The Mineral Industry of South Dakota

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

By Leon E. Esparza

In 1987, the value of South Dakota's nonfuel mineral production reached a record $262.9 million, an increase of nearly 13% over the previous high established in 1986. The increase was due mainly to greater production of gold. Exploration for gold and other precious metals continued at a brisk pace. Twenty exploration permits were issued to 11 companies for projects in the Black Hills, in Custer, Lawrence, and Pennington Counties.

Table 1.—Nonfuel mineral production in South Dakota

<table>
<thead>
<tr>
<th>Mineral</th>
<th>1985 Quantity (thousands)</th>
<th>Value</th>
<th>1986 Quantity (thousands)</th>
<th>Value</th>
<th>1987 Quantity (thousands)</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Masonry—thousand short tons</td>
<td>4</td>
<td>W</td>
<td>4</td>
<td>W</td>
<td>4</td>
<td>W</td>
</tr>
<tr>
<td>Portland—de</td>
<td>610</td>
<td>W</td>
<td>632</td>
<td>W</td>
<td>519</td>
<td>W</td>
</tr>
<tr>
<td>Feldspar—de</td>
<td>117</td>
<td>W</td>
<td>118</td>
<td>W</td>
<td>275</td>
<td>W</td>
</tr>
<tr>
<td>Gold (recoverable content of ore, etc.)—de</td>
<td>NA</td>
<td>*79</td>
<td>NA</td>
<td>100</td>
<td>NA</td>
<td>$100</td>
</tr>
<tr>
<td>Oyster—troy ounces</td>
<td>356,100</td>
<td>W</td>
<td>113,119</td>
<td>W</td>
<td>263</td>
<td>W</td>
</tr>
<tr>
<td>Sand and gravel (construction)—de</td>
<td>34</td>
<td>269</td>
<td>31</td>
<td>265</td>
<td>W</td>
<td>W</td>
</tr>
<tr>
<td>Silica (recoverable content of ore, etc.)—de</td>
<td>*0.400</td>
<td>9.713</td>
<td>18,603</td>
<td>*9.600</td>
<td>*19,100</td>
<td></td>
</tr>
<tr>
<td>Slate: Crushed—thousand short tons</td>
<td>9,071</td>
<td>14,412</td>
<td>6,190</td>
<td>12,500</td>
<td>5,070</td>
<td>18,815</td>
</tr>
<tr>
<td>Dimension—de</td>
<td>51</td>
<td>18,636</td>
<td>*56</td>
<td>18,360</td>
<td>31</td>
<td>18,000</td>
</tr>
<tr>
<td>Combined value of beryllium concentrate, clays (excluding, 1985-86 common, 1987), lime, mica (talc), and values indicated by symbol W</td>
<td>XX</td>
<td>44,800</td>
<td>XX</td>
<td>181,291</td>
<td>XX</td>
<td>206,908</td>
</tr>
</tbody>
</table>

*Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1Combination value" figure. XX Not applicable.
2Production as measured by mine shipments, sales, or marketable production (including consumption by producer), includes certain clays; kind and value included with "Combined value" data.
Table 2.—Nonfuel minerals produced in South Dakota in 1986, by county:

