



2005 Minerals Yearbook

UTAH

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 2005, Utah's nonfuel raw mineral production was valued¹ at \$2.79 billion, based upon annual U.S. Geological Survey (USGS) data. This was an \$840 million, or 43% increase from the State's total nonfuel mineral value of \$1.95 billion in 2004, which was up \$590 million from 2003 to 2004, then representing a nearly identical percentage increase of 43.4%. The State rose to 5th from 6th in rank among the 50 States in total nonfuel mineral production value and accounted for more than 5% of the U.S. total value.

Metals accounted for more than 74% of Utah's nonfuel mineral production value, and copper and molybdenum concentrates accounted for about two-thirds of the State's entire metal value. In 2005, the most substantial changes were in the metals sector—the values of molybdenum concentrates, copper, and gold, up more than \$600 million, more than \$60 million, and nearly \$50 million, respectively. Other mineral commodities with substantial increases in value in 2005 were the industrial mineral commodities of salt, up \$25 million; construction sand and gravel, up \$24 million; portland cement and potash, up more than \$15 million each; magnesium compounds, up \$14 million; and lime, up about \$11 million (table 1). Significant increases also took place in silver and phosphate rock. The values per unit (quantity) of production or sales increased for each of these nonfuel minerals, especially those of copper, molybdenum concentrates, magnesium compounds, potash, salt, and lime (descending order of increase), the unit value of each rising by about 20% or more. The only substantial decrease in value was that of magnesium metal, down about 12%. Smaller decreases in total value also took place in Grade-A helium, crude perlite, and dimension sandstone (table 1).

The single highest increase in value, that of molybdenum concentrates, has resulted from the dramatic increases in the commodity's prices, especially during 2004-05, the upward trend having previously begun in December 2002 and continuing on throughout 2003 into 2004. As reported in *Platts Metals Week* (in dollars per pound of contained molybdenum), the annual average price of molybdc oxide rose from \$8.27 per kilogram (kg) in 2002 to \$11.75 per kg in 2003, to \$36.73 per kg in 2004, and nearly doubled to \$70.10 per kg (about \$32 per pound) in 2005. In June 2005, the monthly average molybdc

¹The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity. All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals>.

oxide price reached its highest point of the 4-year run at \$82.54, and then followed a generally downward trend the rest of the year to close at \$61.84. Molybdenum concentrate prices had stayed relatively level during the early months of 2006.

In 2005, Utah continued to be the only State to produce magnesium metal and beryllium concentrates (descending order of value). The State remained second in rank in the quantities of copper and potash produced, as well as fourth in phosphate rock, silver, and perlite, fifth in bentonite, and sixth in salt. The State rose to first from third in the production of molybdenum concentrates, to second from third of 11 gold-producing States, and to second from third in magnesium compounds. Additionally, Utah was a producer of substantial quantities of portland cement, construction sand and gravel, lime, common clays, and gemstones (commodities listed in descending order of value).

The Utah Geological Survey² (UGS) provided the following narrative information. UGS production data were based upon its surveys, estimates, and information gathered from company annual reports. These data may differ from some USGS annual production figures, which were based upon USGS company surveys and estimates.

Exploration and Development Activities

In 2005, mineral exploration increased significantly for copper, iron, molybdenum, gold, zinc, and uranium, mainly as a result of steadily increasing metal prices. Several mine development projects were carried out to improve and expand the mining of copper, copper-molybdenum, iron, and uranium ores. Specifically, ore reserves at the Bingham Canyon Mine (molybdenum-copper-gold-silver) were increased, mining at the Lisbon Valley Mine (copper) was initiated, advanced stages of exploration and development were conducted in the Iron Springs (iron) and Rocky Range-Beaver Lake (copper-gold) mining districts, and exploration in the historic mining areas of the Colorado Plateau (uranium) was resumed. Also, the number of new mining claims filed in the State rose dramatically from a low of 508 in 2001 to more than 7,500 in 2005. San Juan County recorded the most new mining claims with more than 3,400.

