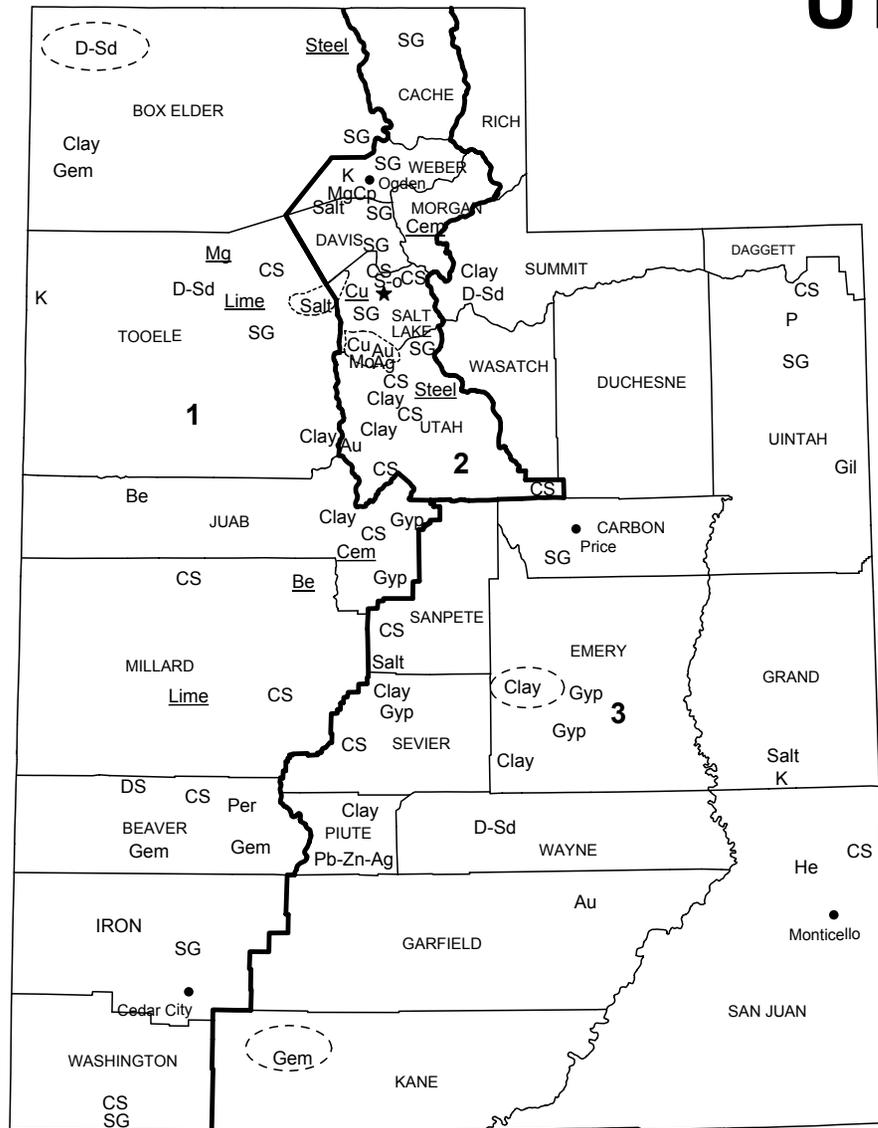


UTAH



LEGEND

- County boundary
 - ★ Capital
 - City
 - 1** — Crushed stone/sand and gravel districts
- ### MINERAL SYMBOLS (Major producing areas)
- Ag Silver
 - Au Gold
 - Be Beryllium
 - Be Beryllium plant
 - Cem Cement plant
 - Clay Common clay
 - CS Crushed stone
 - Cu Copper
 - Cu Copper plant
 - D-Sd Dimension sandstone
 - DS Dimension stone
 - Gem Gemstones
 - Gil Gilsonite
 - Gyp Gypsum
 - He Helium
 - K Potash
 - Lime Lime plant
 - Mg Magnesium metal plant
 - MgCp Magnesium compounds
 - Mo Molybdenum
 - P Phosphate rock
 - Pb-Zn-Ag Lead-zinc-silver
 - Per Perlite
 - S-o Sulfur (oil)
 - Salt Salt
 - SG Construction sand and gravel
 - Steel Steel plant
 - Concentration of mineral operations

Source: Utah Geological Survey/U.S. Geological Survey (2002)

THE MINERAL INDUSTRY OF UTAH

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

In 2002, the estimated value¹ of nonfuel raw mineral production for Utah was \$1.23 billion, based upon preliminary U.S. Geological Survey (USGS) data. This was about a 10% decrease from that of 2001² and followed a 5% decrease from 2000 to 2001. The State was 10th in rank (8th in 2001) among the 50 States in total nonfuel mineral production value, of which Utah accounted for more than 3% of the U.S. total.

