

1999 SUMMARY OF MINERAL ACTIVITY IN UTAH

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SUMMARY

The value of Utah's mineral production (including coal) in 1999 is estimated to be \$1.82 billion, \$39.6 million less than in 1998. Contributions from each of the major industry segments are: base metals, \$626 million (35 percent of total); industrial minerals, \$583 million (32 percent of total); coal, \$453 million (25 percent of total); and precious metals, \$153 million (8 percent of total).

The changes in Utah's mineral valuation by industry segment for the years 1996-1999 are shown in figure 1. Compared to 1998, the 1999 values of: (1) base metals decreased \$62 million, (2) industrial minerals increased \$49 million, (3) coal decreased \$21 million, and (4) precious metals decreased \$1.4 million. Prices decreased for most base metals (copper, molybdenum, and magnesium) and precious metals (gold and silver). Coal prices were also lower in 1999. Industrial mineral prices increased slightly for several commodities (crushed stone, gilsonite, magnesium chloride, potash, and expanded shale), remained flat for most commodities, and were lower for other commodities (cement, lime, perlite, phosphate, potassium sulfate, and sand and gravel).

OUTLOOK

The value of mineral production is expected to increase in 2000 primarily due to increased production and a modest increase in precious- and base-metal prices. Operator surveys indicate that in 2000, both base- and precious-metal production should increase modestly while coal production should increase slightly. Industrial mineral commodities as a whole should show an increase in value in 2000, due mostly to increased production, especially sand and gravel and crushed stone. Spot prices for both base and precious metals have risen above their respective multi-year lows and some improvement in prices is anticipated for 2000. Prices for most industrial minerals should remain relatively flat while coal prices are expected to increase slightly. Base- and precious-metal exploration will remain relatively slow until the market for these minerals improves.

MINE PERMIT SUMMARY AND STATUS

During 1999, the Utah Division of Oil, Gas and Mining (DOGGM) received eight Large Mine permit applications (5 acres [2 hectares] and larger disturbance) and 51 new Small

Mine permit applications (less than 5 acres [2 hectares] disturbance). Seven of the Large Mine applications were made to change from Small to Large Mine status. These numbers represent no increase in Large Mine permit applications and an increase of nine Small Mine permit applications compared to 1998. New Large Mine permits include two dimension stone quarries, two precious metal mines, one limestone quarry (aggregate), one gypsum quarry, one gemstone mine, and one road construction permit for a potential phosphate mine. New Small Mine permits are grouped as follows: industrial minerals - 32, uranium-vanadium - 2, base and precious metals - 8, gems and fossils - 7, and other - 2.

The state has 79 active Large mines (excluding sand and gravel) that are grouped by industry segment as follows: base metals - 4, precious metals - 1, coal - 14, and industrial minerals - 60. Eighty Small mines reported production in 1998, the same number as in 1997. Small mines are grouped as follows: industrial minerals - 62 (including building, decorative, and dimension stone), gemstones - 7, precious and base metals - 7, and fossils and geodes - 4.

In December 1999, DOGM sent 434 annual production questionnaires to all Large and Small Mine permit holders. By March 10, 2000, 289 questionnaires had been returned. Sixty-one Large mines and 98 Small mines reported production. Several reporting mines produced more than one commodity. In addition, 12 coal mines reported production in 1999.

EXPLORATION PERMITS

Mineral exploration statewide increased slightly compared to 1998. Twenty-six Notices of Intent (NOIs) to explore on public lands were filed with DOGM in 1999, compared to 22 in 1998, and 34 in 1997. The number of new NOIs listed by county included: Beaver - 7, Emery - 3, Garfield - 1, Iron - 1, Juab - 2, Millard - 1, Piute - 3, Tooele - 5, Uintah - 2, and Washington - 1. Eleven permits were issued for industrial minerals exploration, six for base metals and precious metals, and nine for precious metals only. All but two of the base- and precious-metal NOIs were from individuals or small companies.

NATIONAL RANKINGS

The U.S. Geological Survey (USGS) ranked Utah 10th in the nation (down from 8th) in the value of nonfuel minerals produced in 1998 (latest year that production figures are available). Utah accounted for nearly 3.25 percent of the U.S. total nonfuel mineral production value. The state ranked first in production of beryllium and gilsonite; second in copper, magnesium metal, and potash; fourth in molybdenum and phosphate rock; fifth in gold, silver, bentonite, and Grade - A helium; sixth in salt; and seventh in construction sand

and gravel (up from 10th in 1998). Utah ranked 14th in coal production (the same as in 1998).