Bingham District

Kennecott Utah Copper Corporation (KUC) approved the \$170 million East 1 overburden removal project at Bingham Canyon that would extend the open pit mine life to 2017, and will fund an expansion of the molybdenum-recovery plant.

²Kenneth Krahulec, Geologist, and Roger Bon, Industry Outreach Specialist, of the Utah Geological Survey authored the text of the State mineral industry information provided by that State agency.

The East 1 project would add about 147.8 million metric tons (Mt) of ore, averaging 0.83% copper, 0.10% molybdenum, 0.27 parts per million (ppm) gold, and 2.7 ppm silver to the existing porphyry reserve. KUC also drilled nine deep exploration holes in 2005, totaling 9,898 meters (m). KUC continued to evaluate various plans to exploit the deep porphyry roots beneath the pit. Options being studied included expanding overburden removal of the open pit on the west side (Highland Boy); developing the North Skarn underground mine, a resource of 12.2 Mt averaging 1.9% copper, 1.23 ppm gold, and 13.4 ppm silver; or constructing a large block-cave type underground mine to recover mineral values from the northeast and southeast porphyry roots.

As part of an ongoing porphyry copper exploration program, Kennecott Exploration Company investigated the Oquirrh Mountains about 23 kilometers (km) southwest of Bingham. Using aeromagnetic prospecting techniques, results indicated little or no copper mineral value imbedded in the massive monzonite and latite porphyry. As a result, all exploration on the property was discontinued (W.L. Gunter, Consultant, written commun., 2006).

Fish Springs District

Lithic Resources Ltd. acquired Eurozinc Mining Corporation's 100% interest in the Crypto zinc skarn in the Fish Springs mining district of western Juab County. In 1993, Cyprus Amax Minerals Company estimated a mineral resource of about 5.4 Mt of sulfide mineralization grading 8.7% zinc and approximately 2.8 Mt of oxide mineralization grading 7% zinc.

Gold Hill District

Dumont Nickel Inc. intersected more than 3 m of 1 ppm gold in 4 of the 24 holes drilled on its Cane Springs property in Tooele County. The best hole (RC-20) included a 6-m cut from 4.6 m to 10.7 m, averaging 9.6 ppm gold near the historic Cane Springs skarn gold mine. Dumont also intersected 54.9 m of 1.1 ppm gold in the nearby Kiewit zone (KZ-01), starting at the surface in an intense quartz vein stockwork hosted by granodiorite. Further exploration drilling was planned for 2006.

Iron Springs District

Palladon Ventures Ltd. acquired the idle Comstock/Mountain Lion open pit mine (about 16 Mt averaging 52% iron) and the Rex iron ore deposit in Iron County from the former Geneva Steel for \$10 million. Iron Springs has been one of the most productive iron mining districts in the western United States, having yielded an estimated 91 Mt of ore from 1845 through 1995. Iron was recovered from several skarn/replacement-type ore bodies, averaging slightly more than 50% iron during this period. As part of the acquisition, Palladon purchased its partner's (Western Utah Copper Company) interest in the properties, posted a reclamation bond to complete the closing of the purchase, and selected a local mining contractor to begin redevelopment activities. Palladon further agreed to project financing terms with a new 50% partner, Luxor Capital Partners,

LLP, for an open pit mine and mill with expected capital costs of about \$16 million (Don Foot, Palladon Ventures, verbal commun., January 19, 2006).

Lisbon Valley District

Constellation Copper Corporation began mining, crushing, stacking, and acid treating at its Lisbon Valley solvent extraction-electrowinning (SX-EW) copper mine in southeastern Utah. The Lisbon Valley operation focused on the use of sandstone-hosted copper oxide as feed material. Reserves at yearend 2005 were estimated to be 35.5 Mt, averaging 0.49% copper in three previously mined open pits (Constellation Copper Corporation, 2006³). The project was expected to produce about 24,500 metric tons per year of cathode copper during the life of the mine. Construction of the Lisbon Valley SX-EW facility was delayed somewhat as a result of supply and labor shortages associated with the rebuilding efforts on the Gulf Coast following Hurricanes Katrina and Rita in August and September. Mining was begun initially at a rate of 21,800 metric tons per day (t/d) in preparation for copper cathode production at the SX-EW facility in early 2006. Exploration was continued at the new Flying Diamond copper discovery, several kilometers to the southeast of the current mining operation. Initial drilling at Flying Diamond intersected an average 25.3 m of 0.71% copper in 13 holes.

