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2010–2011 Minerals Yearbook

UTAH [ADVANCE RELEASE]

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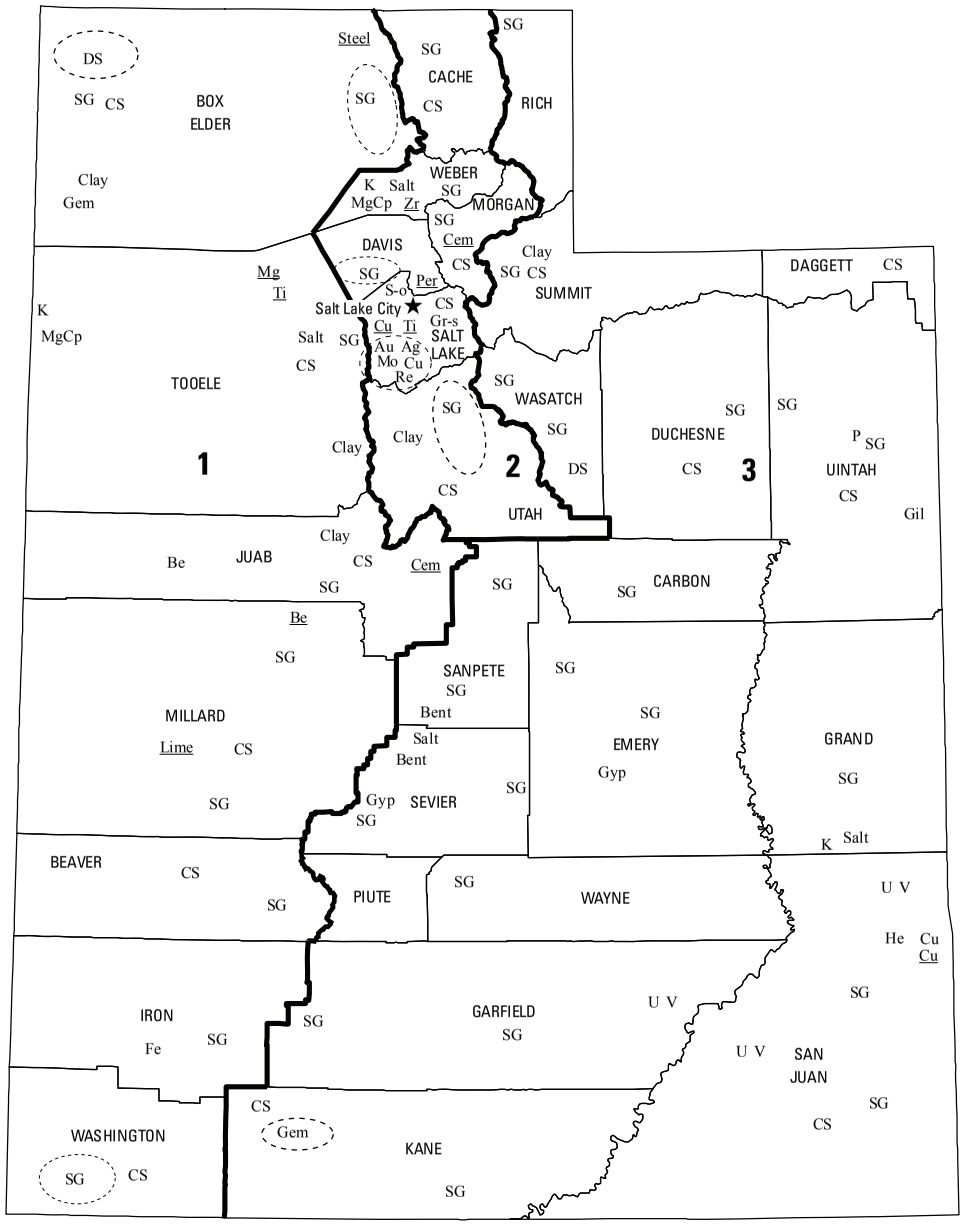
UTAH



LEGEND

——	County boundary
★	Capital
•	City
1——	Crushed stone/sand and gravel district boundary

MINERAL SYMBOLS (Principal producing areas)

Ag	Silver
Au	Gold
Be	Beryllium
Be	Beryllium plant
Bent	Bentonite
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper
Cu	Copper plant
DS	Dimension stone
Fe	Iron
Gem	Gemstones
Gil	Gilsonite
Gr-s	Graphite - synthetic
Gyp	Gypsum
Gyp	Gypsum plant
He	Helium
K	Potash
Lime	Lime plant
Mg	Magnesium metal plant
MgCp	Magnesium compounds
Mo	Molybdenum
P	Phosphate rock
Per	Perlite plant
Re	Rhenium
Salt	Salt
SG	Construction sand and gravel
S-o	Sulfur (oil)
Steel	Steel plant
Ti	Titanium metal plant
U	Uranium
V	Vanadium
Zr	Zirconium metal plant
⬭	Concentration of mineral operations

0 50 100 Kilometers

Albers equal area projection

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

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 2011, Utah's nonfuel mineral production[1] was valued at $4.3 billion, based upon annual U.S. Geological Survey (USGS) data. This was essentially unchanged from that in 2010, which followed a $480 million (13%) increase from the total production value of $3.8 billion in 2009. After ranking fourth for 4 consecutive years, Utah rose to third in 2010 among the 50 States in total value of nonfuel mineral production, and then fell back to fourth in 2011. The State accounted for approximately 6% of the U.S. total nonfuel mineral production, down from 6.6% in 2010 and 2009. On a per capita basis, Utah ranked fourth in the Nation in nonfuel mineral production in 2011 with a value of $1,530, more than six times the national average of $240.