Metals accounted for about 58% of Utah's nonfuel mineral production value, with copper being more than one-half of the State's entire metal value. In 2002, the most significant changes in value were in the metals sector; copper and gold production were down with a combined \$160 million drop in value; silver production and value also was down. This was offset somewhat by an increase in the production and resulting value for magnesium metal, up \$22 million, while the value of molybdenum concentrates held even with that of 2001. In industrial minerals, the production and values of potash and construction sand and gravel were up, \$10 million and \$9 million, respectively; the values of portland cement and lime also were up. The only significant industrial mineral decreases in value were those of salt, common clay, crushed stone, and dimension stone (descending order of change) (table 1).

In 2001, the largest increases were those of salt, up \$13 million, magnesium compounds, up about \$9 million, and gold, up about \$3 million. Also significantly up was bentonite; its value doubled from that of 2000. The State's drop in value resulted mostly from decreases in the values of copper, down more than \$40 million, magnesium metal, down more than \$25 million, and molybdenum concentrates, down about \$10 million. Decreases also occurred in the values of phosphate rock and potash, down about \$5 million each (table 1).

Based upon USGS estimates of quantities produced in the 50 States during 2002, Utah remained the only State to produce beryllium concentrates. It ranked second in copper, gold, and magnesium compounds; second of two magnesium-metal-producing and three potash-producing States; third in molybdenum concentrates; fourth of four States that produce phosphate rock; fifth in bentonite; and sixth in salt. The State was tied for third (from fourth in 2001) in perlite, it rose to fourth from fifth in the production of silver, and it dropped to ninth from fifth for gemstones. Additionally, the State was a significant producer of construction sand and gravel, portland cement, lime, and common clays.

The Utah Geological Survey³ (UGS) provided the following narrative information. UGS production data are based upon its surveys, estimates, and information gathered from company annual reports. These data may differ from some USGS preliminary estimates and final production figures, which are based upon USGS company surveys and estimates.

Exploration and Development Activities

During 2002, the Utah Division of Oil, Gas and Mining (DOG M) received 5 large mine permit applications [2 hectares (ha) and larger disturbance] and 20 new small mine permit applications (less than 2 ha disturbance). The large mine permit applications were for four industrial mineral mines and one base and precious metal mine. Two of the large mine permit applications were made to change from a small mine permit to a large mine permit, and three applications were for new mines. The 20 small mine permit applications were for 16 industrial mineral mines, two base-metal and precious-metal mines, one oil recovery site (oil shale), and one gemstone and fossil site. These numbers represent a decrease of 12 small mine permit applications and no change in the number of large mine permit applications compared with that of 2001.

Exploration for base metals, precious metals, and industrial minerals remained at a low level in 2002. DOGM received only 11 new notices of intent (NOIs) to explore, the lowest level in the past 10 years. Six were for precious metals (one unspecified but likely precious metals), two for base metals, and three for industrial minerals. Four of the base and precious metal NOIs were from individuals, and four were from small to medium-sized companies. New mine development was also depressed, and several planned operations were on hold awaiting financing. Work at most developing operations was confined to clearing and rehabilitating existing workings and/or limited sampling and test mining.

After several delays because of environmental challenges, U.S. Department of the Interior review, and corporate restructuring, Constellation Copper Corp. planned to proceed with construction of a mine and mill complex on its Lisbon Valley copper property,

¹The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or 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 2002 USGS mineral production data published in this chapter are preliminary estimates as of July 2003 and are expected to change. For some mineral commodities, such as construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Specialist contact information may be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals/contacts/comdir.html>; alternatively, specialists' names and telephone numbers may be obtained by calling USGS information at (703) 648-4000 or by calling the USGS Earth Science Information Center at 1-888-ASK-USGS (275-8747). All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals>.

²Values, percentage calculations, and rankings for 2001 may differ from the Minerals Yearbook, Area Reports: Domestic 2001, Volume II, owing to the revision of preliminary 2001 to final 2001 data. Data for 2002 are preliminary and are expected to change; related rankings may also change.

³Robert Gloyn, Senior Geologist, and Roger Bon, Industry Outreach Specialist, at the Utah Geological Survey authored the text of the State mineral industry information provided by that agency.

subject to arranging appropriate financing. The property was permitted, and a revised and updated feasibility study was completed using copper sales prices ranging from \$1.65 to \$1.98 per kilogram (\$0.75 to \$0.90 per pound). Announced reserves are 33.3 million metric tons (Mt) at an average grade of 0.514% copper in three separate open pit areas.