According to the USGS, between 1988 and 1998 the value of nonfuel mineral production in Utah ranged from a low of \$1.02 billion in 1988 to a high of \$1.84 billion in 1995 (figure 2). Nonfuel mineral production for 1998 is estimated to be \$1.30 billion, about the same as in 1993. The Utah Geological Survey's (UGS) estimate for nonfuel mineral production for 1999 is \$1.36 billion, \$14 million less than its estimate for nonfuel mineral production in 1998.

BASE- AND PRECIOUS-METAL PRODUCTION

Base-metal production, valued at \$626 million, was the largest contributor to the value of minerals produced in 1999. In descending order of value, those metals are: copper, magnesium metal, molybdenum, and beryllium. Precious-metal production, valued at \$153 million, included gold (87% of total value) and silver (13% of total value). Kennecott Utah Copper Corporation's Bingham Canyon mine, located a few miles west of Salt Lake City in Salt Lake County, is the state's only significant producer of copper, silver, and molybdenum, and a major producer of gold. The combined value of minerals produced from the Bingham Canyon mine is more than one-third of the total value of all minerals produced statewide.

Copper

Copper is the largest contributor to the value of nonfuel minerals in the state. Significant price increases in 1994 and 1995 pushed the value of copper to historical highs and the value of base-metal production statewide to over \$1 billion for the first time in 1995. Since 1995 the price of copper has fallen significantly (\$1.38/lb [\$3.04/kg] in 1995 vs \$0.76/lb [\$1.68/kg] in 1999). Copper production from Kennecott's Bingham Canyon mine in Salt Lake County increased slightly in 1999 to approximately 315,000 short tons (st) (286,000 metric tons [mt]) from 1998 production of approximately 314,000 st (285,000 mt) of copper metal. With the completion of their modernization and expansion program, Kennecott's copper production has stabilized at a rate slightly higher than 300,000 st (272,000 mt) annually.

Magnesium Metal

Magnesium metal was the second-largest contributor to the value of base metals in 1999. Magnesium metal is produced from Great Salt Lake brines by Magnesium Corporation of America (Magcorp) at its electrolytic plant at Rowley in Tooele County. The plant has a capacity to produce 44,000 st (40,000 mt) of magnesium metal (99.9 percent purity) annually and is one of only two active primary processing facilities in the U.S.

Magnesium production was less than capacity in 1999: demand has decreased worldwide and domestic producer prices were at their lowest level since 1994.

Molybdenum

The sole molybdenum producer in Utah is Kennecott's Bingham Canyon mine, which produced more than 11,000 st (10,000 mt) of molybdenum concentrate (MoS_2) in 1999, a slight increase from that produced in 1998. The Bingham Canyon mine was one of eight (down from 11 in 1998) molybdenum-producing mines in the U.S. in 1999. Molybdenum is recovered as a by-product from the copper milling operation.

Beryllium

Utah continued to be the nation's leading producer of beryllium. Beryllium ore (bertrandite) is mined at Brush Wellman, Inc.'s Topaz and Hogs Back mines in Juab County and processed with imported beryl at the company's plant a few miles north of Delta in Millard County. The Hogs Back mine began producing in 1998. In 1999, approximately 100,000 st (91,000 mt) of ore was mined and trucked to the company's Delta plant for processing. The amount of beryllium ore mined in 1999 was slightly lower than 1998. 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. The demand for beryllium alloys and beryllium oxide has increased modestly over the past several years as alloys are being introduced into components for the automobile and electronics industries.

Vanadium

No vanadium ore was mined in Utah in 1999, although the White Mesa mill located near the town of Blanding in San Juan County processed stockpiled vanadium and uranium ores mined in Colorado. Vanadium prices reached their highest level in the past five years in early 1998 before declining significantly by year's end. This spike in price led to a resurgence of new Small Mine permits, but almost no increase in ore production. Vanadium prices did not improve in 1999.

Gold and Silver

Gold production in 1999 is estimated to be more than 470,000 troy ounces (oz) (15,000 kilograms [kg]), a slight increase from the nearly 450,000 oz (14,000 kg) produced in 1998. Gold is produced from two surface mines owned by Kennecott Corporation: one primary producer (Barneys Canyon mine) and one by-product operation (Bingham Canyon mine), both located in Salt Lake County. Several small mines in the state are known to produce minor amounts of precious metals but metal-specific production is not reported, and not included in the above totals.

