



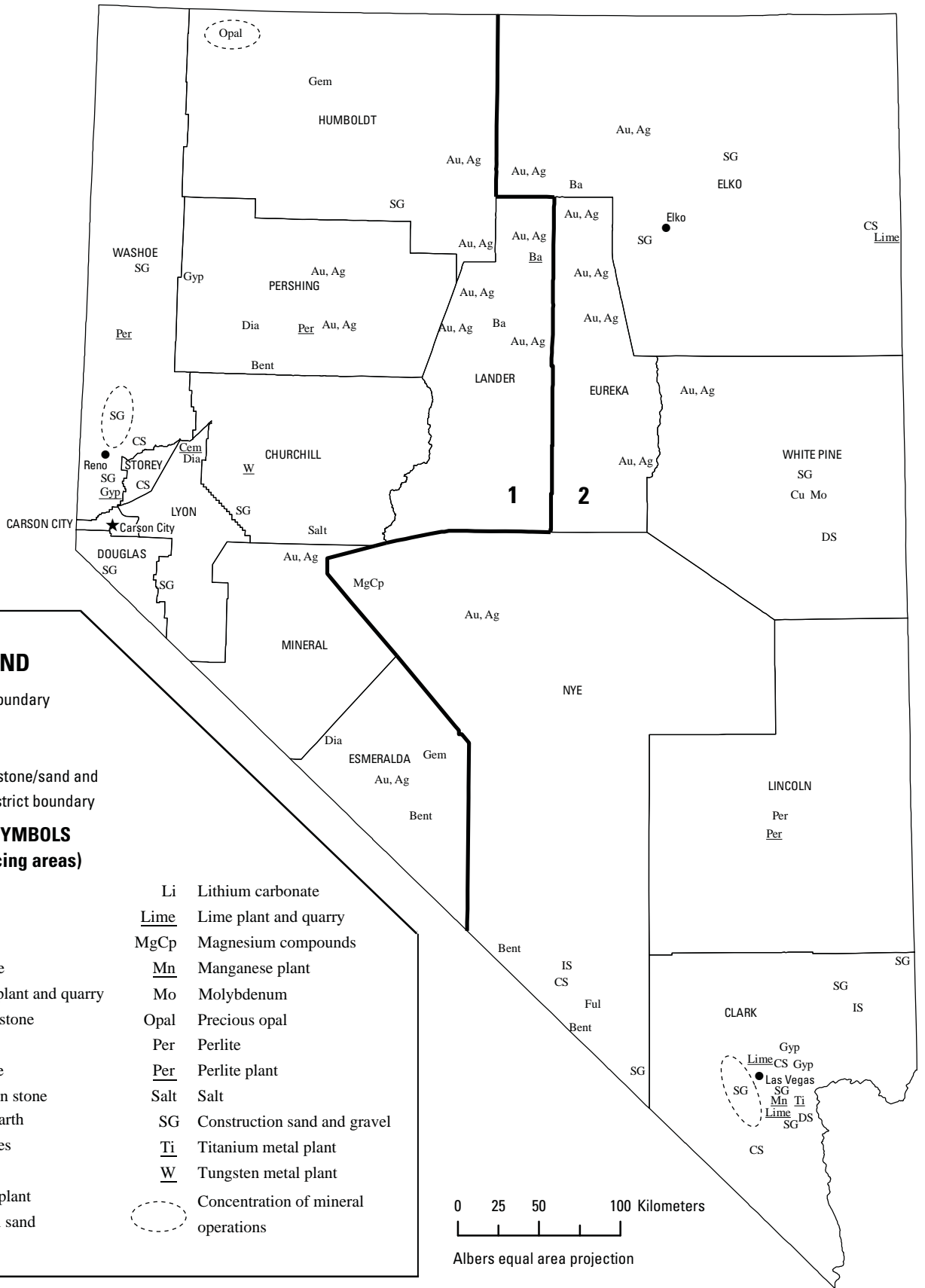
# 2007 Minerals Yearbook

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NEVADA [ADVANCE RELEASE]

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# NEVADA



Source: Nevada Bureau of Mines and Geology/ U.S. Geological Survey (2007).

# THE MINERAL INDUSTRY OF NEVADA

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

In 2007, Nevada's nonfuel raw mineral production<sup>1</sup> was valued at \$5.39 billion, based upon annual U.S. Geological Survey (USGS) data. This was an increase of \$230 million, or 4.5% rise from that of 2006, following a \$1.25 billion, or 32%, increase from 2005 to 2006. The increase again set an alltime high for the State, principally owing to continued increases in the annual average prices of copper, gold, and silver. The State continued to rank second in the Nation in total nonfuel mineral production value in 2007, which followed rankings of third in 2005, second 1994–97 and 1999–2004, and first in 1992–93 and 1998. Nevada accounted for more than 7.7% of the U.S. total nonfuel value in 2007.

Nevada, which has led the Nation in gold production since 1981, provided 78% of the Nation's gold produced in 2007. In 2007, gold accounted for nearly 78% of the State's total nonfuel raw mineral production value, followed by copper (data withheld—company proprietary data), construction sand and gravel with about 3.4%, and lime, crushed stone, and silver with somewhat less than 2% each. Nevada, for the fifth consecutive year, ranked second in silver production (first from 1987–2001) accounting for 19% of the silver produced from U.S. mines, down from about 22% in 2005–06, 24% in 2004, 26% in 2003, and 30% in 2002.

In 2007, despite a nearly 10% decrease in the production of gold, its value of production increased by nearly 4%, up by \$160 million. A more than 12% increase in copper production, principally from Quadra Mining Ltd.'s Robinson Mine, just west of Ely, White Pine County, and higher average prices resulted in a large increase in the commodity's total value. A large increase in the production of diatomite and even larger increases in those of magnesite and molybdenum led to a combined increase in value of the three of nearly \$45 million. A 10% increase in the production of crushed stone resulted in a slightly more than \$9 million increase in that mineral commodity's value. Although silver production decreased by about 6.5%, its value rose by nearly \$8 million, or up by more than 8%. Although small decreases took place in portland cement production and lithium carbonate production, those commodities' values rose by about \$4 million each. The largest decreases in value took place in construction sand and gravel, down by \$44 million, followed by a much smaller decrease in the value of fuller's earth clay. Decreases in the production of barite, crude gypsum, and industrial sand and gravel in part resulted in smaller yet

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<sup>1</sup>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 2007 USGS mineral production data published in this chapter are those available as of June 2009. 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>.

significant decreases in the values of those mineral commodities. Although not significantly affecting the State's overall total nonfuel mineral value, the value of gemstone production was down about 23% (table 1).

In 2007, while Nevada continued by far to lead the Nation in the quantity of gold produced, it also continued to be the only State to produce magnesite and lithium carbonate minerals (minerals listed in descending order of value) and remained first of two barite-producing States, second in silver and diatomite, fourth in copper, and sixth in lime and pumice and pumicite. Nevada was second of two States in the production of brucite with the resumption of mining since last reported in 2004. The State increased to tie for 5th from 7th in the production of kaolin, and it decreased to 4th from 3d in crude gypsum production, to 11th from 9th in the production of construction sand and gravel, to 12th from 9th in gemstones (gemstones ranking based upon value), and was the producer of significant quantities of crushed stone and industrial sand and gravel. Mercury was produced as a byproduct of gold-silver processing at several mines, but no data were reported to the USGS. Mercury has not been mined domestically as a primary mineral commodity since the 1992 closure of the McDermitt Mine, located in northern Nevada in Humboldt County, north of Winnemucca (Brooks and Matos, 2005).