Western Utah Copper Co. (WUCC) was active during 2002 in the San Francisco, Beaver Lake, and Rocky mining districts in west-central Beaver County. WUCC assembled a large property position including the patented and unpatented claims held by Nevada Star Resources Corp., the patented Cactus claim block held by Horn Silver Mines, Inc., and other claims and leases. During the year, WUCC did planning and permitting work in contemplation of resumption of mining at the Maria deposit in the Rocky district and the Cactus deposit in the San Francisco district.

Franconia Minerals Corp. also was active in the San Francisco district in the Horn Silver-King David area. The exploration targeted manto and structurally controlled sulfide and zinc-rich oxide ores at depth, along strike, and west of the known resource and earlier mining. Work completed in 2002 consisted of data compilation from old maps and reports, underground mapping and sampling of accessible workings, a modified Mise-a-la-Masse geophysical survey, and drilling three diamond coreholes of a proposed four-hole program. Drill results were encouraging.

Several companies were active in the Gold Hill-Clifton district in western Tooele County. In mid-December 2002, Clifton Mining Co. announced it had signed an option agreement with Dumont Nickel, Inc. for a multiyear program to explore the Cane Springs and other properties in the district held by Clifton Mining and Woodman Mining Co. (more than 50% owned by Clifton Mining). Dumont Mining Co. (a wholly owned subsidiary of Dumont Nickel, Inc.) was formed to conduct the exploration. Initial exploration will concentrate on the high-grade Cane Springs Mine with an initial 610 meter (m) drilling program scheduled to begin in early 2003. The Cane Springs Mine was a gold-copper skarn deposit in garnet-wollastonite marble; historical ore grades at the mine were 17.1 to 34.3 grams per metric ton (g/t) gold. Dumont was also planning to evaluate the "Clifton shears" (Herat Mine), and anticipated up to 1,525 m of drilling to test the downdip continuation of the ore zone. The "Clifton shears" were a series of gold, silver, lead, and copper-bearing fissure veins and shear zones in quartz monzonite. Previous surface and underground sampling indicated an average grade of 1.3 g/t gold, 285 g/t silver, and 5.6% lead for the veins and mineralized shear zones. Metallic Ventures, Inc. acquired several properties in the district. Its main focus was high-grade vein and replacement deposits with a secondary emphasis on lower grade, surface minable, disseminated deposits.

Unico resumed work on its properties in the Bromide Basin area in eastern Garfield County in late April 2002. Work included cleaning, rehabilitating, and sampling several existing tunnels and adits. Several hundred tons of ore was mined during 2002 mostly as a consequence of rehabilitating the two adits and exposing the Turner-Kimball vein. Most of the ore in Bromide Basin is in high-grade veins and breccia pipes at structural intersections along the veins. The gold-copper-silver-bearing veins are 0.6 to 1.5 m wide with gold values generally greater than 34.3 g/t. The recently discovered New vein, located east of the Bromide vein, is similar to others in the area and surface samples average 42 g/t gold and 26 g/t silver. In March 2002, Unico announced a resource estimate of 136,000 t containing 11.6 t of gold. This resource estimate is only for four veins/structures (Bromide, Crescent, Henrietta, and Turner-Kimball) and does not include the recently discovered New vein or other known veins in the area.

Unico was also active at its Deer Trail mine in central Piute County. During 2002, the company continued to develop the 3400 area along the PTH tunnel level. Several thousand tons of ore was mined from two manto deposits on the PTH level, and a 56-m development raise was driven to develop the upper parts of the ore bodies.

In March 2002, Unico announced a resource estimate for the Deer Trail Mine of 1.66 Mt. More than half the tonnage was in Callville Limestone-hosted deposits in the 3400 area, and nearly one-fourth was in Toroweap Formation-hosted deposits in the 8600 area. The 3400 resource estimate includes three ore blocks: (1) a drill-indicated, proven and probable resource of 27,200 t, (2) a projected downdip resource of 109,000 t representing an extension to the southwest from the known 34 East mineralization, and (3) an inferred 900,000 t resource northwest of the PTH workings associated with the Red Fissure feeder zone. Average grades for the 136,000-t resource (1 and 2 above) are 8.9 g/t gold, 1,070 g/t silver, 4.6% lead, and 6.1% zinc. The 8600 resource includes an inferred resource of 450,000 t along the northwest extension of the Red Fissure, the main ore conduit, with an estimated grade of 3.4 g/t gold, 510 g/t silver, 5% lead, 12% zinc, and 0.5% copper. The total resource estimate also includes 169,000 t of tailings with an average grade of 1.4 g/t gold and 120 g/t silver. Additional resources not included in the above estimate are present in the area along additional fissures, including an area north of the 8600 area that assayed 240 g/t silver.