In 1999, silver production statewide was estimated to be approximately 3.7 million oz (0.12 million kg), nearly 300,000 oz (9,000 kg) less than 1998. Silver was produced as a by-product metal from the Bingham Canyon mine.

INDUSTRIAL MINERAL PRODUCTION

The industrial minerals segment, valued at \$583 million, was the second-largest contributor to the value of minerals produced in 1999. Major commodities produced by group or individual commodity in descending order of value included: (1) sand and gravel and crushed stone; (2) Portland cement, lime, limestone, and dolomite; (3) salines, including sulfate of potash, salt, potash (KCl), and magnesium chloride; (4) phosphate; (5) gilsonite; (6) common clay and bentonite; (7) expanded shale and perlite; and (8) gypsum.

Sand and Gravel and Crushed Stone

Sand and gravel, and crushed stone (including limestone and dolomite) are the largest contributors to the value of industrial minerals produced in 1999. These materials are produced in every county in Utah by commercial operators, and by state, federal, and county agencies. Due to the large number and diversity of producers, operators are not sent UGS production questionnaires. However, data are compiled by the USGS. The latest data show that in 1998, 44.9 million st (40.7 million mt) of sand and gravel, and 13.0 million st (11.8 million mt) of crushed stone were produced with a combined value of \$179.3 million. The UGS's estimate for the combined value of sand and gravel and crushed stone for 1999 (based on USGS 1999 mid-year data) is \$188.7 million. Due to increased highway construction, airport runway construction, and rapid population growth, usage should remain relatively high for the next several years.

Portland Cement, Lime, Limestone, and Dolomite

Portland cement, lime, limestone, and dolomite were the second-highest value industrial minerals produced in 1999 with a combined value of \$156.4 million. Two operators produce Portland cement in Utah: Holnam, Inc. and Ash Grove Cement Company. Holnam's Devil's Slide plant is east of Morgan in Morgan County, and Ash Grove's Leamington plant is east of Lynndyl in Juab County. Both companies have recently expanded production capacity; the two plants have a combined capacity of more than 1.5 million st (1.4 million mt) of cement annually, up from 1 million st (0.9 million mt) in 1997. Both plants operated at or near capacity in 1999.

Lime production was slightly higher in 1999 than 1998. Continental Lime Company, which produces high-calcium quick lime, and Chemical Lime of Arizona, Inc., which produces dolomitic hydrated and quick lime, have a combined capacity of more than 1 million st (0.9 million mt) per year. Both operations serve markets in Utah and surrounding

states. Continental Lime's plant is in the Cricket Mountains, approximately 35 miles (56 km) southwest of Delta in Millard County, and is rated as one of the 10 largest lime plants in the United States. Chemical Lime of Arizona's plant is near Grantsville in Tooele County.

Nine Large mine operators quarried 3.5 million st (3.2 million mt) of limestone and dolomite in 1999 which was used mainly in the construction industry (2.14 million st [1.94 million mt]). Approximately 300,000 st (272,000 mt) were used in steel-making and for flue gas desulfurization in power plants. The three largest suppliers of crushed aggregate used in construction are: Valley Asphalt Company from two quarries in Utah County, IME Inc. from one quarry in Utah County, and Harper Construction Company from one quarry in Salt Lake County. A small amount of limestone and dolomite was also crushed to a fine powder and marketed as "rock dust" to the coal mining industry.

Salt, Magnesium Chloride, Potash (Potassium Chloride), and Sulfate of Potash

Saline resources including salt are the third-largest contributors to the value of industrial mineral production in Utah. In addition to salt, other saline products include magnesium chloride and potash (potassium chloride and sulphate of potash [SOP]). One company (North Shore Limited Partnership) produces a small amount of concentrated brine which is used as an ingredient in human mineral supplements. The location of operators around Great Salt Lake is shown in figure 3. The production of salt and other saline products, excluding magnesium metal, statewide is estimated to be 3.2 million st (2.9 million mt) in 1999, 0.46 million st (0.42 million mt) more than 1998.

