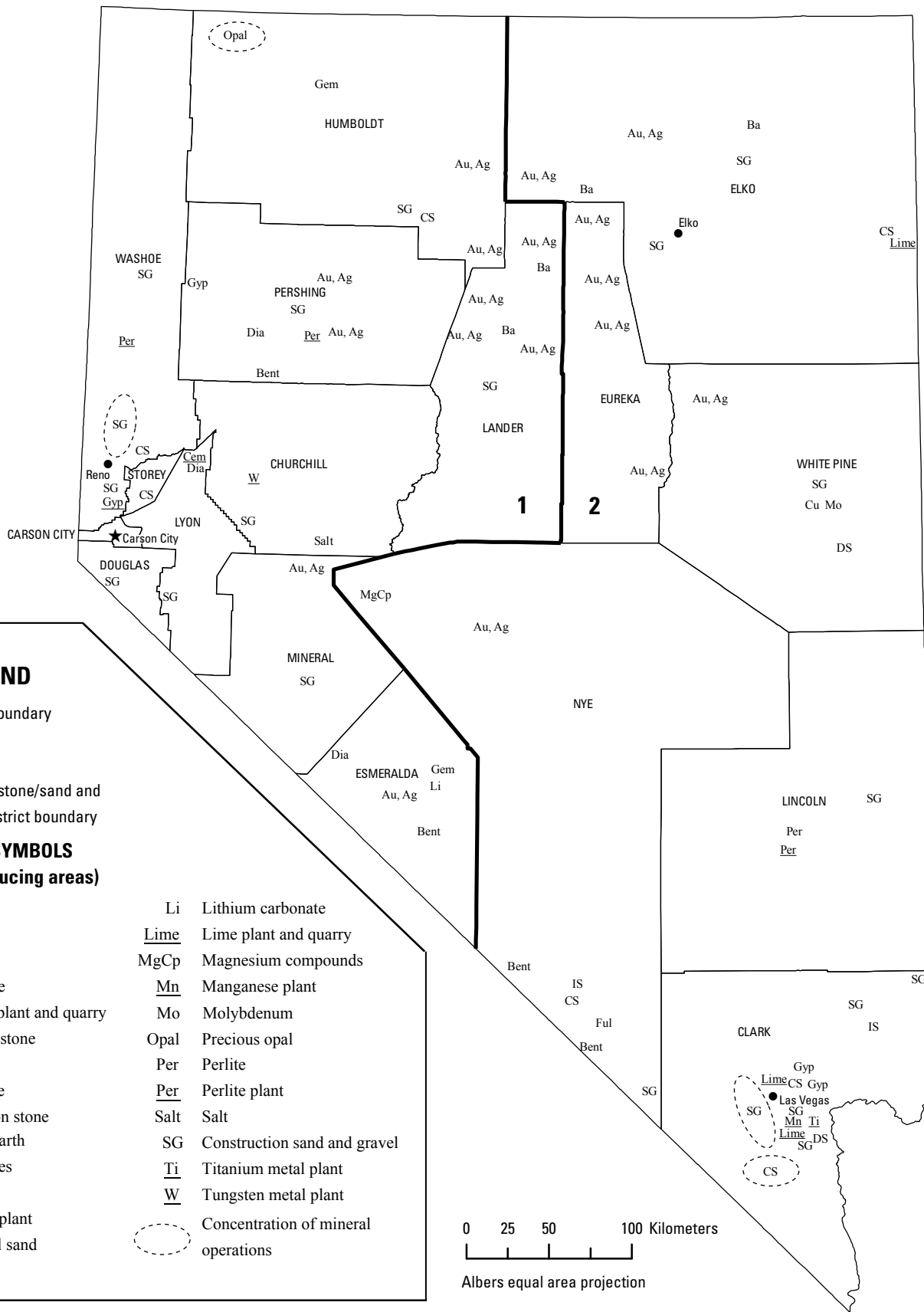




2008 Minerals Yearbook

NEVADA

NEVADA



LEGEND

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

MINERAL SYMBOLS (Principal producing areas)

