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SOUTH DAKOTA

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COVER PHOTO:
The South Dakota Capitol Building in Pierre symbolizes the cooperative working relationship between the U.S. Bureau of Mines and the mineral agencies of the State. (Photo is courtesy of the South Dakota Department of Tourism.)

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THE MINERAL INDUSTRY OF SOUTH DAKOTA

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

By Eileen K. Peterson[1] and Richard H. Hammond[2]

South Dakota mineral producers reported a 1992 value of production for nonfuel minerals of $300 million, an increase of about 4% from the 1991 level of $290 million but still below the record-high level of $319 million reported in 1990.

Both gold production and value increased in 1992 from 1991 levels, 14% and 8%, respectively. Modest increases in value were also noted for cement, feldspar, gypsum, and sand and gravel. Values decreased for clay, lime, mica, silver, and crushed and dimension stone.

Nonfuel mineral production came from 63 of the State's 67 counties. Lawrence County was again the leading county in terms of value for nonfuel mineral production, contributing nearly 70% of the State's total.

The State ranked 34th nationwide in total value of nonfuel mineral production, accounting for about 1% of the Nation's total. South Dakota ranked fourth in gold production, behind Nevada, California, and Utah, and in the top five nationally in production of mica and iron ore.

Gold accounted for approximately $7 out of every $10 of the State's total nonfuel mineral value. In terms of value, leading nonmetallic commodities were portland cement, sand and gravel, and stone. Construction commodities contributed about 24% of the State's total nonfuel mineral production value (see table 1).

TRENDS AND DEVELOPMENTS

Most of South Dakota's industrial minerals production is used in construction. Production of aggregate (crushed stone and construction sand and gravel) in the State decreased more than 6% from 1991 levels.

The decrease in aggregate production could be attributed to a stagnant construction industry, both building and highway construction. Sand and gravel production was not impacted to the extent that crushed stone production was during 1992.

According to U.S. Department of Commerce figures, 2,296 new residential units, valued at $200.6 million, were permitted for construction in 1992. The number of units permitted was down more than 8% but the value was up more than 20% from 1991 figures. Permitted nonresidential construction was valued at $78 million, down more than $24 million from 1991.

State mineral extraction taxes for State fiscal year 1992 (July 1991 through June 1992) generated $4.374 million in revenue for the State treasury. That figure represents a decrease of nearly $1 million from the previous fiscal year. Lower revenues can be attributed to lower gold production and lower gold prices during the State's 1992 fiscal year and, in part, to a severance tax break given to Homestake Mining Co. Gold and silver severance taxes in South

TABLE 1
NONFUEL MINERAL PRODUCTION IN SOUTH DAKOTA[1]

Mineral		1990		1991		1992	
		Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Gemstones		NA	$110	NA	W	NA	$967
Gold[2]	kilograms	17,870	221,157	16,371	$191,217	18,681	207,195
Sand and gravel (construction)	thousand short tons	r9,676	r23,513	e8,700	e20,800	8,279	22,187
Silver[2]	metric tons	10	1,566	7	944	6	802
Stone (crushed)	thousand short tons	e4,800	e16,800	4,824	19,657	e4,500	e18,900
Combined value of cement, clays (common), feldspar, gypsum (crusde), iron ore (usable), lime, mica (scrap), stone (dimension), and values indicated by symbol W		XX	r55,897	XX	57,304	XX	50,619
Total		XX	r319,043	XX	289,922	XX	300,670

eEstimated. rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Recoverable content of ores, etc.

Dakota, the highest in the country, are based on a twofold system: companies are taxed on gross production and on profits. Because of continued low gold prices, all gold mining operations in the State were trying to cut production costs to show a profit for the year. If gold prices remain below $350 per troy ounce (tr oz), it will drive some producers currently operating at, or above, the price of gold out of business. Low gold prices have undoubtedly contributed to decisions by some companies to postpone planned expansions.

The gold mining industry in South Dakota faced much uncertainty in 1992. Because of falling gold prices, increasing production costs, and approval of a November ballot issue that could limit mine expansions, most companies were forced to reevaluate future mining plans and operation methods. It can be expected that the number of operators will decline over the next few years.

Two of the four surface heap-leach mines are in fact nearing closure. One completed mining reserves in 1992 and did not identify additional reserves during exploration drilling in the mine area. The other is scheduled to complete mining of permitted oxide reserves in 1993. Although some additional resources have been found, the company has not yet filed for a mine permit with the State. Both mines will continue leaching operations for about 1 year from cessation of mining. The drop in employment, State and local taxes, and severance taxes will be felt throughout the State. Mineral severance taxes have been a significant source of revenue for South Dakota.

A first of its kind stop work order was issued against a large-scale gold mine operator in the Black Hills. The South Dakota Department of Environment & Natural Resources (DENR) issued the order in response to mine permit violations related to acid mine drainage. Issuance of the stop work order has opened the possibility of similar action against other operators. The discovery of acid mine drainage also resulted in closer State DENR examination of waste rock piles at other gold mines in the Black Hills.

Environmental groups, and some citizens in the State, continue to be concerned about environmental problems associated with the large-scale heap-leach gold mines that have been developed in the Black Hills since 1983. The discovery of acid mine drainage problems at a gold mine refueled concerns and will undoubtedly result in additional calls for more regulations as well as stricter control and enforcement of existing regulations on all mining companies.

EMPLOYMENT

South Dakota Department of Labor's 1992 annual report on earnings covered by unemployment insurance indicated the 1992 average mining employment figure of 2,695 was up 6.9% from the 1991 revised average of 2,520 employees. Employment in the mineral resources dependent construction industry also increased slightly in 1992 to 12,488, up from 11,878 in 1991. Employment in oil and gas extraction fell 25% from 1991 figures to 75 people employed in 1992.

The State report also showed that the mining industry in South Dakota continued to have the highest average annual earnings of any industry group in the State in 1992. Average mining earnings were $34,136, up 4% from the $32,810 reported in 1991. Metal mining had the highest average wage at $37,803, oil and gas earnings averaged $30,881, and other mining averaged $25,876. The 1992 average annual wage in the State was $18,016, about 52% of the average for the mining sector.

According to U.S. Department of Labor Mine Safety and Health Administration (MSHA) figures, no fatalities were reported in 1992 in South Dakota's mining and milling operations. During the almost 4.5 million employee-hours worked at mines and milling facilities, a reported 98 injuries occurred to workers resulting in lost workdays, down nearly 20% from that of 1991 when 125 such injuries were recorded. An additional 116 injuries occurred with no workdays lost, down about 22% from 148 such injuries recorded in 1991. Fatalities and injuries were down significantly in the Homestake Mine after the 1991 minewide cleanup and safety evaluation following four deaths in unrelated incidents in the mine during 1991. Reported injuries in the mine fell by 76% from 1991 to 1992.

ENVIRONMENTAL ISSUES

Required environmental controls in place at the State's large-scale surface gold mines allows mining to occur, and at the same time, maintains legislated environmental protection. One surface heap-leach mine completed mining operations in 1992 and after completing leaching operations sometime in 1993, will complete reclamation of the mine site. This will be the first of the heap-leach mines to undertake final site reclamation and will be examined closely, both by the State and by environmental groups, for compliance with State regulations as well as any closure and reclamation problems. Any problems identified during mine closure could result in additional regulations for the three surface heap-leach mines still operating in the State.

During 1992, two Notices of Violation were issued by the South Dakota DENR for mine permit violations related to acid mine drainage problems. Although no fine was assessed, the State DENR ordered the offending mine operator (LAC Minerals Inc.) to immediately stop new mining and waste rock dumping at the mine.

