerals, materials used in the process of making cement or lime, and rock to be crushed and used in construction. There were also 35 mine permits that covered the mining of other minerals, such as bentonite, dimension stone, placer gold, and slate.

Crushed Stone.—Sioux quartzite overtook limestone in 2003 as the second leading industrial mineral commodity produced in 2003. Sioux quartzite production was reported to be 3.2 million metric tons (Mt), and limestone production was reported to be 3.09 Mt. Sioux quartzite was quarried from four

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[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]E.H. Holm, and T. Cline, Jr., Natural Resources Project Engineer and Environmental Project Scientist, respectively, with the South Dakota Department of Environment and Natural Resources' Minerals and Mining Program, jointly authored the text of the State mineral industry information provided by that agency.

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

locations in southeastern South Dakota. Most of the quartzite was crushed and used in construction. Some larger blocks were used for riprap, railroad ballast, and, occasionally, for decorative purposes. Limestone was produced in the Black Hills of western South Dakota and was used primarily in the production of cement and for construction projects.

Dimension Stone.—Dakota Granite Co. and Cold Spring Granite Co. produced a total of 327,000 metric tons (t) of dimension stone from quarries near Milbank in northeastern South Dakota. Due to its beauty and distinctive red color, the "mahogany" granite was used primarily for monuments and building construction. Much of it was exported.

Sand and Gravel.—In terms of quantity, sand and gravel was the leading industrial mineral commodity produced in 2003 with production reported to be 13.1 Mt. Sand and gravel was produced in nearly every county in South Dakota and was used mainly for road construction projects.

Other Industrial Minerals.—Other minerals produced in smaller amounts included iron ore, mica schist, pegmatite minerals (feldspar, mica, rose quartz), placer gold, shale, and slate.

Metals

Gold.—There were 11 mine permits that covered seven large-scale gold mining operations in South Dakota in 2003. Wharf Resources, the only gold mine still actively mining in South Dakota, held four of these permits. No new mine permits or mine permit amendments were issued to large-scale gold operations in 2003.

Gold mines were surface heap-leach operations, with the exception of Homestake Mining Co. (which was owned by Barrick Gold Corp.). Gold production continued to decrease in 2003. Homestake, LAC Minerals (USA), LLC, and Wharf Resources produced 2,451 kilograms (kg) of gold in 2003; this was a 34% decrease compared with 2002. Wharf Resources became the only producing large-scale gold mine in the State, as Homestake completed mineral processing operations in January 2002 and recovered 241 kg of gold during mill demolition activities. LAC Minerals recovered 5 kg of gold during removal of sediments from its process ponds. The average price of gold (London final) in 2003 was $363.38 per troy ounce, which yielded a gross value of about $28.6 million. This was 22% less than the 2002 gross value of $36.7 million.

Silver.—Wharf Resources was the only company to report silver production, which was a byproduct of its gold recovery process. A total of 2,382 kg of silver was recovered in 2003. At an average price of $4.87 per troy ounce, the value of the silver was $373,000. This was an increase from the 1,836 kg and $271,000 value reported in 2002.

Environmental Issues and Mine Reclamation

Homestake continued closure activities at its historic gold mine in Lead during 2003. The mine was closed at the end of 2001 because of low gold prices, high productions costs, and lower-than-expected ore grades. On June 10, 2003, a milestone was reached when Homestake turned off the pumps to the underground mine and allowed it to begin filling with water. Before the pumps were turned off, department staff conducted several inspections of the underground mine to ensure that all waste materials, equipment, fuels, solvents, and other chemicals were removed from the mine. Homestake also continued reclamation at its former mill site. The company planned to turn the area into an interpretive park. The company also closed an aqueduct that diverted Little Spearfish Creek to its Hydroelectric Plant #2 in Spearfish Canyon. As a result, in November, year-round flows returned to Spearfish Falls for the first time in many years.

On May 30, 2003, a National Science Foundation committee selected the Homestake Mine as the best site for an underground laboratory to study neutrinos and other subatomic particles. In June 2003, Governor Michael Rounds created the Homestake Laboratory Conversion Office to prepare a plan to submit to the National Science Foundation for converting the mine into an underground laboratory. Homestake worked cooperatively with the office and took steps to protect the main mine shafts from deterioration while the lab proposal proceeded. However, because there were no approved plans or funding, on June 10, 2003, Homestake decided to shut off the underground pumps. This action created some controversy and concern within the scientific community about possible delays in accessing the lower levels of the mine.

