2010–2011 Minerals Yearbook

SOUTH DAKOTA [ADVANCE RELEASE]

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U.S. Geological Survey

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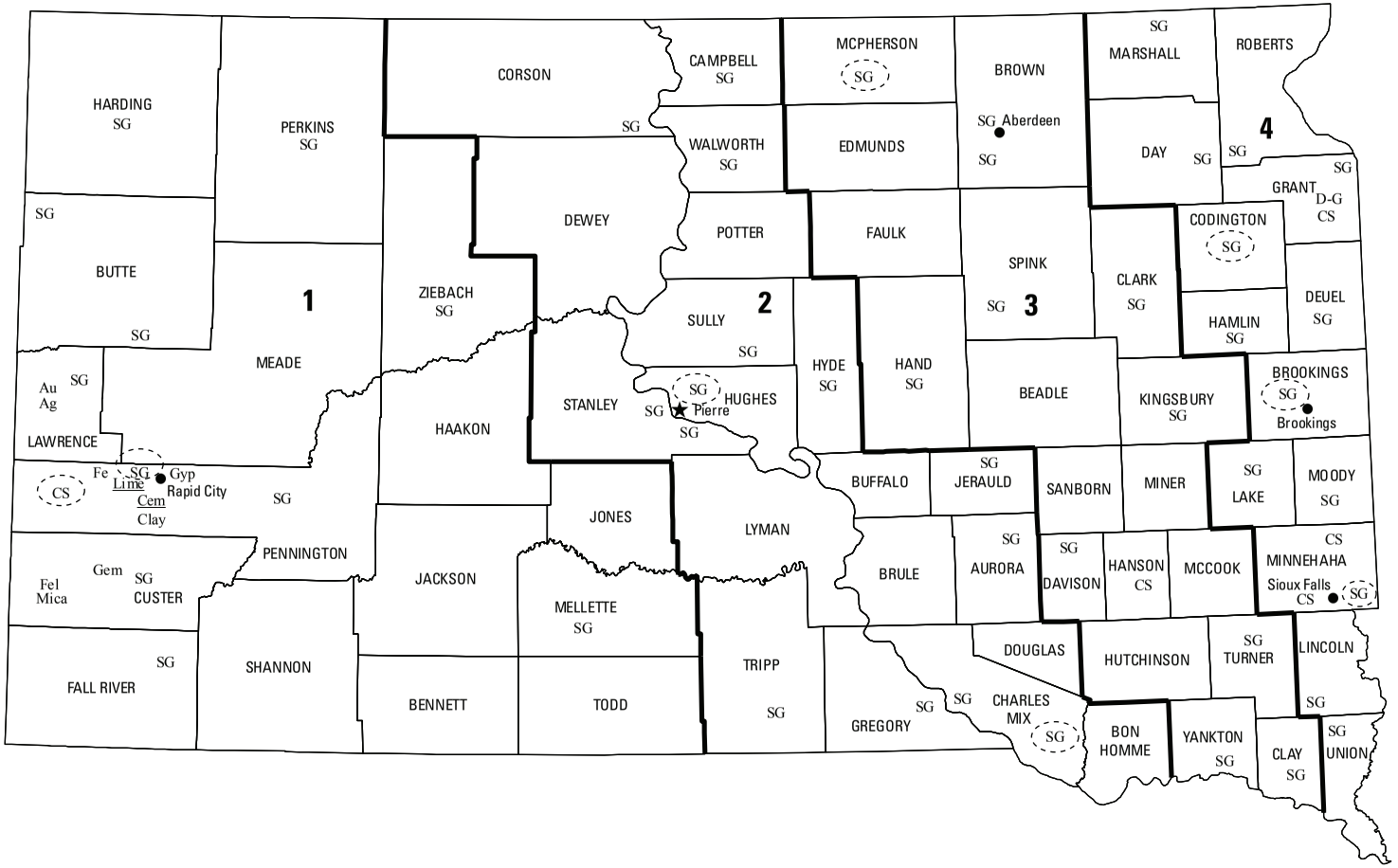
SOUTH DAKOTA



LEGEND

County boundary

★ Capital

● City

1 Crushed stone/sand and gravel district boundary

MINERAL SYMBOLS
(Principal producing areas)

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

Concentration of mineral operations

Source: South Dakota Geological Survey/U.S. Geological Survey (2010–11).