- | | | | |
|------------|-------------------------|-------------|-------------------------------------|
| Ag | Silver | Li | Lithium carbonate |
| Au | Gold | <u>Lime</u> | Lime plant and quarry |
| Ba | Barite | MgCp | Magnesium compounds |
| Bent | Bentonite | <u>Mn</u> | Manganese plant |
| <u>Cem</u> | Cement plant and quarry | Mo | Molybdenum |
| CS | Crushed stone | Opal | Precious opal |
| Cu | Copper | Per | Perlite |
| Dia | Diatomite | <u>Per</u> | Perlite plant |
| DS | Dimension stone | Salt | Salt |
| Ful | Fuller's earth | SG | Construction sand and gravel |
| Gem | Gemstones | <u>Ti</u> | Titanium metal plant |
| Gyp | Gypsum | <u>W</u> | Tungsten metal plant |
| <u>Gyp</u> | Gypsum plant | ○ | Concentration of mineral operations |
| IS | Industrial sand | | |

0 25 50 100 Kilometers

Albers equal area projection

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 2008, Nevada's nonfuel raw mineral production¹ was valued at \$6.3 billion, based upon annual U.S. Geological Survey (USGS) data. This was an increase of \$890 million, or 16% rise from that of 2007, following a \$270 million, or 5.2%, increase from 2006 to 2007. The increase again set an alltime high value for the State, principally owing to continued increases in the annual average prices of gold and silver. The State continued to rank second in the Nation in total nonfuel mineral production value in 2008, which followed rankings of third in 2005, second in 1994–97 and 1999–2004, and first in 1992–93 and 1998. Nevada accounted for 8.9% of the U.S. total nonfuel value in 2008.

Nevada, which has led the Nation in gold production since 1981, accounted for 76% of the Nation's gold production in 2008. Gold accounted for 79% of the State's total nonfuel raw mineral production value in 2008, followed by copper, construction sand and gravel, silver, lime, and crushed stone. Nevada, for the seventh consecutive year, ranked second in silver production (first from 1987–2001) accounting for 19% of the silver produced from U.S. mines, as in 2007, and down from about 22% in 2005–06, 24% in 2004, 26% in 2003, and 30% in 2002.

In 2008, despite a 4.2% decrease in the production of gold, its value of production increased by 20%, up by \$822 million. A more than 23% increase in copper production, despite declining prices, resulted in a large increase in the commodity's total value. A \$7.5 million increase in the total value of silver (table 1) occurred despite a 3.1% decrease in gold production and similarly, the value of lithium carbonate increased significantly though its production decreased slightly (value withheld—company proprietary data). Significant increases in the production of bentonite clay, crude gypsum, lime and salt resulted in a \$17 million combined increase in the value of these mineral commodities. A significant increase in the production of barite took place simultaneously with a significant increase in value (data withheld—company proprietary data). Fuller's earth production increased, resulting in a significant increase in its unit value (data withheld—company proprietary data). A significant decrease in the production of zeolites resulted in a slight increase in the mineral commodity's value (data withheld—company proprietary data). A slight decrease in the production of diatomite resulted in a minor increase in the commodity's value (value withheld—company proprietary data).

The largest decrease in value took place in crushed stone, down \$24.5 million (table 1), and construction sand and

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

All 2008 USGS mineral production data published in this chapter are those available as of July 2010. 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>.

gravel, down \$18.2 million (table 1). Significant decreases in the combined value of molybdenum, portland cement, and magnesite resulted in a total decrease of \$26.6 million (withheld—company proprietary data). Decreases in the production value of kaolin and industrial sand and gravel resulted in a combined decrease of \$1.3 million (value withheld—company proprietary data).

In 2008, Nevada 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, fifth in kaolin, and sixth in lime and pumice and pumicite. The State rose to first from 4th in crude gypsum production, to 10th from 14th in the production of construction sand and gravel, and was the producer of significant quantities of crushed stone and industrial sand and gravel. Nevada dropped from 13th in the production of gemstones (ranked based upon value) to 12th. Mercury was produced as a byproduct of gold-silver processing at several mines, but no data were reported to the USGS (U. S. Geological Survey, 2010).