In the fall of 2003, Governor Rounds worked out an agreement with Barrick Gold, Homestake's parent company, for donating the mine to the State. Under the agreement, Homestake would donate the mine to a newly created State Science and Technical Authority that would make the mine available to the National Science Foundation for scientific research. The Authority would indemnify Homestake for all future liabilities associated with the lab. Liability insurance and an indemnification fund would be created to cover any claims against Homestake and its successors. The South Dakota Legislature approved this plan in early 2004 and also approved State funding for insurance, an indemnification fund, and operating funds for the Authority. The lab still needed final action and funding from the National Science Foundation before it could be constructed.

The Gilt Edge Mine was an open pit heap-leach gold mine operated by Brohm Mining Co. The company abandoned the site after its parent, Dakota Mining, declared bankruptcy in 1999. The site was placed on the Superfund National Priorities List in 2000, and the South Dakota DENR and the U.S. Environmental Protection Agency (EPA) worked on reclaiming the site.

A major milestone at the mine was completed in 2003 when reclamation of the Ruby waste rock depository, the major source of acid mine drainage at the site, was completed. Capping of the waste depository was completed in 2002, and topsoil placement and hydroseeding were completed in June 2003. By late summer 2003, a mixture of grasses and clover were becoming established on the depository.

Water treatment at the site resumed in September 2003 after the water treatment plant was shut down in August 2002 to convert it from a caustic system to a high-density sludge lime treatment system. Acid water was stored in the mine pits until

the water-treatment plant resumed operations. EPA dedicated the plant in a public ceremony on September 19, 2003. After some adjustments were made to the treatment system, the plant started treating water at a rate of 170 gallons per minute. EPA and the State prepared plans to reclaim the rest of the site, including the mine pits and heap-leach pad.

Reclamation activities at the Richmond Hill Mine, which was an open pit heap-leach gold mine that developed an acid mine drainage problem during operations, continued to be successful. The bulk of reclamation was completed by the mine operator, LAC Minerals (USA), LLC in the mid-1990s. The pit impoundment, which was backfilled with acid-generating rock and covered with a low permeability capping system, was still performing as designed. Monitoring data show that only minimal amounts of oxygen and water were being detected in the impoundment. This indicated that the cap was effective in limiting oxygen and water infiltration and was preventing acid generation.

In addition, the capped leach pads continued to perform well. Monitoring data show that the capping systems were effective in reducing water infiltration into the spent ore. Most parameters in the pad effluent continued to show a decreasing trend.

During routine surveys of both the pit impoundment and leach pads, no signs of settling, slumping, or cracking were noted. A dense, self-sustaining vegetative cover has become established on these facilities.

LAC operated its water-treatment plant at the Richmond Hill Mine from May to September 2003 and discharged about 14.7 million gallons. Water was treated regularly based on the amount of water needing treatment and the pond storage capacities at the mine site. Effluent from the leach pads was collected and stored in the former process ponds and then was treated prior to discharge. LAC planned to treat water throughout 2004 in an effort to reduce the amount of water stored at the site. The company planned to reduce the size of its stormwater pond in 2005, which will help reduce the amount of water needing treatment.

Ground and surface water quality around the mine site was closely monitored. Ground water impacted by acid rock drainage prior to mine reclamation was generally improving. Monitoring wells showed decreasing trends in sulfate and metal concentrations and increasing pH. Biological assessments of Squaw Creek below the mine showed that the stream remained healthy and supported a viable coldwater fishery.

Internet Reference Cited

South Dakota Department of Environment and Natural Resources, Minerals and Mining Program, 2004 (March), Summary of the Mining Industry in South Dakota 2003, accessed September 20, 2004, at URL http://www.state.sd.us/denr/DES/mining/2003stat.pdf.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN SOUTH DAKOTA[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2001		2002		2003[p]	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	200	W	208	W	208	W
Sand and gravel, construction	11,200	41,500	11,900	47,500	13,000	52,600
Stone, crushed	5,730 [r]	26,700 [r]	6,780	33,600	6,700	33,500
Combined values of cement (portland), feldspar, gemstones, gold, gypsum (crude), iron ore (usable), lime, mica (crude), silver, stone (dimension granite), and values indicated by symbol W	XX	200,000	XX	135,000	XX	120,000
Total	XX	268,000 [r]	XX	216,000	XX	206,000

[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.