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 2011, nonfuel mineral production[1] in South Dakota was valued at $312 million, based upon annual U.S. Geological Survey (USGS) data. This was a $45 million (17%) increase from the State's total nonfuel mineral production value of $267 million in 2010, which followed a $34 million (15%) increase from 2009. After ranking 39th for 3 consecutive years, South Dakota rose to 38th in 2010 and to 36th in 2011 among the 50 States in total nonfuel mineral production value. It accounted for less than half of one percent of the total U.S. value in each year. On a per capita basis, the South Dakota ranked 11th in the Nation in nonfuel mineral production in 2011 with a value of $379, above the national average of $240.

Gold was South Dakota's leading nonfuel mineral in 2010 and 2011. It replaced portland cement as the leading commodity in 2009; gold had been the leading commodity for more than four decades prior to 2002. In descending order of production value, portland cement, crushed stone, construction sand and gravel, and lime followed gold as the leading nonfuel minerals. Crushed stone represented 16% of the total nonfuel production value in 2011 while construction sand and gravel made up about 15% of the total; the leading five commodities together accounted for more than 90% of the State's total nonfuel mineral production value.

Except for a decrease in the production value of portland cement, all of South Dakota's top five mineral commodities increased in production quantity and value in 2011 relative to 2009. The production value of gold increased by 63% in 2011 from that of 2009, the production value of portland cement decreased 4.4%, and the production value of lime increased by 125% (values withheld—proprietary company data). Nearly 12.7 million metric tons (Mt) of construction sand and gravel was produced in 2011, a 12% increase from 11.3 Mt in 2009, and production value increased 17% from $40.8 million to $47.8 million. Crushed stone production climbed by 1.5 million Mt (33%) and $20 million (66%) from 2009 to 2011. Prior to 2010, the quantities and production values of construction sand and gravel and crushed stone had declined for 3 consecutive years. The amount of construction sand and gravel produced in 2011 was down 23% compared to 2006 and the production value was 20% lower, whereas a higher unit value for crushed stone in 2011 relative to 2006 resulted in a 13% increase in production value despite a 10% decrease in production quantity.

Among other nonfuel mineral commodities, the production quantity of dimension stone increased considerably in the 2010–11 time period while production value dropped 25% compared to 2009. Feldspar, mica, and silver saw overall increases in production value through 2011, while the production values of common clay, dimension stone, gemstones, and iron ore decreased (values withheld—proprietary company data).

In 2011, South Dakota remained seventh in the production quantity of three mineral commodities: gold (out of 10 producing States), silver (out of 11 producing States), and feldspar (out of 7 producing States). The State fell in rank to second in mica production (out of four States) from first in 2009, and to fourth in iron ore (out of four producing States) from third in 2009 and 2010. Relative to 2009, South Dakota rose to 1st (out of 36 producing States) from 13th in the production of dimension stone and to 17th (out of 33 producing States) from 22d in lime.

The following narrative information was provided by the South Dakota Department of Environment and Natural Resources (DENR).

Overview

In 2011, there were 515 licensed mine operators and 1,815 active licensed sites in South Dakota, slightly fewer than the 519 mine operators with 1,821 active mine sites in 2010. Mine licenses were required to mine construction aggregates; pegmatite minerals; and gypsum, iron ore, limestone, sand, or shale used to make cement or lime. The mining of all other minerals required a mining permit. At the end of both 2010 and 2011, there were a total of 47 mine permits that covered the mining of minerals in South Dakota, including bentonite, gold, dimension stone, mica schist, and slate. The DENR issued five mine permits in 2010; four were large-scale permits for bentonite mining, and one was a small-scale permit for a gold placer operation. Only one new permit was issued in 2011, for a small-scale gold placer operation (DENR, 2011; 2012 p. 2–2.)