The following narrative information was provided by the Nevada Bureau of Mines and Geology<sup>2</sup> (NBMG). Production data in the text that follows are those reported by the NBMG as measured by mine shipments, sales, or marketable production (including consumption by producers) and were compiled by the Nevada Commission on Mineral Resources Division of Minerals (NDM) and the Nevada Bureau of Mines and Geology, based upon the surveys and canvasses of and estimates made by those State agencies, including information gathered from company annual reports (Price, 2008b, p. 3). The NBMG data are reported by that agency to be nonproprietary and may differ from some USGS production figures as reported to and estimated by the USGS.

## Industry Overview and Trends

Although production of gold continued to decrease from a high of nearly 277,000 kilograms (kg) (8.9 million troy ounces) in 1998 to 187,000 kg (6.04 million troy ounces) in 2007, nonetheless, 2007 represented the 16th consecutive year of production in excess of 186,600 kg (6 million troy ounces) as well as the 19th consecutive year in which production was

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<sup>2</sup>Jonathan G. Price, Director and State Geologist, David A. Davis, Geologic Information Specialist, and John L. Muntean, Research Economic Geologist, coauthored the text of the State mineral industry information provided by the Nevada Bureau of Mines and Geology.

in excess of 156,000 kg (5 million troy ounces). Nevada was fourth in gold production in the world in 2007, and the United States as a whole also was fourth. Nevada alone accounted for nearly 8% of world production of gold, and the United States altogether produced 10% of world production. Only China with 11.6% of world gold production, South Africa with 10.6%, and Australia with 10.3%, produced more gold in 2007; Peru was fifth with 7.1%. In large part, because of Nevada's production, the United States continued to be a net exporter of gold, most of which was sold on the international market for bullion, jewelry, and arts, and some of which was sold for its conductive and noncorrosive qualities in computers and other electronics, for its heat-reflecting quality as a coating on windows, and for use in dental work. Nevada's gold production was valued at nearly \$4.2 billion.

Production of gold was derived from 22 major mining operations. The Carlin trend in northeastern Nevada accounted for 49% of the total production. Eleven additional mining operations, not on the Carlin trend, each produced more than 3,100 kg (100,000 troy ounces) of gold from mostly multimillion-troy-ounce deposits. Through 2007, cumulative gold production in Nevada (beginning with the Comstock Lode in 1859) was about 5,460 metric tons (t) (nearly 177 million troy ounces). Nearly 86% of this total was produced after the Carlin Mine began production in 1965, of which 83% was produced in the period from 1981 to 2007 and 43% was produced in the decade from 1998 to 2007. Total cumulative U.S. production, primarily since 1835, has been estimated to be about 16,500 t (530 million troy ounces), nearly 11% of total world gold production with Nevada production nearly 3% of total world production. The Carlin trend alone accounts for 1.3% of total world production of gold. By yearend 2007, cumulative production from the Carlin trend reached about 2,130 t of gold (68.5 million troy ounces), placing it as one of the most productive gold-mining districts in the world.

Nevada's industrial minerals mining industry served to appreciably support the State's economic growth. Aggregate production was near its alltime high in 2006 as a result of Nevada's expanding population and need for construction materials for airports, highways, homes, resort hotels, schools, streets, and other businesses. Construction projects benefit greatly by local sources of crushed stone, gypsum, raw materials for cement, sand and gravel, and all of which are abundant in the State. Despite a significant slowdown in 2007 in the construction of condominiums, hotels, and new homes in Las Vegas, demand for construction raw materials, nevertheless, was likely to remain strong because of Nevada's continued significantly increasing population, requiring significant quantities of construction raw materials. Population growth was particularly strong in the Las Vegas metropolitan area (Clark County). New cement plants had been planned for both the greater Las Vegas and Reno markets but were later put on hold because of conflicts arising with the local governing authority, possibly to be permanently cancelled. But gypsum production declined in 2007, relative to 2006, in part because of an overall slowdown in construction in California and Nevada.

An interesting trend that has been taking place in the Las Vegas area as well as nationwide has been the combination

of aggregate quarries with landfill operations. Planning ahead of time for the eventual uses of quarries was being considered vital in areas where urban expansion encroaches on the mineral resources. Aggregate is mined locally to reduce transportation costs and related concerns regarding highway safety. Post-mining land uses included suburban developments, landfills, and recreation areas. Gypsum mines near the urban growth areas of Las Vegas were being considered as sites for housing developments.

### ***Employment***

According to the Nevada Department of Employment, Training and Rehabilitation, the mining industry directly employed nearly 12,100 people in 2007, and the industry was responsible for another 52,000 jobs related to providing the goods and services needed by the industry and its employees (Driesner and Coyner, 2008a, p. 24). Productivity of Nevada mining operations remained exceptionally high. Measured simply by the value of the commodities produced divided by the number of employees, each employee in the nonfuel mineral industry produced, on average, approximately \$447,000 in mined products in 2007, an alltime high figure.

### **Exploration and Development Activities**

As a result of its favorable geology, Nevada has a significant potential for the discovery of additional mineral deposits. Areas where prospective rocks exist beneath a cover of young, valley-filling sediments (Pennsylvanian-Permian-age limestones) intruded by (Eocene-age) volcanic rocks with Basin and Range faulting have been explored only to a limited extent in the State, and ore deposits have continued to be discovered in and near Nevada's 526 historical mining districts.

The term "reserve" has a very specific meaning: the deposit must be able to be mined profitably. In regard to gold, in particular, with the relatively high prices of the past several years and continued technological improvements, some of the State's subeconomic resources of previous years have been upgraded to reserves. The NDM estimated that the mining industry held nearly 2,270 t (73 million troy ounces) in gold reserves at yearend 2007, enough to sustain production at current levels for about 12 years (Price, 2008b, p. 19).

Exploration in 2007 included high-grade (mostly breccia and vein) targets, which tend to be popular during times of depressed prices for gold, and low-grade, large tonnage deposits, which generally become more profitable when gold prices are higher. Average gold price in 2007 was about \$695 per ounce, well above prices in the previous 6 years (\$603 in 2006, \$440 in 2005, \$410 in 2004, \$363 in 2003, \$310 in 2002, \$280 in 2001). New discoveries were reported in several districts. To help guide exploration for concealed deposits below alluvial or young volcanic cover, geologists were employing various electrical, gravity, magnetic, and seismic geophysical methods.

About 70 companies, ranging from juniors to majors,<sup>3</sup> drilled at least 127 projects in Nevada in 2007 (Muntean, 2008, p. 28). Exploration activity, including new claims staked, was reported in 16 of Nevada's 17 counties (with none reported in Carson City). Barrick Gold Corp. moved forward with underground development of the Cortez Hills deposit in Lander County, a multimillion-ounce gold deposit that was discovered in 2004.

Most exploration focused on gold and silver, but high prices have stimulated exploration for several other commodities, including copper, iron, molybdenum, tungsten, uranium, and zinc. Advanced exploration projects at previously delineated deposits showed promise for major developments, particularly in the Yerington District in Lyon County, at the Ann Mason copper deposit and the Lyon/Pumpkin Hollow copper-iron deposits, and at the Mount Hope molybdenum deposit in Eureka County. According to a survey of exploration activities by the NDM, exploration activity in Nevada has been steadily increasing since 2001, when companies reported \$51.2 in expenditures in Nevada. The 31 companies responding to the survey reported spending \$168 million on exploration in 2007, slightly more than the \$165 million in 2006 but substantially higher than the \$121 million reported in 2005 or the \$80 million reported in 2004, and well above the level of \$139 million in 1995. Exploration companies continued to be optimistic about Nevada's potential and reported that they project spending \$197 million in 2008 (Driesner and Coyner, 2008b, p. 1, 9).

Another measure of exploration activity was the number of exploration geologists employed by these companies: 227 in 2007, compared with 228 in 2006, 190 in 2005, 123 in 2004, and 309 in 1997. These companies projected employing 235 exploration geologists in 2008. Because of favorable geology for high-priced mineral commodities and the State's regulatory climate, Nevada continued to attract a large portion of the worldwide exploration expenditures of the companies actively exploring in Nevada. The number of active claims in Nevada rose substantially in 2007.