In January 1992, the State DENR identified sulfide waste rock in a valley-fill waste repository at LAC Minerals Inc.'s Richmond Hill heap-leach gold mine as a source of acid mine drainage. The reactive rock was a sulfide-bearing altered amphibolite containing marcasite and pyrite. A rapid rate of acid generation was manifested in elevated rock temperatures atop the waste dump where fumaroles formed and temperatures of 82° C (180° F) were recorded. The DENR ordered LAC Minerals to submit an acid mine drainage mitigation plan to address a long-term plan for how the operator would control the drainage. The

DENR halted all new mining operations in the mine and issued two Notices of Violation. Settlement of the enforcement action was pending at yearend.

Acid mine drainage was an unexpected problem at the mines operating in oxide ore deposits. Identification of the problem at Richmond Hill has, therefore, resulted in closer scrutiny at the three other heap-leach gold mines in the Black Hills.

The South Dakota Board of Minerals and Environment considered options it could use to ensure financial liability from gold mining companies if cyanide spills should occur at the mines they operate. In May, the Board decided three companies, Golden Reward Mining Co. (Golden Reward Mine), Wharf Resources Inc. (Wharf Mine), and LAC Minerals (Richmond Hill Mine), would be allowed to use net worth to meet financial assurance requirements against possible spills. Because of its less stable financial picture, Brohm Mining Corp. (Gilt Edge Mine) would be required to provide either a surety bond, commerical bank guarantee, or a collateral backed note.

Wharf Resources completed construction of a $2.2 million Counter Current Ion Exchange (CCIX) unit in October to remove excess nitrate in spent ore before offloading leached ore from the leach pads. Excess nitrate levels were noted by the State DENR in spent ore piles in 1991. The CCIX plant is designed to operate at up to 1,000 gallons per minute and remove nitrates from 120 parts per million down to fewer than 10 parts per million. According to Wharf Resources 1992 Annual Report, an added benefit of the CCIX process is its ability to recover up to an additional 31 kilograms (kg) (1,000 tr oz) of gold during the pad neutralization process. Wharf Resources is converting the waste stream from the CCIX plant to ammonium nitrate, usable as fertilizer.[3]

Despite Wharf Resources' efforts to mitigate potential environmental impact from the relic Annie Creek drainage tailings, the Environmental Protection Agency (EPA) has proposed to place the site on the National Priorities List (NPL) and under the regulations of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). With approval of the State DENR, Wharf Resources had constructed a rock buttress to contain the tailings and installed a French drain around the tailings. After a rock blanket was placed over the tailings, water quality in Annie Creek improved. Between 1906 and 1916, approximately 163,296 metric tons (mt) (180,000 short tons) (st) of processed ore from mining operations in the Annie Creek drainage was deposited on properties now owned by Wharf Resources. At yearend, it had not been determined by EPA if the site would be declared a Superfund site.

Wharf Resources' 1992 Annual Report indicated the company had agreed to conduct a technical assessment of the drainage and had set aside $1.667 million to cover expected costs of the Engineering Evaluation/Cost Analysis (EE/CA) study on the Annie Creek tailings, as well as EPA oversight costs. The technical assessment was begun in 1992 and an interim EE/CA report was expected early in 1993 and a "Record of Decision" by EPA was expected in 1994.

To limit exposure of migratory birds to process solutions containing cyanide, operators at the Wharf and Golden Reward Mines installed netting over all ponds and ditches containing process solutions. Continued maintenance of the nets is necessary to ensure they do not break under snow or wind loads. Other measures undertaken to reduce the exposure included the installation of drippers at the Wharf Mine in lieu of using sprayers for application of cyanide solution on the leach pads. About 1,300 birds have reportedly died during the past 10 years from cyanide poisoning in the Lead area of Lawrence County. Under the Migratory Bird Treaty Act, a company that kills a migratory bird faces a maximum penalty of $10,000 per bird. No South Dakota mines, however, have been fined to date.

Gold mine operators in the Black Hills have been involved in discussions with the EPA to determine if natural springs, seeps, and stormwater runoff and drainage are to be permitted through traditional or stormwater National Pollutant Discharge Elimination System (NPDES) permits. While awaiting a decision by the EPA, several operators have applied for NPDES permits to avoid possible problems or delays when a decision is reached.

On the Whitewood Creek Superfund site, Homestake Mining Co. signed a consent decree with the EPA that required the company to perform remedial work on the 29-kilometer (18-mile) stretch of the creek declared a Superfund site. Thousands of tons of mine and mill tailings were deposited in the creek over a period of more than 100 years during which Homestake Mining Co., and many other mine operators, used the creek for tailings disposal. Homestake Mining discontinued discharging tailings into the creek in the 1970's. Because Homestake Mining is the only mining company identified as having disposed of tailings in the creek that is still operating, the company was the only identified "potentially responsible party."

The State DENR received a grant from the EPA, through the Western Governor's Association Mine Waste Task Force, to more fully document the hydrogeochemical impacts of mining wastes and to identify areas where improved waste management techniques can be applied. Other States participating in the study are Alaska, California, Colorado, Montana, South Carolina, and Utah.

A proposed ash landfill near Igloo, Fall River County, has been delayed again, this time by a U.S. Army Corps of Engineers warning that the site may contain unexploded chemical and conventional ordnance from the old Black Hills Army Depot.

The Pennington County Air Quality Board tried during the year to determine why Rapid City is the only city in the State that does not meet EPA clean air standards. A study funded by the Board and the State DENR pointed a finger at, but did not make charges against, three large quarries operating west of the city. The final report on the study is expected to be released early in 1993.

Pete Lien and Sons, Inc. installed a new air pollution control device on a vertical kiln at the company's lime manufacturing facility in Rapid City. The kiln had not attained compliance for emission standards with the previous air pollution control unit. After installation of the new unit, emissions dropped from 16.8 kg (37 pounds) of dust per hour to 0.17 kg (0.38 pounds) per hour.[4]

EXPLORATION ACTIVITIES

The South Dakota DENR issued 15 exploration permits in 1992, up from 11 issued in 1991. Six of the fifteen permits were for gold exploration in Lawrence and Pennington Counties by Cyprus Gold Co., Wharf Resources, LAC Minerals, Newmont Mining Corp., and Black Hills Resources. About 1,150 exploration drill holes were permitted, 92% of which were for gold. Not all permitted drill holes were expected to be drilled.

Harrison Western Mining, in a joint venture with Cyprus Gold (Cyprus Minerals Co.) and Texas Star Resources Corp., completed an eight hole drilling program near Keystone, Pennington County. Drilling took place around the old Holy Terror, Keystone, and Bullion gold mines. The best four holes averaged 8.75 grams per mt (0.31 tr oz per st) gold over a width of 4.3 meters (14 feet) (ft). The resource was estimated at 680,400 mt (750,000 st) of ore. Cyprus and Texas Star pulled out of the project late in the year leaving Harrison Western looking for new joint-venture partners.

In Lawrence County, Newmont Mining reportedly has filed in excess of 300 mining claims. The claims are clustered around two sites, the Rochford and Custer Crossing areas. Newmont Mining acquired an interest in a property previously owned by the Noranda Mining Co., which has since discontinued its exploration operations in the Black Hills. Newmont Mining had not contacted the State concerning development on any of the claims at yearend.

In eastern South Dakota, both the South Dakota Geological Survey and private companies were evaluating manganese in the Pierre Shale, a Cretaceous sedimentary rock in Aurora, Brown, Clark, Davison, Hand, Hanson, Jerauld, Lake, Lincoln, McCook, Miner, Minnehaha, Spink, and Turner Counties. Both BHP Minerals International and Addwest Minerals have acquired exploration permits in the eastern half of the State. BHP mines and processes manganese in Australia.