Utah's leading nonfuel mineral commodities in 2011 and 2010, in descending order of production value, were copper, molybdenum, gold, and potash. Together these commodities accounted for 84% of the State's total nonfuel mineral production value in 2011 and 87% in 2010. Metals produced in the State included beryllium, copper, gold, magnesium, molybdenum, and silver, which together accounted for 85% and 87% of the State's total nonfuel production value in 2011 and 2010, respectively. In 2011, the production of beryllium increased by 33% from that of 2010, and in 2010 it increased by 48% from that of 2009. In 2011, the production quantity of magnesium metal and molybdenum increased by 14% and by 8%, respectively, and the value of production of these mineral commodities increased in 2011. In 2010, the quantity of magnesium metal produced increased by 20%, and molybdenum production went up by 8%. The values of production of these mineral commodities also increased in 2010; magnesium metal increased by 18% and molybdenum grew by 12%. In 2011, copper production fell by 22% and the value of copper production decreased by 9% from that of 2010. The value of gold production increased by 6% in 2011, despite an almost 18% decrease in the quantity of gold production. In 2010, the value of copper production increased by 19%, and the value of gold production increased slightly, despite a 17% decrease in copper production tonnage and a 20% decrease in the quantity of gold production. The value of silver production increased by 38% in 2011 and by 6% in 2010, even though silver production tonnage was down by 21% and 23% in 2011 and 2010, respectively. The decrease in the value of copper production in 2011 nearly negated all increases made in the values of production of all other nonfuel mineral commodities.

The production quantity and value of construction sand and gravel has steadily decreased since 2008. The production quantity of construction sand and gravel decreased by 1.5 million metric tons (Mt) (6%), in 2011and by 6.7 Mt (21%) in 2010, and the value of production of construction sand and gravel decreased by $7 million in 2011 and $42 million in 2010. Conversely, the production of crushed stone increased by 2.3 Mt (42%) in 2011 and 1.1 Mt (22%) in 2010, and the value of crushed stone production increased by $20.4 million (49%) in 2011and $4.3 million (12%) in 2010. Portland cement production rose by 13% in 2011 but fell by 5% in 2010. The value of portland cement production increased by 9% in 2011 but decreased by 9% in 2010. Lime production rose by 22% in 2011 and by 13% in 2010, and the value of lime production increased by 27% in 2011 and by 23% in 2010. In 2011, the production quantity of potash decreased slightly from that of 2010, but its value of production increased by 16%. In 2010, the quantity of potash production doubled, and its value grew by 42% from that of 2009.

Utah continued to be the only State to produce beryllium concentrates and magnesium metal in 2011 and 2010. In 2011and 2010, Utah remained second in rank in the production of copper among seven producing States, third in the production of gold among 10 producing States, fourth in the production of phosphate rock among 4 producing States, and second in the production of potash among 3 producing States in 2011. The State ranked second in 2011 and 2010, rising from third in the production of bentonite clay in 2009. In 2011, Utah ranked 10th in the production of lime among 33 producing States, up from 11th in 2010 and 12th in 2009. The State rose to 13th in 2011 from 15th in 2010 in the production of common clay. In 2011, Utah returned to 10th in gypsum production among 16 producing States after rising to ninth in 2010. In 2011, the State retained the 11th rank in the production of construction sand and gravel, having fallen from fifth in 2009 to 11th in 2010. In 2011, Utah ranked fourth in the production of gemstones (by value), which was unchanged from that in 2010 and 2009. In 2011, the State retained its rank as sixth in the production of salt. In 2011, the State ranked third in molybdenum concentrates production among seven producing States after rising to second in 2010 from third in 2009. The State fell in rank in the production of silver to fifth from fourth in 2010 and 2009.

The Utah Geological Survey[2] (UGS) provided the following narrative information. The UGS production data were based upon its surveys, estimates, and information gathered from company annual reports and may differ from some USGS

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

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

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

annual production figures, which were based upon USGS company surveys and estimates.

Industry Overview

In 2010, the estimated gross value of all energy and mineral commodities produced in Utah was estimated to be $8.44 billion. This was a $1.12 million (15%) increase from the State's total inflated-adjusted value of $7.32 billion in 2009, but 12% ($1.14 billion) lower than the revised and inflation-adjusted record of $9.58 billion record set in 2008. The value of Utah's mineral production (excluding oil and natural gas) was estimated to be $4.82 billion in 2010. In 2010, the production value of base metals accounted for 55% of the State's total mineral production value (excluding oil and natural gas), followed by industrial minerals accounting for 18%, precious metals accounting for 14%, and energy minerals (coal and uranium) accounting for 13%.

Prices for many mineral commodities, especially metals, rebounded slowly throughout 2009 and into 2010 with some increasing sharply late in 2010. However, many industrial mineral prices remained low as a result of a recession-related decrease in construction activity in the United States. Uranium oxide spot prices rose from about $18/kilogram (kg) in 2001 to a high of $300/kg in June 2007 before dropping to around $88/kg in early 2010. The low price remained relatively stable through much of 2010 before climbing to about $119/kg at the end of the year. Because uranium exploration and development activity closely tracks the spot price, a number of mines that had been rehabilitated when prices were high were idled when prices dropped.

Exploration and Development Activities

Mineral exploration and development remained slow through the first three-quarters of 2010 before rapidly increasing late in the year. Most of these exploration efforts focused on copper, gold, silver, and potash. In 2010, a total of 1,460 new mining claims were filed with the Bureau of Land Management (BLM) in Utah for a total of about 20,000 unpatented mining claims in the State. Beaver, Tooele, Juab, San Juan, and Garfield Counties each had over 100 new mining claims in 2010 (Opie Abeyta, Utah BLM, written commun., March 2011).

The State of Utah School and Institution Trust Lands Administration (SITLA), which manages about 1.8 million hectares (ha) (4.4 million acres) of State-owned lands in Utah, issued leases and (or) contracts on 124 tracts in 2010, more than double the 61 seen in 2009. Of these 124 new tracts, 60 were metal, 26 were potash, 20 were sand and gravel, 3 were geothermal, 2 were coal, 2 were clay, 1 was gemstone/fossil, 1 was humic shale, and the remaining 9 were other mineral commodities (William Stokes, SITLA, written commun., March 2011).