### *Industrial Minerals*

**Aggregate (Sand and Gravel, Construction, and Stone, Crushed).**—The U.S. Department of the Interior's Bureau of Land Management (BLM) received requests for materials from the Agency's southern Nevada community pits, which required environmental assessments and competitive bidding. Diamond Construction requested 450,000 t of sand and gravel from the North Jean Community Pit. All Star Aggregate, Inc. requested about 17.7 million metric tons (Mt) of aggregate from the South Jean Lake Community Pit. Las Vegas Paving Corp. requested 535,000 cubic meters (about 910,000 t) of material from the East Community Pit. American Asphalt and

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<sup>3</sup>As determined by the NBMG, the classification of companies into major, mid-tier, or junior in this section of the report is arbitrarily based on gold production and market capitalization. The loose criteria are as follows: 1) major companies produce greater than 1 million ounces of gold worldwide, and have market capitalizations of more than \$3 billion, 2) mid-tier companies produce between 50,000 and 1 million ounces of gold and/or have market capitalizations less than \$3 billion but more than \$500 million, and 3) junior companies produce less than 50,000 of gold and/or have market capitalizations less than \$500 million.

Aggregate Co. requested about 545,000 t of sand and gravel from the Henderson Community Pit. The BLM also completed environmental assessments for others areas for which it had received a number of requests, which include 450,000 t of sand and gravel from the Cactus Springs Community Pit, about 1.8 Mt of material from the Salt Lake Highway Community Pit, and about 7.3 Mt of sand and gravel from the Mesquite Community Pit.

**Barite.**—M-I SWACO, Nevada's leading barite producer, located 21 lode claims about 9 kilometers (km) south of the Argenta Mine in an area prospected and drilled for barite in the past. The barite deposits of the Argenta Mine and the newly claimed area were in the upper plate of the Roberts Mountain thrust.

Heemskirk Canada, Ltd. leased the Monitor barite property in the Northumberland District of Nye County and was investigating a future exploration project that could extend Nevada's barite reserves from the presently estimated 7 years to 13 years.

Spirit Minerals, LP received reclamation and water pollution control permits from the Nevada Division of Environmental Protection (NDEP) for the company's plans to explore the Big Ledge Mine area in the Snake Mountains of Elko County. The area was explored by Chromalloy American Corp. in the late 1970s and later mined by Circle A Construction Inc. in the 1990s.

**Cement.**—The Nevada Cement Co. in Fernley, Lyon County, located an area that included more than 100 lode claims adjacent to Buffalo Mountain in the Antelope Springs District. This area is underlain by massive dolomite and limestone of the Triassic Natchez Pass formation. Nevada Cement also located another 73 claims adjacent to its existing operating limestone quarry south-southeast of Fernley. Plans for a new cement plant near Lovelock were put on hold, but plans to open a new limestone quarry at the west base of the Humboldt Range about 40 km northeast of Lovelock were ongoing. The company's proposed plans included mining about 0.9 Mt to about 1.4 million metric tons per year (Mt/yr) of limestone for 50 years.

Ash Grove Cement Co. (a Kansas corporation) had previously announced plans for a major cement plant northeast of Las Vegas on the Moapa Indian Reservation in 2004 with plant construction slated to begin in late 2007, however, disagreements with the newly elected tribal government resulted in cancellation of the project.

**Clays.**—Calico, LLC filed a plan of operations for its Barrett Springs Project about 16 km northwest of Winnemucca and also proposed the deepening of an existing clay pit on the company's group of five placer claims by about 3 meters (m) to take in an additional 16,800 cubic meters of montmorillonite clay, which would be mined as needed during the next 20 years.

**Gypsum.**—Meadow Valley Gypsum received a reclamation permit from the NDEP, which was required for its Meadow Valley Gypsum Project, the Thrasher Gypsum Mine, in Lincoln County about 40 km north of Moapa. The project will include an open pit and associated facilities, dump, and stockpiles on 5 hectares (ha) of land with production projected to last about 5 years.

**Lime (Limestone and Dolomite).**—Ireland, Inc. entered into merger agreements with Columbus Brine, Inc. and Columbus S.M., LLC to acquire the Columbus Project at the Columbus Salt Marsh in Esmeralda County. The project consisted of about 17,400 ha of placer mining claims, 24 ha of mill sites, an approved plan of operations to mine and process about 150 of these hectares, and a 1,400-square-meter processing plant. The permit allowed for mining down to about 8 m and processing up to 70,800 metric tons per year (t/yr) of calcium carbonate and precious metals. By yearend 2007, Ireland, Inc. had drilled nine holes exploring for gold.

**Lithium.**—Western Uranium Corp. planned to spinoff the lithium-rich hectorite clay resources in its Kings Valley Project into a newly incorporated subsidiary called Western Lithium Corp. Western Uranium controlled about 32,400 ha including about 3,800 lode claims mainly in the Disaster District, Humboldt County. The claims, which were within the McDermitt Caldera, covered several areas containing inferred uranium resources and broader zones of lithium, molybdenum, and uranium mineralization. In 1985, Chevron Resources Corp. estimated a total resource of about 2.1 Mt of lithium (equivalent to nearly 11 Mt of lithium carbonate) with a 0.25% cutoff grade and minimum 1.5-meter thickness for these areas.

**Potash.**—Rulco LLC shipped a small amount of stockpiled potassium alum (kalinite) from a deposit in Esmeralda County about 16 km north of Silver Peak. The kalinite, which occurs with sulfur as veins and stringers in rhyolitic rock, was being marketed for horticultural use, and because of increased demand, plans were being made to begin mining in 2008.

**Pozzolana.**—The Silver Bells Project, for which an environmental assessment was completed in 2004, was an operation with plans submitted by an individual from Tooele, UT, to mine pozzolanic volcanic ash about 10 km south of Pioche. The deposit, containing about 3.6 t of ash (white and granular when pure), forms a layer up to about 4.6 m thick overlying lacustrine rocks of the Pliocene Panaca formation. The project, which proposed to process up to about 90 tons per day of material for up to 12 years for use as cement additives, was permitted but on hold in 2007.

**Stone, Dimension.**—In late 2007, Mt. Moriah Stone, LLC located eight placer stone claims in the area already quarried by the company, at least one of the claims were on U.S. Forest Service land. Placer stone is generally near the surface and weathered and commonly is used for landscaping rock as opposed to cut stone.

**Vermiculite.**—In 2006, IBI Corp. completed an agreement granting a 2-year option for Rio Tinto America Industrial Minerals, Inc. to acquire IBI's interest in the Mica Peak vermiculite property about 97 km east-northeast of Las Vegas for \$1.25 million. Rio Tinto paid \$25,000 on signing the agreement, another \$25,000 in January 2007, and is to spend \$250,000 on exploration and development during the option period. The vermiculite as an alteration of biotite within ultramafic rock on three claim blocks with estimated recoverable reserves to be between nearly 2 to 3 Mt.

## *Metals*

As exploration in Nevada continued in 2007 at an even greater pace than in 2006, in addition to gold, other metals continued to be increasingly targeted. Nevada county recorders registered 180,568 claim filings in 2007, an 18% increase from 2006, including new claims and annual maintenance of existing claims. The BLM listed 33,556 new claims that were filed in 2007. Most of these companies focused on greenfields targets. At least 127 projects were drilled in 2007. The main exploration objective in Nevada continued to be gold, though an increasing number of projects were drilled for copper, gallium, molybdenum, silver, tungsten, and uranium. For example, 16 of the 127 projects drilled in 2007 targeted metals other than gold compared with 2006, when 12 of 117 projects were drilled for metals other than gold.