The following narrative information was provided by the Nevada Bureau of Mines and Geology² (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). They 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, canvasses, and estimates made by those State agencies, including information gathered from company annual reports. 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.

Exploration and Mine Development Activities

Most exploration focused on gold and silver, which maintained high prices throughout the year. For many other mineral commodities, prices declined in the latter part of the year owing to the recession. Nonetheless, high prices earlier in the year stimulated exploration for copper, iron, molybdenum, nickel, tungsten, uranium, vanadium, and zinc. Exploration in 2008 included high-grade (mostly vein and breccia) targets and low-grade, large tonnage deposits, which generally become more profitable when gold prices are higher. At least 68 companies, ranging from small to large, drilled at least 123 projects in Nevada in 2008, about the same numbers as in 2007. Exploration activity, including new claims staked, was reported in most of Nevada's 17 counties. In 2008, Barrick Gold Corp. saw its first

²Jonathan 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.

production from the Cortez Hills deposit in Lander County, a multimillion-ounce gold deposit that was discovered in 2004. Allied Nevada Gold Ltd. reopened the Hycroft Mine late in 2008, and Great Basin Gold significantly increased its production from its underground Hollister Mine. Advanced exploration projects at previously delineated deposits show promise for future 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 Nevada Division of Minerals, exploration activity in Nevada in 2008 declined slightly from 2007, after steadily increasing since 2001, when companies reported \$51.2 million in expenditures in Nevada (Driesner and Coyner, 2008b). The 22 companies responding to the survey reported spending \$158.1 million on exploration in Nevada in 2008, somewhat less than the \$167.9 million in 2007 and \$164.9 million in 2006, but more than the \$121.3 million reported in 2005 or the \$79.7 million reported in 2004. Perhaps because of the difficulty in raising funds for exploration during the recession, the companies were less optimistic about Nevada's potential than they had been in 18 recent years, and they reported that they planned to spend \$134 million in 2009.

In 2008, as in the last several years, companies focused their exploration in and around their active mines. On the Carlin Trend, Barrick continued to carry out major drill programs in and around its Goldstrike Mine, both on the surface and underground. At the north end of the Carlin Trend, Barrick continued its feasibility study of the South Arturo deposit (60% Barrick, 40% Goldcorp Inc.); it made a new discovery adjacent to it at West Button Hill that is reportedly higher grade than South Arturo. Elsewhere, Barrick also carried out major programs at its Cortez, Bald Mountain, and Turquoise Ridge Mines (75% Barrick, 25% Newmont Mining Corp.). At Cortez, most of the work concentrated on the Cortez Hills deposit, where an important milestone was reached in November when the U.S. Department of the Interior's Bureau of Land Management (BLM) issued a Record of Decision, allowing construction and prestripping to commence. Full-scale gold production is projected to begin in early 2010. Production in the first 5 years from Cortez Hills was expected to be nearly 31,000 kilograms (kg) (1 million troy ounces) of gold per year. Barrick also made a discovery located about 6 kilometers (km) southeast of Cortez Hills. Newmont carried out large drill programs at its surface and underground mines along the Carlin trend and at its Twin Creeks, Midas, and Phoenix Mines. Other active mines with major drill programs in 2008 were Marigold (67% Goldcorp, 33% Barrick), Jerritt Canyon (Yukon-Nevada Gold Corp.) prior to its closure, Robinson (Quadra Mining Ltd.), and Round Mountain (50% Kinross Gold Corp., 50% Barrick).

Substantial drill programs carried out by major or mid-level companies targeting gold outside active mine areas included Sandman (Fronteer Development Corp.), Buffalo Valley (Fairmile Goltech Inc., formerly Fairmile Acquisitions Inc.), Pinson (Barrick), West Pequop (West Pequop Project LLC), and Gabbs (Newcrest Mining Ltd.). Newmont carried out major drill programs at Sandman and Buffalo Valley. At Pinson, Barrick spent the required \$30 million and earned back a 70% interest

in the property from Atna Resources Ltd. Agnico-Eagle (joint venture with AuEx Ventures Inc.) continued to drill high-grade, oxidized gold mineralization at two separate areas at its West Pequop project near Wells, and Newcrest continued to drill at its Gabbs property near the old Paradise Peak and Sullivan Mines. Much of the drilling for gold by junior companies in 2008 occurred 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 U.S. Securities and Exchange Commission regulations.