In the East Tintic district in Utah County, Chief Consolidated Mining Co., through its wholly owned subsidiary Tintic Utah Metals, operated the Trixie gold-silver-copper mine between January and late March 2002 when the mine experienced a cave-in that collapsed workings on and above the 600 level. No one was injured in the cave-in, but the mine was subsequently shut down, and no information has been released on when, if ever, it will resume production. Chief Consolidated wrote off its reserves from the Burgin Mine, also in the East Tintic district, currently estimated (proven and probable) at 971,000 t of ore at an average grade of 566 g/t silver, 21% lead, and 6.7% zinc. The writeoff was caused by the low probability of near-term production resulting from the difficult and expensive work required to bring the property into production and continued low metal prices.

Chief Consolidated subsequently entered into talks to restructure its debt and was attempting to maximize the value of its extensive real estate holdings in the district. The company owned approximately 7,810 ha in the Main and East Tintic districts. The company hired a real estate firm in August with approval to sell approximately 1,820 ha. In September, the company held talks with a number of shareholders to assist in developing a recapitalization plan. No announcements have been made concerning the recapitalization plan and/or future plans for the company. In spite of recent events, Chief still thinks potential exists in the district for discovery and development of significant ore deposits.

There were also several developments in the industrial minerals sector. In mid-2001, Atlas Mining Co. signed a lease/option agreement on the Dragon halloysite property in the southern part of the Tintic district, about 4 kilometers (km) south of Eureka.

During 2002, the mining plan was finalized, and the operation was permitted as a small, underground mine. In addition, the company drilled five short holes to verify earlier drill-indicated reserves in the northwestern part of the ore body. The drilling confirmed the earlier estimates. Current reserves remain at 270,000 t with potential for a total resource of 910,000 t. Mining was scheduled to begin in the summer of 2003.

U.S. Gypsum Co. received a permit for a new gypsum operation on the west side of the San Rafael Swell north of Interstate 70 in southern Emery County. The operation will be on a Utah School and Institutional Trust Lands Administration section. Three other gypsum mines were active in the area. The west side of the Swell was becoming the center of gypsum mining in Utah as gypsum deposits in the Sigurd area in Sevier County were depleted.

Commodity Review

Industrial Minerals

Bentonite and Clays.—Nearly 245,000 metric tons (t) of common clays and about 32,000 t of bentonite were produced by five companies in 2002, a 14% decrease in common clay and a 22% decrease in bentonite compared with that of 2001. Statewide, there were 12 active large mine permits and 11 active small mine permits held by clay operators in 2002. Many of these mines, both large and small, were operated intermittently. The three largest producers of common clay in 2002, in descending order, were Interstate Brick Co., Interpace Industries, and Paradise Management Co. Two companies (Western Clay Co. and Redmond Minerals, Inc.) produced bentonite from pits located in central Utah. More than 75% of all common clay was used in the manufacture of brick.

Crushed Stone and Sand and Gravel.—Crushed stone (including limestone and dolomite) and sand and gravel were valued at an estimated \$156 million in 2002, up from \$150 million in the previous year (table 1). These materials were produced in every county in Utah by commercial operators, and by Federal, State, and county agencies. Because of the large number and intermittent operation of producers, operators are not sent UGS production questionnaires.

Gilsonite.—Gilsonite production for 2002 was estimated to be about 59,000 t, about 4,500 t more than in 2001. Gilsonite is an unusual solid hydrocarbon that has been mined in Utah for more than 100 years. All of the gilsonite mines are near the town of Bonanza in eastern Uintah County. The three companies that produce gilsonite, in descending order of production, are American Gilsonite Co., Zeigler Chemical and Minerals Co., and Lexco, Inc. Gilsonite is marketed worldwide for use in more than 150 products ranging from printing inks to explosives. Gilsonite production has been relatively stable for the past several years.

Gypsum.—Six companies mined about 318,000 t of gypsum in 2002, nearly 45,000 t less than in 2001. In descending order of production, the companies are U.S. Gypsum Co., Georgia Pacific Corp., Nephi Gypsum, Inc., H.E. Davis and Sons, D.K. Gypsum Industries, and Western Clay Co. Both U.S. Gypsum and Georgia Pacific operated wallboard plants near Sigurd in Sevier County. The Georgia Pacific plant closed in 2002 and the company's mines in Utah were inactive. Wallboard manufacturing was shifted to the company's Las Vegas, NV, facility. The majority of gypsum produced in Utah was used for making wallboard, but several operators supplied raw gypsum to regional cement companies where it is used as an additive to retard the setting time of cement and to the agriculture industry for use as a soil conditioner.

Lime and Portland Cement.—Lime and portland cement had a combined value of \$159 million in 2002. Two operators produced portland cement in Utah—Holcim (US) Inc. (formerly Holnam, Inc.) and Ash Grove Cement Co. Holcim's Devil's Slide mine and plant is east of Morgan in Morgan County, and Ash Grove's Leamington mine and plant is east of Lynndyl in Juab County. The companies have a combined capacity of more than 1.4 Mt/yr of cement. Both plants operated near capacity in 2002, with total production slightly exceeding that of 2001. In addition to limestone, both Holcim and Ash Grove Cement mined modest amounts of shale and sandstone that are used in the manufacture of cement.