Two mine permits were issued during 1992, one to Homestake Mining Co. for expansion of its Open Cut mine in Lawrence County and one to Pete Lien & Sons, Inc. for a small shale mine in Pennington County.

LEGISLATION AND GOVERNMENT PROGRAMS

During the 1992 session, the South Dakota Legislature passed, and the Governor signed, legislation requiring postclosure plans for mines, including postclosure financial assurance.

On January 1, 1992, a 2-year moratorium on expansion of large-scale gold and silver mining in the Black Hills expired. The moratorium was initiated to allow time for completion and evaluation of a Cumulative Environmental Evaluation (CEE) on such mines in the Black Hills. Following expiration of the moratorium, the 1992 State Legislature approved the Second Century Environmental Protection Act. The act includes a surface mining limit, proposed by the Board of Minerals and Environment and the CEE Task Force, allowing no more than 2,428 hectares (6,000 acres) to be affected by large-scale gold and surface mining at any one time. Mining companies also would have to reclaim 202 hectares (500 acres) by September 1997: the limit could be lifted after that date if State reclamation requirements are found to be adequate. The act also includes a requirement that operating companies file annual reports with the State on surface mine disturbed land and reclamation acreages.[5]

Despite the new law, for the third straight year South Dakota voters were asked to limit gold and silver mining activities in the Black Hills by ballot initiative. An environmental group successfully petitioned to add an initiative to the November 1992 ballot that would lower the legislated acreage limit. The ballot initiative proposed to limit mine expansions to 81 hectares (200 acres) and limit lands affected by new large-scale gold and silver mines to 129 hectares (320 acres) for each new operation. The initiative passed by a 59% to 41% margin. Because of unclear wording in the initiative, State regulators were studying the new law to determine what effect it will have on gold mining in the Black Hills.

The legislature took a historic step in 1992 when it reduced the State tax on gross earnings of mining companies from 2% to 1% for 1 year, effective July 1, 1992. Mining companies having gross sales of more than $50 million will be the only ones affected by the temporary change. All companies will continue to pay a precious-metals tax of 8% on net earnings.

Other legislative action included a bill requiring reclamation of sand and gravel pits within 3 years of the end of mining and a $500 reclamation bond. Operators are surveyed annually by the State DENR to determine when the 3-year limit has been reached.

A 3-year National Science Foundation (NSF) grant of $3 million was awarded to the South Dakota School of Mines and Technology (SDSM&T), the University of South Dakota, and South Dakota State University. SDSM&T will use the NSF "Experimental Program for Stimulation of Competitive Research" (EPSCoR) grant money to study safer ways of mining. Proposed areas of research include ground water movement and aquifer contamination, cleanup of petroleum in soils, and effects of heap-leach mining.

During the year, the two divisions within the South Dakota DENR with mineral development duties were reorganized. The Division of Geological Survey, in Vermillion, has been placed in charge of promotion of mineral development. The Division of Environmental Regulation, in Pierre, will continue to be in charge of regulatory matters related to mineral development.

Division of Geological Survey staff members will be responsible for duties such as developing a coordinated mineral resource data base and bibliography for the State, conducting an assessment of the potential uses of the States's mineral resources, and serving as the primary contact within the department for potential mineral developers.

During 1992 the South Dakota Geological Survey continued to assess the potential for economic deposits of manganese in eastern South Dakota and work on building its mineral resource data base and bibliography.

During the 1992 consideration period, the DENR received two requests from mining companies for determination of "special, exceptional, critical, or unique land determination." Wharf Resources received notification that the land area it submitted for consideration was not eligible for designation, meaning no additional restrictions on mineral resource development would be in effect in those areas. Tinton Partners expected notification early in 1993. A citizens group request for a determination on 3,205 hectares (7,920 acres) in the Dome Mountain-Lost Gulch and Anchor Hill Lookout areas of Lawrence County also was considered by the DENR. Only a limited area, about 40.5 hectares (100 acres), was determined eligible for designation. The designation would have adversely affected any future plans by Brohm Resources Inc. to expand operations at the company's Gilt Edge Mine southeast of Lead.

The U.S. Bureau of Mines Twin Cities Research Center conducted an outreach meeting with gold producers in South Dakota to discuss items of concern for the industry. Areas for possible U.S. Bureau of Mines (USBM) research and outreach were identified, including acid mine drainage, nitrate residuals from blasting, location of voids from previous underground mining, biotechnical remediation of mine wastes, and public education-communication.

An allotment grant of $16,000 from the USBM was received by the Mining and Mineral Resources Research Institute at the South Dakota School of Mines and Technology in Rapid City. The grant was given under provisions of Public Laws 98-409 and 100-483. The purpose of the institute is to coordinate and administer training and research in mining, mineral resources, minerals development, and mineral processing.

During the State fiscal year running from July 1, 1992, through June 30, 1993, research, sponsored in part by the USBM, included: (1) development of a probabilistic slope stability analysis package, (2) study of adsorption behavior of metal ions on various substrates, (3) development of a predictive procedure for pathways and fate of nitrate hydration products in spent ores at heap-leach gold mining facilities, and (4) study of potential chemical contamination from abandoned mines in the Black Hills National Forest. Allotment grant funds were used to support six graduate fellowships.[6]

A three-way land exchange in South Dakota and Colorado was completed in January between Homestake Mining Co., the U.S. Forest Service, and Summit County, CO (and several ski resorts in Colorado). Homestake traded 4,978 hectares (12,300 acres) in Spearfish Canyon in return for 350 hectares (865 acres) in Summit County, CO. Homestake then sold the Colorado land to resorts and Summit County for $8.5 million and received $2 million in timber credits from the Forest Service. The $10.5 million in compensations received by Homestake equals the appraised value of the land in South Dakota. The Forest Service had been working on the deal with Homestake for about 3 years. Because the two parties were trading land between States, the deal required congressional approval and the signature of the President.

South Dakota received $509,000 in Federal royalties for minerals produced on Federal lands within State borders, down from the $592,000 received in 1991. The money represents the State's share of bonuses, rents, and royalties collected by the U.S. Department of the Interior's Minerals Management Service.

FUELS

Permits for new oil and gas wells dropped to eight in 1992, less than one-half the number issued in 1991. Late in the year Hunt Oil Co. announced plans to drill several shallow wildcats wells on the Sioux Uplift near Chamberlain in Buffalo County. There had been no drilling in the area in the past 30 years. The nearest production is about 112.6 kilometers (70 miles) to the northwest in Dewey County.[7]

REVIEW BY NONFUEL MINERAL COMMODITIES

Metals

Despite continued low gold and silver prices, increasing production costs, and a newly passed ballot initiative regulating surface mining, most gold producers in the State remained hopeful of improvements in the future. The metal mining industry in the State increased employment by 100, primarily in exploration departments. With low metal prices, companies were looking for higher grade ore deposits with low stripping ratios to lower future production costs. Resistance by environmental groups will, however, make future developments expensive and time consuming to undertake.

Gold and Silver.—The quantity of gold produced in the State increased 14% from that of 1991 and the gross value increased 8% according to South Dakota DENR figures. State figures showed gold production from mines in the northern Black Hills at 18,678 kg (600,519 tr oz) with a gross value of about $206 million.[8] Those figures make the 1992 gross value the second highest for gold produced in a single year since record keeping began in 1881 and the seventh highest production. Most of the increase was attributed to Homestake Mining Co.'s underground and open cut operations at Lead.