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

Kind	2001 Number of quarries	2001 Quantity (thousand metric tons)	2001 Value (thousands)	2001 Unit value	2002 Number of quarries	2002 Quantity (thousand metric tons)	2002 Value (thousands)	2002 Unit value
Limestone	4	W	W	$4.17	4	W	W	$4.19
Granite	--	--	--	--	1	W	W	5.51
Quartzite	5 r	W	W	5.26	9	W	W	5.60
Miscellaneous stone	--	--	--	--	5	2	$9	4.96
Total or average	XX	5,730 r	$26,700 r	4.65	XX	6,780	33,600	4.96

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable. --Zero.
[1]Data are rounded to no more than three significant digits, except unit values; may not add to totals shown.

TABLE 3
SOUTH DAKOTA: 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):			
Riprap and jetty stone	W	W	$4.96
Filter stone	W	W	9.92
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	7.72
Bituminous aggregate, coarse	W	W	7.72
Bituminous surface-treatment aggregate	W	W	9.92
Railroad ballast	W	W	6.34
Fine aggregate (-3/8 inch):			
Stone sand, bituminous mix or seal	W	W	4.96
Screening, undesignated	W	W	4.96
Coarse and fine aggregates:			
Crusher run or fill or waste	W	W	4.96
Graded roadbase or subbase	W	W	5.24
Other construction materials	53	$294	5.55
Chemical and metallurgical, cement manufacture	W	W	3.58
Other miscellaneous uses and specified uses not listed	W	W	5.17
Unspecified:[2]			
Reported	3,870	20,600	5.32
Estimated	1,400	6,700	4.80
Total or average	6,780	33,600	4.96

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

TABLE 4
SOUTH DAKOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2002, BY USE AND DISTRICT[1,2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1 1/2 inch)[3]	--	--	--	--	W	W
Coarse aggregate, graded[4]	--	--	--	--	W	W
Fine aggregate (-3/8 inch)[5]	--	--	--	--	W	W
Coarse and fine aggregate[6]	--	--	--	--	W	W
Other construction materials	--	--	--	--	W	W
Chemical and metallurgical[7]	W	W	--	--	--	--
Other miscellaneous uses	W	W	--	--	--	--
Unspecified:[8]						
Reported	789	3,480	631	2,780	2,450	14,300
Estimated	1,100	5,300	--	--	260	1,500
Total	3,060	12,800	631	2,780	3,080	18,000

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]No production for District 2.
[3]Includes filter stone and riprap and jetty stone.
[4]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), and railroad ballast.
[5]Includes stone sand (bituminous mix or seal) and screening (undesignated).
[6]Includes crusher run (select material or fill) and graded roadbase or subbase.
[7]Includes cement manufacture.
[8]Reported and estimated production without a breakdown by end use.

TABLE 5
SOUTH DAKOTA: 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)	881	$4,120	$4.67
Plaster and gunite sands	84	567	6.75
Concrete products (blocks, bricks, pipe, decorative, etc.)	53	798	15.06
Asphaltic concrete aggregates and other bituminous mixtures	922	3,850	4.17
Road base and coverings[2]	4,430	14,600	3.30
Fill	556	1,410	2.53
Snow and ice control	49	478	9.76
Other miscellaneous uses[3]	98	783	7.99
Unspecified:[4]			
Reported	1,230	5,650	4.60
Estimated	3,600	15,000	4.17
Total or average	11,900	47,500	4.00

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

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

(Thousand metric tons and thousand dollars)

Use	District 1 and 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[3]	80	244	10	130	928	5,110
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	890	3,620
Road base materials[4]	1,470	4,970	760	1,860	2,200	7,790
Fill	10	16	30	76	517	1,320
Other miscellaneous uses[5]	66	351	28	123	84	1,020
Unspecified:[6]						
Reported	861	3,770	54	165	314	1,720
Estimated	1,800	7,000	900	3,500	900	4,700
Total	4,280	16,400	1,820	5,830	5,790	25,300

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

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

[2]Districts 1 and 2 are combined to avoid disclosing company proprietary data.

[3]Includes plaster and gunite sands.

[4]Includes road and other stabilization (cement).

[5]Includes railroad ballast, roofing granules, and snow and ice control.

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