Salt production alone is estimated to be 2.34 million st (2.12 million mt) in 1999, with most of the production coming from three operators using brine from Great Salt Lake. These operators are, in descending order of production: (1) IMC Kalium Ogden, Inc. (formerly GSL Minerals), (2) Cargill Salt Company, and (3) Morton International, Inc. In addition, three other companies produce salt and/or potash from operations not related to Great Salt Lake: (1) Reilly Chemical Company at Wendover in Tooele County (potash), (2) Moab Salt Company near Moab in Grand County (salt and potash), and (3) Redmond Minerals, Inc. near Redmond in Sanpete County (salt only).

Potash (KCl and SOP) is produced by three companies: IMC Kalium Ogden, Inc., Reilly Chemical Company, and Moab Salt Company at their above-mentioned facilities. Potash production is estimated to be more than 470,000 st (426,000 mt) in 1999, approximately 40,000 st (36,000 mt) less than 1998.

Phosphate

Utah's only phosphate operation, SF Phosphate Ltd.'s Vernal Phosphate Operation, is

11 miles (18 km) north of Vernal in Uintah County. SF Phosphates is a partnership of Farmland Industries, Inc. (Missouri) and J. R. Simplot Company (Idaho). The company mines roughly 2.5 million st (2.3 million mt) of ore annually, which is processed into about 1 million st (0.9 million mt) of concentrate and transported in slurry form to the company's Rock Springs, Wyoming fertilizer plant via a 90-mile-long (145 km) underground pipeline. During 1999 the mine produced substantially more than 2.5 million st (2.3 million mt) of ore, the highest production level in the past eight years.

Gilsonite

Gilsonite production for 1999 is estimated to be more than 50,000 st (45,000 mt), approximately 10,000 st (9,000 mt) less than 1998. Gilsonite is an unusual solid hydrocarbon that has been mined in Utah for more than 100 years. The three operations that produce gilsonite are all near the town of Bonanza in eastern Uintah County. In descending order of production they are: (1) American Gilsonite Company's Bonanza mine, (2) Zeigler Chemical and Minerals Company's Zeigler and Tom Taylor mines, and (3) Lexco, Inc.'s Cottonwood mine. Gilsonite is used in over 150 products ranging from printing inks to explosives and is marketed worldwide. Gilsonite production has been relatively stable for the past several years.

Clay and Bentonite

More than 290,000 st (263,000 mt) of both common and high-alumina clay and approximately 100,000 st (91,000 mt) of bentonite were produced by five companies in 1999, a 23 percent increase in common and high-alumina clay and a 19 percent increase in bentonite compared to 1998. In descending order of production the companies are: (1) Interstate Brick Company (common clay), (2) Interpace Industries (common clay), (3) Redmond Minerals, Inc. (bentonite), (4) Paradise Management Company (high-alumina clay), and (5) Western Clay Company (bentonite). More than 75 percent of all clay is used in the manufacture of brick. High-alumina clay is used in the manufacture of cement and 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.

Expanded Shale and Perlite

One company, Utelite, Inc., mined more than 200,000 st (181,000 mt) of shale in 1999 to manufacture "expanded shale" for use as a lightweight aggregate for the construction industry. The mine is located near the town of Wanship in Summit County. Production of "expanded shale" products has increased moderately over the past several years. Two other companies (Holnam and Ash Grove Cement) mine modest amounts of shale for use in the manufacture of cement.

Pearl Queen Perlite Corporation produced approximately 20,000 st (18,000 mt) of perlite in 1999 from its recently opened mine northeast of Milford in Beaver County. The ore was trucked to the company's mill in Milford for processing and distribution.

Gypsum

More than 480,000 st (435,000 mt) of gypsum was produced by five Large mine operators in 1999, 80,000 st (73,000 mt) more than in 1998. In descending order of production the companies are: (1) Georgia Pacific Corporation, (2) U.S. Gypsum Company, (3) Nephi Gypsum, (4) H.E. Davis and Sons, and (5) D.K. Gypsum Industries. Both U.S. Gypsum and Georgia Pacific operate wall board plants near Sigurd in Sevier County. The majority of gypsum produced in Utah is used for making wall board, but several operators supply 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.