Production reported to the State DENR by the five operating gold mines was as follows: Homestake Mining, 12,336 kg

(396,626 tr oz);[9] Wharf Resources, 2,958 kg (95,092 tr oz); Golden Reward Mining Co., L.P., 1,590 kg (51,135 tr oz); Richmond Hill, Inc., 990 kg (30,561 tr oz) and; Brohm Mining Corp., 843 kg (27,105 tr oz).[10] USBM data indicated the average price for gold during 1992 was $356.59 per tr oz, compared with $363.29 per tr oz in 1991. About 34% of the gold and 51% of the silver produced in South Dakota came from heap-leaching operations.

Production of silver, obtained as a coproduct with gold at four of the five major gold mines, fell to 6 mt (200,500 tr oz) from the 1991 production figure of 10 mt (324,815 tr oz).

Worldwide demand for silver exceeded the supply available from mine production and secondary sources for the third straight year. The demand, however, did not translate into higher silver prices in 1992; the average price for silver during 1992 was $3.94 per tr oz, compared with $4.04 per tr oz in 1991. Companies with mines that were primarily silver producers suffered through another year of financial losses. South Dakota silver producers are less dependent of silver prices because they are primarily gold producers. Higher silver prices would improve the financial equation for all South Dakota companies producing both gold and silver but probably would never have a significant financial impact.

According to a State document,[11] in 1992 the major gold mining operations processed in excess of 7.8 million mt (8.6 million st) of ore from which 18,678 kg (600,519 tr oz) of gold and 6 mt (201,515 tr oz) of silver were recovered. More than 22.9 million mt (25.3 million st) of waste rock and overburden was moved to recover the gold and silver. The five operating gold mines reported using more than 1.4 million kg (3 million pounds) of cyanide to recover gold and silver during 1992. Of the 1,138 hectares (2,812 acres) permitted to be affected by mining, 571 hectares (1,410 acres) has been affected through 1992.

All major gold operations were within a 11.3-kilometer (7-mile) radius of Lead, in Lawrence County. Four of the five major gold producers recovered gold by heap leaching with cyanide; Homestake Mining used vat leaching with cyanide.

Homestake Mining continued to be the State's largest gold producer, accounting for two-thirds of the total output. Homestake's Annual Report for 1992 reported that gold production levels for the Homestake mines at Lead increased by 24% over production levels from 1991. Production from the underground mine amounted to 8,365 kg (268,952 tr oz), and 3,970 kg (127,674 tr oz) came from the Open Cut. Homestake's mine in South Dakota was the company's largest gold producer, accounting for about 20% of the company's total production. Average grade of processed ore was 4.46 grams (g) per mt (0.158 tr oz per st), up from the average grade of 3.95 g per mt (0.140 tr oz per st) reported in 1991. A total of 2.3 million mt (2.5 million st) of ore was milled with a recovery of 95.2%, up from the 92.7% recovery rate reported in 1991. Total production costs were $337 per tr oz of gold recovered, down from the $400 per tr oz reported in 1991. The company's 1992 annual report also listed yearend reserves at the two mines of 24.5 million mt with 6.1 g per mt gold (27.0 million st with 0.214 tr oz per st).

Increased gold production at the mines was attributed to increased ore grades and increased tonnages milled. The improvements were the result of a comprehensive program in 1991 to reemphasize safe working practices and upgrade underground working conditions. The mine achieved the best quarterly safety record in its history in the fourth quarter of 1992. To lower operating costs, both employees and equipment were shifted from low-grade areas of the underground mine into areas containing a greater density of ore-grade material. The number of stopes being mined was decreased from 309 to 138. Homestake also offered early retirement to 117 hourly workers and 15 salaried employees. In May, a 3-year contract was signed with the United Steel Workers of America. The average pay for all Homestake employees will be $13.93 per hour in 1992 and will increase to $14.21 per hour by June 1, 1994.

Expansion of the Open Cut mine continued during the year with receipt of a State DENR mining permit and relocation or demolition of houses and businesses. Reclamation bonds in the amount of $1.74 million have been posted on the project. Relocation of a highway through Lead and construction of a tunnel for another highway will take place during 1993.

The underground mine has been operated almost continuously for 117 years and has been developed to a depth of 2,438.4 meters (8,000 feet). Drilling conducted in the lower reaches of the mine during the year expanded reserves for the underground operation. The North Homestake Project drift was advanced to a length of 2,825 meters (9,270 feet). Total length of the drift will be 5,090 meters (16,700 feet) when it reaches an area 1,935 meters (6,350 feet) beneath Sheeptail Gulch, north of Central City, in 1995. Homestake believes the Sheeptail Gulch area contains a gold deposit that is an extension of the ore-bearing Homestake Formation that the company has been mining for 117 years. Exploration expenditures for the drift in 1993 will be about $8 million according to company reports.

Homestake remains interested in the possibility of recovering gold from old mine tailings along Whitewood Creek, including the area designated by EPA as a Superfund site. Plans for going ahead with the project are on hold pending higher gold prices. The project would be a joint venture between Whitewood Development Corp. (a wholly owned subsidiary of Homestake) and Goldstake Explorations.

Homestake made a major acquisition during the year when its stockholders approved the issue of 37.2 million common shares to acquire International Corona Corp., a publicly traded Canadian gold producer. The merger reportedly made Homestake the largest gold producer in North America, with about 57 mt (1.845 million tr oz) of gold produced in 1992, and the third largest holder of gold reserves with a combined reserve of approximately 622 mt of gold.

The two companies have four of the world's most productive gold mines: Homestake in South Dakota; Hemlo in Ontario; Round Mountain in Nevada; and Kalgoorlie in Australia.

The 1992 Annual Report of Wharf Resources Inc., operators of the Wharf Mine complex 8 kilometers (5 miles) west of Lead, listed a slight increase in gold production in 1992 to 2,958 kg (95,092 tr oz). According to the company report, about 3.4 million mt (3.7 million st) of ore with an average grade of 0.93 g per mt (0.033 tr oz per st) was processed during 1992. Severance taxes and royalties paid amounted to $22 per tr oz, down from $27 per tr oz in 1991. The mine reached a historic milestone during the year when it produced its 15,552d kg (500,000th tr oz) of gold. Regulatory approval was received from the State during the year to increase the annual mining rate by 12% to 4.08 million mt (4.5 million st).

Mining of the Annie Creek pit was completed in 1992, and the pit is now being backfilled with waste rock from other pits at the mine. Use of mined out pits for waste rock disposal is part of the reclamation plan for the Wharf Mine and will limit the need to disturb additional land areas for disposal of waste rock.

Wharf Resources' Annual Report cited continuing efforts at improving productivity and achieving a lower stripping ratio at the mine, resulting in a 12% reduction of the cash production costs to $183 per tr oz while gold production increased by 2%. Total cost per troy ounce was $259, down from $296 in 1991.

Overall leach pad capacity was increased by 20% to 6.44 million mt (7.1 million st) by partially filling in the areas between the four separate leach pads, making better use of the available space for leaching. The mine now uses buried drippers on each lift of the leach heaps, resulting in improved winter production, lower cyanide consumption, and less surface ponding. Overall gold recovery from the leach pads is about 79%.

Over the past 3 years, exploration activities outside the existing permitted mining area has resulted in a 49% increase in the mine's reserves and could extend the mine life by 5 years, according to the company. Wharf Resources' Annual Report listed total reserves at the end of 1992 at more than 32,000 kg (1.029 million tr oz) of gold within the permitted area and 26,687 kg (858,000 tr oz) outside the permitted area in the Clinton Project. More than 99% of Wharf Resources reserves are on patented claims, according to the company's 1992 annual report.