New resource estimates were released for Hycroft (Allied Nevada Gold Corp.), Fire Creek (Klondex Mines Ltd.), North Bullfrog (International Tower Hill Ltd.), Golden Arrow (Nevada Sunrise Gold Corp.), Jessup (Ry Patch Gold Corp.), Independence (General Metals Corp.), Gold Pick (US Gold Corp.), Mount Hamilton (Ely Gold and Minerals Inc.), Pine Grove (Lincoln Gold Corp.), Sleeper (X-Cal Resources Ltd.), and Borealis (Gryphon Gold Corp.). Junior company-controlled projects with underground development in progress or in the process of being permitted and financed included Goldwedge (Royal Standard Minerals Inc.), Sterling (Imperial Metals Corp.), Fire Creek, and Midway (Midway Gold Corp.). AuEx Ventures Inc.'s claim blocks in the Pequop Mountains and Midway's Spring Valley project in the Humboldt Range remained the most promising early stage projects in 2008. AuEx Ventures Inc. joint venture partners continued to drill high-grade, oxidized gold mineralization on its Pequop properties near Wells. At Long Canyon, on the east side of AuEx's Pequop property, its joint venture partner, Fronteer, continued to expand the deposit. Midway expanded its Spring Valley deposit with a major drill program in 2008, and in early 2009 released a new resource estimate of 56,000 kg (1.8 million ounces) of gold, an 85% increase from its last resource estimate. In October, Midway and Barrick became joint venture partners at Spring Valley. Barrick will fund future exploration and can earn a 60% interest in Spring Valley by spending \$30 million over the next 5 years. Following success in the Pequops and at Spring Valley, junior companies drilled more early stage projects in 2008 than in each of the last few years. A notable example was Rye Patch Gold Corp.'s drilling of high-grade intercepts [7.6 meters (m) reportedly grading 75 grams per metric ton gold] at its Lincoln Hill project located southwest of Spring Valley in the Humboldt Range. In addition, companies were eager to find Carlin-type gold deposits in areas not yet explored off the main trends. Notable examples include Columbus Gold Corp.'s Bolo project in the Hot Creek Range and Fronteer's aggressive early-stage drilling at its Long Canyon mining property in northeastern Nevada. Other examples of drilling early-stage projects by junior companies included Evolving Gold Corp.'s drilling in Boulder Valley, Sheep Creek Range, the pediment between Sleeper and Sandman, and Nevada Exploration Inc.'s drilling pediment projects at Hot Pot, Bull Creek, and Fletcher Junction, which were generated based on groundwater geochemistry.

High prices for all metals continued to bring more companies to Nevada to look for metals other than gold in 2008. Most of