ENERGY MINERALS PRODUCTION

Coal

Utah's coal operators mined 26.3 million st (23.9 million mt) of coal from 12 underground mines in 1999 valued at \$453 million, approximately 300,000 st (272,000 mt) less than 1998 (figures 4 and 5). Utah's only coal recovery plant was idle during the year. Coal production in 1999 was the fourth-highest in Utah history. The mines are located in Carbon (6), Emery (5), and Sevier (1) Counties in east-central Utah. The coal recovery facility is located near the town of Wellington in Carbon County. The largest producer was the SUFCO mine, operated by Canyon Fuel Company, LLC (Sevier County), which produced more than 5 million st (4.5 million mt) of raw coal. The following four mines each produced more than 3.5 million st (3.2 million mt) of coal: (1) Deer Creek mine, operated by Energy West Mining Company (Utah Power, Inc.) (Emery County); (2) Skyline #1 and #3 mines, operated by Canyon Fuel Company, LLC (Carbon and Emery Counties); (3) Crandall Canyon mine, operated by Genwal Coal Company (Emery County); and (4) Trail Mountain mine, operated by Energy West Mining Company (Emery County). Slightly more than 50 percent of Utah's coal was consumed by electric utilities within the state. Utah coal is also used for industrial and other purposes within the state, shipped to electric utilities and industrial users in other states, and exported to Pacific Rim countries for both power generation and industrial use. One new mine located in Carbon County (West Ridge) began producing coal in early 2000 and one additional mine (also in Carbon County) is in the permitting process. Coal production is expected to increase to a near-record level in 2000.

Uranium

Because of the continued weak market for uranium and particularly vanadium, there was no uranium ore mined in Utah in 1999.

International Uranium Corporation (IUC) continued operating its White Mesa mill throughout 1999 on both conventional ores and alternate feeds. The company milled approximately 84,000 st (76,000 mt) of stockpiled conventional ore between June and November 1999 and recovered approximately 487,000 pounds (221,000 kg) of U_3O_8 and approximately 2 million pounds (0.91 million kg) of V_2O_5 . Most of this stockpiled ore was mined from the company's operations in Colorado which were shut down in mid-1999. The mill ran several alternative feed campaigns on material from a nuclear fuel cycle company and uranium-bearing waste from a U.S. Department of Defense site in New York. The company recovered approximately 160,000 pounds (73,000 kg) of U_3O_8 from the nuclear fuel company feed and an undisclosed amount of uranium from the defense site feed.

International Uranium Corporation plans to concentrate solely on the development of alternate feed milling during the next several years and has obtained several additional contracts for alternate feed processing. One contract involves more than 100,000 st (91,000 mt) of uranium-bearing waste from defense sites.

In mid-March 1999, the Utah Department of Environmental Quality issued a groundwater discharge permit for U.S. Energy Company's Shootaring Canyon uranium mill in Garfield County. The mill is now fully permitted and ready to operate. However, no production is planned until there are significant increases in the price of both uranium and vanadium. The mill has a rated capacity of 750 st per day (stpd) (680 mt per day [mtpd]) but is capable of rates exceeding 1,000 stpd (900 mtpd).

BASE AND PRECIOUS METAL EXPLORATION

Exploration for base and precious metals in 1999 remained at a relatively low level. The Utah Division of Oil, Gas and Mining received 26 Notices of Intent to explore, (NOIs) which was several more than in 1998 but significantly less than the 50 to 60 received during the early 1990s. Nine NOIs were for precious metals, six for base and precious metals, and 11 for industrial minerals. Most exploration for metals was concentrated in and around old mining districts, particularly in the Milford and Marysvale areas (figure 6). Most exploration was done by small to mid-sized companies; Breccia Development Company (Milford, UT) was one of the most active metal explorers in the state drilling over 60 holes on several prospects in the Milford area. The few drilling programs by majors were relatively small and limited in scope.

Northwestern Utah

Oquirrh Mountains

Minor exploration drilling was done by Barrick Gold Exploration in the West Dip area west of Mercur in 1999. No additional work is planned for 2000.

Kennecott Utah Copper Company drilled 10 holes with an aggregate footage of 25,884 feet (7,889 m) in the Bingham Canyon open pit to better define and delineate mineralization in the deeper parts of the Bingham porphyry copper deposit. This detailed geologic and ore-grade information will be used for mine planning for the open-pit and possible later underground block-caving operations.

Tintic Area

Chief Consolidated Mining Company, through its subsidiaries Tintic Utah Metals and Chief Gold Mines, continued exploration and rehabilitation work on its East Tintic properties. Most of the work was concentrated on rehabilitating the Burgin mill, rehabilitating workings and underground long-hole drilling in the Trixie mine and acquiring the necessary operating permits. The Burgin mill has been completely rehabilitated with new gravity and flotation circuits and has a rated capacity of 420 stpd (380 mtpd). The mill is expected to begin operating in early April 2000 at an initial rate of 200 stpd (180 mtpd), gradually increasing to full 24-hour-per-day operation. Initial mill feed will be Trixie dump material.