| County     | Minerals produced in order of value | Count
|------------|-------------------------------------|-------
| Aurora     | Sand and gravel (construction)      | 2.92
| Beadle     | Do                                  | 2.92
| Bon Homme  | Do                                  | 2.92
| Brookings  | Do                                  | 2.92
| Brown      | Do                                  | 2.92
| Brule      | Do                                  | 2.92
| Butte      | Clays, sand and gravel (construction) | 2.92
| Campbell   | Sand and gravel (construction)      | 2.92
| Charles M. | Do                                  | 2.92
| Clark      | Do                                  | 2.92
| Codington  | Do                                  | 2.92
| Corson     | Do                                  | 2.92
| Custer     | Mica, feldspar, beryllium           | 2.92
| Day        | Sand and gravel (construction)      | 2.92
| Deuel      | Do                                  | 2.92
| Deuel      | Do                                  | 2.92
| Edwards    | Do                                  | 2.92
| Fall River | Do                                  | 2.92
| Faulk      | Do                                  | 2.92
| Grant      | Do                                  | 2.92
| Gregory    | Do                                  | 2.92
| Haakon     | Do                                  | 2.92
| Hamlin     | Do                                  | 2.92
| Hand       | Do                                  | 2.92
| Hanson     | Do                                  | 2.92
| Harding    | Do                                  | 2.92
| Hughes     | Do                                  | 2.92
| Hutchinson | Do                                  | 2.92
| Hyde       | Do                                  | 2.92
| Jackson    | Do                                  | 2.92
| Jerauld    | Do                                  | 2.92
| Jones      | Do                                  | 2.92
| Kingsbury  | Do                                  | 2.92
| Lawrence  | Gold, sand and gravel (construction), silver. | 2.92
| Lincoln    | Sand and gravel (construction)      | 2.92
| Lyman      | Do                                  | 2.92
| McCook     | Do                                  | 2.92
| McPherson  | Do                                  | 2.92
| Marshall   | Do                                  | 2.92
| Meade      | Do                                  | 2.92
| Mellette   | Do                                  | 2.92
| Miner      | Do                                  | 2.92
| Minnehaha  | Do                                  | 2.92
| Moody      | Concrete, lime, sand and gravel (construction), clays, gypsum. | 2.92
| Pennington | Sand and gravel (construction)      | 2.92
| Potter     | Do                                  | 2.92
| Roberts    | Do                                  | 2.92
| Roberts    | Do                                  | 2.92
| Spink      | Do                                  | 2.92
| Stanley    | Do                                  | 2.92
| Sully      | Do                                  | 2.92
| Todd       | Do                                  | 2.92
| Tripp       | Do                                  | 2.92
| Turner      | Do                                  | 2.92
| Union      | Do                                  | 2.92
| Walworth   | Do                                  | 2.92
| Yankton    | Do                                  | 2.92
| Zeibach    | Do                                  | 2.92
| Undistributed* | Stone (dimension and crushed), gem stones. | 2.92

*No production of nonfuel mineral commodities was reported for counties not listed.
*Data not available by county for minerals listed.

Trends and Developments.—Objections to, and debate about, open pit gold mining and the use of cyanide heap-leaching methods continued to grow in 1987. In recent years, gold exploration for large low-grade deposits and open pit development had increased mainly because of improvements in cyanide heap-leach technology and a strong precious metals market.

Most of South Dakota's industrial mineral production was used by the construction industry. The U.S. Department of Commerce reported a modest construction decline in South Dakota in 1987. The number of private and public residential units authorized fell a little over 5% from 1986, and the value of nonresidential construction dropped about 4%. The value of State road contract awards paralleled this decline, falling about 10% for the same period.

Mineral taxes in South Dakota are levied only on gold and silver production. Collections for fiscal year July 1, 1986, to June 30, 1987, totaled nearly $4.5 million, up about 18%.

Mining employment totaled 2,626 in 1987, a slight increase over that of 1986.

Legislation and Government Programs.—Laws enacted during the 1987 State legislative session had a major effect on mining in South Dakota. The legislative action ultimately resulted in a review and major redrafting of State mining regulations. Two laws in particular contributed to a need for the redraft. The first clarified the authority of local governments to enact zoning regulations relating to surface mining. The second law required the State Board of Minerals and Environment to make socioeconomic studies before issuing mine permits.

To comply with the new laws, the Governor ordered a 6-month hold, beginning in June, on processing mine permit applications and amendments. This action provided time for a Governor-appointed task force to draft new mining regulations. The task force consisted of members from academia, environmental advisory groups, the mining industry, and government. The new mining regulations unveiled in December included changes in permit procedures and rules for reclamation, heap leaching, and disposal of mill tailings.