Lime production was about 3% higher in 2002 than in 2001. There were two suppliers of lime in Utah, with a combined capacity of more than 0.9 Mt/yr: Graymont Western U.S., Inc. (formerly Continental Lime Co.), which produced dolomitic lime and high-calcium lime, and Chemical Lime of Arizona, Inc., which produced dolomitic lime and hydrated lime. Both operations served markets in Utah and surrounding States. Graymont's plant was in the Cricket Mountains, approximately 56 km southwest of Delta in Millard County, and was one of the 10 largest lime plants in the United States. Chemical Lime's plant was about 13 km northwest of Grantsville in Tooele County.

Ten to twelve companies quarried about 2.1 Mt of limestone and dolomite in 2002, which was used mainly for construction and flue-gas desulfurization in coal-fired powerplants. A small amount of limestone and dolomite was also crushed to a fine power and marketed to the coal mining industry as "rock dust." The three largest suppliers of crushed limestone used for construction were Harper Construction Co. (one quarry in Salt Lake County), Valley Asphalt Co. (two quarries in Utah County), and Pelican Point Rock Products Co. (one quarry in Utah County).

Perlite.—Basin Perlite Co. mined perlite from its Pearl Queen and Schoo mines in central Beaver County and processed the material at its mill near Milford in Beaver County. Large-scale production began in 1996. The operation, begun by Pearl Queen Perlite Corp., was acquired by Basin Perlite in late 1999. The company increased production and developed additional products for sale. In 2002, the two mines produced 55,300 t of perlite, and 52,600 t were processed at the mill.

Phosphate.—SF Phosphates, Ltd. was Utah's only phosphate producer. The company's phosphate operation was 18 km north of Vernal in Uintah County. SF Phosphates is a partnership of Farmland Industries, Inc. and J.R. Simplot, Inc. The company mined 2.7 Mt/yr to 3.6 Mt/yr of ore, which was processed into 0.9 Mt to 1.8 Mt of phosphate concentrate. The concentrate was transported in

slurry form to the company's Rock Springs, WY, fertilizer plant via a 144-km-long underground pipeline. During 2002, the mine produced about 3.6 Mt of ore, its highest production in the past 11 years.

Salt and other brine-derived products (magnesium chloride and potash).—Brine-derived products, including salt, magnesium chloride, and potash (potassium chloride and sulfate of potash), had a combined value of about \$148 million. One company (North Shore Ltd. Partnership) produced a small amount of concentrated brine that was used as an ingredient in mineral food supplements. Statewide production in 2002 of salt and other brine-derived products, excluding magnesium metal, was estimated to be 3.34 Mt, about 160,000 t higher than in 2001. Potash production (including sulfate of potash) in 2002 was estimated to be about 318,000 t, about 18,000 t more than 2001.

Salt production alone was estimated to be 2.7 Mt in 2002, about 180,000 t more than in 2001. Most production was from three operators using brine from Great Salt Lake. These operators were, in descending order of production, IMC Kalium Ogden Corp. (formerly GSL Minerals), Cargill Salt Co., and Morton International, Inc. In addition, three other companies produced salt and/or potash from operations not located on Great Salt Lake. They were Reilly Chemical Co. at Wendover in Tooele County (potash), Moab Salt LLC near Moab in Grand County (salt and potash), and Redmond Minerals, Inc. near Redmond in Sanpete County (salt).

Shale.—Utelite, Inc. mined more than 180,000 t of shale in 2002 to manufacture “expanded shale” for use as a lightweight aggregate for the construction industry. The mine was located near the town of Wanship in Summit County. Production of “expanded shale” was approximately 10% higher in 2002 than that of 2001.

Metals

Beryllium.—Utah continued to be the Nation's sole producer of beryllium ore (bertrandite), which was mined at Brush Wellman Inc.'s Topaz and Hogs Back mines in Juab County and processed along with imported beryl at the company's plant a few miles north of Delta in Millard County. The product (beryllium hydroxide) was then sent to the company-owned refinery and finishing plant in Ohio, where it was converted into beryllium metal, alloys, and oxide. In 2002, about 14,000 t of ore was mined and trucked to the processing plant. Mine production was substantially less than previous years because of reduced demand, increased processing of stockpiled ore, and the use of imported beryl. Although the demand for beryllium alloys and beryllium oxide has increased modestly during the past several years, the current economic downturn and increased imports of beryl and finished beryllium (beryllium-copper master alloy) have reduced the demand for beryllium ore.