No drilling was done in 1999 on the Burgin, Eureka Standard, or Apex properties. The initial request for a dewatering permit for the Burgin mine was rejected by Utah Division of Water Rights in late 1999. Tintic Utah Metals made a new application which addresses the concerns that the dewatering could adversely affect the water level of Utah Lake. No future work is expected on the Burgin property until the dewatering permit is granted.

In early 1999, approximately 30 underground long holes were completed at the Trixie mine that intersected low-grade, currently uneconomic, gold values. An aggressive underground drilling program is planned for 2000 requiring one or more drill rigs for nearly the entire year. Most drilling will be done from the 750 and 1,200 levels with possibly some work on the 1,350 level.

No exploration work was done on Chief Consolidated's properties in the Main Tintic district.

American Fork District

Groundstar Resources continued exploration on the Silver Bell polymetallic lead-zinc-silver fissure vein/breccia deposit in the American Fork district. Exploration work

consisted of surface and underground mapping and sampling. A four-hole drilling program of approximately 2,000 feet (600 m) is planned for calendar year 2000.

Milford Area

San Francisco District

Kennecott Minerals drilled three holes totaling approximately 1,600 feet (490 m) on the Copper Gulch prospect southeast of the Cactus mine in the southern San Francisco Mountains. The target was breccia-hosted, gold-copper mineralization below a strongly jarosite-stained, quartz sericite-altered, quartz monzonite breccia. The drilling intersected several anomalous but non-ore-grade copper zones. During the last two years, Kennecott drilled a total of nine holes on this property but returned it to the owners (Horn Silver Mines).

Sepa Resources drilled four holes to moderate depths on their Hillside/Frisco property near the Frisco Contact mine with negative results. The target was porphyry copper-gold mineralization in complexly altered and pyritized volcanic rocks.

Horn Silver Mines has leased its oxidized zinc resource in the Horn Silver-King David mine to World Hydrocarbons, Dallas, TX. The property was originally drilled in 1999 by Breccia Development. This drilling confirmed the zone of oxidized zinc mineralization on the footwall of the Horn Silver fault and included several intercepts of 30 to 35 feet (9 to 11 m) averaging 21 to 24 percent zinc. No reserve numbers have been announced. World Hydrocarbons is currently doing preliminary mine planning for a possible open-pit mine. Several other parties are interested in the sulfide potential of the district, particularly the manto replacement deposits of the Blikenstaff stopes between the 850 and 1,000 levels between the Horn Silver and New King David shafts. As many as four manto runs are known to be present; ore mined from these manto runs had grades of 10 to 12 percent zinc, 10 percent lead, and 10 ounces per ton (opt) (340 grams per metric ton [gpmt]) silver.

Rocky Range-Beaver Lake Districts

Little work was done by Nevada Star Resources on their copper properties in the Rocky Range and Beaver Lake districts. The properties are fully permitted for mining and a feasibility study has been completed, but Nevada Star is waiting for copper prices to increase before beginning mine and plant construction. The drill-indicated resource for the properties is 6.4 million st (5.8 million mt) of 0.74 percent copper. Nevada Star is also seeking joint-venture partners for the project.

Star District

Breccia Development Company drilled two prospects in and around the Star Range south of Milford. Breccia drilled 22 holes with an average depth of 800 feet (240 m) on their Star prospect. The targets were lead-zinc-silver vein and manto, and porphyry-copper-style mineralization. The drilling intersected moderately anomalous copper, lead, and zinc values but there were no ore-grade values. No additional work is planned for 2000. Breccia also drilled eight holes with depths of 800 to 900 feet (240 to 270 m) on their SH prospect. The target was porphyry or Climax-style molybdenum. Anomalous pathfinder element values were found in intrusive rhyolite and several deeper follow-up holes are planned for 2000.

Southern Wah Wah Mountains-White Mountain Area

Breccia Development drilled a number of prospects in the southern Wah Wah Mountains-White Mountain area west of Milford with mixed success. Breccia drilled a single 1,100 foot (340 m) hole to test a magnetic anomaly west of Miners Hill Reservoir. The hole intersected unaltered andesite and basalt with no anomalous values and the prospect was abandoned.