The process of permitting the Clinton Project area, where the new reserves were located, was begun late in the year and was expected to take 2 years to complete.

Late in 1992, Wharf Resources commissioned a $2.2 million wastewater treatment plant at the mine. According to the company, the plant is designed to remove dissolved nitrates from the spent ore dumps and is the first of its kind in North America.

According to Wharf Resources' Annual Report, despite higher gold production and lower production costs, the mine lost money during the year because of low gold prices and the $1.667 million set aside to cover expected costs associated with an EE/CA study on the proposed Annie Creek tailings Superfund site.

Management of the Golden Reward Mine, adjacent to and east of the Wharf Mine, changed hands during the year when Wharf Resources completed the purchase of 60% of the mine stock from MinVen Gold Corp. in October. Wharf Resources purchased the shares for $21.25 million and loaned MinVen $2 million, repayable over 3 years.

MinVen Gold Corp.'s 1992 Annual Report showed that during 1992, the Golden Reward Mine's first full year of commercial production, the mine processed 1.9 million mt (2.127 million st) of ore with an average grade of 1.07 g per mt (0.038 tr oz per st) to recover 1,290 kg (51,135 tr oz) of gold and 2.1 mt (67,712 tr oz) of silver. Wharf Resources' 1992 Annual Report indicated the company's share of gold production from October 8 to December 31, 1992, was 203 kg (6,534 tr oz) and MinVen's share for the full year was 775 kg (24,909 tr oz). The remaining 613 kg (19,692 tr oz) apparently went to former joint-venture partner United Coin Ltd.

MinVen Gold Corp.'s 1992 Annual Report showed cash costs at the Golden Reward Mine, including royalties and exploration costs, were $398 per tr oz compared with $269 in 1991. Higher stripping ratios and an extensive drilling program were cited as reasons for the jump in cash costs. Operations at the mine were adversely affected by lower than expected gold ore grades and a lack of continuity in the deposit. It was determined by the operating company that developmental drilling information had been inadequate and additional drilling was undertaken.

MinVen's 1992 Annual Report cites proven and probable reserves for the Golden Reward property of more than 7 million mt (7.88 million st) with an average gold grade of 1.2 g per mt (0.043 tr oz per st). Defined mineral deposits within the permitted mine area were cited as containing 3.7 million mt (4.1 million st) with an average gold grade of 1.24 g per mt (0.044 tr oz per st). Outside the permitted mine area, on contiguous acreage controlled by Golden Reward, another 19.57 million mt (11.656 million st) has been defined with a similar ore grade.

Several lawsuits involving the Golden Reward Mine were settled during the year. One involved a payment of $850,000 to MinVen by the design/construction company involved with a failed heap-leach pad. The supplier of a malfunctioning spent ore reclaimer paid MinVen $1.0 million and forgave a $400,000 debt. A dispute over royalty payments with LAC Minerals Ltd. also was settled.

LAC Minerals Ltd.'s, operator of the Richmond Hill Mine, Annual Report for 1992 reported production from the mine at 945 kg (30,373 tr oz) gold and 1.13 mt (36,453 tr oz) of silver from 1.02 million mt (1.1 million st). The average mill head ore grade was 0.76 g per mt (0.027 tr oz per st). Cash production costs were listed at $302 per tr oz with total mine site costs of $510 pe tr oz.

Exploration activities in the mine area were not successful in developing additional reserves, and the company expected to complete mining of the deposit late in 1992 or early in 1993. Treatment of stockpiled ore is expected to continue over the next 2 years. Probable reserves at the mine were listed in LAC Minerals' Annual Report at only 251,300 mt (277,000 st) with an average gold ore grade of 1.7 g per mt (0.06 tr oz per st).

The company encountered problems last year when excessive precipitation resulted in acid mine drainage that spilled into a dry creek bed. Early in 1992, State DENR inspectors detected sulfide waste rock in a valley fill waste depository and subsequent inspections detected acid mine drainage from the dumps. The State has proposed fines in excess of $400,000 as a result of the incident. As required by the State, the company filed an amendment to its reclamation plans to detail how the company will deal with the long-term problem of acid mine drainage. LAC Minerals is treating the drainage with soda ash and crushed limestone to neutralize the water. The State DENR halted new mining and waste rock dumping in July and issued two Notices of Violation in December. An additional $132,000 bond was required by the State to cover expected additional reclamation costs and more bonds may be required to cover long-term reclamation costs associated with acid mine drainage. The bond is separate from the company's original $1.2 million reclamation bond.

The State's move to stop new mining at Richmond Hill in July moved up the company's plan to close the mine late in 1992 by 6 months.

MinVen Gold Corp.'s (parent company of Brohm Mining Corp.) 1992 Annual Report showed 1992 production at the Gilt Edge Mine to have been 835 kg (26,836 tr oz) of gold and 1.4 mt (45,210 tr oz) of silver recovered from 701,064 mt (772,778 st) of ore. The Annual Report also stated that cash production costs were $308 per tr oz compared with $389 per tr oz in 1991. The parent company report indicated mining at Gilt Edge will cease early in 1993 owing to exhaustion of permitted oxide reserves. Heap leaching of mined ore will continue through mid-1993.

In August, mine operators received permission from the State to conduct a small-scale bulk test to heap-leach approximately 36,288 mt (40,000 st) of sulfide gold ore. The test is unique for two reasons. Brohm is attempting to do what no other mining operation in the Black Hills has been able to do—successfully leach sulfide-bearing gold ore.

Although relatively cheap, the process has never proven effective in recovering enough gold to be economical. Cyanide used in the heap-leaching process tends to bond with the sulfates in sulfide ore, rather than with the gold. To counter that tendency, Brohm is crushing the ore much finer than the oxidized ore and is adding an agglomeration compound to the sulfide ore to help the cyanide solution seep through the heap. The heaps also will be allowed to soak for longer periods of time, allowing cyanide to permeate the ore more efficiently. Another reason the test is unique is that if it is successful, it will provide useful information on how to neutralize sulfide ores, information that can be used by other mines in the area to address acid rock drainage problems. Brohm has experimented with adding about 68 kg (150 pounds) of crushed limestone to every 0.9 mt (1 st) of sulfide-bearing gold ore to neutralize acids.[12] The company must be able to convince the State DENR that the sulfides can be neutralized safely before there is any possibility of getting State permits for a full-scale operation.

If test results prove a recovery rate of better than 55% can be achieved, the company planned to pursue necessary permits to allow it to mine and process about 17 million mt (18.75 million st) of currently defined sulfide gold ore.

The company expected capital costs of developing the sulfide ore would be minimal due to maximum usage of existing facilities. If, however, the bulk testing does not prove successful, a substantial portion of the company's remaining $16.7 million investment in the Gilt Edge Mine could be in jeopardy, according to MinVen Gold Corp.'s Annual Report. Although sulfide ore can be treated by other methods, the capital investment required to convert the mine facility would be prohibitive for the financially strapped company.

MinVen's 1992 Annual Report indicated Wharf Mining had defined, but not permitted, 5.56 millon mt (6.13 million st) of oxide ore with a gold grade of 0.76 g per mt (0.027 tr oz per st) and a stripping ratio of 1.11:1. The 17 million mt of sulfide proposed for heap leaching at the Gilt Edge Mine has an average gold grade of 0.99 g per mt (0.035 tr oz per st). An additional 24 million mt (26.4 million st) of contiguous sulfide mineralization, with an average gold grade of 1.13 g per mt (0.04 tr oz per st), has been classified as indicated.