**Copper.**—Outside Quadra Mining's active Robinson Mine, the Yerington District was the focus of most copper exploration. At Pumpkin Hollow, Nevada Copper Corp. completed a \$7 million development program and released a new resource estimate and a preliminary economic assessment. At a copper price of about \$6.60 per kilogram (\$3 per pound), the company estimated its net present value at about \$1.9 billion of contained copper; however, capital costs were estimated to be \$780 million. Quaterra Resources Inc. expanded the limits of copper oxide mineralization at the MacArthur resource, and at depth identified chalcocite mineralization. Although likely a smaller resource than Pumpkin Hollow, the acid-soluble and shallow nature of the mineralization at MacArthur indicated capital costs would be lower. Pacific Magnesium Corp. continued drilling the Ann Mason resource area. Outside of Yerington, early stage copper exploration took place in the Dolly Varden District in eastern Elko County (Consolidated Gold Win Ventures Inc. and Cloudbreak Resources), at Majuba Hill (Minterra Resources Corp.), and in the Buena Vista Hills (Boxxer Gold Corp.), with the latter two being near Lovelock. No activity was reported from the New York Canyon, which was the most significant copper exploration project in 2005 and 2006.

**Gold.**—As in the past several years, major companies made gold the focus of exploration to in and around their active mines. On the Carlin trend, Barrick Gold continued to carry out major drill programs in and around its Goldstrike Mine, both on the surface and underground. It continued its feasibility study of the South Arturo deposit—Barrick (60%) and Goldcorp (40%). It also carried out major programs at its Bald Mountain, Cortez, and Turquoise Ridge Mines—Barrick (75%) and Newmont Mining Corp. (25%). Barrick, including joint-venture partner Kennecott Minerals Co., spent about \$28 million on exploration at Cortez. Most of the work concentrated on the Cortez Hills deposit, where a record of decision was expected to be in late 2008, after which production was expected to commence in late 2009 or early 2010. Production in the first 5 years from Cortez Hills was expected to be nearly 31,100 kg per year (one million troy ounces) of gold. Newmont Mining Corp. carried out large drill programs at its surface and underground mines

along the Carlin trend and at its Midas and Phoenix Mines. Other active mines with major drill programs in 2007 were the Marigold [Goldcorp (67%) and Barrick (33%)], Jerritt Canyon (Yukon-Nevada Gold Corp.), Robinson (Quadra Mining), and Round Mountain [Kinross Gold Corp. (50%) and Barrick (50%)].

Substantial drill programs carried out by major or mid-tier companies targeting gold outside active mine areas include Buffalo Valley, Gabbs, Hollister, Limousine Butte, Northumberland, Pinson, Rain, West Pequop, and Tonkin Springs. At Hollister in 2007, Great Basin Gold Ltd. purchased Hecla Mining Co.'s 50% interest, released a new resource estimate, and continued an aggressive underground exploration and development program. Great Basin expected to put the mine into production in late 2008. Newmont Mining carried out major drill programs at Buffalo Valley, Northumberland, and Rain, where results were deemed not encouraging enough to continue; the company returned Northumberland to Fronteer Development Corp. Barrick began a major program at Pinson, where it needed to spend \$30 million by April 2009 to earn back a 70% interest in the property from Atna Resources Ltd. Newcrest Mining Ltd. continued to drill at its Gabbs property near the old Paradise Peak and Sullivan Mines, whereas Agnico-Eagle Mines Ltd. (joint venture with AuEx Ventures Inc.) drilled high-grade oxidized gold mineralization at two separate areas at its West Pequop Project near Wells. U.S. Gold Corp. spent \$20 million on its Nevada properties, mainly on Limousine Butte and Tonkin Springs. The company drilled nearly 42,700 m at Tonkin Springs, mostly in and around the existing resources. A modest increase in the resources was announced.

Much of the drilling for gold by junior companies in 2007 continued to take place around known, unmined deposits or inactive mines, commonly with old resource estimates. In addition to expanding a given resource beyond its margins, an important objective of many of these drill programs was to upgrade the resource estimate with infill and confirmation drilling in order to produce a new resource estimate that is compliant with current security and exchange regulations. Examples of such projects, in order of the amount of drilling (descending amount including the number of holes and total depth of holes) completed in 2007, included Sleeper (X-Cal Resources Ltd.), Pan (Midway Gold Corp.), Hycroft (Allied Nevada Gold Corp.), Fire Creek (Klondex Mines Ltd.), Converse (Metallic Ventures Gold Inc.), Willard and Colado (Rye Patch Gold Corp.), Borealis (Gryphon Gold Corp.), Sandman (Fronteer), Relief Canyon (Firstgold Corp.), New Pass (Bonaventure Enterprises Inc.), Toiyabe (Golden Oasis Exploration Corp.), Independence Mine (General Metals Corp.), Wind Mountain (Fortune River Resource Corp.), Lookout Mountain (Stacatto Gold Resources Ltd.), Pony Creek (Grandview Gold Inc.), Afgan (Midway), Monte Cristo (Gold Summit Corp.), Railroad (Royal Standard Minerals Inc.), Reward (Canyon Resources Corp.), Robertson (Coral Gold Resources Ltd.), White Rock (Golden Odyssey Mining Inc.), Sterling (Imperial Metals Corp.), and Fondaway Canyon (Royal Standard). New resource estimates were released for Colado, Reward, Robertson, Sandman, Willard, and Wind Mountain, as well as Jessup (Rye Patch) and Northumberland (Fronteer).

Increasingly, junior companies are putting in declines to explore resources from underground. Projects with underground development in progress or planned for 2008, which are controlled by junior companies, include Fire Creek (Klondex, planned), Gold Wedge (Royal Standard), Midway (Midway, planned), and Sterling (Imperial).

Most projects drilled by junior companies outside areas with historical resources were limited to small programs, typically less than 10 drill holes or less than about 3,000 m (10,000 feet). The major exceptions that continued to experience successful drilling in 2007 were AuEx Ventures' Pequop claim blocks and Midway's Spring Valley Project. Midway drilled 188 holes totaling more than 34,400 m in 2007 at Spring Valley, a diatreme-hosted gold system completely covered by pediment gravels located near the Rochester silver mine. In January 2008, it significantly increased its inferred resource estimate, which now stands at just below 31,100 kg (one million ounces) of gold. AuEx Ventures' joint-venture partners continued to drill high-grade, oxidized gold mineralization on its Pequop properties near Wells. Agnico-Eagle's encouraging results at West Pequop were mentioned above. At Long Canyon, on the east side of AuEx Ventures' Pequop property, Fronteer continued to drill several intercepts of greater than 15 m grading greater than 3 grams per metric ton (0.1 troy ounces per ton) gold. Drilling has now defined a zone of oxidized gold mineralization that is almost about 1,100 m long.

Whether the significant increase in exploration that started around 2004 will reverse the trend of decreasing gold production in Nevada was in question. Commencement of production at Cortez Hills in 2010 was projected to add a significant quantity of gold production to the State's total, but the NBMG speculated that this could be somewhat offset by decreasing production from the Pipeline open pit at Cortez. Besides Cortez Hills, gold projects that the NBMG projected could be put into production by 2010 included the Gold Wedge, Hollister, Hycroft, Relief Canyon, and Reward Projects, based on released information and intentions of the companies.

Graymont Western US, Inc. located an area that included about 150 gold placer claims mostly adjacent to its other claims. Graymont Western was the owner of Pilot Peak high-calcium lime operation (Proctor District in the Toano Range, Elko County) that principally marketed lime to gold-mining operations for use in cyanide-solution pH control.