Breccia drilled 15 to 20 holes on several prospects including the AB and IM areas on its 2-D prospect for sediment- and volcanic-hosted gold. Most of the drilling targeted Cambrian shales and limestones near and adjacent to altered and silicified zones. Several of the holes were moderately successful with intercepts of 0.01 to 0.02 opt (0.34 to 0.68 gpmt) gold. Breccia is evaluating the results of this drilling program and planning its 2-D drilling program for 2000.

Breccia also drilled 17 holes with a total length of 20,400 feet (6,220 m) on their 3-D prospect west of Milford to test magnetic and molybdenum-copper surface geochemical anomalies. The drilling intersected an intrusive body and several mineralized zones containing up to 6 percent zinc and 900 parts per billion gold. The target was porphyry or Climax-style molybdenum, and the mineralized zones could represent fringe mineralization from a porphyry system. Additional drilling is planned for 2000. The company is currently looking for joint-venture partners for this and other prospects.

Mineral Mountains

Breccia Development drilled three additional holes on their AP prospect north of Milford. A total of nine holes ranging in depth from 600 to 1,000 feet (200 to 300 m) have been drilled to date on the property. The drilling intersected altered and pyritized Paleozoic sedimentary units with anomalous copper, molybdenum, and gold values. The company is currently evaluating the data.

Southwestern Utah

Goldstrike District

Bull Valley, LLC drilled six holes on their Goldstrike prospect in Washington County. Drill holes ranged in depth from 1,200 to 1,600 feet (370 to 490 m). Five holes were drilled in and around the Hamburg pit area and one hole was drilled approximately one mile (1.6 km) to the west near the Covington pit. The target was structurally controlled mineralization along east-west-trending structures. The drilling intersected breccia zones and calcite veins with only somewhat elevated gold values. No additional work is planned.

Marysvale Area

In 1999, Tullaree Resources Ltd. drilled 12 holes of a planned 30+ hole program to test the Cascade-Shamrock and Bully Boy base- and precious-metal vein systems in the Ohio mining district southwest of Marysvale in Piute County. The total drilled footage was 8,240 feet (2,510 m) with hole depths ranging from 140 to 1,015 feet (43 to 309 m). Six holes were drilled on the Bully Boy vein and tested a strike length of 2,135 feet (651 m) and six holes were drilled on the Cascade, Shamrock, and Glen Erie vein systems over a strike length of 1,175 feet (358 m). Multiple quartz-calcite veins and quartz-stockwork zones were intersected by drilling, but no economic mineralization was discovered. Intercepts ranged from five to sixty feet (2 to 18 m) thick with variable amounts of gold, silver, copper, and lead and included gold values up to 0.44 opt (15 gpmt), silver values up to 2.3 opt (79 gpmt), copper values up to 1.82 percent, and lead values up to 2.0 percent. Additional drilling is planned for 2000 to test the northern and southern extensions of the drilled veins and to test several other targets identified during 1999 farther south in the Mt. Baldy district.

UNICO Resources continued their exploration and mining operations at the Deer Trail mine in the Mt. Baldy district southwest of Marysvale. During 1999, UNICO continued to rehabilitate and upgrade the PHT tunnel (Lower or New Deer Trail) to MSHA standards and dewater the 280 level of the 8,600 orebody. The company began shipping newly mined and stockpiled lead-silver ore as part of its contract with ASARCO, Inc. to supply up to 1,200 st (1,100 mt) per year of lead-silver concentrates to ASARCO's East Helena facility in Montana. UNICO also received approval to reopen the old Deer Trail mine which is estimated to contain several hundred thousand tons of gold-silver ore. Work for 2000 will continue to concentrate on treating dumps, mining crushed ore from old stopes, and developing existing known ore shoots for both gold-silver and lead-silver ore. The company plans to install a 50-st-per-hour (45 mt) screening plant and build a mill using gravity tables or Knelson concentrators. Initial feed will be approximately 175,000 st (159,000 mt) of broken gold-silver ore in old stopes and dump material from the old Deer Trail mine. The company is also investigating heavy media separation for the lead-zinc-silver ore, and bench and pilot plant tests are underway.