In October, Lawrence County voters defeated by a greater than 3:1 margin a proposed moratorium on open pit gold mining. The moratorium would have delayed issuance of permits for new open pits until December 31, 1988, and also would have delayed major amendments to existing open pit mining permits. Part of the measure would have required the county commissioners to conduct a study of the cumulative effects of open pit mining. Local environmental groups continued efforts to include an open pit mining initiative on the 1988 statewide general election ballot. Although exact wording of the initiative was incomplete at year's end, the intent was to severely restrict growth of open pit projects in the Black Hills.

The proposed Sioux Nation Black Hills Act (U.S. Senate bill 705 and U.S. House bill 1506) was introduced in the 100th U.S. Congress. The stated purpose of the bill, which may affect the mining industry, was "to affirm the boundaries of the Great Sioux Reservation to convey federally held lands in the Black Hills to the Sioux Nation." The measure would return to the Sioux 1.5 million acres, which included nearly all Federal land in South Dakota, mostly west of longitude 103. All Federal lands in five counties and large parts of two counties would be included.

Although the proposed act indicated that individuals would not be deprived of valid existing rights of use or possession or any other contract right, there was disagreement whether these rights would be protected. Some observed that since the 1851 Treaty of Fort Laramie predates the Mining Law of 1872, existing mineral rights might not be valid.

The South Dakota School of Mines and Technology received nearly $72,000 from the State to study chlorination extraction for processing metallic ores. The study was to focus on gold-producing operations in the Black Hills and other Western States.

The U.S. Bureau of Mines distributed $505,000 to the State's Mining and Mineral Resources and Research Institute of the South Dakota School of Mines and Technology at Rapid City. The funds were provided as part of a program to assist the institute's efforts in training engineers and scientists in mineral-related disciplines.
REVIEW BY NONFUEL MINERAL COMMODITIES

METALS

Beryllium—Pacer Corp. produced beryllium
feldspar, and mine from pegmatite deposits in
Custer County. Production and value of
beryllium decreased from 1986.

Gold and Silver.—The second largest gold
country in the state was South Dakota.
The State ranked third of 14 States in gold
production. Gold production and value in
1987 increased nearly 7% and 9%, respec-
respectively. Lawrence County was the region
for all the major gold operations in South
Dakota. Homestake Mining Co. (HMC) was
the State's largest gold producer. Gold
production from HMC's Open Cut and
Homestake Mines at Lead totaled about
326,000 troy ounces. Ore reserves at the
Open Cut totaled 9,700,000 short tons at
0.19% ounces per ton. Ore reserves at the
Homestake Mine were 19,002,000 tons at
0.231 ounces of gold per ton. Average produc-
tion costs for the mines increased to $239
per ounce in 1987, up from $238 in 1986 due
to decline in underground ore grades and
processing costs at the Open Cut oper-
ation. Homestake also produced silver as
a byproduct of mine operations.

Wharf Resources (USA) Inc., a wholly
owned subsidiary of Wharf Resources Ltd.,
a Canadian company, continued surface
mining at its Aria Creek-Foley Ridge dis-
position in Lawrence County west of Lead
in the Black Mountain mining district. Total
gold production in 1987 was about 46,000
ounces. Direct mining costs were $178 per
ounce. Ore reserves totaled about 34 million
short tons at an average grade of 0.041
ounces of gold per ton. Wharf also recovered
silver as a byproduct. In December 1987,
Dickenson Mines Ltd. notified Wharf that it
had acquired 99% of Wharf's voting
common stock.

Broom Resources Inc. began construction
in July of its Gilt Edge Mine. Gold produc-
tion at the open pit/crusher operation
was anticipated to be 42,000 ounces per
year, gradually increasing to 135,000 ounces per
year by 1991. The company said reserves were about 41.6 million tons of ore grading 0.463 ounces of gold per ton.