Milford Area

Palladon Ventures and Western Utah Copper (joint-venture partners in the Western Utah Copper Project) released a resource estimate on their Nevada Star copper property near Milford. Exploration results in the Rocky Range and Beaver Lake mining districts showed a combined indicated resource from four separate skarn and porphyry deposits of 2.2 Mt, averaging about 1.38% copper at a 0.6% copper cutoff level. Results from an exploration drill hole (BCC-1) near the Beaver Carbonate lead-silver mine in the San Francisco district revealed a 5-m-thick deposit containing 3.7% copper and 843 ppm silver at a depth of 218 m. The joint venture has applied for a large mine permit with the State of Utah (Mark Dotson, Western Utah Copper, verbal commun., February 8, 2006).

Nevada Pacific Gold Company acquired the Bat Ridge gold-copper-skarn prospect in the Beaver Lake mining district. Nevada Pacific then completed a program of geologic mapping, rock-chip geochemical sampling, and an aeromagnetic survey of the prospect. Additional work leading to a drill program was anticipated in 2006.

Ohio-Mount Baldy District

In 2005, Unico, Inc. drilled 13 holes totaling more than 2,135 m at the Deer Trail Mine in Piute County. The main objective was to identify and evaluate the mineralization contained in extensions of known base-metal mantos in the Pennsylvanian Callville Limestone, ores from which historically have averaged

³References that include a section mark (§) are found in the Internet References Cited section.

6.5 ppm gold, 538 ppm silver, 2.84% lead, 6.26% zinc, and 0.76% copper. Unico was granted a large mine permit by the State (Bon and Wakefield, 2006).

Tintic District

Atlas Mining Company (Osburn, Idaho) purchased the Dragon halloysite mine in Juab County for \$500,000. Halloysite is a high-value, bright white, microtubular clay with unique applications based on its unusual structure. The deposit is a selective hydrothermal replacement of the Cambrian Ajax Limestone adjacent to a monzonite plug. Atlas began developing the 272,000-t deposit as an underground mine, constructing both an adit and a 15° decline to access the halloysite beds. The majority of the higher grade material is below the 91-m level. The decline reached the 76-m level in 2005.

Uranium

No uranium ore was mined in Utah in 2005, although uranium prices have increased significantly since December 2002, rising from \$22.44/kg at the end of 2002 to \$80.30/kg at the end of 2005 (TradeTech, 2006§). Eleven of 12 permitted uranium/vanadium mines were listed as inactive in 2004. One new small mine permit application was received in 2005, and seven notices of intent were received for uranium exploration.

A uranium staking rush in the Four Corners region since the beginning of 2005 has resulted in the location of more than 5,000 new unpatented claims in Emery, Garfield, Grand, and San Juan Counties. Most of these new claims cover either known sandstone-hosted uranium resources or exploration plays in the major historical uranium districts. The Tony M and Frank M uranium reserves in the Shootaring Canyon District (Garfield County) are controlled by International Uranium Corporation and Energy Metals Corporation, respectively. Energy Metals has also acquired the nearby Congress uranium property.

The Lisbon Valley mining district, Utah's largest producer with 35.4 million kg of triuranium octaoxide (U_3O_8) recovered from approximately 11.6 Mt of ore, has been particularly heavily targeted by Universal Uranium Ltd. and Mesa Uranium Corp. Energy Metals Corp. is also active in the district. Both the Shootaring Canyon and Lisbon Valley mining districts are located near existing, permitted uranium mills that include the Shootaring Canyon mill at Ticaboo (U.S. Energy Corp., on standby) and the White Mesa mill at Blanding (International Uranium Corporation, active).