The Utah Division of Oil, Gas, and Mining (DOGM) received 8 new large mine permit applications (2 ha or more of surface disturbance in incorporated areas and 5 ha or more of surface disturbance unincorporated areas) and 21 new small mine permit applications (2 ha or less of surface disturbance in incorporated areas and 5 ha or less of surface disturbance unincorporated areas) in 2010. This was an increase of four large mine permit applications and six small mine permit applications compared to 2009. The number of DOGM Notices of Intent (NOI) to explore on public lands rebounded, with 31 NOIs being filed in 2010 compared with just 18 for 2009. The 2010 NOIs included 11 for base and precious metals, 10 for uranium, 6 for industrial minerals, 2 for tar sands/oil shale, and 2 for other mineral commodities.

Industrial Minerals

In 2010, exploration for industrial minerals, principally for potash, increased in Utah. Several companies acquired parcels totaling over 50,000 ha of ground and explored for potash brines in the Paradox Basin of southeastern Utah, primarily in Grand and San Juan Counties. In addition, Mesa Uranium Corp. announced that it acquired approximately 2,400 ha of property at its Green Energy lithium brine project in the Paradox Basin. The BLM initiated potash leasing on Sevier Lake, Millard County. These leases consisted of 64 parcels totaling over 50,900 ha. Sevier Lake has the potential to produce both potash and salt.

Metals

In 2010, major companies performed exploration for base metals in the Bingham and Tintic mining districts. Rapidly rising precious metal prices led to renewed gold and silver exploration in Utah in the last quarter of 2010. Precious-metal exploration largely took place in the eastern Basin and Range Province of Western Utah.

Kennecott Utah Copper Corp. (South Jordan, UT; a subsidiary of Rio Tinto plc) performed exploration in the Oquirrh Mountains in 2010. This exploration included the completion of 13 deep core holes for a total of nearly 15,900 meters (m), principally within 4 kilometers (km) of the Bingham Pit. The company also drilled a nearly 1,560-meter hole in the southwestern Oquirrh Mountains (Russ Franklin, Kennecott Exploration Co., written commun., March 2011).

Andover Ventures Inc. (Vancouver, British Columbia, Canada) drilled three holes, for a total of nearly 1,560 m, in the Burgin Extension deposit in the East Tintic District. The Burgin Extension is a historic resource; the total metal mined from the Tintic and East Tintic Districts between 1869 and 1976 was 16.5 million tons containing 250 million ounces of silver, 2.3 million ounces of gold, 2.2 billion pounds of lead, 350 million pounds of zinc, and 250 million pounds of copper. The company worked toward establishing the deposit as a Canadian NI 43-101-compliant reserve.

Kennecott Exploration Co. (Salt Lake City, UT) and Andover Ventures, in a joint venture, optioned a porphyry copper lithocap target on Big Hill near the center of the East Tintic District, Utah County. Kennecott Exploration performed a series of geophysical surveys in 2010, which included adding 77 magnetotelluric stations to an existing grid with 155 magnetotelluric stations, six lines of induced polarization, and a helicopter-borne, high-resolution aeromagnetic survey

of 800 line km. This exploration program also consisted of geological/alteration mapping and collection of about 200 rock samples. Drill testing was scheduled to begin in 2011 (Russ Franklin, Kennecott Exploration Co., written commun., March 2011).

Quaterra Resources Inc. (Vancouver, British Colombia, Canada) and Freeport-McMoRan Exploration Corp. (Phoenix, AZ), in a joint venture, held about 1,300 ha of patented and unpatented mining claims covering the Southwest Tintic porphyry copper system in Juab County. In 2010, Freeport completed a 5-hole, 3,390-m (11,122-ft) drilling program and further drilling was planned for 2011.

Clifton Mining Co. (Alpine, UT) and Desert Hawk Gold Corp. (Reno, NV) agreed to develop Clifton's mineral properties in the Gold Hill District, Tooele County. The initial plan was to put the Yellow Hammer copper-gold-silver mine into production. This small open pit was developed on a very unusual, structurally controlled, hydrothermal alteration "pipe" in a Jurassic granodiorite stock. Primary ore-controlling structures are reportedly intersecting north-south and east-west faults. Copper pitch-malachite-scheelite-molybdenite mineralization is associated with locally very coarse grained actinolite, black tourmaline, garnet, orthoclase, titanite, apatite, and magnetite in very strongly altered granodiorite. In 2009 and 2010, Desert Hawk completed drilling 116 shallow holes totaling 1,830 m in the Yellow Hammer Mine. The company planned to process ore from the Yellow Hammer Mine at the rehabilitated 180 metric tons-per-day (t/d) Cactus gravity/flotation mill, eight km north of Gold Hill. The company mined 3,260 t (3,600 tons) of ore for pilot scale testing at the mill in 2010.

Silver Verde May Mining Co. (Wallace, ID) acquired 78 claims and a nearly 260-ha State lease covering a porphyry copper-molybdenum system in the West Tintic mining district, Juab County. West Tintic is a historic lead-gold-tungsten-silver skarn and replacement deposit district in carbonate sedimentary rocks. Silver Verde May has concentrated its efforts on gold and performed rock, soil, and bulk leach-extracting gold sampling on the district margins. The company also controlled 20 unpatented claims and a more than 270-ha State lease on a sedimentary rock-hosted gold target on the south flanks of Maple Peak, Juab County, 7.2 km east of West Tintic. The gold prospect occurs in the Chiulos Member of the Mississippian Great Blue Limestone and jasperoid samples are anomalous in gold-silver-arsenic-antimony-mercury (Peter Maciulaitis, written commun., March 2011).

Inland Explorations Ltd. (Vancouver, British Columbia, Canada) has conducted base-metal exploration in Utah since 2006. As of 2010, the Company acquired four properties, including Thompson Knoll, Keg, Dugway, and Dunes (Sand Mountain).

Cadillac Mining Corp. (Vancouver, British Columbia, Canada) acquired 1,540 ha covering the historic mining area of the Goldstrike sedimentary rock-hosted gold-silver mining district, Washington County. Historic production through the 1980s and 1990s totaled approximately 6,000 kg of gold and 5,600 kg of silver. In 2010, the company worked toward consolidating, digitizing, and compiling the historic data on the district.