Gold Reward Mining Co. was a joint
venture composed of Gold Reward Mining Inc.
(1980) NL of Australia, Cinox Lake Gold
Minerals Ltd. of Canada, and Ventures Tri-
inent of Colorado. The company's efforts to
obtain a State mining permit were delayed
because of the Governor's moratorium. It
expected to begin construction by the
summer of 1988 if a permit is awarded.
Company-reported reserves for the propo-
sed open pit and cyanide leach oper-
ation were 25.5 million tons of ore with an
average grade of 0.388 ounces of gold per ton
for a contained 670,000 ounces of gold and
2.5 million ounces of silver.

Goldstar Explorations (SD) Inc., in
a joint venture with Strawberry Hill Mining
Co. of Deadwood, announced plans to re-
claim about 6 million tons of old gold-
bearing tailings along an 18-mile stretch of
Whitewood Creek in Meade County south of
Whitewood. The area had been on the Environ-mental Protection Agency Superfund list because of elevated arsenic concentrations in tailings. The mining and milling operations dated back to the 1780s.

The operation would use gravity concen-
tration and/or cyanide heap-leach technol-
gy and cyanide/pulp methods to recover gold that the company reported averaged
0.06 ounce per ton.

St. Joe Gold Corp. filed a mine permit
application with the State in late Septem-
ber for its Richmond Hill project. The open
pit and cyanide leach operation had company-reported reserve of 1.8 million tons of ore, grading 0.035 ounces of gold and
0.23 ounces of silver per ton. The deposit
occurs near the surface and reaches depths
of about 25 feet. Annual production is anticipated at about 40,000 ounces of gold.

INDUSTRIAL MINERALS

Cement.—Portland cement sales and
substantially decreased about 15%.

In the same year, masonry cement
production was substantially unchanged; how-
ever, value increased more than 13%.

Changes in portland cement fluctuations
attributed to a lengthy plant shutdown for
repair and decreased output of state sales.

The only Government-owned cement plant
in the Nation, and the only cement plant in
South Dakota, was operated by the

cement plant in Rapid City. The business is admin-
istered by Gutenberg Cement, which is appointed
by the Secretary of the Interior. The facility can produce up to 1 million short tons of cement per
year. Cement products are marketed in South
Dakota, six adjacent States, and in Colora-
ado. About 60% of the finished portland
cement was sold to ready-mixed concrete
companies, 14% to highway contractors, 9% to
other contractors, and 17% to various
other consumers.

Sand and Gravel (Construction).—Con-
struction sand and gravel production is
surveyed by the U.S. Bureau of Mines for
even-numbered years only; this chapter con-
tains estimates for 1985 and 1987 and
actual data for 1986. Data for odd-numbered
years are based on annual company esti-
mates. Estimated production and value in
1987 was down slightly from the previous
year's level.

Stone.—Stone production is surveyed by
the U.S. Bureau of Mines for odd-numbered
years only; this chapter contains actual
Data for even-numbered years are based on
annual company estimates.

Crushed.—Production and value of crush-
ed stone in 1987 increased nearly 41% and
47%, respectively, establishing record highs.
Limitations, which accounted for more
than three-fourths of the crushed stone output,
was produced by 9 companies from 11 quarries in 7 counties. Pennington Coun-
yly, in west-central South Dakota, was the
source of most of the production. Quartzite
and sandstone were produced by five com-
panies at five quarries in Hansen, Mellette,
Minnehaha, and Tripp Counties.