MAX Resource Corp. acquired 195 lode claims on a potential in-situ leach uranium play in the Spor Mountain District of west-central Utah. The mineralization is hosted in late Tertiary caldera-fill volcanoclastic rocks, similar to the nearby Yellow Chief uranium deposit. MAX Resource Corp. also received a permit for a six-hole, 366-m drill program.

Commodity Review

Industrial Minerals

Industrial-minerals production, with an estimated value of \$759 million (an alltime high) was the second-leading

contributor to the value of minerals produced in 2005. The value of industrial minerals has grown substantially during the past 10 years, increasing by 75% from the \$434 million recorded in 1996. Commodities or commodity groups that have realized the majority of these gains include sand and gravel and crushed stone; portland cement; salines, including salt, magnesium chloride, potash (potassium chloride), and sulfate of potash (SOP); lime; and phosphate rock. These commodities accounted for 89% of the total value of the industrial minerals production. Other important commodities produced in Utah, in descending order of value, included gilsonite, expanded shale, common clay, bentonite and kaolinite, and gypsum.

Cement.—Holcim (US) Inc. and Ash Grove Cement Company produced portland cement in the State during 2005. Holcim's Devil's Slide Mine and plant are east of Morgan in Morgan County, and Ash Grove's Leamington Mine and plant are east of Lynndyl in Juab County. Both plants operated at or above design capacity during the year, with total production of about 1.5 Mt. In addition to limestone, both Holcim and Ash Grove Cement mine modest amounts of shale and sandstone that are used in the manufacture of cement.

Common Clay and Bentonite.—Based upon UGS surveys, nearly 300,000 t of common clay and approximately 62,000 t of bentonite were produced by eight companies in 2005, a 7% increase in common clay and a 38% decrease in bentonite compared with production in 2004. Statewide, there were 21 active mine permits held by clay operators in 2005. Many of these mines were operated intermittently. The two largest producers of common clay in 2005 were Interstate Brick and Interpace Industries. Two companies (Western Clay Company 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. Bentonite is used as a sealant in many civil engineering applications, as a pet-waste absorbent (litter-box filler), as an additive in oil-and-gas-drilling fluids, and as a binder in foundry molds. ECDC Environmental, LLC intermittently produces clay for use at their waste disposal facility near the town of East Carbon in Carbon County.

Construction Sand and Gravel and Crushed Stone.—Sand and gravel and crushed stone (including limestone) were the third-leading contributors to the value of industrial minerals produced in Utah during 2005 (down from the leading contributors in 2004), with an estimated value of \$186 million, about \$16 million (9%) higher than in 2004. These materials were produced in nearly every county in Utah by commercial operators, and by Federal, State, and county agencies. Because of the large number of operations (approximately 140 active pits and quarries), the UGS did not send production questionnaires to this group. However, production data for 2005, as compiled by the USGS, showed production of 33.9 Mt of sand and gravel, with a value of \$149 million, and 8.4 Mt of crushed stone, with a value of \$46.6 million. Sand and gravel production increased by 13% and crushed stone production increased by 4.0% in 2005 compared with that of 2004. Crushed stone production includes raw material for both lime and cement plants.

Expanded Shale and Perlite.—Two companies, Utelite, Inc. and Basin Perlite Company, produced lightweight "expanded" products from shale and perlite for use primarily in the

construction and building industries. Mine production was about 248,000 t in 2005, a slight increase from 2004. Utelite's mine is south of the town of Wanship in Summit County. The Basin Perlite mine, located northeast of the town of Milford in Beaver County, was shut down in March 2005 and is inactive.

Gilsonite.—Gilsonite production for 2005 was estimated to be about 73,000 t, about 9,100 t more than in 2004. Gilsonite is an unusual solid hydrocarbon that has been mined in Utah for more than 100 years. All of the gilsonite mines are located in southeastern Uintah County. The three companies that produced gilsonite were, in descending order of production, American Gilsonite Co., Ziegler Chemical & 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 increasing modestly during the past several years.