In 2010, heap leach gold mining led all permitted mines in production with 3.28 Mt of ore mined, followed by dimension stone (189,000 metric tons (t)), mica schist (18,200 t), and slate (2,530 t). Heap leach gold mining produced 3.07 Mt of ore mined during 2011, followed by dimension stone (173,000 t), bentonite (104,000 t), mica schist (18,400 t), agricultural lime (3,800 t), and slate (2,540 t). Other minerals produced in lesser amounts included limestone and placer gold ore. Gold production quantity and value increased in 2010 compared to 2009. Even though gold production decreased in 2011, gold value still increased owing to higher prices. Wharf Resources was the only company to report gold production, with 2,280 kilograms (kg) produced in 2010 (an increase from the 2,110 kg reported in 2009) and 2,090 kg produced in 2011. The average price of gold in 2010 was $1,227.51 per troy ounce,

[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 USGS mineral production data published in this chapter are those available as of May 2013. Data in this report are rounded to three significant digits and percentages are calculated from unrounded data. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at http://minerals.usgs.gov/minerals.

yielding a gross value of about $89.8 million, while the average price of gold in 2011 was $1,572.48 per troy ounce, yielding a gross value of about $106 million (DENR, 2011; 2012, p. ii).

Mine Development

Industrial Minerals

Clays.—In April and May of 2010, DENR issued two large-scale mine permits to American Colloid Company (Hoffman Estates, IL) for bentonite mining in the Shear/Clarkson area near Belle Fourche. About 25 ha (62 acres) were to be mined and about 75 ha would be affected at the Shear/Clarkson East operation while about 20 ha were to be mined and about 70 ha would be affected at the Shear/Clarkson West operation. In June of 2010, DENR issued two additional large-scale mine permits to American Colloid for bentonite mining in the Davis Ranch area north of Belle Fourche. About 40 ha were to be mined and about 105 ha would be affected at the Davis North operation, while about 50 ha were to be mined and about 95 ha would be affected at the Davis South operation. All areas would be mined using cut and fill mining techniques and would be reclaimed to rangeland for livestock grazing (DENR, 2011, p. 2–2).

Metals

Gold.—In November of 2011, the Board of Minerals and Environment unanimously approved a large-scale mine permit application submitted by Wharf Resources Ltd. (Vancouver, Canada) for its proposed mine expansion project approximately 5 kilometers (km) west of Lead. The proposed mine expansion project would involve open pit mining and disposal of overburden primarily to the south of the existing Wharf Mine and to the west of the Golden Reward Mine. A portion of the reclaimed Golden Reward Mine would be redisturbed during the project. Ore extracted from the expansion area would be hauled to the existing heap leach facility at the Wharf Mine for processing. A portion of State Highway 473 would be relocated during the project. Wharf Resources planned to disturb approximately 125 ha with the 215-ha expansion area, and total production was estimated to be about 160 Mt of ore and overburden. The proposed expansion would extend the total life of the mine from 2012 to 2020. The proposed future land use would be a mixture of rangeland (woodland grazing), home sites, recreation, and industrial or commercial development (DENR, 2012, p. ii).

In April of 2010, DENR issued a small-scale mine permit to an individual for a placer gold mining operation near Tinton. The mine would affect a total of 4 ha and remove a maximum of 23,000 t of ore annually during the 20-year life of the project. Mining would be conducted in three phases, and ore extracted during each phase would be processed using a gravity-wash process plant. Reclamation would be conducted concurrently with mining. The proposed future use of the mine was grassland (DENR, 2011, p. 2–3).

In 2011, an individual submitted a small-scale mine permit application for a placer gold mining operation near Iron Creek Lake southwest of Spearfish. About 2 ha would be affected during the 6-year life of the operation. Exposed placer gravels would be mined and processed with a portable trommel/sluice. Reclamation would be conducted concurrently with mining. The proposed future use of the mined area was forest grassland (DENR, 2012, p. 2 – 2).