Table 3.—South Dakota: Crushed stone sold or used by producers in 1987, by use

<table>
<thead>
<tr>
<th>Use</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandstone bricks and missile silos</td>
<td>1,350</td>
</tr>
<tr>
<td>Crushed stone for embankments and fill</td>
<td>1,070</td>
</tr>
<tr>
<td>Crushed stone for erosion控制 and fill</td>
<td>860</td>
</tr>
<tr>
<td>Crushed stone for bridge subbase, etc.</td>
<td>813</td>
</tr>
<tr>
<td>Crushed stone for road base or subbase</td>
<td>201</td>
</tr>
<tr>
<td>Crushed stone for other uses</td>
<td>386</td>
</tr>
<tr>
<td>Total</td>
<td>4,050</td>
</tr>
</tbody>
</table>

*Includes crushed rock, concrete aggregate, and other uses.

**Includes crushed rock, concrete aggregate, and other uses.

Table 2.—South Dakota: Crushed stone sold or used by producers in 1987, by use

<table>
<thead>
<tr>
<th>Use</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crushed sand and gravel</td>
<td>5,210</td>
</tr>
<tr>
<td>Crushed stone for embankments and fill</td>
<td>1,070</td>
</tr>
<tr>
<td>Crushed stone for erosion control and fill</td>
<td>860</td>
</tr>
<tr>
<td>Crushed stone for bridge subbase, etc.</td>
<td>813</td>
</tr>
<tr>
<td>Crushed stone for road base or subbase</td>
<td>201</td>
</tr>
<tr>
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<td>386</td>
</tr>
<tr>
<td>Total</td>
<td>4,050</td>
</tr>
</tbody>
</table>

*Includes crushed rock, concrete aggregate, and other uses.

**Includes crushed rock, concrete aggregate, and other uses.

Dimension.—Granite from Grant County
was the only rock type used in dimension
stone production. Sales of products for con-
struction and monument use were reported
by five companies operating nine quarries in
the Black Hills area. Production and value
posted slight declines from the previous
year's estimates.

Other Industrial Minerals.—Common
clay and shale decreased in both production
and value during 1987. The decreases re-
sulted from lower cement production at the
South Dakota Cement Commission plant.
Production and value decreased about 27% and
39%, respectively. The value of granite block
removed during the year was estimated to have
remained about the same as that of 1986.

Cryolite and Pyrophyllite.—Cryolite pro-
duction increased almost 19%, and value decreased almost 12%. Gypsum was used mostly in
cement production. Output and value of

tone. The value of line sold almost 28% and
39%, respectively, and included both hydrated lime and quick-
lime. Sales of line and production and value decreased more than 17% and 36%, respec-

*Includes crushed rock, concrete aggregate, and other uses.