Adjacent to the Spor Mountain Beryllium Mine owned by Materion Corp., the largest beryllium producer in the world, IBC Advanced Alloys Corp. (Vancouver, British Columbia, Canada) acquired 371 claims. In 2010, IBC completed a nearly 2,500-line-km airborne magnetic and radiometric survey of the property. The survey was processed and potential targets were delineated.

Uranium and Vanadium

Energy Fuels Inc. (Toronto, Ontario, Canada) explored and worked toward rehabilitating its historic uranium mine, the Whirlwind Mine on Beaver Mesa, which straddles the Utah-Colorado border, about 45 km northeast of Moab in Grand County. The property began limited production in 2009 and remained on standby through 2010. The company estimates that the Whirlwind resource was about 149,000 t of ore averaging 0.20% uranium oxide (U_3O_8) and 0.66% vanadium pentoxide (V_2O_5) (Peters, unpub. data, October 2008). Energy Fuels anticipates mining 45 to 180 t/d when mining resumes. Energy Fuels continued to rehabilitate the Energy Queen Mine, in the La Sal district, San Juan County, that the Company acquired in 2007.

Commodity Review

Contributions from each of the mineral segments in 2010 were: base metals, $2.65 billion (55% of total); industrial minerals, $0.86 billion (18% of total); energy minerals, $0.63 billion (13% of total); and precious metals, $0.69 billion (14% of total). Compared to 2009, the 2010 values of base metals increased by $505 million (24%), industrial minerals decreased by $94 million (10%), energy minerals decreased by $24 million (4%), and precious metals increased by $57 million (9%).

Industrial Minerals

At an estimated value of $856 million, industrial-minerals production was the second largest contributor to the total value of minerals produced in Utah during 2010. Industrial minerals comprised 20% of the total value of nonfuel mineral commodity production in 2010. Industrial mineral values decreased by about $94 million (10%) in 2010 compared to 2009, but the difference was less pronounced than the 2008 to 2009 drop. The economic downturn severely impacted the construction industry, which is a major consumer of industrial minerals, and was a major reason for the decline. Despite the decreases of the last 3 years, the value of industrial mineral production in 2010 was still about 59% higher than in 2001.

Brine-derived products, including salt, magnesium chloride, potassium chloride, and sulfate of potash, were the largest contributors to the value of industrial-mineral production in Utah in 2010, with a combined value of $370 million, about $75 million (17%) less than that in 2009. Construction sand and gravel, crushed stone (including limestone and dolomite), and dimension stone contributed the second-largest share

of the overall value of industrial minerals produced in Utah during 2010, with an estimated value of $201 million, a $9 million (4%) decrease from that of 2009. These commodity groups, together with portland cement and lime (actual values withheld—proprietary company data), contribute about 85% of the total value of industrial minerals produced in Utah. Most of the remainder of the value of industrial minerals in Utah is shared, in descending order of value, by phosphate, gilsonite, bentonite, common clay, kaolin, expanded shale, and gypsum.

Clays.—The amount of common clay, bentonite, and high-alumina clay mined in Utah during 2010 was about 22% more than was produced in 2009. A number of mines produce these commodities although many only operate intermittently. The three leading producers of common clay were, in descending order of production, Interstate Brick Co., Interpace Holdings LLC, and Holcim (US) Inc. Together they produced around 110,000 t of common clay, which is primarily used to manufacture bricks. Western Clay Co. produced the majority of bentonite although Redmond Minerals, Inc. made a significant contribution. Bentonite is used in many applications in civil engineering, well drilling, foundry operations, and as litter-box filler. High-alumina clay production in 2010 was minimal; the primary producers from previous years reported little or no new production. High-alumina clays are mainly used to produce portland cement.

Gilsonite.—Gilsonite is a shiny, black, solid hydrocarbon that has been mined in Utah since the late 1800s. Gilsonite is an important industrial mineral that is shipped worldwide for use in over 150 diverse products ranging from printing inks to explosives. American Gilsonite Co. and Ziegler Chemical and Minerals Co. both mined gilsonite in 2010. All of the gilsonite mines are located in southeastern Uintah County and the two companies together produced around 61,000 t of gilsonite. This quantity represents an increase over 2009 production.

Gypsum.—Four operators produced gypsum in Utah in 2010. Although the quantity produced represented a 20% increase over the previous year, 2010 saw the second lowest gypsum production of the last 15 years. Utah gypsum producers, in descending order of production, were (1) Sunroc Corp., (2) United States Gypsum Co., (3) Diamond K Gypsum Co., and (4) Nephi Gypsum. Two wallboard plants operated in Utah near the town of Sigurd in Sevier County. The United States Gypsum plant was active in 2010, but the Georgia Pacific Corp. plant was not, owing to economic considerations. This plant was closed from 2002 to 2006, closed again in 2008, and was expected to remain idle for the foreseeable future. Most Utah gypsum is used for producing wallboard, although some is used as a cement additive or soil conditioner.

Phosphate Rock.—Simplot Phosphates, LLC was the only active phosphate producer in Utah. The 2010 yield of ore represented an increase of about 8% over that of 2009. Simplot's phosphate operation is located 19 km north of Vernal in Uintah County. About 3 to 4 Mt of ore is mined annually. Processing of the ore yields approximately 1 to 2 Mt of phosphate concentrate, which is then transported in slurry form through a 155-km underground pipeline to the company's fertilizer plant near Rock Springs, WY.

Portland Cement, Lime, and Limestone.—Portland cement was produced in Utah by Holcim and Ash Grove Cement Co. Holcim operated the Devils Slide plant and mine east of Morgan in Morgan County and Ash Grove Cement operated the Leamington plant and mine east of Lynndyl in Juab County. Ash Grove Cement also mined some shale and sandstone that are used in cement manufacturing.

Lime was produced by two companies in Utah. Graymont Western U.S., Inc. produced high-calcium quicklime and dolomitic quicklime at a plant in the Cricket Mountains approximately 56 km southwest of Delta in Millard County. Lhoist North America (formerly Chemical Lime Co.) also produced dolomitic quicklime, as well as hydrated dolomitic lime, at its plant about 13 km northwest of Grantsville in Tooele County. However, the Lhoist plant was idled in 2008 and was likely to remain closed through at least 2011. When both plants operate, the production capacity for lime exceeds 900,000 metric tons per year (t/yr).