Gypsum.—Four companies produced about 390,000 t of gypsum in 2005, about 9,100 t more than in 2004. In descending order of production, the three largest producers were U.S. Gypsum Co., H.E. Davis and Sons, and Nephi Gypsum, Inc. U.S. Gypsum operates the only active wallboard plant in Utah. The plant is located near the town of Sigurd in Sevier County. The Georgia-Pacific plant, also near Sigurd, closed in 2002, and the company's mines in Utah were inactive. Statewide, there were only five active gypsum mines.

Most gypsum produced in Utah is used for wallboard production, but several operators supply crude gypsum to regional cement companies where it is used as an additive to retard the setting time of cement. Gypsum is also used by the agricultural industry as a soil conditioner.

Lime.—Lime production increased by about 10% in 2005 more than that of 2004, with an estimated production of about 726,000 t. There were two suppliers of lime in Utah, with a combined capacity of more than 0.9 million metric tons per year. Graymont Western U.S., Inc. produced dolomitic quick lime and high-calcium quick lime, and Chemical Lime Co. produced dolomitic quick lime and hydrated dolomitic lime. Both operations serve markets in Utah and surrounding States. Graymont Western's plant is in the Cricket Mountains, approximately 56 km southwest of Delta in Millard County, and is one of the 10 largest lime plants in the United States. Chemical Lime's plant is about 13 km northwest of Grantsville in Tooele County.

In 2005, an additional 13 to 15 operators quarried about 2.0 Mt of limestone and dolomite, which was used mainly for crushed stone as well as flue-gas desulfurization in coal-fired powerplants. A small amount of limestone and dolomite was also crushed to a fine powder and marketed as "rock dust" to the coal mining industry.

Phosphate Rock.—Simplot Phosphates LLC (formerly SF Phosphates, Ltd.) is Utah's only phosphate rock producer. The company's phosphate operation is 18 km north of Vernal in Uintah County. The mine produces roughly 2.7 to 3.6 Mt of ore annually, which is processed into 0.9 to 1.8 Mt of phosphate concentrate. The concentrate is transported in slurry form to the company's Rock Springs, WY, fertilizer plant via a 144-km-long underground pipeline. During 2005, the mine produced about 3.4 Mt of ore, about the same as in 2004.

Salt, Magnesium Chloride, and Potash.—Brine-derived products, including salt, were the most significant contributors (up from third-leading in 2004) to the value of industrial mineral production in Utah during 2005, with a combined value of \$262 million, about \$83 million (46%) more than in 2004. Most of the increase in value was owing to a substantial increase in the production of potash. In addition to salt, brine-derived products include magnesium chloride and potash [potassium chloride and sulfate of potash (SOP)]. North Shore Limited Partnership produced a small amount of concentrated brine that was used as an ingredient in mineral food supplements. The statewide production of salt and other brine-derived products, excluding magnesium metal, was estimated to be 4.38 Mt in 2005, about 0.94 Mt more than in 2004. Potash production, including SOP, was estimated to be about 1.16 Mt in 2005, approximately 0.71 Mt more than in 2004.

Salt production alone was estimated to be 2.63 Mt in 2005, about 63,500 t more than in 2004, with most of the production coming from three operators processing brine from Great Salt Lake. The three leading companies were, in descending order of production, Great Salt Lake Minerals Corporation, Cargill Salt Company, and Morton International. In addition, three other companies produce salt and/or potash from operations not located on Great Salt Lake. These included Intrepid Mining, LLC at Wendover in Tooele County (solar salt and potash), Moab Salt, LLC near Moab in Grand County (solar salt and potash), and Redmond Minerals, Inc. near Redmond in Sanpete County (rock salt).