**Molybdenum.**—In addition to Golden Phoenix Minerals, Inc. producing molybdenum from its underground Ashdown Mine and Quadra Mining producing byproduct molybdenum from its Robinson Mine, General Moly Inc. (formerly Idaho General Mines) continued to permit the extensive Mount Hope porphyry molybdenum deposit north of Eureka. The company anticipated having all permits by the first half of 2009. In addition, it completed a bankable feasibility study in 2007. General Moly also made progress in financing the construction of the mine, which had an estimated initial capital cost of \$852 million, by entering into financing agreements with ArcelorMittal USA Inc. and POSCO. General Moly also began a prefeasibility study of the Hall-Tonopah deposit, renamed (by the company) the Liberty Project. In addition to General Moly's advanced projects, Mexivada Mining Corp. discovered a

previously undrilled porphyry molybdenum system, referred to as Moly Dome, in northern Elko County near Owyhee. Drilling intersected molybdenite-pyrite-bearing quartz veinlets in brecciated metasedimentary rocks and altered granitic intrusions to a depth of at least 300 m. The system, which locally crops out, was originally identified by Anaconda Minerals Co. prior to 1962.

**Silver.**—Despite the high price of silver, only two projects were drilled primarily for silver in 2007. At the old Taylor Mine near Ely, Fury Explorations Ltd. released a resource estimate of 463 t (14.9 million troy ounces) of silver based on historic drilling and drilling it completed in 2006 and 2007. Permitting is ongoing, and the company planned to reopen the mine in 2009. AuEx Ventures (with joint-venture partner Piedmont Mining Co.) continued to explore the Trinity silver mine near Lovelock by completing a small drill program.

**Tungsten.**—Galway Resources Ltd. continued to evaluate the Indian Springs tungsten deposit north of Wells, releasing a new resource estimate. Golden Predator Mines, Inc. began work to reopen the old General Electric Springer tungsten mine. All improvements necessary to produce scheelite concentrates were scheduled for completion by the end of 2008. In addition, Golden Predator began to design a standalone 900 metric-ton-per-day gravity and carbon-in-leach gold circuit for the Springer Mine; permitting for that circuit was ongoing. In anticipation of the completion of the tungsten and gold circuits, Golden Predator was acquiring other properties with known tungsten resources, as well as gold exploration properties.

## Commodity Review

### *Industrial Minerals*

**Aggregate (Sand and Gravel, Construction, and Stone, Crushed).**—The Las Vegas area produced about 30 Mt of construction aggregate, 75% of which came from sand and gravel operations. The Lone Mountain area in northwest Las Vegas remained the most significant source, but production was estimated to have fallen below 9 Mt for the first time in several years. Significant production also came from sand and gravel pits and stone quarries south and northeast of Las Vegas, and in the El Dorado Valley area west of Boulder City. Sand and gravel from portable crushers at construction sites were also important producers of base aggregate in Las Vegas.

The Lone Mountain Pit mining area was increasingly under pressure on its eastern and southeastern flanks from residential development. Plans included the looping of Clark County Route 215 along the eastern edge of the mining area and closing the eastern portions of the mining area by 2012 with mining continuing and expanding to the west away from the residential development.

Aggregate Industries US of Las Vegas, Diamond Construction Co. Inc., Impact Sand and Gravel Co., Las Vegas Paving Corp., and Nevada Ready Mix Corp. produced more than 900,000 t of aggregate. American Sand and Gravel LLC, Wells Cargo, Inc., and Hollywood Sand and Gravel Co. produced about the same, a combined total of approximately 900,000 t in 2007.

Las Vegas Paving Corp. mostly produced sand and gravel

from its Blue Diamond and Lone Mountain pits and crushed stone from the Apex landfill. Nevada Ready Mix mined most of its aggregate from a complex of pits in alluvium in the Lone Mountain area, with minor production coming from quarries in adjacent bedrock. Frehner, Inc. mined and crushed limestone from its Sloan property. Rinker Materials Corp. produced crushed granite from the El Dorado pit. Community pits and other aggregate mining facilities administered by BLM and operated by several companies contributed about 6.4 Mt to the Las Vegas area in total. American Sand and Gravel and Hollywood Sand and Gravel mostly produced aggregate from community pits. The Southern Nevada Lightweight operation near Jean produced aggregate for lightweight concrete block and sand for use in stucco. Cind-R-Lite Block Co. also shipped lightweight aggregate to the Las Vegas market from the company's cinder operation near Amargosa Valley in Nye County. Granite Construction Co. sold its Apex operation to Ready Mix, Inc.

About 8.2 Mt of construction aggregate was produced in the Reno-Sparks-Carson City area. Granite Construction produced nearly 1 Mt of aggregate from several pits in the area, but the majority of the company's production was crushed andesite and crushed granitic rock from its Lockwood and Hidden Canyon pits, respectively. A and K Earthmovers, Inc. also produced a similar quantity from two pits, but much of this was fill. Martin Marietta Materials, Inc. produced mostly crushed granitic rock from the company's Rocky Ridge Quarry north of Sparks. CEMEX Construction Materials LP produced aggregate from the former All-Lite Aggregate Co. crushed rhyolite pit and the Paiute sand and gravel pit. Crushed rock accounted for about 60% of the aggregate used in the Reno-Sparks-Carson City area. Basalite Concrete Products LLC, CEMEX, and Rilite Aggregate Co., also produced lightweight aggregate, an important component of crushed rock production in the area.

The NBMG estimated that about 4.5 Mt of aggregate was produced outside of the major Nevada metropolitan areas. Nye County produced about 1.4 Mt of aggregate, mostly in the Pahrump area. Churchill County produced more than 800,000 t, and Douglas County produced more than 680,000 t. Lyon County produced almost 450,000 t, and Elko and Pershing Counties produced between 270,000 t and 360,000 t each. Humboldt County produced about 270,000 t. Lander County produced about 140,000 t, but Esmeralda, Eureka, Lincoln, and White Pine Counties produced less than 90,000 t of aggregate each.

At yearend 2007, Aggregate Industries US (Western Region) sold its Mustang operation in Washoe County to Sierra Nevada Construction Inc. and its Mound House operation in Lyon County to Road and Highway Builders, LLC. D and H Mining Co. mined spicerite and crushed stone from a pit about 8 km north of Beatty for use as landscaping materials. Spicerite is a strong, bright white, hydrothermal altered tuff used to make bricks and blocks.

**Barite.**—Nevada produced barite from three mining operations, accounting for more than 95% of the barite produced domestically. Although 2007 production was considerably more than the recent low of less than 342,000 t produced in 2002, it is far below the 2.25 Mt-high of 1981. About 95% of domestic



production was used as a weighting agent in oil and gas well drilling fluids. Shipments of ground barite from Nevada mostly went to Colorado and Wyoming gas drilling customers.

M-I SWACO, the State's leading producer, produced crude and ground barite from the Greystone Mine and Battle Mountain plant, both in Lander County. Baroid Drilling Fluids Inc. mined barite from the Rossi Mine in Elko County and processed it at the Dunphy Mill in Eureka County. Heemskirk Canada, Ltd. mainly used barite from the Dunphy Mill at its Lethbridge, Alberta, Canada, plant to process the barite into a new grade of barite with a lower specific gravity of 4.1. Baker Hughes INTEQ shipped barite from its Argenta Mine near Battle Mountain in Lander County.

**Cement.**—Nevada's only cement producer, the Nevada Cement Co. in Fernley, Lyon County, had a production capacity of about 540,000 t/yr. The company's cement was manufactured from Tertiary lacustrine limestone mined a few miles south of Fernley and from other raw materials mined in northern Nevada. Nevada Cement's parent company (Eagle Materials Inc.) planned to add 0.9 Mt of annual capacity by spending more than \$300 million to expand and modernize its plants in Nevada and Wyoming. Construction at the Fernley facility was expected to start in the first half of 2008 and included replacing the existing portland cement manufacturing facility (a pair of kilns) with a new single kiln with five stage preheater. The 1964-built Fernley plant had a rated clinker capacity of 460,000 t/yr.