More than 2.0 Mt of limestone was produced in Utah in 2010. Most limestone production supported the manufacture of cement and lime products, although lesser quantities were used in other aspects of the construction industry and for flue-gas desulfurization in coal-fired powerplants. Small quantities of limestone are pulverized and sold to the coal mining industry as "rock dust."

Salt, Magnesium Chloride, Potash (Potassium Chloride), and Sulfate of Potash.—The Great Salt Lake is an important resource with respect to the production of salt and other brine-derived commodities, including magnesium chloride and potassium sulfate. Operations in other areas of the State produced potash (potassium chloride) along with lesser amounts of magnesium chloride and salt. Additionally, NorthShore LP produced a small amount of concentrated magnesium brine for use in nutritional supplements.

Estimated salt production in 2011 was 2.7 Mt and in 2010 was 2 Mt, a decrease of about 0.6 Mt from 2009. Three operators processing brine from the Great Salt Lake are responsible for 76% of salt production in Utah. These operators were, in descending order of production: (1) Great Salt Lake Minerals Corp., (2) Cargill, Inc., and (3) Morton International, Inc. The remaining salt production was from Redmond Clay and Salt Co., Inc. near Redmond in Sanpete County, Intrepid Potash, Inc. near Wendover in Tooele County and near Moab in Grand County. Potash production in 2011 increased over 2010 levels and again in 2010 over 2009 levels (production withheld—proprietary company data). Potash was produced by Intrepid Potash, Inc. Great Salt Lake Minerals produced potassium sulfate in 2011 and 2010.

Sand and Gravel, Construction, and Stone, Crushed and Dimension.—More than 150 pits and quarries were active across the State producing sand and gravel, dimension stone, and crushed stone. Production was accomplished by commercial operators as well as various county, State, and Federal agencies. The UGS does not send annual production questionnaires to the producers of this commodity group owing to the sheer numbers involved. The USGS, however, does compile and track this industry. In 2011, Utah operators produced approximately

25.4 Mt of construction sand and gravel valued at $149 million, and in 2010 the production was 26.9 Mt valued at $156 million (table 1). Crushed stone produced in 2011 was 8 Mt valued at $$61.8 million, and in 2010 the production was 5.7 Mt valued at $41.3 million (table 1). Approximately 7,000 t of dimension stone with a value of $595,000 was produced in 2011 and 9,000 t with a value of 674,000 in 2010 (table1). As a group, these commodities reflect a decrease in production and drop in value, primarily owing to decreased production of sand and gravel in the second and third quarters of 2010 compared to the same timeframe in 2009, and slightly lower unit values. The continuing slowdown of the regional and local construction industries were the main cause for these decreases. Crushed stone production and value increased in 2011.

Shale, Expanded.—In 2010, expanded shale production dropped to about 99,000 cubic meters (m^3) from 122,000 m^3 in 2009. Utelite Corp. was the only expanded shale producer in Utah, operating a mine and plant near Wanship in Summit County. Expanded shale, sometimes called "bloated shale," is a lightweight aggregate used primarily in the construction industry. High-purity shale from the Cretaceous Frontier Formation is heated to about 1,100 °C (2,000 °F), causing it to expand and vitrify. The resulting aggregate is stable, durable, and lightweight with a density of only about one-half that of conventional materials.

Metals

In 2011 and 2010, the Bingham Canyon Mine continued to produce larger quantities of metals; a sedimentary rock-hosted copper solvent extraction-electrowinning (SX-EW) operation in Lisbon Valley ramped up toward full production; and the Iron Mountain Mine resumed production in 2010. Base-metal production in 2010 was estimated to be $2.65 billion and constituted about 63% of the total value for all nonfuel mineral production in Utah. Base-metal values climbed by about 24% over the 2009 figures based primarily on increased unit values and, to a lesser extent, increased production of some commodities. Three metals accounted for roughly 98% of the total base-metal value. These contributors were copper (73%), molybdenum (15%), and magnesium (10%). Beryllium, iron, and vanadium constitute the remaining 2% of the total base-metal value.

Kennecott Utah Copper's (KUC) Bingham Canyon Mine, located about 32 km southwest of Salt Lake City in Salt Lake County, produced the majority of Utah's copper, gold, and silver, and was the only source of molybdenum in Utah. Kennecott also produced a relatively small quantity of gold at the Barneys Canyon facility about 4 km north of the Bingham Canyon operation. At approximately $2.97 billion, the combined value of metals produced by Kennecott in 2010 was about 71% of the total value of all nonfuel minerals produced in the State.

Kennecott's Bingham Canyon porphyry Cu-Mo-Au-Ag Mine, Salt Lake County, was the leading producer of copper and the second-leading producer of molybdenum in the U.S. in 2011 and 2010. Kennecott also continued a development program with efforts concentrated on extending the mine life past the current 2019 plan. The Cornerstone project, if approved, will extend the mine life to 2028 while maintaining other long-term development options.

Beryllium.—Utah remained the Nation's sole producer of beryllium concentrates, the fourth largest contributor to 2010 base-metal values. Materion Natural Resources, Inc., formerly Brush Resources, operated a beryllium (bertrandite) mine about 68 km northwest of Delta in Juab County and a mill 18 km north of Delta in Millard County where it converted the bertrandite ore, along with imported beryl and beryl from the National Defense Stockpile, into beryllium hydroxide. Some of the beryllium hydroxide was then shipped to a refinery and finishing plant in Ohio, also owned by the parent company, Materion Corp., where it was further processed into beryllium-copper master alloy, beryllium metal, and oxide. Beryllium is used in various aerospace/defense components, electronic devices, and industrial components. Proven reserves of bertrandite from the Spor Mountain area in Utah were about 15,900 t of contained beryllium. A rebound in many of the markets using beryllium and a substantial price increase significantly increased the beryllium value in 2010. Approximately 65% of the output from the facility was intended for defense and government use with the remaining portion going to the private sector (Jaskula, 2011).