Copper.—Copper production from Kennecott Utah Copper Corp.'s Bingham Canyon Mine decreased 18% in 2002 to 260,000 t from 2001 production of 318,000 t of copper owing to the processing of harder ore from the south side of the pit. Production of refined metal increased from 234,000 t in 2001 to 294,000 t in 2002 owing to much improved smelter performance. Large-scale underground mining is expected to extend the mine's life by 15 years after open pit reserves are exhausted around 2013.

Gold.—Gold production in 2002 was estimated at nearly 15,600 kilograms (kg), a 35% decrease from the nearly 24,100 kg produced in 2001. Gold was produced from two surface mines owned by Kennecott Corp.—one primary producer (Barneys Canyon Mine) and one byproduct operation (Bingham Canyon Mine), both located in Salt Lake County. Gold was also produced by one small underground mine (Trixie) operated by Chief Gold Mines Inc. near the town of Eureka in Utah County. Several other small mines in the State were known to produce minor amounts of gold and silver, but these companies reported no metal-specific production to the UGS. The decrease in production is mainly because of lower gold-content copper ore and lower smelter throughput from the Bingham Canyon Mine in 2002. The Barneys Canyon Mine's ore reserves were exhausted in late 2001 and mining ceased, but Kennecott will continue to produce gold from its heap-leach pads at a much reduced rate until 2004, when those pads will be depleted. The Trixie Mine was active only until late March 2002 when the mine experienced a cave-in and was shut down.

Magnesium.—U.S. Magnesium LLC (formerly Magnesium Corp. of America, or Magcorp) produced magnesium metal from Great Salt Lake brines at its electrolytic plant at Rowley in Tooele County. U.S. Magnesium purchased the assets of Magcorp in June 2002 from the U.S. Bankruptcy Court. The plant, having a capacity of 43,000 metric tons per year of magnesium metal (99.9% purity), was one of only two active primary processing facilities in the United States. Magnesium production was less than capacity in 2002 because of depressed magnesium prices and ongoing modernization of the processing plant. U.S. Magnesium planned to complete the modernization work in 2003 and will evaluate the possibility of expanding operations if and when the market improves.

Molybdenum.—Kennecott's Bingham Canyon Mine, one of six molybdenum-producing mines in the United States in 2002, produced slightly more than 10,000 t of molybdenum concentrates (MoS₂), a significant decrease (more than 25%) from 2001 (Bon and Gloyn, 2003). Production was lower because of a combination of lower amounts of molybdenum in the copper ore and lower mill throughput. Molybdenum was recovered as a byproduct from the copper milling operation.

Silver.—Silver production was estimated to be approximately 120,000 kg in 2002, nearly 25,000 kg less than in 2001. Silver was produced as a byproduct metal from the Bingham Canyon Mine, and from polymetallic ore from the Trixie Mine. Lower silver production resulted from the same factors that caused lower gold production.

Environmental Issues

Several ongoing environmental issues in Utah were still to be resolved. These issues include a proposed nuclear waste storage site on the Goshute Indian Reservation and moving or capping the Atlas Corp. uranium tailings pile near Moab. In 2001, the U.S. Environmental Protection Agency designated the area around Eureka, Juab County, as a Superfund site. It was still being cleaned up

in 2002; topsoil has been removed and replaced around most homes and businesses in Eureka, and additional work was planned for other areas away from the town itself. Utah had 22 active Superfund sites, of which 12 were related to mining, milling, or smelting.

Legislation and Government Programs

A Utah legislative committee (Impacts of Gravel Pit Task Force) reviewed the environmental and social impacts of sand and gravel operations. Under current State statute, aggregate operations were exempt from filing mine reclamation plans and from securing bonds for reclamation. Recommendations from the committee were expected by November 30, 2003.

In 2002, the Utah Legislature passed a law requiring licensing for all individuals “practicing geology before the public.” The requirement became effective January 1, 2003, and the “grandfathering period” will end December 31, 2003. The law mostly affects individuals practicing environmental and engineering geology. Most exploration and development geologic work done for companies would be exempt from the act, but some activities would require licensing. Additional information is available at the Utah Division of Professional Licensing (DOPL) Web site at URL <http://www.dopl.utah.gov>.

During 2002 and early 2003, the UGS released maps and publications of mining and related interest. Some of these were a bulletin on energy, mineral, and ground water resources of Carbon and Emery Counties (Bulletin 132); a special publication on Great Salt Lake that includes sections on geology, hydrology, chemistry, lake industries, biology, and recreation; maps showing large and small permitted mines in Utah in 2002 (OFR-398 and OFR-405); two 7.5-minute geologic quadrangle maps covering the Silver Reef district in Washington County (M-187, M-191); three 30x60-minute geologic quadrangle maps covering most of Millard County (M-182, M-184, M-186); and a CD-ROM of the 1900 USGS Tintic Special District atlas. Information on other publications can be found at URL <http://geology.utah.gov>.