Environmental Remediation

In 2011, there were 11 mine permits that covered six large-scale gold mining operations in South Dakota. Wharf Resources Ltd., which operated the only active gold mine in South Dakota, held five of the permits. The other permits were held by Bald Mountain Mining, Homestake Mining, LAC Minerals (now part of Barrick Gold Corp.), and Brohm Mining Corporation. Most of South Dakota's gold mines are in varying stages of reclamation and closure, with about 205 ha of Homestake's reclaimed area being released from reclamation liability and placed into postclosure since 2006. Also, about 165 reclaimed ha at the Golden Reward Mine have been released and placed into postclosure status since 2009 (DENR, 2012, p. 1–2).

In 2011, the U.S. Environmental Protection Agency (EPA) continued acid water treatment at the Gilt Edge Superfund site located approximately 8 km southeast of Lead. A total of 475,000 kiloliters were treated and discharged in 2011; acid water and sludge volumes at the mine were reduced to 125,000 kiloliters. The EPA also completed repairs on storm water diversion ditches along the capped Ruby Waste Rock Depository to prevent storm water from entering the depository and creating additional acid drainage. In December, the EPA submitted the intermediate (65%) design for Operational Unit 1, which covers reclamation of the site, except for the reclaimed Ruby Depository (DENR, 2012, p. 1–3).

Reclamation activities at the Richmond Hill Mine, located nearly 7 km northwest of Lead, continued to be successful. This was an open pit heap leach gold mine that developed an acid-mine drainage problem during operations in the early 1990s. Most of the reclamation was completed by the mine operator, LAC Minerals (USA) LLC, in the mid-1990s. The original impoundment consisted of acid-generating waste rock, which contaminated the neighboring surface water. This was extensively studied during the 1990s and several possible solutions recommended and tried, including removing some of the waste rock and placing it onto leach pads. Finally, a low permeability cap design was developed and implemented. This appeared to perform acceptably and monitoring data seem to confirm that this cap was effective in reducing water infiltration into the spent ore. With a few minor exceptions, monitoring continued to show stable or improving water quality in all of the reclaimed areas (DENR, 2012, p. 1–4).

Homestake was to continue reclamation and closure activities at its Lead Open Cut surface mine. Postclosure monitoring, maintenance, and water treatment activities would continue in the released areas (DENR, 2012, p. 1–16).

Government Programs

In July 2007, the National Science Foundation selected the Homestake underground mine in Lead as the site for a

deep underground science and engineering laboratory. Work continued in 2010 and 2011 to develop an interim lab inside the mine. A staging room, a larger detection cavern, and a secondary access tunnel were carved out of the rock in preparation for various experiments. Construction of a research facility was nearing completion (DENR, 2011; 2012, p. 1–4).

References Cited

South Dakota Department of Environment and Natural Resources (DENR), 2011, Summary of the Mining Industry in South Dakota—2010. (Accessed September 19, 2014, at http://denr.sd.gov/des/mm/documents/Goldrpt10a.pdf.)

South Dakota Department of Environment and Natural Resources (DENR), 2012, Summary of the Mining Industry in South Dakota—2011. (Accessed September 19, 2014, at http://denr.sd.gov/des/mm/documents/Goldrpt11a.pdf.)a

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

(Thousand metric tons and thousand dollars)

Mineral	2009		2010		2011	
	Quantity	Value	Quantity	Value	Quantity	Value
Sand and gravel, construction	11,300 r	40,800 r	11,600	48,600	12,700	47,800
Stone, crushed	4,540 r	29,800 r	5,470	36,600	6,050	49,400
Combined values of cement (portland), clays (common), feldspar, gemstones (natural), gold, gypsum [crude (2010–11)], iron ore (usable shipped), lime, mica (crude), silver, and stone (dimension granite)	XX	163,000 r	XX	182,000	XX	215,000
Total	XX	233,000 r	XX	267,000	XX	312,000