Copper.—Copper was the largest contributor to the value of nonfuel minerals in 2010. Copper production at Kennecott's Bingham Canyon Mine decreased in 2010 from 2009. However, the decreased 2010 production was offset by a significant price increase that boosted copper production values by 13% over those in 2009.

Following some startup problems, Lisbon Valley Mining Co. LLC successfully started mining operations in 2009. Copper King Mining Corp., through its wholly owned subsidiary, Western Utah Copper Co., controlled about 6,200 ha in the Rocky and Beaver Lake mining districts, Beaver County. These districts host seven partially defined copper skarn and breccia pipe deposits. In 2009, Copper King completed construction of a flotation mill and started open pit mining the Hidden Treasure copper skarn. The mill began production at about 1,100 t/d in May 2009 and produced a limited amount of copper concentrate. A separate magnetite concentrate was produced and sold to a coal wash plant in the fall of 2009. The mill experienced less than 20% copper recovery, owing to the mixed oxide-sulfide nature of the skarn ore, and operations were halted near the end of 2009; however, a final batch of approximately 18 t of copper concentrate was shipped in 2010. The future of the operation remained uncertain until Chapter 11 bankruptcy proceedings were resolved.

Gold.—Most of the gold produced in Utah was recovered as a byproduct of the copper operation at Kennecott's Bingham Canyon Mine. The Barneys Canyon Mine, also owned by Kennecott, exhausted its economic ore reserves and ceased active mining in late 2001. Since then, gold has been produced from residual leaching of existing heaps at a declining rate. Despite the decreased gold production, substantial price increases in 2010 raised the value by about 8%.

Iron.—Iron ore production was reinitiated at the Iron Mountain Mine in the third quarter of 2010 by CML Metals, Corp., the sole producer in the State. The mine is located about 30 km west of Cedar City in Iron County.

The Iron Mountain Mine (formerly the Comstock-Mountain Lion open pit) was acquired by Palladon Iron Corp. in 2005. The company was restructured into CML Metals Corp. in early 2010. The ore occurs as a massive magnetite skarn/replacement deposit adjacent to Miocene laccoliths. Mining by Palladon was initiated in 2008, but ceased in 2009 owing to instability in the iron ore market and logistical problems. In 2009, Palladon completed a Canadian NI 43-101-compliant resource estimate on the Comstock-Mountain Lion deposit, showing a resource of 28.4 Mt averaging 48.6% iron (SRK Consulting, unpub. data, September 2009). Previously, stockpiled run-of-mine ore and some newly mined ore was shipped out of the new rail load-out at the mine by Union Pacific Railroad to the port of Richmond, CA, for overseas transport to China. CML initiated construction of a new 167,000-metric-ton-per-month concentrator to produce a high-grade iron concentrate. The concentrator was scheduled for completion in early 2012.

Magnesium.—An electrolytic process was used to produce magnesium metal from Great Salt Lake brines at a plant operated by U.S. Magnesium, LLC. The plant at Rowley in Tooele County was the only primary magnesium processing facility in the United States. Production capacity at the plant was approximately 52,000 t/yr. Overall consumption of magnesium metal in the United States can be attributed to aluminum-based alloys (41%), structural uses such as castings (32%), desulfurization of iron and steel (13%), and various other uses (14%) (Kramer, 2011). Magnesium production in 2010 was somewhat higher than in 2009 and experienced an additional, but smaller, increase in 2011. The average price for magnesium metal increased from $5.07/kg ($2.30/ pound) in 2009 to $5.73/kg ($2.60/pound) in 2010 (Kramer, 2011).

Molybdenum.—Approximately 8% more molybdenum was produced at Kennecott's Bingham Canyon Mine in 2011 than in 2010, and 12% more in 2010 than 2009. Increased production resulted in an 8% increase in value in 2011 and 12% increase in 2010. Approximately 75% of the molybdenum is combined with other metals to produce various alloys (Polyak, 2011a). Kennecott began construction of a $340 million molybdenum autoclave process (MAP) facility scheduled to begin production in late 2012. The new facility was planned to increase the capacity to produce 13.6 million kg of molybdenum products and an additional 4,090 kg of rhenium per year.

Silver.—Silver is another byproduct metal from the Bingham Canyon Mine. Silver production decreased by about 21% in 2011 and 23% in 2010. However, higher prices resulted in overall increased values in both years. Several other small mines in Utah may have produced small quantities of gold and silver, but production is not reported.

Vanadium.—Vanadium, in the form of V_2O_5, is coproduced with uranium during the milling of uranium ore. Average V_2O_5 prices, which experienced a sharp decline in 2009 to $11.97/kg ($5.43/ pound), rebounded slightly to an estimated $14.11/kg ($6.40/ pound) in 2010. Vanadium is a ferroalloy closely tied to the steel industry, which consumes the majority of annual vanadium production (Polyak, 2011b).

Mineral Fuels and Related Materials

Uranium.—Denison Mines Corp. and Utah Energy Corp. (a subsidiary of White Canyon Uranium Ltd.) were responsible for most uranium production in Utah during 2010. Together, they produced about 280 t of uranium oxide with a value of approximately $28 million from their mines in southern Utah. The uranium and byproduct vanadium ore mined by the companies was hauled to Denison's White Mesa mill, about 10 km south of Blanding in San Juan County, for processing into U_3O_8 and V_2O_5. The sharp decline in uranium spot prices after the mid-2007 high of $300/kg extended through the first half of 2010, resulting in less-intensive uranium exploration and production. The spot price recovery for uranium that began in the second half of 2010 was the primary reason that production and value increased by about 6% and 5%, respectively, from those of 2009.

Denison Mines owned five permitted uranium mines in Utah as well as the 1,800-t/d, dual-circuit White Mesa mill near Blanding. The mill processed both uranium ore and an alternate feed-waste material. The mill began operating on stockpiled ore from Denison-owned mines in 2008, and began accepting ore from other companies for toll milling in 2009. The mill had the capacity to produce about 1.36 million kg/yr of U_3O_8 and 2 million kg/yr of V_2O_5. Uranium recoveries from ore averaged over 90%.