**Includes crushed rock, concrete aggregate, and other uses.

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<table>
<thead>
<tr>
<th>Commodity and company</th>
<th>Address</th>
<th>Type of activity</th>
<th>County</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beryllium concentrate: Pacer Corp</td>
<td>Box 912 Custer, SD 57730</td>
<td>Mine and plant</td>
<td>Custer.</td>
</tr>
<tr>
<td>Cement: South Dakota Cement Commission</td>
<td>Box 360 Rapid City, SD 57709</td>
<td>3 rotary kilns</td>
<td>Pennington.</td>
</tr>
<tr>
<td>Clays: American Colloid Co</td>
<td>5100 Suffield Ct. Skokie, IL 60076</td>
<td>Open pit and plant</td>
<td>Butte.</td>
</tr>
<tr>
<td>South Dakota Cement Commission</td>
<td>Box 360 Rapid City, SD 57709</td>
<td>Open pit</td>
<td>Pennington.</td>
</tr>
<tr>
<td>Feldspar: Pacer Corp</td>
<td>Box 912 Custer, SD 57730</td>
<td>Open pits and dry-grinding plant</td>
<td>Custer.</td>
</tr>
<tr>
<td>Gold: Homestake Mining Co</td>
<td>Box 875 Lead, SD 57754</td>
<td>Underground mine and open pit, cyanidation mill, refinery</td>
<td>Lawrence.</td>
</tr>
<tr>
<td>Wharf Resources (U.S.A.) Inc</td>
<td>Box 987 Lead, SD 57754</td>
<td>Open pit and leach pads</td>
<td>Do.</td>
</tr>
<tr>
<td>Gypsum: South Dakota Cement Commission</td>
<td>Box 360 Rapid City, SD 57709</td>
<td>Open pit mine</td>
<td>Pennington.</td>
</tr>
<tr>
<td>Lime: Pete Lien &amp; Sons Inc</td>
<td>Box 440 Rapid City, SD 57709</td>
<td>Rotary and vertical kilns, continuous-hydrator plant</td>
<td>Do.</td>
</tr>
<tr>
<td>Mica: Pacer Corp</td>
<td>Box 912 Custer, SD 57730</td>
<td>Mine and dry-grinding plant</td>
<td>Custer.</td>
</tr>
<tr>
<td>Sand and gravel (construction, 1986): Birdsall Sand &amp; Gravel Co</td>
<td>Box 767 Rapid City, SD 57709</td>
<td>Pits and plants</td>
<td>Fall River, Pennington, Sully.</td>
</tr>
<tr>
<td>Fischer Sand &amp; Gravel Co</td>
<td>Box 1034 Dickinson, ND 58601</td>
<td>Pits and plants</td>
<td>Charles Mix, Davison, Lawrence, Ziebach.</td>
</tr>
<tr>
<td>Mehlhoff Construction Co</td>
<td>Route 1, Box 25 Tripp, SD 57376</td>
<td>Pit and plant</td>
<td>Hutchinson.</td>
</tr>
<tr>
<td>Myrl &amp; Roy's Paving Inc</td>
<td>1500 East 39th St. Sioux Falls, SD 57101</td>
<td>Pits and plants</td>
<td>Minnehaha.</td>
</tr>
<tr>
<td>Sweetman Construction Inc</td>
<td>100 South Dakota Ave. Summit, SD 57266</td>
<td>Pits and plants</td>
<td>Minnehaha and Roberts.</td>
</tr>
<tr>
<td>Silver: Homestake Mining Co</td>
<td>Box 875 Lead, SD 57754</td>
<td>See &quot;Gold&quot;</td>
<td>Lawrence.</td>
</tr>
<tr>
<td>Wharf Resources (U.S.A.) Inc</td>
<td>Box 987 Lead, SD 57754</td>
<td></td>
<td>Do.</td>
</tr>
<tr>
<td>Stone: Crushed: Limestone: Pete Lien &amp; Sons Inc</td>
<td>Box 440 Rapid City, SD 57709</td>
<td>Quarries and plants</td>
<td>Custer and Pennington.</td>
</tr>
<tr>
<td>Northwestern Engineering Co. (Hills Materials Co.)</td>
<td>Box 2320 Rapid City, SD 57709</td>
<td></td>
<td>Pennington.</td>
</tr>
<tr>
<td>South Dakota Cement Commission</td>
<td>Box 360 Rapid City, SD 57709</td>
<td>Quarry and plant</td>
<td>Do.</td>
</tr>
<tr>
<td>Sandstone-quartzite: Concrete Materials Co</td>
<td>Box 809 Sioux Falls, SD 57101</td>
<td></td>
<td>Minnehaha.</td>
</tr>
<tr>
<td>L. G. Everist Inc</td>
<td>Box 829 Sioux Falls, SD 57101</td>
<td></td>
<td>Do.</td>
</tr>
<tr>
<td>Spencer Quarries Inc</td>
<td>Box 23 Spencer, SD 57374</td>
<td></td>
<td>Hanson.</td>
</tr>
<tr>
<td>Dimension: Granite: Cold Spring Granite Co</td>
<td>202 South 3d Ave. Cold Spring, MN 56320</td>
<td>Quarries and plant</td>
<td>Grant.</td>
</tr>
<tr>
<td>Dakota Granite Co</td>
<td>Box 1351 Milbank, SD 57252</td>
<td></td>
<td>Do.</td>
</tr>
</tbody>
</table>