[r]Revised. 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 IN THE UNITED STATES, BY TYPE[1]

Type	2009 Number of quarries	2009 Quantity (thousand metric tons)	2009 Value (thousands)	2009 Unit value	2010 Number of quarries	2010 Quantity (thousand metric tons)	2010 Value (thousands)	2010 Unit value
Limestone[2]	4	2,470	$14,200	$5.75	7	2,690	$15,700	$5.82
Granite	--	--	--	--	1	64	916	14.29
Sandstone and quartzite[3]	3	1,970	15,000	$7.63	3	2,590	19,300	7.44
Slate	--	--	--	--	1	11	73	6.88
(2010–11)], iron ore (usable shipped), lime, mica	2 r	99 r	649 r	$6.58	1	113	625	5.51
Total or average	XX	4,540 r	29,800 r	$6.58	XX	5,470	36,600	6.69

Type	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone[2]	7	2,870	$24,900	$8.68
Granite	--	--	--	--
Sandstone and quartzite[3]	3	2,840	20,600	7.25
Slate	1	11	115	10.70
(2010–11)], iron ore (usable shipped), lime, mica	2	329	3,780	11.48
Total or average	XX	6,050	49,400	8.16

[r]Revised. XX Not applicable. -- Zero.

[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 kinds of stone.

[3]Includes sandstone-quartzite reported with no distinction between the two kinds of stone.

TABLE 3
SOUTH DAKOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 2010, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse and fine aggregates:		
Graded road base or subbase	64	421
Other coarse and fine aggregates	W	W
(2010–11)], iron ore (usable shipped), lime, mica	W	W
Unspecified:[2]		
Reported	1,860	12,900
Estimated	2,210	16,600
Total	5,470	36,600

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits; 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 2011, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch), riprap and jetty stone	W	W
Coarse aggregate, graded:		
Concrete aggregate, coarse	W	W
(2010–11)], iron ore (usable shipped), lime, mica	W	W
Bituminous surface-treatment aggregate	W	W
Railroad ballast	W	W
Fine aggregate (-⅜ inch):		
Stone sand, bituminous mix or seal	W	W
Coarse and fine aggregates:		
Graded road base or subbase	W	W
Terrazzo and exposed aggregate	(3)	3
Crusher run or fill or waste	W	W
Unspecified and other construction materials	106	582
Chemical and metallurgical, cement manufacture	726	2,100
Unspecified:[2]		
Reported	2,040	15,200
Estimated	2,060	22,000
Total	6,050	49,400

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits.
[2]Reported and estimated production without a breakdown by end use.
[3]Less than ½ unit.

TABLE 5

SOUTH DAKOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2010, 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 and fine aggregates[3]	W	W	--	--	64	422
Chemical and metallurgical[4]	W	W	--	--	--	--
Unspecified:[5]						
(2010-11)], iron ore (usable shipped), lime, mica	667	4,620	--	--	1,200	8,270
Estimated	1,390	9,640	413	4,210	402	2,780
Total[6]	2,820	16,600	413	4,210	1,660	11,500

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

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

[2]No production in District 2.

[3]Includes graded road base or subbase, unpaved road surface, terrazzo and exposed aggregate, crusher run, roofing granules, and other coarse and fine aggregates.

[4]Includes cement manufacture, lime manufacture, dead-burned dolomite manufacture, flux stone, chemical stone, glass manufacture, and sulfur oxide removal.

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

[6]District totals may not add up to the published State total, owing to revisions made after the production of the table and (or) proprietary data being withheld.

TABLE 6

SOUTH DAKOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2011, 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 (+1½ inch)[3]	--	--	--	--	W	W
Coarse aggregate, graded[4]	--	--	--	--	W	W
Fine aggregate (-⅜ inch)[5]	--	--	--	--	W	W
(2010–11)], iron ore (usable shipped), lime, mica	W	W	--	--	W	W
Other construction materials	W	W	--	--	--	--
Chemical and metallurgical[7]	W	W	--	--	--	--
Unspecified:[8]						
Reported	601	6,330	--	--	1,430	8,910
Estimated	1,550	16,600	505	5,390	--	--
Total	2,980	25,600	505	5,390	2,560	18,400

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

[1]Data are rounded to no more than three significant digits.