Denison's Pandora Mine, in the eastern La Sal District, San Juan County, shipped about 180 t/d of ore, 110 km south to the White Mesa mill. In 2009, Denison reopened the Beaver Mine, 3 km west of the Pandora Mine. The Beaver Mine produced about 170 t/d of ore. Denison production in 2010 was about 168,600 kg U_3O_8 and 943,500 kg V_2O_5. The La Sal District uranium ores are hosted in the Upper Jurassic Salt Wash Member of the Morrison Formation.

White Canyon's Daneros Mine in the White Canyon District, San Juan County, was permitted in May 2009, development began in July, and production started in December 2009. The Daneros ore body is hosted by the basal Shinarump Conglomerate Member of the Upper Triassic Chinle Formation and also contains about 1% copper. The mine was accessed by twin declines, developed by room-and-pillar methods, and was ramping up production to 160 t/d of ore. Ore was shipped 100 km to the White Mesa mill for toll milling. In 2010, the Daneros Mine produced 41,866 t of ore averaging about 0.26% U_3O_8.

Environmental Issues and Other Activities

The U.S. Department of Energy (DOE) and the State of Utah agreed to move 10.8 Mt of uranium mill tailings located along the Colorado River near Moab. The tailings were to be moved 48 km north to a site near Crescent Junction. The DOE planned to transport the tailings by rail to a 100-ha disposal cell developed in the Cretaceous Mancos Shale. The project began shipping tailings in April 2009 and had moved approximately 2.5 Mt by the end of 2010. In 2011, DOE continued to ship 4,500 t/d in spite of reduced funding.

State Information

The following publications provide new information on the mineral resources of Utah. These and others publications are available through the Utah Department of Natural Resources Map and Bookstore (http://mapstore.utah.gov/). Additional geographic information system (GIS) data on Utah is available for free download at http://geology.utah.gov/resources/data-databases/.

Bon and Krahulec (2010) report on the exploration, development, and production of uranium and nonfuel minerals in Utah for 2009. Krahulec and Schroeder (2010) provide road logs, papers, and "Economic Geology" reprints on the porphyry systems in the Bingham and Tintic mining districts.

Additional information on the geology and mineral resources of Utah are available at the Utah Geological Survey Web site http://geology.utah.gov/.

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TABLE 1
NONFUEL MINERAL PRODUCTION IN UTAH[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2009		2010		2011	
		Quantity	Value	Quantity	Value	Quantity	Value
Beryllium concentrates	metric tons	3,030	NA	4,460	NA	5,920	NA
Clays, Common		342	7,230	322	7,020	334	7,260
Gemstones, natural		NA	783	NA	786	NA	789
Salt		2,000	152,000	1,940	100,000	2,660	126,000
Sand and gravel, construction		33,100 r	194,000 r	26,900	156,000	25,400	149,000
Stone:							
Crushed		4,640 r	37,000 r	5,650	41,300	8,000	61,800
Dimension		9	844	9	674	7	595
Combined values of cement (portland), clays (bentonite), copper, gold, gypsum (crude), helium [Grade-A (2009–10)], industrial sand and gravel, lime, magnesium compounds, magnesium metal, molybdenum concentrates, phosphate rock, potash, silver		XX	3,420,000 r	XX	3,990,000	XX	3,960,000
Total		XX	3,810,000 r	XX	4,300,000	XX	4,300,000

rRevised. NA Not available. XX Not applicable.

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

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

TABLE 2
UTAH: CRUSHED STONE SOLD OR USED IN THE UNITED STATES, BY TYPE[1]

Type	2009				2010				2011			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone[2]	18	3,430	$29,700	$8.66	15	3,250	$25,000	$7.69	15	3,890	$33,000	$8.49
Dolomite	--	--	--	--	2	959	7,320	7.63	2	2,350	16,200	6.89
Sandstone and quartzite[3]	4 r	200 r	2,630 r	13.15	--	--	--	--	4	76	736	9.73
Volcanic cinder and scoria	--	--	--	--	3	2	27	10.97	3	7	50	6.89
Miscellaneous stone	13 r	1,160	6,780 r	5.84	16	1,450	9,010	6.23	15	1,680	11,800	7.02
Total or average	XX	4,640 r	37,000 r	8.16	XX	5,650	41,300	7.31	XX	8,000	61,800	7.72

rRevised. XX Not applicable. -- Zero.
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two kinds of stone.
[3]Includes sandstone-quartzite reported with no distinction between the two kinds of stone.

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

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Fine aggregate (-⅜ inch), screening, undesigned	3	25
Coarse and fine aggregates:		
Terrazzo and exposed aggregate	7	188
Crusher run or fill or waste	41	293
Other construction materials	W	W
Agricultural, poultry grit and mineral food	W	W
Chemical and metallurgical:		
Cement manufacture	1,680	14,700
Lime manufacture	W	W
Unspecified:[2]		
Reported	2,210	14,600
Estimated	787	7,460
Total	5,650	41,300

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

TABLE 4
UTAH: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 2011, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch), riprap and jetty stone	5	74
Coarse aggregate, graded, bituminous aggregates, coarse	W	W
Coarse and fine aggregates:		
Graded road base or subbase	15	61
Terrazzo and exposed aggregate	2	41
Unspecified and other construction materials	W	W
Agricultural, agricultural limestone	W	W
Chemical and metallurgical:		
Cement manufacture	2,070	18,300
Lime manufacture	W	W
Sulfur oxide removal	38	297
Special, mining dusting or acid water treatment	W	W
Other miscellaneous uses and specified uses not listed	183	2,810
Unspecified:[2]		
Reported	3,890	26,900
Estimated	474	3,470
Total	8,000	61,800

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

TABLE 5
UTAH: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2010, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Fine aggregate (-⅜ inch)[2]	--	--	3	$25	--	--
Coarse and fine aggregates[3]	W	W	41	293	W	W
Other construction materials	W	W	W	W	W	W
Agricultural[4]	--	--	W	W	--	--
Chemical and metallurgical[5]	W	W	W	W	--	--
Unspecified:[6]						
Reported	845	$6,440	1,010	7,740	22	$160
Estimated	235	2,840	475	4,030	78	595
Total[7]	2,910	21,900	2,500	20,700	107	943