Metals

Base-metal production, with an estimated value of \$2.09 billion, was the leading contributor to the value of minerals produced in Utah during 2005, an alltime high. In descending order of value, the base metals included molybdenum, copper, magnesium, and beryllium. The 2005 base-metal values were about \$957 million (84%) more than 2004. This increase followed a 65% increase in the value of base-metal production in 2004. Precious-metal production, valued at \$209 million, included gold (87% of total value) and silver (13% of total value). Precious-metal values in 2005 were \$51 million (32%) higher than in 2004.

KUC's Bingham Canyon Mine, located about 32 km southwest of Salt Lake City in Salt Lake County, was the State's major producer of copper, gold, and silver, and its sole producer of molybdenum. For the first time in its more than 100-year history, molybdenum surpassed copper as the most valuable product. The combined value of minerals produced from the Bingham Canyon Mine in 2005 was about 63% of the total value of all minerals produced statewide.

Beryllium.—Utah continued to be the Nation's sole producer of beryllium concentrates. Beryllium ore (bertrandite) is mined at Brush Resources' 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) is then sent to the company-owned refinery and finishing plant in Ohio, where it is converted into beryllium metal, alloys, and oxide. No bertrandite ore was

mined in 2005, but about 38,000 t of stockpiled and purchased ore was milled at the Delta plant.

Brush Wellman (the parent company of Brush Resources) announced that it was awarded a \$9 million contract under the Department of Defense's Defense Production Act, Title III Program. The contract is intended to support the engineering and design of a new facility for the processing of beryllium hydroxide, the feedstock material used to produce beryllium metal products. The awarding of the contract represents a key step toward the return of a sustainable domestic supply of beryllium, a material critical to the Nation's strategic interests (Shedd, 2006). The new facility, to be owned and operated by Brush Wellman, will be located at an existing plant site in Elmore, Ohio. The total cost of the facility is expected to range from \$40 to \$60 million. Approximately 25 additional jobs are expected to be created to operate and maintain the facility (Brush Wellman, 2006\$).

Copper.—Copper was the second-leading contributor to the value of nonfuel minerals in Utah. Substantial price increases in 2003, 2004, and 2005 raised the unit value of copper to an alltime high, and the value of base-metal production statewide to more than \$2 billion for the first time. From 2002 through 2005, the average annual price of copper increased from \$1.67 per kilogram (\$0.758 per pound) to \$3.72 per kilogram (\$1.69 per pound). Refined copper production from Kennecott's Bingham Canyon Mine decreased slightly in 2005 to approximately 232,000 t from approximately 247,000 t in 2004 (Rio Tinto, 2006).

The Lisbon Valley copper mine, located 72 km southeast of Moab in San Juan County, began operating in December 2005, and was scheduled to produce about 18,000 t of copper in 2006 (Greg Hahn, Constellation Copper Corporation, written commun., March 2006).

Gold and Silver.—Refined gold production in 2005 was estimated to be about 12,500 kilograms (kg) (401,000 troy ounces) (oz), a 30% increase from the 9,600 kg (308,000 oz) produced in 2004. Gold was produced from two surface mines owned by Kennecott Corporation: one primary producer (Barneys Canyon Mine) and one byproduct operation (Bingham Canyon Mine), both located in Salt Lake County. Several other small mines in the State may produce minor amounts of gold and silver, but metal-specific production is not reported and not included in the above totals. The Barneys Canyon Mine exhausted its economic ore reserves in late 2001 and ceased mining, but was to continue to produce gold from its heap-leach pads at a much reduced rate into 2007, when those pads were expected to be depleted. Silver byproduct recovered from the Bingham Canyon Mine netted 0.11 million kg (3.54 million oz) of refined silver in 2005, about 6% higher than in 2004.

Magnesium.—Magnesium metal was the third-leading contributor to the value of base metals in 2005. Magnesium metal was produced from Great Salt Lake brines by US Magnesium LLC at its Rowley electrolytic plant in Tooele County. The plant's annual capacity was 43,000 t of magnesium metal (99.8% purity). It is the only active primary magnesium processing facility in the United States. Magnesium production in 2005 was slightly lower than in 2004. The planned expansion of the plant to 50,000 t was anticipated by yearend 2005.