[2]No production in District 2.

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

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

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

[6]Includes graded road base or subbase, unpaved road surface, terrazzo and exposed aggregate, crusher run, roofing granules, and other coarse and fine aggregates.

[7]Includes cement manufacture, lime manufacture, dead-burned dolomite manufacture, flux stone, chemical stone, glass manufacture, and sulfur oxide removal.

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

TABLE 7
SOUTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2010,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)[2]	1,090	$6,630	$6.08
Asphaltic concrete aggregates and other bituminous mixtures	178	789	4.43
Road base and coverings[3]	3,360	11,300	3.36
Fill	334	926	2.77
(2010–11)], iron ore (usable shipped), lime, mica	59	265	4.49
filtration	12	135	11.25
Other miscellaneous uses	70	836	11.94
Unspecified:[4]			
Reported	889	4,130	4.65
Estimated	4,520	19,300	4.27
Total or average	11,600	48,600	4.19

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

TABLE 8
SOUTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2011,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)[2]	950	$4,990	$5.25
Asphaltic concrete aggregates and other bituminous mixtures	241	819	3.40
Road base and coverings[3]	4,570	15,800	3.46
Fill	404	1,070	2.65
(2010–11)], iron ore (usable shipped), lime, mica	47	234	4.98
Other miscellaneous uses[4]	21	233	11.10
Unspecified:[5]			
Reported	1,130	4,780	4.23
Estimated	5,310	19,900	3.75
Total or average	12,700	47,800	3.76

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

TABLE 9
SOUTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2010,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)[2]	W	W	287	1,660	W	W
Asphaltic concrete aggregates and road base materials[3]	345	1,800	564	1,760	462	1,480
Fill	--	--	22	91	144	394
Other miscellaneous uses[4]	38	161	(5)	4	21	246
Unspecified:[6]						
Reported	175	799	5	93	117	530
Estimated	1,460	6,770	1,410	6,400	1,230	5,800
Total[7]	2,020	9,530	2,290	10,000	1,980	8,450

	District 4		Unspecified districts	
	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)[2]	W	W	--	--
Asphaltic concrete aggregates and road base materials[3]	1,960	6,220	209	801
Fill	168	442	--	--
Other miscellaneous uses[4]	20	88	--	--
Unspecified:[6]				
Reported	813	2,710	--	--
Estimated	1,090	6,110	--	--
Total[7]	4,020	15,500	209	801

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 plaster and gunite sands.
[3]Includes road and other stabilization (cement).
[4]Includes filtration, and snow and ice control.
[5]Less than ½ unit.
[6]Reported and estimated production without a breakdown by end use.
[7]District totals may not add up to the published State total, owing to revisions made after the production of the table and (or) proprietary data being withheld.

TABLE 10
SOUTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2011,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)[2]	W	W	244	1,090	W	W
Asphaltic concrete aggregates and road base materials[3]	W	W	585	1,870	W	W
Fill	70	162	53	127	106	283
Other miscellaneous uses[4]	46	228	--	--	10	106
Unspecified:[5]						
Reported	216	902	100	449	168	651
Estimated	1,280	4,800	1,140	4,250	1,510	5,610
Total	2,490	10,300	2,120	7,790	2,560	9,670

	District 4		Unspecified districts	
	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)[2]	W	W	--	--
Asphaltic concrete aggregates and road base materials[3]	W	W	229	820
Fill	175	496	--	--
Other miscellaneous uses[4]	12	133	--	--
Unspecified:[5]				
Reported	641	2,780	--	--
Estimated	1,390	5,210	--	--
Total	5,280	19,300	229	820

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 plaster and gunite sands.
[3]Includes road and other stabilization (cement).
[4]Includes filtration, and snow and ice control.
[5]Reported and estimated production without a breakdown by end use.