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Bon, R.L., and Gloyn, R.W., 2003, Utah, *in* Annual review 2002: Mining Engineering, v. 55, no. 5, May, p. 95-100.

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

(Thousand metric tons and thousand dollars unless otherwise specified)

| Mineral | 2000 | | 2001 | | 2002 ^P | | |
|---|-------------|--------------------|---------------------|--------|-------------------|--------|-----------|
| | Quantity | Value | Quantity | Value | Quantity | Value | |
| Beryllium concentrates | metric tons | 4,510 | 5 | 2,480 | 3 | 2,500 | 3 |
| Clays: | | | | | | | |
| Bentonite | | W | W | 51 | W | W | W |
| Common | | 335 | 5,380 | 360 | 5,490 | 454 | 2,180 |
| Gemstones | | NA | 1,030 | NA | 1,020 | NA | 331 |
| Salt | | 2,110 | 108,000 | 2,300 | 121,000 | 2,590 | 83,700 |
| Sand and gravel, construction | | 30,900 | 109,000 | 28,400 | 109,000 | 30,300 | 118,000 |
| Stone, crushed | | 8,400 ^r | 40,700 ^r | 8,430 | 40,500 | 7,800 | 38,300 |
| Combined values of cement (portland), copper, gold, gypsum (crude), helium (Grade-A), lime, magnesium compounds, magnesium metal, molybdenum concentrates, perlite (crude), phosphate rock, potash, silver, stone [dimension quartzite and sandstone (2000), dimension sandstone (2001-02)], and values indicated by symbol W | | | | | | | |
| | | XX | 1,160,000 | XX | 1,090,000 | XX | 985,000 |
| Total | | XX | 1,430,000 | XX | 1,360,000 | XX | 1,230,000 |

^PPreliminary. ^rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not available.

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

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

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

| Kind | 2000 | | | | 2001 | | | |
|----------------------------|--------------------|---------------------------------|-----------------------|-------------------|--------------------|---------------------------------|-------------------|------------|
| | Number of quarries | Quantity (thousand metric tons) | Value (thousands) | Unit value | Number of quarries | Quantity (thousand metric tons) | Value (thousands) | Unit value |
| Limestone | 19 ^r | 4,820 ^r | \$23,500 ^r | \$4.87 | 15 | 5,260 | \$26,100 | \$4.97 |
| Dolomite | 3 | 2,350 | 8,310 | 3.54 | 3 | 2,200 | 7,800 | 3.58 |
| Sandstone and quartzite | 4 | W | W | 7.40 | 5 | W | W | 6.21 |
| Volcanic cinder and scoria | 5 ^r | W | W | 8.82 | 3 | W | W | 9.28 |
| Miscellaneous stone | 8 ^r | 401 ^r | 2,720 ^r | 6.78 ^r | 7 | 282 | 2,190 | 7.78 |
| Total or average | XX | 8,400 ^r | 40,700 ^r | 4.85 ^r | XX | 8,430 | 40,500 | 4.81 |

^rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

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

TABLE 3
UTAH: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2001, BY USE¹

| Use | Quantity (thousand metric tons) | Value (thousands) | Unit value |
|---|---------------------------------------|----------------------|---------------|
| Construction: | | | |
| Coarse aggregate (+1 1/2 inch): | | | |
| Riprap and jetty stone | 119 | \$569 | \$4.78 |
| Filter stone | W | W | 3.58 |
| Coarse aggregate, graded: | | | |
| Concrete aggregate, coarse | W | W | 4.08 |
| Bituminous aggregate, coarse | W | W | 4.08 |
| Railroad ballast | W | W | 4.08 |
| Fine aggregate (-3/8 inch): | | | |
| Stone sand, bituminous mix or seal | W | W | 3.53 |
| Screening, undesignated | 32 | 114 | 3.56 |
| Coarse and fine aggregates: | | | |
| Graded road base or subbase | W | W | 3.53 |
| Unpaved road surfacing | W | W | 3.58 |
| Crusher run or fill or waste | W | W | 3.58 |
| Other construction materials | 10 | 36 | 3.60 |
| Agricultural: | | | |
| Agricultural limestone | W | W | 19.22 |
| Poultry grit and mineral food | W | W | 30.55 |
| Other agricultural uses | 22 | 248 | 11.27 |
| Chemical and metallurgical: | | | |
| Cement manufacture | 2,120 | 14,000 | 6.61 |
| Lime manufacture | W | W | 3.85 |
| Sulfur oxide removal | 137 | 1,000 | 7.33 |
| Special, mine dusting or acid water treatment | W | W | 4.41 |
| Unspecified:² | | | |
| Reported | 3,100 | 12,200 | 3.94 |
| Estimated | 1,100 | 5,300 | 4.63 |
| Total or average | 8,430 | 40,500 | 4.81 |

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

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

²Reported and estimated production without a breakdown by end use.