**Clays.**—IMV Nevada produced bentonite, saponite, and sepiolite in the Ash Meadows-Amargosa Flat area of Nye County. The clays were processed at a plant in Amargosa Valley, and the clay products were exported worldwide. The saponite and sepiolite deposits likely originated in a 57-square-kilometer Pliocene playa. The sepiolite, which yields most of the profits, occurs in an almost continuous bed averaging about two meters thick. IMV Nevada was the only commercial producer of saponite and sepiolite in North America.

Two companies campaign mined and shipped relatively minor amounts of various clays from several sites for use in high-value specialty products. At its White Caps Mill near Beatty, Nye County, Vanderbilt Minerals Co. processed small amounts of clay stockpiled from several deposits in Nevada, Arizona, and California. In 2007, the company did not actively mine but shipped smectite from the New Discovery Mine just south of Beatty, the Blanco Mine in the Coaldale District, Esmeralda County, and the Buff and Satin Mines in the Willard District, Pershing County.

The American Colloid Co. mined and shipped white bentonite from its Nassau property in Coal Canyon in the Willard District for use in specialty clay products. American Colloid also mines several thousand tons of hectorite every few years from its Disaster Peak Mine in the Disaster District, Humboldt County, but did not produce in 2007.

The Art Wilson Co. mined halloysite on an as needed basis for the Nevada Cement Co., which owned the pit in the Terraced Hills about 13 km northwest of Pyramid Lake. Halloysite, which has a high alumina content, is used in the production of portland cement.

**Diatomite.**—Nevada accounted for about 40% of domestic diatomite production. About two-thirds of the State's production

was used in filtration and the remainder is largely used in absorbents, fillers, and cement. EP Minerals, LLC, which produced most of the State's diatomite, operated a plant at Lovelock, mostly making filtration products from diatomite that was mined about 24 km to the northwest in the Velvet District. The diatomite occurs in thick beds interbedded with freshwater tuffaceous sedimentary rocks of probable Miocene age. The company also produced diatomite used in fillers and absorbents at its Clark plant and mine in the Clark District, Storey County, and diatomite used in insulation from a pit near Hazen in Lyon County. The diatomite at Clark occurs with diatomaceous shale and thin beds of volcanic tuff within the Miocene-Pliocene Kate formation.

The Celite Corp. operated a mine at Hazen and a plant in Fernley that produced diatomite fillers. The Moltan Co. shipped absorbent products, cat litter, and soil conditioner under several labels from a mine and plant complex in the Desert District, Churchill County. Diatomite deposits in western Churchill County are interbedded with Pliocene lacustrine tuffaceous shale, sandstone, and limestone and siliceous tuff. The Grefco Inc. diatomite operation near the Esmeralda/Mineral County line was small relative to other Nevada diatomite companies but has produced diatomite for many years for fillers. The deposit is in Miocene-Pliocene lacustrine sedimentary rocks consisting of diatomite, argillaceous and calcareous diatomite, clay, and sand with intercalated volcanic ash. Since 2004, production has been from stockpiled ore.

**Gemstones.**—Precious opal was produced from several mines in the Virgin Valley area of northern Humboldt County, a well-known North American gemstone source. The most well-known mines are the Bonanza, Hidden Valley, Rainbow Ridge, and Royal Peacock Mines. The Rainbow Ridge and the Royal Peacock Mines produced from pay-to-dig operations. In addition, Nevada has probably produced more than \$30 million worth of turquoise, mostly during the first half of the 20th century when as much as 4,500 kg or more were produced in a single year. In 2007, turquoise was shipped from the Blue Ridge Mine, a family-owned property in the Bullion District, Lander County.

**Gypsum.**—In Clark County, PABCO Gypsum, Nevada's leading producer, mined gypsum and processed it into wallboard at its plant adjacent to the mining operation. Processing yielded about 70% by weight gypsum from the ore, which is in a nearly flat-lying late Miocene gypsite blanket atop a 13-square-kilometer mesa. Drilling has indicated the gypsum to be at least 37 m thick in the area of current mining.

United States Gypsum Company, the nation's leading wallboard producer, mined gypsum in western Pershing County and processed it into wallboard and plaster at a plant in Empire in Washoe County. The gypsum occurs as a deposit in several large outcrops of Triassic or Jurassic sedimentary rocks in a 5-kilometer-square-mile area.

The Art Wilson Co. of Carson City produced gypsum and anhydrite from the Adams Mine in Lyon County. The D. L. Denman Construction Co. mined gypsum at the Pioneer Mine about 16 km east of Las Vegas. Material from these relatively small operations was used in agricultural and cement applications. The Adams deposit is a folded body associated

with limestone in Triassic metavolcanic rocks. The Pioneer Mine exploits the same late Miocene gypsite deposit as the PABCO operation about 8 km to the north.

**Lime (Limestone and Dolomite).**—Nevada's leading producer, the Pilot Peak high-calcium lime operation of Graymont Western US, Inc., was in the Proctor District in Toano Range, Elko County. Pilot Peak continued to market lime for use in cyanide-solution pH control to gold-mining operations. The plant had three kilns with a combined capacity of more than 635,000 t/yr of quicklime and a hydrated lime plant capable of producing 320 tons per day. In addition to lime, Pilot Peak also shipped crushed limestone, mainly from interbedded limestone and dolomite of the Devils Gate Limestone.

Nevada's other large producer, Chemical Lime Co., produced lime at Apex in the Apex District, Clark County. The operation manufactured high-calcium quicklime used in metallurgical processing, paper manufacturing, and environmental markets. The company also produced dolomitic lime and hydrated high calcium lime at Apex, mainly for construction uses. The company's Henderson plant produced Type S hydrated dolomitic lime for building and home construction. In addition to lime, Chemical Lime also shipped crushed limestone, which was from dolomite and limestone of the Devonian Sultan Limestone.

Of Nevada's small limestone producers, Nutritional Additives Corp. produced agricultural and nutritional dolomite products from massive black dolomite of the Late Triassic Dun Glen formation along the northwest edge of the Sonoma Range about 8 km south of Winnemucca. Min-Ad, Inc. produced dolomite from the Dun Glen formation about 5 km south of the Nutritional Additives Corp. operation, which it mostly sold for use in beef and dairy feed in the midwestern United States and as far as New York State and Alberta, Canada.

Along with anhydrite and gypsum, the Art Wilson Co. produced high purity limestone from the Adams Mine; this limestone, which contained no detectable magnesium, was used for soil pH control.

**Lithium.**—Chemetall Foote Co. produced lithium carbonate, lithium hydroxide monohydrate, and lithium hydroxide anhydrite at its Silver Peak facility in Esmeralda County. Brine was pumped from beneath Clayton Valley playa and the lithium chemicals were produced by solar evaporation preconcentration and subsequent refining techniques.

**Magnesium (Magnesite).**—Premier Chemicals, LLC's Gabbs magnesia operation in Nye County was the Nation's only producing magnesite mine. Magnesite and some brucite have been mined at Gabbs since 1935, and in the 1940s were processed in Henderson, NV, to make magnesium metal. From the 1950s to the 1980s, Basic Industries Inc. mined and processed ores and was a major producer of refractory magnesia. During the 1990s, the availability of less expensive foreign refractory magnesia caused production at Gabbs to be switched to light-burned magnesia that was mainly marketed for agricultural and wastewater treatment uses. Although production of magnesia at Gabbs has been still substantially below a peak that took place in 1981, magnesia shipments from the Gabbs operation increased steadily between 1996 and 2005. Following a dip in 2006, production rose again in 2007. The current plant's

annual capacity is rated at about 140,000 t of magnesium oxide equivalent. The magnesite and brucite occur as complex replacement bodies in Triassic dolomite in the Paradise Range just east of the town of Gabbs. The resource, estimated to be about 12 Mt in 1973, was considered to be sufficient for more than 50 years of production at present mining rates.