In November, the EPA issued a Compliance Order alleging discharge of pollutants at the mine into two small streams. The company submitted an interim compliance plan for EPA's approval and applied for a point source NPDES permit. MinVen expected future environmental compliance costs could be increased by $180,000 annually and that the costs of modifying existing facilities to meet the anticipated revised compliance standards could cost as much as $522,000.

Continuing concerns about the possibility of acid rock drainage (ARD) prompted the State DENR to require that Brohm submit a comprehensive ARD mitigation plan for the Gilt Edge Mine by June 1993.

Dakota Placers Inc. did not report any gold production to the State for 1992. The company produced 3.8 kg (122 tr oz) of gold in 1991 when it processed alluvial deposits along Whitewood Creek near Deadwood.

In September, The Tinton Partners of Lake Forest, IL, filed a "Request for Determination of Special, Exceptional, Critical, or Unique Lands and Notice of Intent to Operate" with the State DENR. Company paperwork filed with the State indicated the company planned to conduct mining on placer deposits in the historic Tinton mining district in western Lawrence County. The company listed

gold, tin, tantalum, and other precious-metal resources as the targeted metals for recovery.

Mining activities, as proposed in the Notice of Intent, would consist of a hydraulic excavator used to remove about 0.9 meter (3 feet) of material from the streambeds over an area from 3 meters to 12 meters (10 feet to 40 feet) wide and over distances from 274 meters to 914 meters (900 feet to 3,000 feet) along the streambeds of four gulches in the area. A determination by the State of the "Special, Exceptional, Critical, or Unique" qualities of the area was expected early in 1993.

Iron Ore.—Pete Lien and Sons produced iron ore (low-grade hematite) from a pit near Nemo in Pennington County. Eight employees work at the mine, which was operated intermittently during 1992. The ore was used by the South Dakota Cement Plant in Rapid City as an ingredient in cement manufacturing. Although production figures are concealed, production and value figures reported to the USBM decreased significantly from those reported in 1991. The State, however, remained the fourth largest producer of iron ore of nine States reporting production.

Industrial Minerals

The State's industrial minerals sector produced or processed 10 different industrial minerals. The top three, which accounted for more than 23% of the total nonfuel mineral value, were sand and gravel, stone, and lime.

Cement.—All cement manufactured in South Dakota came from the State-owned plant in Rapid City. Production of portland and masonry cement at the plant decreased for the second year but remained second only to gold production in value. Declining demand for portland cement was a direct reflection of a sluggish construction industry in western South Dakota.

Mineral resources used in the manufacturing of cement at this plant included clay, gypsum, iron ore, and limestone. The plant has three kilns, two wet and one dry process. The plant has a finish grinding capacity of 1.36 million mt (1.5 million st).[13] USBM data[14] indicate cement shipments in South Dakota during 1992 amounted to 645,746 mt (711,801 st) of finished portland cement and 3,666 mt (4,041 st) of prepared masonry cement.

Clays.—The South Dakota Cement Commission mined common clay in Pennington County for use in cement manufacturing. Production decreased slightly in both quantity and value, returning to levels reported in 1990. The decline in clay production was a direct result of decreased cement production.

Pete Lien and Sons (Dakota Block Co.) received a small-scale mining permit from the State for a shale mine in Pennington County. According to the permit application, the company planned to produce about 21,773 mt (24,000 st) per year during the 30-year life of the mine. The clay will be used primarily in production of concrete blocks.

American Colloid Co. processed bentonite mined in Wyoming at a mill near Belle Fourche, Butte County. The milling operation employed about 75 people.

The Oglala Sioux Tribe continued to look at the possibility of mining zeolites on the Pine Ridge Reservation, Shannon County. The tribe voted down a proposal to mine the mineral 6 years ago but appears to be willing to look at proposals again because it would boost economic development and employment on the reservation, perennial problems for the tribe. One proposal under consideration by the tribe is to mine the potassium- and calcium-rich mineral (clinoptilolite) and mix it with phosphate mined by the Shosone-Bannock Tribe at Fort Hall, ID, to make fertilizer. Another possibility is for the tribe to mine the clay to make bricks or pottery.

Feldspar.—For the fourth year in a row feldspar production decreased, both in quantity and value. Production decreased by 25% from that reported in 1991. Pacer Corp. of Custer was the sole processor of the hand-cobbed feldspar from pegmatite deposits in Custer County. South Dakota was one of only seven States reporting feldspar production in 1992.

Gemstones.—Rose quartz was the only gemstone of note produced in South Dakota. The rose quartz deposits in Custer County are perhaps the best known and largest sources in the United States. Other gemstones collected in limited quantities in the State included apatite, beryl, spodumene, and tourmaline from pegmatite deposits in Custer and Pennington Counties; Fairburn agates from Custer, Fall River, Pennington, and Shannon Counties; moss agate from Harding County; and barite crystals from Meade County. White to gray alabaster that can be used for carving is found in Pennington County; red pipestone (catlinite) in Minnihaha County also is suitable for carving. Freshwater pearls have been recovered from the Vermillion River and Big Stone Lake, and amber has been found in lignite coalbeds in the northwestern part of the State.

Gypsum.—Crude gypsum was produced in Meade County by the South Dakota Cement Commission for use in cement manufacturing. Both quantity and value of production increased significantly, 57% and 25%, respectively, from 1991 figures. The increases were not reflective of increased cement production because cement production went down. Increased production was probably the result of company stockpiling for future use.

Lime.—Pete Lien and Sons Inc. of Rapid City, Pennington County, was the sole producer of lime in the State. Although concealed, both production and value of quicklime and hydrated lime decreased from figures reported for 1991.

Pete Lien & Sons installed and tested a new air pollution control unit in a vertical lime kiln during the year. During testing, the new unit reportedly

TABLE 2

SOUTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1992, BY MAJOR USE CATEGORY

Use	Quantity (thousand short tons)	Value (thousands)	Value per ton
Concrete aggregates (including concrete sand)	924	$3,962	$4.29
Plaster and gunite sands	14	47	3.36
Asphaltic concrete aggregates and other bituminous mixtures	743	2,727	3.67
Road base and coverings[1]	4,478	9,681	2.16
Fill	395	622	1.57
Snow and ice control	43	117	2.72
Unspecified:[2]			
Actual	1,058	3,347	3.16
Estimated	623	1,684	2.70
Total	[3]8,279	22,187	2.68
Total[4 5]	7,511	22,187	2.95

[1]Includes road and other stabilization (cement and lime).
[2]Includes production reported without a breakdown by end use and estimates for nonrespondents.
[3]Data do not add to total shown because of independent rounding.
[4]One metric ton is equal to 1,000 kilograms or 2,204.62 pounds. To convert short tons into metric tons, multiply short tons by 0.907185.
[5]Total quantity and total value in thousand metric tons and thousand dollars.

reduced emissions from the kiln from 16.8 kg (37 pounds) of dust per hour to 0.17 kg (0.38 pounds) per hour. Although point sources for dust in Rapid City have not been identified, actions such as this taken by Pete Lien and Sons can only help improve air quality in the city.

Mica.—Mica production and value both decreased significantly in 1992, continuing a 4-year downward trend. Of the five States reporting scrap mica production, South Dakota was the smallest producer. Pacer Corp. of Custer accounted for the entire State output with scrap mica produced from pegmatites in Custer County.

Sand and Gravel (Construction).—Construction sand and gravel production is surveyed by the USBM for even-numbered years only: data for odd-numbered years are based on annual company estimates. This chapter contains actual data for 1990 and 1992 and estimates for 1991.