Kaiparowits Plateau Area

3-R Minerals continued pilot-scale work on unconsolidated Recent fluvial sands at its permitted Escalante zirconium-titanium prospect in southern Garfield County. The tests showed that the upper sands contain from 15 to 25 percent heavy minerals and are replenished with up to 3 to 5 feet (1 to 1.5 m) of new high-grade ore with each storm event. The lower, more conglomeratic sands contain from 8 to 12 percent heavy minerals. Nearly 75 percent of the heavy mineral concentrate is zircon and the remainder is mostly ilmenite and leucoxene. 3-R Minerals is in the process of amending its permit to include an on-site 50-st-per-hour (45 mt) sand-screening and spiral-gravity concentrating plant at the Alvey Wash mine site. The permit amendment has been approved by DOGM but the U.S. Bureau of Land Management (BLM) is proceeding with an Environmental Impact Statement (EIS) on the permit modification. 3-R Minerals contends the EIS should not be required under prior existing rights from the initial lease agreement which was with the Utah School and Institutional Trust Lands Administration. Until the matter is resolved, 3-R Minerals will continue to operate under its existing permit by hauling raw sand for off-site concentration.

The status of 3-R Minerals' Calf Canyon-Dave Canyon claims has not been resolved. The BLM rejected 3-R Minerals' application for a drilling permit because the claims were located after the Carcass Canyon Wilderness Study Area (which encompasses the claims) was established, and the BLM contends that any activity must follow a non-impairment standard. The Interior Board of Land Appeals supported BLM's decision and 3-R Minerals filed suit. 3-R Minerals contends that the area was found not suitable for wilderness designation and legally should be managed under an undue degradation standard. The case is currently before the U.S. Court of Federal Claims and the two parties are in the process of jointly filing for summary judgement.

Other Areas

Southern Uinta Mountains

An independent prospector, G.R. Conn, drilled seven shallow holes from 60 to 150 feet (18 to 46 m) deep on his Warlock property in and along splays of the South Flank fault in Duchesne County. Two holes were drilled to test a south-dipping, silicified, and iron-stained fault breccia zone. The holes intersected thick pyritic clay or gouge zones before drilling was halted due to lost circulation. An additional hole was drilled along the same fault breccia zone approximately ½ mile (0.8 km) to the east. Three more shallow holes were drilled to test a copper-silver anomaly in Cambrian quartzite approximately ½ mile (0.8 km) north of the breccia zone. The holes intersected bleached and iron-stained quartzite but copper values were low. Although no ore-grade intercepts were found, the holes were anomalous in several pathfinder elements. In calendar year 2000 Mr. Conn plans to deepen all of the previously drilled holes using improved drilling techniques.

Lisbon Valley

Summo Minerals (USA), Inc. is preparing an updated feasibility and project financing study for its Lisbon Valley copper project. The study will be completed in early 2000. The updated study will incorporate the existing construction, mining, acid, and power contracts and confirm the project economics. The study will be used to secure project funding, but development is not expected until the price of copper improves by 10 to 15 percent. The Lisbon Valley project is an open-pit, heap-leach, solvent- extraction copper prospect with minable reserves of 35 million st (32 million mt) of 0.464 percent copper. The project is permitted and ready to proceed. The project was initially approved by the BLM and all major permits were obtained in early 1997, but appeals and petitions for reconsideration to the Interior Board of Land Appeals delayed final “unfettered” approval until March 1999.

In 1999, Summo Minerals drilled 10 holes with a total footage of nearly 6,000 feet (1,800 m) to test scattered sandstone-hosted copper mineralization on Jarosite Hill where copper mineralization is exposed along a strike length of 2,500 feet (760 m) and over a stratigraphic thickness of 200 to 300 feet (60 to 90 m) in the Cutler, Kayenta, and Wingate Formations. The drilling failed to identify a bulk minable reserve. A 15-hole drilling program is planned for early 2000 to explore the southeastern extension of the Centennial deposit. Testing of the northern extension of the Centennial deposit is planned for the future, most likely when mine and plant construction begins. Copper mineralization was encountered in six widely spaced holes in this area, but substantial in-fill drilling is required to confirm the extent and continuity of the mineralization.

Links to figures:

Figure 1.

Utah mineral and coal valuation, 1996 through 1999.

Figure 2.

Utah value of nonfuel minerals, 1988 through 1998.

Figure 3. Location of brine processing plants around Great Salt Lake, Utah.

Figure 4. Utah coal production, 1989 through 1999.

Figure 5. Utah coal valuation, 1989 through 1999.

Figure 6. Major base- and precious-metals exploration areas in Utah during 1999.