Magnesium metal prices declined from \$3.48/kg in 2004 to \$2.71/kg in 2005 (Kramer, 2006).

Molybdenum.—In 2005, for the first time, molybdenum was the largest contributor to the value of Utah's base-metal production. Kennecott's Bingham Canyon Mine produced about 15,600 t of coproduct molybdenum in 2005, 130% more than in 2004 (Rio Tinto, 2006). The increased production of molybdenum, supported by the substantial increase in the price of molybdenum, supplanted copper as the most valuable mineral product from the century-old porphyry copper-molybdenum-gold-silver operation. The Bingham Canyon Mine was one of only eight molybdenum-producing mines in the United States in 2005. The USGS reported that domestic mine output of molybdenum increased 37% in 2005, following a 24% increase in 2004 (Magyar, 2006). According to an industry report, the substantial increase in molybdenum production in 2005 was in response to increased worldwide demand (Rio Tinto, 2006).

Government Programs and Activities

Federal Government

Environmental Issues.—The U.S. Department of Energy and the State of Utah agreed in 2005 to move the 10.7 Mt of uranium mill tailings located along the Colorado River near Moab. The tailings were planned to be moved 48 km north to a site near Crescent Junction, Utah. The best method for the move was to be studied in 2006 and the move was anticipated to begin in 2007. Costs for moving the tailings were estimated at more than \$400 million.

The U.S. Environmental Protection Agency (EPA) began or continued steps toward environmental restoration of the areas at three historic Utah mining sites. The most significant of these efforts was the Eureka Mills project in the Tintic mining district. The EPA and Chief Consolidated Mining Company have agreed upon Chief's liability for the cleaning up of this site. The EPA also focused on the Jacobs Smelter and related sites in the Stockton district, and historic mine and mill sites in the Ophir district. In addition, the Utah Division of Oil, Gas and Mining continued work within its abandoned mine reclamation program in the Ophir District, Gold Hill District, Browns Hole District, San Rafael Swell, as well as the Uinta Basin gilsonite mines.

State Government

Utah Geological Survey Publications.—The UGS published a "Uranium and vanadium in Utah" digital map (Gloyn and others, 2005) that shows Utah's uranium-vanadium occurrences, mines, mining districts, mills, and the distribution of the primary host strata. The UGS also completed studies on the "High-calcium limestone resources of Utah" (Tripp, 2005), the coal resources of the southern Wasatch Plateau (Quick and others, 2005), and "Large mines in Utah, 2005" (Bon and Wakefield, 2006).

The new "Uinta Mountains Geology" guidebook published by the Utah Geological Association (Dehler and others, 2005) contains two interesting papers on ore deposits. One paper discusses the many metal occurrences in the Uinta Mountains (Conn, 2005) and a second paper covers the recently discovered Columbian-type, hydrothermal emerald and fibrous calcite mineralization along

the South Flank fault zone (Nelson and others, 2005). A detailed summary of Utah's coal industry and other energy and mineral data can be found on the UGS Web site <http://geology.utah.gov>.

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

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005		
	Quantity	Value	Quantity	Value	Quantity	Value	
Beryllium concentrates	metric tons	2,100	NA	2,210	NA	2,780	NA
Clays:							
Bentonite		W	W	73	W	64	W
Common		300	3,270	443	5,600	478	6,710
Gemstones		NA	233	NA	235	NA	235
Salt		2,200	119,000	2,250	107,000	2,250	132,000
Sand and gravel, construction		27,400	113,000	29,800	125,000	33,900	149,000
Stone, crushed		7,820	40,100	8,030 ^r	45,100 ^r	8,350	46,600
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 sandstone), and values indicated by symbol W		XX	1,080,000	XX	1,660,000	XX	2,460,000
Total		XX	1,360,000	XX	1,950,000 ^r	XX	2,790,000

¹Revised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

²Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

³Data 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	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	12	3,820 ^r	\$25,800 ^r	11	3,550	\$19,400
Dolomite	3	W	W	3	2,890	15,800
Sandstone and quartzite	6	747	4,990	6	1,350	7,730
Volcanic cinder and scoria	2	W	W	2	28	189
Miscellaneous stone	6	579 ^r	3,680 ^r	5	536	3,370
Total	XX	8,030 ^r	45,100 ^r	XX	8,350	46,600

^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; may not add to totals shown.