**Perlite.**—Although Nevada has large perlite resources and several deposits of perlite that have been mined extensively, only minor amounts have been mined in recent years, current perlite production being restricted to small-scale mining of two deposits for niche markets. Wilkin Mining and Trucking Inc. shipped perlite mined from the Tenacity Perlite Mine in the South Pahroc Range District, Lincoln County. The company has a small popping plant in Caliente, and sales were almost exclusively of expanded perlite used for horticultural purposes. The deposit consisted of a large, flat-lying, 6-meter thick perlite flow with obsidian pellets (marekanites) in Tertiary rhyolitic rocks, in the 1950s estimated to contain a reserve of more than 13.6 Mt.

Noble Perlite LLC produced expanded perlite from its plant in Fallon. Although not mined in 2007, Noble Perlite had eight placer claims about 32 km south-southeast of Fallon on the south side of the White Throne Mountains. The company purchased ore in New Mexico and had it transported in by train and truck. Most of its processed perlite is microspheres used for fillers.

EP Minerals LLC produced a small amount of expanded perlite marketed as a filter aid from its Colorado diatomite plant in Pershing County. Annual plant capacity was about 7,300 t. The company's crude perlite mined from the Popcorn Mine about 24 km south of Fallon, Churchill County, was usually mined only a week or two per year.

**Salt.**—The Huck Salt Co. mined salt, mainly for use in road deicing, from a playa on Fourmile Flat, Churchill County, where it has been harvested almost continuously since the 1860s; it was then hauled to the mills that processed Comstock silver and gold ore.

**Silica.**—Simplot Silica Products Inc., the State's major silica producer, at Overton, Clark County, mined sand from a large open pit in the relatively friable Cretaceous Baseline Sandstone, washed it in the pit, and transported it through an 8-km slurry pipeline to a plant where it was screened and bagged. The facility produced four grades of sand based on coarseness, AFS 55, 60, 70, and 100. AFS 70 is used mainly in manufacturing glass.

American Silica, Inc. produced silica sand from its Mercury Mine about 5 km southeast of Mercury, Nye County. A plan of operations submitted to the BLM in 2001 called for annual production of as much as 72,600 t. The product, containing about 98% silicon dioxide (SiO<sub>2</sub>), was mainly used as construction sand and was mined from the Ordovician Eureka Quartzite.

James Hardie Building Products, Inc. received approval for the expansion of the Kramer Hill Quartzite Quarry on a 21-hectare site about 2.4 km south of Golconda in Humboldt County. The company can mine up to about 150,000 cubic meters during a 5-year period under the terms of a noncompetitive sales contract. The company would need to

renew the contract after 5 years, but can at any time request amounts above the 150,000-cubic-meter limit through the competitive bidding process. The planned use of the material was as feed for the company's fiber-cement siding manufacturing plant in the Tahoe-Reno Industrial Park east of Sparks, Nevada.

**Stone, Dimension.**—Mt. Moriah Stone Quarries, LLC quarried flaggy quartzite of several colors from the Cambrian Prospect Mountain Quartzite at a quarry about 24 km north of Baker in White Pine County. This material, which naturally splits into large slabs, was used for flagstone, ashlar (uncut facing stone), and other types of uncut building stone. Mt. Moriah Stone planned to expand its 2-ha quarry to 20 ha. The company completed an environmental assessment, and the U.S. Department of Agriculture's U.S. Forest Service issued a finding of no significant impact in 2007. However, The company did not post a performance bond, and the BLM did not approve the project. Mt. Moriah Stone planned to continue mining from the smaller pit and possibly pursue a future expansion.

Las Vegas Rock Inc. produced ashlar, boulders, crushed landscape, and flagstone rock from the Jurassic Aztec Sandstone formation at its Rainbow Quarries near Goodsprings, about 32 km southwest of Las Vegas.

**Zeolites.**—Although Nevada has large known resources of zeolite, production has been low and no zeolite was mined in the State. Zeox Mineral Materials Corp. acquired Ash Meadows Zeolite, LLC, which annually ships about 1,000 to 5,000 t/yr of clinoptilolite used in water filtration, odor control, and nuclear cleanup from the company's plant in Amargosa Valley, Nye County. The plant also produced zeolite-based cement for building materials and for use in oil and gas projects. The clinoptilolite was mined from a small open pit just over the State line in Inyo County, CA, in a large area of zeolite deposits that extends into Nevada.

KMI Zeolite, Inc. made plans for an expansion of its 50,000-metric-ton-per-year capacity plant in Sandy Valley, Clark County. KMI's deposit of about 54 Mt of (largely) clinoptilolite was located about 140 km northwest of the mill in California.

## **Metals**

As reported by the NBMG and the NDM, Nevada produced 188,000 kg (6.04 million troy ounces) of gold, 262,000 kg (8.43 million troy ounces) of silver, 64,800 t (143 million pounds) of copper, and 140 t (310,000 pounds) of molybdenum in 2007 (Muntean, 2008, p. 27).

**Gold.**—Based upon NBMG and NDM data, gold production was down nearly 8,680 kg (279,000 troy ounces) from 2006, about a 4.4% decrease. The decrease marked the seventh consecutive year of declining production. There were 22 mines in Nevada that reported gold production in 2007. Forty-nine percent of production came from mines on the Carlin trend.

Barrick Gold Corp. and Newmont Mining Corp. once again dominated Nevada's gold production, accounting for 84% of production in 2007. Barrick's Betze-Post Mine in Eureka County produced slightly more than 37,300 kg (1.2 million troy ounces), making it the largest gold mine in the State, and Barrick's Meikle Mine in Elko County produced more than

12,800 kg (413 thousand troy ounces), making it the leading underground producer. Barrick was the leading gold producing company in Nevada in 2007, both on the Carlin trend and Statewide with production from its Bald Mountain, Betze-Post, Cortez (60% share), Meikle, Ruby Hill, and Turquoise Ridge Mines (75% share), plus its 50% share of the Round Mountain Mine's production and 33% share of the Marigold Mine's amounting to about 85,400 kg (2.75 million troy ounces) of gold, an 8% decrease from 2006. The decrease in Barrick's gold production was because of a decrease at Betze-Post (15%) and a decrease at Bald Mountain (55%). Barrick was able to maintain its top spot mainly by commencing production at Ruby Hill and increasing production at Cortez.

Newmont Mining produced 72,800 kg (2.34 million troy ounces) of gold, reporting production from its Carlin trend mines and from its Lone Tree, Midas, Mule Canyon, Phoenix, Trenton Canyon, and Twin Creeks Mines, and from its 25% share of the Turquoise Ridge joint venture. Newmont Mining's production on the Carlin trend totaled about 40,400 kg of gold (1.3 million troy ounces), making it the second leading gold producer in the State.

**Silver.**—Nevada's production of silver in 2007 accounted for 21% of the U.S. total and 1.3% of the world total. Much of Nevada's silver production in 2007 was a coproduct or byproduct of gold mining. With a ratio of value (average price of gold to average price of silver) of 52:1 in 2007, only those deposits with more than 52 times as much silver as gold generally could be considered primary silver deposits. Only one such deposit operated in Nevada in 2007—the Coeur d'Alene Mines Corp.'s Rochester Mine in Pershing County (with a silver to gold production ratio of more than 90:1). This one mine, which produced more than 50% of Nevada's silver in 2007, produced 144,000 kg (more than 4.61 million troy ounces) of silver, entirely from its Rochester Mine. Coeur d'Alene ceased mining activity at Rochester in 2007, although leaching and silver recovery was slated to continue until 2011. Newmont Mining was the second leading silver producer, producing 65,800 kg (2.12 million troy ounces), primarily from its Midas and Phoenix gold mines.