South Dakota construction sand and gravel statistics are compiled according to geographical districts as depicted on the State map. Most of the production was from District 4 where population density and large highway construction projects were responsible for a higher than usual demand for sand and gravel.

Construction sand and gravel output decreased more than 14% from that of 1990, the last year of actual data, and was the third highest valued mineral commodity produced in the State in 1992.

State DENR files indicated there were 1,900 licensed sites for production of sand and gravel with permits held by 364 operators.

According to information submitted to the USBM, leading counties in terms of production were Mellette, Codington, Minnehaha, and Pennington. Companies reporting the most production to the USBM were Dakota Road Builders Inc.-Rupp Construction Co., Brownlee Construction Co., Concrete Materials-Sweetman Construction, Pete Lien and Sons-Birdsall Sand & Gravel Co., Fisher Sand & Gravel Co., Myrl & Roy's Paving Inc., and Spencer Quarries Inc. These 7 operators had 61 pits at 20 operations. Statewide, 115 operators reported production from 272 pits at 149 operations. Average unit value for all production was $2.68 per st. Reported values ranged from $5.60 down to $1.09 per st. Major use categories and unit values are shown in table 2. Use by district is shown in table 3.

Stone.—Stone production is surveyed by the USBM for odd-numbered years only: data for even-numbered years are based on annual company estimates. This report contains estimates for 1990 and 1992 and actual data for 1991.

Crushed.—Crushed stone production represents the fourth highest value mineral commodity produced in the State. USBM estimates for 1992 are based on responses to quarterly surveys from five companies representing 67% of production. Granite, limestone, quartzite, and sandstone were produced in 1992. Estimated production and value for 1992 both decreased slightly compared with 1991 when actual data were collected. Counties leading in crushed stone production in 1991 were Minnehaha, Pennington, and Hanson. Major uses of the crushed stone were in concrete aggregate, cement manufacturing, lime manufacturing, and graded roadbase.

Dimension.—South Dakota ranked sixth of 34 States in dimension stone production. Production during 1992 was estimated to have remained at about the same level as reported in 1991. Milbank Granite, a dark to medium red granite found in the northeastern part of the State, has been quarried continuously since 1907 and is the major source of dimension stone in the State. Three companies, Cold Springs Granite Co., Dakota Granite Co., and Georgia Stone Industries Inc., produced dimension stone from eight quarries in Grant County. Most of the production was used as monument stone, building stone veneer, steps, and floor tile.

During 1992, Dakota Granite applied to the State DENR to convert three small-scale mining permits in Grant County to a single large-scale mine permit. The conversion would allow the operations to exceed the 10-acre and 22,680-mt (25,000-st) limits placed on small-scale

TABLE 3

SOUTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED BY PRODUCERS IN 1992, BY DISTRICT AND USE

(Thousand short tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)	W	W	109	511	W	W	397	1,392
Plaster and gunite sands	—	—	9	21	—	—	5	26
Asphaltic concrete aggregates and other bituminous mixtures	331	987	W	W	W	W	182	1,100
Road base and coverings[1]	1,288	2,866	816	1,667	732	1,420	1,642	3,728
Fill	W	W	W	W	59	113	297	445
Snow and ice control	3	16	3	6	6	10	31	85
Other miscellaneous uses	224	1,291	63	144	400	1,329	—	—
Unspecified:[2]								
Actual	95	262	68	111	429	1,252	466	1,722
Estimated	258	672	75	194	275	759	14	59
Total[3]	2,200	6,094	1,144	2,654	1,901	4,882	3,034	8,557
Total[4 5]	1,996	6,094	1,038	2,654	1,725	4,882	2,752	8,557

W Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous uses."
[1]Includes road and other stabilization (cement and lime).
[2]Includes production reported without a breakdown by end use and estimates for nonrespondents.
[3]Data may not add to totals shown because of independent rounding.
[4]One metric ton is equal to 1,000 kilograms or 2,204.62 pounds. To convert short tons into metric tons, multiply short tons by 0.907185.
[5]Total quantity and total value in thousand metric tons and thousand dollars.

mining operations. At yearend, no action had been taken to approve or deny the permit.

Cold Springs Granite, the largest granite producer in the world with 30 quarries and 5 plants across the United States and Canada, produced about 60% of its monument granite from South Dakota quarries. The company looked at the possibility of expanding its monument stone operation at Milbank, but no decision was announced during the year.[15]

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[1]Mining engineer, U.S. Bureau of Mines, Denver, CO. She has 17 years of mineral-related work with the government.

[2]Geologist, South Dakota Geological Survey, Vermillion, SD.

[3]Durkin, T. V. State Activities 1992, South Dakota. Min. Eng., May 1992, pp. 475-476.

[4]South Dakota Dep. of Environment and Natural Resources. Water and Environment Today. Summer 1992, Vol. 6, No. 2, p. 9.

[5]———. Summary of the Status of the Large Scale Gold and Silver Surface Mining Industry in the Black Hills for the Year 1992. Feb. 1993, 20 pp.

[6]South Dakota School of Mines & Technology. South Dakota Mining & Mineral Resources Research Institute, Annual Status and Final Report-1993. U.S. Bureau of Mines Grant No. G1124246.

[7]Petroleum Information. Resume 1992.

[8]Reference cited in footnote 3.

[9]Reference cited in footnote 3.

[10]Reference cited in footnote 5.

[11]Reference cited in footnote 5.

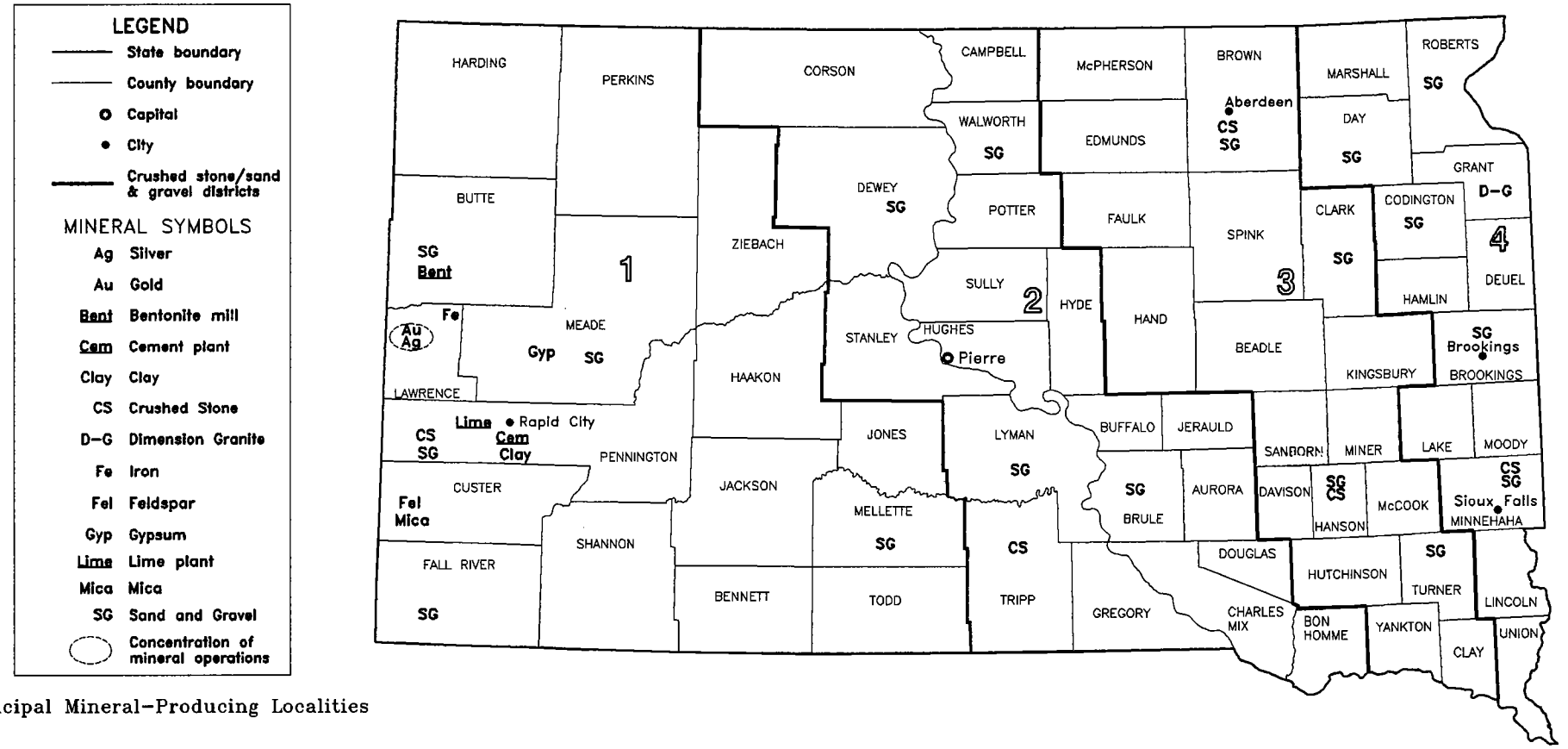
[12]Rapid City Journal. Nov. 24, 1992.