TABLE 4
UTAH: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2001, BY USE AND DISTRICT^{1,2}

(Thousand metric tons and thousand dollars)

| Use | District 1 | | District 2 | | District 3 | | Unspecified districts | |
|---|------------|--------|------------|--------|------------|-------|-----------------------|-------|
| | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value |
| Construction: | | | | | | | | |
| Coarse aggregate (+1 1/2 inch) ³ | W | W | W | W | W | W | -- | -- |
| Coarse aggregate, graded ⁴ | W | W | W | W | -- | -- | -- | -- |
| Fine aggregate (-3/8 inch) ⁵ | W | W | W | W | W | W | -- | -- |
| Coarse and fine aggregate ⁶ | -- | -- | W | W | W | W | -- | -- |
| Other construction materials | -- | -- | 10 | 36 | -- | -- | -- | -- |
| Agricultural ⁷ | W | W | W | W | -- | -- | -- | -- |
| Chemical and metallurgical ⁸ | 2,420 | 10,700 | W | W | W | W | -- | -- |
| Special ⁹ | W | W | -- | -- | -- | -- | -- | -- |
| Unspecified: ¹⁰ | | | | | | | | |
| Reported | 1 | 2 | 3,060 | 12,000 | 37 | 208 | 9 | 47 |
| Estimated | 150 | 1,700 | 1,000 | 3,600 | -- | -- | -- | -- |
| Total | 3,000 | 14,300 | 5,330 | 25,500 | 37 | 208 | 9 | 47 |

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

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

²No crushed stone was produced in District 4.

³Includes filter stone and riprap and jetty stone.

⁴Includes concrete aggregate (coarse), bituminous aggregate (coarse), and railroad ballast.

⁵Includes screening (undesignated) and stone sand (bituminous mix and seal).

⁶Includes crusher run (select material or fill), graded road base or subbase, and unpaved road surfacing.

⁷Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

⁸Includes cement manufacture, lime manufacture, and sulfur oxide removal.

⁹Includes mine dusting or acid water treatment.

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

TABLE 5
 UTAH: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2001, BY MAJOR USE CATEGORY¹

| Use | Quantity (thousand metric tons) | Value (thousands) | Unit value |
|---|---------------------------------------|----------------------|---------------|
| Concrete aggregates (including concrete sand) | 3,960 | \$19,600 | \$4.94 |
| Concrete products (blocks, bricks, pipe, decorative, etc.) ² | 75 | 506 | 6.75 |
| Asphaltic concrete aggregates and other bituminous mixtures | 1,620 | 8,230 | 5.07 |
| Road base and coverings ³ | 4,060 | 14,800 | 3.65 |
| Fill | 2,590 | 7,090 | 2.74 |
| Snow and ice control | 22 | 55 | 2.50 |
| Other miscellaneous uses | 41 | 343 | 8.37 |
| Unspecified: ⁴ | | | |
| Reported | 8,240 | 29,600 | 3.60 |
| Estimated | 7,700 | 28,000 | 3.68 |
| Total or average | 28,400 | 109,000 | 3.83 |

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

²Includes plaster and gunite sands.

³Includes road and other stabilization (cement).

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

TABLE 6
UTAH: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2001, BY USE AND DISTRICT¹

(Thousand metric tons and thousand dollars)

| Use | District 1 | | District 2 | | District 3 | | Unspecified districts | |
|---|------------|--------|------------|--------|------------|--------|-----------------------|-------|
| | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value |
| Concrete aggregate and concrete products ² | W | W | W | W | 780 | 5,190 | 359 | 1,980 |
| Asphaltic concrete aggregates and other bituminous mixtures | W | W | W | W | 315 | 2,060 | 272 | 1,050 |
| Road base and coverings ³ | 428 | 1,390 | 2,030 | 7,580 | 1,400 | 5,330 | 206 | 510 |
| Fill | 114 | 214 | 2,140 | 5,580 | 335 | 1,300 | -- | -- |
| Other miscellaneous uses ⁴ | 862 | 3,710 | 3,100 | 14,400 | 37 | 313 | -- | -- |
| Unspecified: ⁵ | | | | | | | | |
| Reported | 2,950 | 11,200 | 3,570 | 14,200 | 432 | 2,090 | 1,290 | 2,140 |
| Estimated | 2,300 | 8,500 | 5,100 | 19,000 | 350 | 1,400 | -- | -- |
| Total | 6,640 | 25,000 | 15,900 | 60,300 | 3,650 | 17,700 | 2,130 | 5,680 |

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

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

²Includes plaster and gunite sands.

³Includes road and other stabilization (lime).

⁴Includes snow and ice control.

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