the projects, which were being carried out exclusively by junior companies, were focused on areas with historical resources. Some companies were proceeding with feasibility studies, permitting, and financing with plans to put mines into production in the near future. The international recession and financial crisis that began during the second half of 2008 halted most of these plans as well as exploration altogether. In addition to Quadra's active Robinson Mine near Ely, the Yerington District was the focus of intense copper exploration in 2008. At Pumpkin Hollow Copper Project (which contains significant byproduct gold), Nevada Copper Corp. completed a \$9 million development program, mostly aimed toward infill and step-out drilling, but also on permitting and metallurgical, hydrological, and geotechnical studies necessary for planned production. Also in the Yerington District, Quaterra Resources Inc. completed a major drill program and released a resource estimate that amounted to 124,000 metric tons (t) of copper from copper oxide- and chalcocite-bearing material grading 0.239% copper. Also, near Yerington, Pacific Magnesium Corp. continued to drill the Ann Mason resource area and nearby skarn targets. Elsewhere, in the Contact district in northeastern Nevada, International Enexco Ltd., completed a major drill program and prefeasibility study and released a proven and probable reserve of 89,500 t of copper in ore grading 0.293% copper. Other copper projects were explored at Majuba Hill (Minterra Resources Corp.) about 60 km (40 miles) north of Lovelock and in the Belmont district (Nevoro Inc.). In addition to Golden Phoenix Minerals, Inc.'s production of molybdenum from the underground Ashdown Mine and Quadra's production of byproduct molybdenum from its Robinson Mine, General Moly Inc. (formerly Idaho General Mines) continued to permit and secure financing for its Mount Hope porphyry molybdenum deposit northwest of Eureka. General Moly also finished a prefeasibility study of the Hall-Tonopah deposit, which is called Liberty. The estimated proven and probable reserves at Liberty are reportedly 393 million metric tons (Mt) of ore grading 0.071% molybdenum and 0.070% copper. In addition to General Moly's advanced projects, drilling for primarily molybdenum occurred at the Pine Tree project (Mosquito Consolidated Gold Mines) near Mina and the Ravin project (Max Resource Corp.) northwest of Austin. Despite the high price of silver, only two projects were drilled primarily for silver in 2008. Silver Standard Resources Inc. drilled around a known resource at Maverick Springs in the Maverick Springs Range, and Silver Reserve Corp. drilled its Nivco and Silver Queen projects located near Silver Peak. Golden Predator Mines, Inc. spent approximately \$21 million at its Springer tungsten project, rehabilitating the mill and delineating near-surface tungsten mineralization. Until the economic crisis in September 2008, the project was on track and within budget to treat tungsten ores and start operations by January 2009. Western Energy Development Corp. continued to explore for uranium at its Kings Valley project along the east side of the McDermitt caldera in northern Humboldt County. Additionally, Rocky Mountain Resources Corp. carried out a drill program to confirm vanadium mineralization and collect samples for metallurgical testing at the known vanadium resources in the Gibellini district, located south of Eureka. Baker Hughes Inteq. that mines barite located 36 lode claims in sections 3 and 4, T35N, R52E sections 27, 28, and 34, T36N, R52E in southern Independence Mountains

of Elko County. The barite in Independence Mountains forms at least two conformable units associated with chert and argillite of the Ordovician Vinini Formation. The area has been explored for barite at least since the 1950s. Heemskirk Canada, Ltd. had the lease on the Monitor barite property in the Northumberland District of Nye County and was looking into exploring it in the future.

Employment

The mining industry directly employed 12,198 people in 2008 (according to the Nevada Department of Employment, Training and Rehabilitation), and the industry is 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. 20). As a result of favorable geology, Nevada has tremendous potential for the discovery of additional mineral deposits. Areas where prospective rocks exist beneath a cover of young, valley-filling sediments and volcanic rocks have only been explored to a limited extent. Ore deposits continue to be discovered in and near Nevada's 526 historical mining districts.

Commodity Review

Industrial Minerals

Barite. —According to data from the Nevada Division of Minerals, Nevada's barite production, which comes from just four mining operations, accounted for almost 88% of the barite produced domestically. Production increased by 4% to 540,000 t from 520,000 t shipped in 2007. Although this is a considerable increase over the recent low production of 342,000 t in 2002 and is the most production since 545,000 t in 1996, it is far below the 2.25-Mt high in 1981. About 95% of the barite sold domestically is used as a weighting agent in oil and gas well drilling fluids. M-I SWACO, which is jointly owned by Smith International and Schlumberger, was the largest Nevada barite producer in 2008. Its production of crude and ground barite from the Greystone Mine and Battle Mountain plant, both in Lander County, increased by 20% to 289,000 t from 242,000 t shipped in 2007. This was the highest production since 303,000 t was shipped in 2000 and the second highest since 315,000 t was shipped in 1997. The barite of the Greystone Mine is in black chert and minor argillite and shale of the Middle to Late Devonian Slaven Chert. Baroid Drilling Fluids, a subsidiary of Halliburton Co., was the second leading producer of barite in Nevada. Baroid's production decreased by 19% to 169,000 t from 209,000 t shipped in 2007. The company mined barite from the Rossi Mine in Elko County and processed it at the Dunphy Mill in Eureka County. In 2008, Heemskirk Canada, Ltd., a Canadian industrial minerals concern, used barite from the Dunphy Mill for its Lethbridge, Alberta, plant. The barite was then supplied to the western Canadian drilling mud market. The barite occurs in chert of the Ordovician Vinini Formation.