[13]Portland Cement Association. U.S. & Canadian Portland Cement Industry: Plant Information Summary. p. 65

[14]U.S. Bureau of Mines. Cement. Mineral Industry Surveys, Dec. 1992, p. 3.

[15]Daily Times (St. Cloud, MN). Dec. 23, 1992.

SOUTH DAKOTA



Principal Mineral–Producing Localities

TABLE 4
PRINCIPAL PRODUCERS

Commodity and company	Address	Type of activity	County
Cement:			
South Dakota Cement Commission	Box 360 Rapid City, SD 57709	Plant	Pennington.
Clays:			
South Dakota Cement Commission	do.	Open pit mine	Do.
Feldspar:			
Pacer Corp.	Box 912 Custer, SD 57730	Open pit mines and dry-grinding plant	Custer.
Gold:			
Bond Gold-Richmond Hill Inc., a subsidiary of LAC Minerals Ltd.[1]	Box 892 Lead, SD 57754	Open pit and leach pads	Lawrence.
Brohm Mining Corp., a division of MinVen Gold Corp.[1]	Box 485 Deadwood, SD 57732	do.	Do.
Golden Reward Mining Co., a joint venture of Wharf Resources (U.S.A.) Inc. and MinVen Gold Corp.[1]	Box 888 Lead, SD 57754	do.	Do.
Homestake Mining Co.[1]	Box 875 Lead, SD 57754	Underground mine and open pit, cyanidation mill, gravity separation, refinery	Do.
Wharf Resources (U.S.A.) Inc.[1]	Box 897 Lead, SD 57754	Open pit and leach pads	Do.
Gypsum:			
South Dakota Cement Commission	Box 360 Rapid City, SD 57709	Open pit mine	Meade.
Iron ore:			
Pete Lien and Sons Inc.	Box 440 Rapid City, SD 57709	do.	Lawrence.
Lime:			
Pete Lien and Sons Inc.	do.	Plant	Pennington.
Mica:			
Pacer Corp.	Box 912 Custer, SD 57730	Mine and dry-grinding plant	Custer.
Sand and gravel (construction):			
Birdsall Sand & Gravel Co., a division of Pete Lien and Sons Inc.	Box 767 Rapid City, SD 57709-0767	Pits and plants	Fall River, Pennington, Sully.
Brownlee Construction Co.	717 South Broadway Watertown, SD 57201	do.	Codington.
Dakota Road Builders Inc. (Rupp Construction Co.)	Box 1 Schyton, SD 56172	do.	Millette.
Fisher Sand & Gravel Co.	Box 1034 Dickinson, ND 58602	do.	Butte and McPherson.
Myrl & Roy's Paving Inc.	1300 North Bahnson Sioux Falls, SD 57103	do.	Lincoln and Minnehaha.
Spencer Quarries Inc.	Box 198 Spencer, SD 57374	Pit	Hanson.
Sweetman Construction Inc.	Box 84140 Sioux Falls, SD 57118	Pits and plant	Minnehaha, Roberts, Yankton.
Stone:			
Crushed:			
Limestone:			
Pete Lien and Sons Inc.	Box 440 Rapid City, SD 57709	Quarry and plant	Pennington.

See footnotes at end of table.

TABLE 4—Continued

PRINCIPAL PRODUCERS

Commodity and company	Address	Type of activity	County
Stone—Continued:			
Crushed—Continued:			
Limestone—Continued:			
Northwestern Engineering Co. (Hills Materials Co.)	Box 2320 Rapid City, SD 57709	Quarries and plants	Pennington.
South Dakota Cement Commission	Box 360 Rapid City, SD 57709	Quarry and plant	Do.
Sandstone-quartzite:			
L. G. Everist Inc.	Box 829 Sioux Falls, SD 57117	do.	Minnehaha.
Spencer Quarries Inc.	Box 198 Spencer, SD 57374	do.	Hanson.
Sweetman Construction Co.	Box 84140 Sioux Falls, SD 57118	do.	Minnehaha.
Dimension, granite:			
Cold Spring Granite Co.	202 South 3d Ave. Cold Spring, MN 56320	Quarries and plant	Grant.
Dakota Granite Co.	Box 1351 Milbank, SD 57252	do.	Do.

[1]Also silver.

MINERAL-RELATED GOVERNMENT AGENCIES

FEDERAL

U.S. Department of the Interior
Bureau of Mines
Denver Regional Office of State Activities
Eileen K. Peterson
Bldg. 20, Denver Federal Center
Denver, CO 80225-0086
Telephone: (303) 236-0435

U.S. Department of the Interior
Bureau of Land Management
Thomas Lonnie, Deputy State Director for Mineral Resources
Box 36800
Billings, MT 59107
Telephone: (406) 255-2805

U.S. Department of Labor
Mine Safety and Health Administration
Rodric M. Breland, District Manager
Rocky Mountain District Office
Metal and Nonmetal Mine Safety and Health
Box 25367, Denver Federal Center
Denver, CO 80225-0367
Telephone: (303) 231-5465

U.S. Forest Service
Region I (Custer National Forest)
Lands and Minerals
Charles E. Wassinger, Director
Box 7669
Missoula, MT 59807
Telephone: (406) 329-3595

U.S. Forest Service
Region II (Black Hills National Forest)
Watershed, Soils, and Minerals
Charles Hendricks, Director
Box 25127
Lakewood, CO 80225
Telephone: (303) 236-9467

STATE

South Dakota Cement Commission
David O'Brien, Chairman
Box 360
Rapid City, SD 57709
Telephone: (605) 394-5200

South Dakota Department of Environment and Natural Resources
Robert E. Roberts, Secretary
523 East Capitol
Joe Foss Bldg.
Pierre, SD 57501
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South Dakota Geological Survey
Cleo Christensen, State Geologist
Science Center, 414 Clark
University of South Dakota
Vermillion, SD 57069
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South Dakota School of Mines and Technology
Richard J. Gowen, President
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South Dakota School of Mines and Technology
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