**Other Metals.**—Quadra Mining Inc.'s Robinson Mine produced 92% of Nevada's copper in 2007, amounting to 59,900 t (132 million pounds). Newmont's Phoenix Mine near Battle Mountain in Lander County made up the balance of the copper, producing 4,900 t (10.8 million pounds). Golden Phoenix Minerals dramatically increased production from its Ashdown molybdenum mine in northwestern Humboldt County. Golden Phoenix produced 112 t (247,500 pounds) of molybdenum from its underground Ashdown Mine, and Quadra's Robinson Mine, the only other molybdenum producer in Nevada, yielded 28 t (62,000 pounds) of molybdenum.

## **Government Programs**

Through a survey conducted early in 2008, the Nevada Division of Minerals (NDOM) collected data for NBMG Special Publication P-9, Major Mines of Nevada 2007. This publication includes, in handbook form, location maps, names and telephone numbers of operators, number of employees, and nonproprietary

production figures for most mines in Nevada. The publication also contains a section on economic impacts of the industry. The full contents of this 28-page publication are available, free of charge, at [www.nbmng.unr.edu](http://www.nbmng.unr.edu). Additional information about the Nevada mineral industry and the overall U.S. gold industry, including the contents of selected publications, also are available at this Web site, as well as the Nevada Division of Minerals Web site (<http://minerals.state.nv.us/>).

The NBMG supports several interactive maps on the Web that are backed by periodically updated databases on mineral and energy resources and potential, exploration activity, land ownership and restrictions, and other geographic information. Several recent publications are of particular interest to minerals in the State. The NBMG released (2006) Map 149, Gold and Silver Resources in Nevada, which illustrates the locations of 943 deposits; it is supported by a database with coordinates and references (Davis and others, 2006). The Open File Report, OF08-2—Mineral and Energy Resources and Potential in Mineral, Esmeralda, Lyon, and Douglas Counties, Nevada, is a series of maps that includes the land status of those southwestern Nevada counties (Price and others, 2008). The Biennial Report of the Nevada Bureau of Mines and Geology 2008 provides details on the activities of NBMG scientists and support staff during 2006 and 2007, and it incorporates key elements of NBMG's strategic plan for the next 5 to 10 years (Price, 2008a).

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TABLE 1  
NONFUEL RAW MINERAL PRODUCTION IN NEVADA<sup>1,2</sup>

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2005		2006		2007		
	Quantity	Value	Quantity	Value	Quantity	Value	
<b>Clays:</b>							
Bentonite	7	W	W	W	W	W	
Fuller's earth	25	W	W	W	W	W	
Gold <sup>3</sup>	kilograms	212,000	3,030,000	206,000	4,010,000	186,000	4,170,000
Sand and gravel, construction		52,300	230,000	45,500	224,000	34,700	180,000
Silver <sup>3</sup>	kilograms	276,000	65,200	260,000 <sup>r</sup>	97,200 <sup>r</sup>	243,000	105,000
Stone, crushed		9,460	67,900	10,200	88,000 <sup>r</sup>	11,200	97,200
Combined values of barite, brucite (2007), cement, clays (kaolin), copper, diatomite, gemstones (natural), gypsum (crude), lime, lithium carbonate, magnesite, molybdenum concentrates (2006-07), perlite (crude), pumice and pumicite (2006-07), salt, sand and gravel (industrial), zeolites, and values indicated by symbol							
W		XX	493,000 <sup>r</sup>	XX	720,000 <sup>r</sup>	XX	834,000
Total		XX	3,890,000	XX	5,140,000	XX	5,390,000

<sup>r</sup>Revised. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data.

XX Not applicable.

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

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

<sup>3</sup>Recoverable content of ores, etc.

TABLE 2  
NEVADA: CRUSHED STONE SOLD OR USED, BY TYPE<sup>1</sup>

Type	2006			2007		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	9 <sup>r</sup>	5,310 <sup>r</sup>	\$47,100 <sup>r</sup>	8	3,880	\$36,100
Granite	5	3,410	28,000	6	2,690	21,900
Sandstone	1	58	514	1	55	463
Miscellaneous stone	6 <sup>r</sup>	1,450 <sup>r</sup>	12,400 <sup>r</sup>	11	4,570	38,800
Total	XX	10,200	88,000 <sup>r</sup>	XX	11,200	97,200

<sup>r</sup>Revised. XX Not applicable.

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

TABLE 3  
NEVADA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2007, BY USE<sup>1</sup>

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate, graded, concrete aggregate (coarse)	W	W
Fine aggregate ( $\frac{3}{8}$ inch), stone sand (concrete)	W	W
Coarse and fine aggregates:	W	W
Graded road base or subbase	W	W
Terrazzo and exposed aggregate	W	W
Other coarse and fine aggregates	174	1,630
Agricultural, other	W	W
Chemical and metallurgical:		
Cement manufacture	W	W
Lime manufacture	W	W
Unspecified <sup>2</sup>		
Reported	5,470	46,800
Estimated	2,600	22,000
Total	11,200	97,200

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

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

<sup>2</sup>Reported and estimated production without a breakdown by end use.

TABLE 4  
NEVADA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2007, BY USE AND BY DISTRICT<sup>1</sup>

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate graded <sup>2</sup>	--	--	W	W
Fine aggregate ( $\frac{3}{8}$ inch) <sup>3</sup>	--	--	W	W
Coarse and fine aggregates <sup>4</sup>	W	W	W	W
Agricultural <sup>5</sup>	W	W	--	--
Chemical and metallurgical <sup>6</sup>	W	W	W	W
Unspecified: <sup>7</sup>				
Reported	1,890	14,000	3,580	32,800
Estimated	116	986	2,400	21,000
Total	2,940	31,800	8,260	65,300

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

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

<sup>2</sup>Includes concrete aggregate (coarse).

<sup>3</sup>Includes stone sand (concrete).

<sup>4</sup>Includes graded road base or subbase, terrazzo and exposed aggregate, and other coarse and fine aggregates.

<sup>5</sup>Includes other agricultural uses.

<sup>6</sup>Includes cement and lime manufacture.

<sup>7</sup>Reported and estimated production without a break down by end use.

TABLE 5  
NEVADA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2007  
BY MAJOR USE CATEGORY<sup>1</sup>

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	1,600	\$11,300	\$7.09
Plaster and gunite sands	129	1,280	9.95
Concrete products (blocks, bricks, pipe, decorative, etc.)	54	785	14.54
Asphaltic concrete aggregates and other bituminous mixtures	497	5,770	11.60
Road base and coverings <sup>2</sup>	1,980	10,300	5.22
Fill	916	3,720	4.06
Snow and ice control	74	387	5.23
Other miscellaneous uses <sup>3</sup>	604	4,420	7.32
Unspecified: <sup>4</sup>			
Reported	9,960	27,400	2.75
Estimated	19,000	110,000	6.05
Total or average	34,700	180,000	5.18

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

<sup>2</sup>Includes road and other stabilization (cement).

<sup>3</sup>Includes filtration, golf course, and railroad ballast.

<sup>4</sup>Reported and estimated production without a breakdown by end use.

TABLE 6  
NEVADA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2007, BY USE AND DISTRICT<sup>1</sup>

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products <sup>2</sup>	674	3,990	1,110	9,410	--	--
Asphaltic concrete aggregates and road base materials <sup>3</sup>	1,190	9,360	1,290	6,740	--	--
Fill	846	3,400	70	318	--	--
Other miscellaneous uses <sup>4</sup>	428	2,470	250	2,340	--	--
Unspecified: <sup>5</sup>						
Reported	1,070	6,980	806	4,380	8,080	16,000
Estimated	3,100	19,000	16,000	95,000	74	450
Total	7,350	45,000	19,200	118,000	8,160	16,500

-- Zero.

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

<sup>2</sup>Includes plaster and gunite sands.

<sup>3</sup>Includes road and other stabilization (cement).

<sup>4</sup>Includes golf course, filtration, railroad ballast, and snow and ice control.

<sup>5</sup>Reported and estimated production without a breakdown by end use.