TABLE 3
UTAH: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE¹

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse and fine aggregates:		
Graded road base or subbase	W	W
Unpaved road surfacing	W	W
Terrazzo and exposed aggregate	W	W
Other construction materials	144	824
Agricultural:		
Agricultural limestone	(2)	(2)
Other agricultural uses	(2)	(2)
Total	57	1,010
Chemical and metallurgical:		
Cement manufacture	(2)	(2)
Lime manufacture	(2)	(2)
Flux stone	(2)	(2)
Sulfur oxide removal	(2)	(2)
Total	3,100	16,400
Special, other fillers or extenders	W	W
Unspecified:³		
Reported	4,180	23,500
Estimated	842	4,700
Total	5,020	28,100
Grand total	8,350	46,600

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

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

²Withheld to avoid disclosing company proprietary data; included in "Total."

³Reported and estimated production without a breakdown by end use.

TABLE 4
UTAH: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, 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 and fine aggregate ³	W	W	--	--	--	--	--	--
Other construction materials	15	228	129	596	--	--	--	--
Agricultural ⁴	W	W	W	W	--	--	--	--
Chemical and metallurgical ⁵	W	W	W	W	--	--	--	--
Special ⁶	W	W	--	--	--	--	--	--
Unspecified: ⁷								
Reported	1,140	6,300	2,580	14,300	37	205	426	2,720
Estimated	419	2,300	329	1,800	94	523	--	--
Total	3,590	21,100	4,200	22,000	131	728	426	2,720

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 graded road base or subbase, unpaved road surfacing, and terrazzo and exposed aggregate.

⁴Includes agricultural limestone and other agricultural uses.

⁵Includes cement and lime manufacture, flux stone, and sulfur oxide removal.

⁶Includes other fillers or extenders.

⁷Reported and estimated production without a breakdown by end use.

TABLE 5
UTAH: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY¹

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	1,840	\$11,300	\$6.13
Concrete products (blocks, bricks, pipe, decorative, etc.) ²	16	138	8.63
Asphaltic concrete aggregates and other bituminous mixtures	702	4,450	6.34
Road base and coverings ³	6,140	28,800	4.70
Fill	2,900	8,260	2.85
Snow and ice control	22	78	3.55
Railroad ballast	6	43	7.17
Other miscellaneous uses ⁴	133	460	3.46
Unspecified: ⁵			
Reported	8,860	37,600	4.24
Estimated	13,200	58,400	4.41
Total or average	33,900	149,000	4.42

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 (cement).

⁴Includes roofing granules.

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

TABLE 6
 UTAH: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT¹

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products ²	909	5,580	566	2,720	381	3,110
Asphaltic concrete aggregates and other bituminous mixtures	171	1,430	52	332	329	2,030
Road base and coverings ³	1,860	10,100	1,490	6,710	1,680	8,340
Fill	720	2,220	1,860	5,130	190	477
Other miscellaneous uses ⁴	38	160	106	341	16	79
Unspecified: ⁵						
Reported	2,620	11,400	4,730	21,200	1,170	4,320
Estimated	1,900	8,200	10,100	44,700	1,200	5,400
Total	8,190	39,200	18,900	81,100	5,000	23,800
	Unspecified districts					
	Quantity	Value				
Concrete aggregates and concrete products ²	--	--				
Asphaltic concrete aggregates and other bituminous mixtures	150	655				
Road base and coverings ³	1,110	3,650				
Fill	123	428				
Other miscellaneous uses ⁴	--	--				
Unspecified: ⁵						
Reported	342	660				
Estimated	--	--				
Total	1,720	5,390				

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 (cement).

⁴Includes railroad ballast, roofing granules, and snow and ice control.

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