Use	Unspecified districts	
	Quantity	Value
Construction:		
Fine aggregate (-⅜ inch)[2]	--	--
Coarse and fine aggregates[3]	--	--
Other construction materials	--	--
Agricultural[4]	--	--
Chemical and metallurgical[5]	--	--
Unspecified:[6]		
Reported	330	$241
Estimated	--	--
Total[7]	330	241

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregates.
[3]Includes graded road base or subbase, unpaved road surface, terrazzo and exposed aggregate, crusher run, roofing granules, and other coarse and fine aggregates.
[4]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.
[5]Includes cement manufacture, lime manufacture, dead-burned dolomite manufacture, flux stone, chemical stone, glass manufacture, and sulfur oxide removal.
[6]Reported and estimated production without a breakdown by end use.
[7]District totals may not add up to the published State total, owing to revisions made after the production of the table and (or) proprietary data being withheld.

TABLE 6
UTAH: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2011, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	--	--	--	--	W	W
Coarse aggregate, graded[3]	W	W	--	--	--	--
Coarse and fine aggregates[4]	W	W	--	--	17	101
Other construction materials	W	W	--	--	--	--
Agricultural[5]	W	W	W	W	--	--
Chemical and metallurgical[6]	W	W	W	W	38	297
Special[7]	W	W	--	--	--	--
Other miscellaneous uses and specified uses not listed[8]	W	W	--	--	--	--
Unspecified:[9]						
Reported	1,420	10,600	W	W	W	W
Estimated	82	712	377	2,600	16	154
Total	3,830	30,900	3,980	30,100	75	628

Use	Unspecified	
	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch)[2]	--	--
Coarse aggregate, graded[3]	--	--
Coarse and fine aggregates[4]	--	--
Other construction materials	--	--
Agricultural[5]	--	--
Chemical and metallurgical[6]	--	--
Special[7]	--	--
Other miscellaneous uses and specified uses not listed[8]	--	--
Unspecified:[9]		
Reported	111	106
Estimated	--	--
Total	111	106

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits.
[2]Includes macadam, riprap and jetty stone, filter stone, and other coarse aggregates.
[3]Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregates.
[4]Includes graded road base or subbase, unpaved road surface, terrazzo and exposed aggregate, crusher run, roofing granules, and other coarse and fine aggregates.
[5]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.
[6]Includes cement manufacture, lime manufacture, dead-burned dolomite manufacture, flux stone, chemical stone, glass manufacture, and sulfur oxide removal.
[7]Includes mine dusting or acid water treatment, whiting or whitening substance, and other fillers or extenders.
[8]Includes drain fields, waste material, lightweight aggregate (slate), pipe bedding, refractory stone (including ganister), and other miscellaneous uses.
[9]Reported and estimated production without a breakdown by end use.

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

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products[2]	1,530	$12,400	$8.10
Asphaltic concrete aggregates and road base materials[3]	3,430	19,800	5.77
Fill	2,490	9,220	3.70
Other miscellaneous uses[4]	121	942	7.79
Unspecified:[5]			
Reported	6,530	37,100	5.68
Estimated	11,600	68,700	5.92
Total or average	26,900	156,000	5.80

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

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

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	724	$5,870	$8.11
Plaster and gunite sands	7	81	11.57
Asphaltic concrete aggregates and road base materials[2]	2,780	17,600	6.33
Fill	1,820	8,440	4.64
Other miscellaneous uses[3]	354	4,170	11.78
Unspecified:[4]			
Reported	8,560	47,600	5.56
Estimated	11,200	64,900	5.79
Total or average	25,400	149,000	5.87

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

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

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	W	W	897	5,970	W	W
Asphaltic concrete aggregates and road base materials[3]	1,050	6,720	1,170	7,480	931	4,260
Fill	806	3,660	1,310	4,260	237	880
Other miscellaneous uses[4]	74	641	23	92	24	210
Unspecified:[5]						
Reported	1,400	8,590	3,330	21,400	836	5,070
Estimated	3,310	21,600	6,440	39,700	2,440	13,900
Total[6]	6,650	41,200	13,200	78,900	4,470	24,300

	Unspecified districts	
	Quantity	Value
Concrete aggregate (including concrete sand)[2]	--	--
Asphaltic concrete aggregates and road base materials[3]	282	$1,360
Fill	140	410
Other miscellaneous uses[4]	--	--
Unspecified:[5]		
Reported	961	2,020
Estimated	--	--
Total[6]	1,380	3,790

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement).
[4]Includes snow and ice control and railroad ballast.
[5]Reported and estimated production without a breakdown by end use.
[6]District totals may not add up to the published State total, owing to revisions made after the production of the table and (or) proprietary data being withheld.

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

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	148	1,790	329	1,910	174	1,610
Plaster and gunite sands	--	--	--	--	7	81
Asphaltic concrete aggregates and road base materials[2]	1,020	7,080	838	4,840	854	5,220
Fill	523	2,320	1,170	5,570	105	473
Other miscellaneous uses[3]	217	3,080	32	156	100	862
Unspecified:[4]						
Reported	1,150	7,000	4,910	29,700	1,300	7,740
Estimated	2,070	12,200	5,990	35,500	2,710	14,900
Total	5,120	33,500	13,300	77,700	5,240	30,800

Use	Unspecified districts	
	Quantity	Value
Concrete aggregate (including concrete sand)	75	558
Plaster and gunite sands	--	--
Asphaltic concrete aggregates and road base materials[2]	69	445
Fill	19	69
Other miscellaneous uses[3]	5	70
Unspecified:[4]		
Reported	1,210	3,140
Estimated	402	2,370
Total	1,780	6,650

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes road and other stabilization (cement and lime).
[3]Includes filtration, railroad ballast, and snow and ice control.
[4]Reported and estimated production without a breakdown by end use.