Baker Hughes shipped 82,000 t of barite from its Argenta operation near Battle Mountain in Lander County, up 18% from about 70,000 t in 2007. In 2008, Baker Hughes located 47 lode claims near its Argenta operation. Baker Hughes also dropped 21

lode claims located in 2007 and located 21 more in 2008, nearly 9 km south of the Argenta Mine. The area of these claims has been prospected and drilled for barite in the past and is just east of the old Miller Mine, which produced over 45,000 t of barite in the 1960s. Baker Hughes also located four lode claims in Slaven Canyon about 27 km south of the Argenta Mine and near the old Elquist Mining, Inc. barite pit that was in production around 1980. The barite deposits of the Argenta Mine and the areas of the new claims area are in black chert and minor argillite and shale of the Middle to Late Devonian Slaven Chert in the upper plate of the Roberts Mountain thrust. Spirit Minerals, LP, mined barite at the Big Ledge Mine area in the Snake Mountains of Elko County for about 20 days starting in December 2007, shut down, and then restarted production in March 2008. Spirit expected to mine about 227,000 t of ore and to produce 454 tons per day (t/d) through its Dry Creek jig plant for a total of 45,500 t. The barite was then shipped to its grinding plant in Evanston, WY. Most of the 68,000 t of barite that was mined and stockpiled by Old Soldier Minerals Co. in the 1980s was shipped in 2008. The mine was expected to have a 3- to 5-year life span, though it may hold more reserves. The barite occurs in argillite and chert of the Ordovician Valmy Formation.

Cement.—Production from the only Nevada cement producer, the Nevada Cement Co. (a subsidiary of Eagle Materials, Inc., of Dallas, Texas) in Fernley, Lyon County, was confidential but its Web site reports it is more than 454,000 t annually of Type I/II, low-alkali, moderate sulfate-resistant cement, and IP-blended cement. The plant, which was built in 1964, has a rated annual clinker capacity of 458,000 t. The cement is manufactured from Tertiary lacustrine limestone mined a few miles south of Fernley, and from other raw materials that come from northern Nevada. Most of the cement goes to the northern Nevada market with a little going to California. Both markets were particularly hard hit by the housing slowdown. Though production from the Fernley facility was confidential, Eagle Materials reported their overall cement volume was down by 13%, and overall cement sales revenue was down by 14% in 2008. Eagle Materials received permits from the State for its planned expansion of the Fernley facility, but negotiations with the vendors delayed the start of the project, which will take 18 to 24 months to complete. In 2008, Nevada Cement Co. located a group of 36 lode claims adjacent to 73 lode claims located in 2007 and west of their existing operating limestone quarry south-southeast of Fernley. These claims are largely underlain by the upper Miocene to lower Pliocene Chloropagus Formation, which mainly consists of basaltic and andesitic lava flows and breccias interbedded with rhyolitic tuffs and minor sedimentary rocks, including some oolitic limestone. In 2008, Holcim (US), Inc., of Waltham, MA, acquired a long-term lease option to the mining rights on a 712-hectare (ha) site about 64 km east of Las Vegas in Clark County and will be testing the limestone reserves there for potential raw material for cement production. Holcim (US), Inc. was looking at potential future growth in the Nevada and Utah markets. The company currently has a cement plant at Devil's Slide, UT, which provides cement to its sister company, Aggregate Industries, in Las Vegas. Holcim, Inc. and Aggregate Industries are both subsidiaries of Holcim, Ltd., a worldwide supplier of cement and aggregate, based in Switzerland.

Clays.—In 2008, IMV Nevada, owned by Mud Camp Mining Company, LLC, produced sepiolite, saponite, and bentonite from deposits in the Ash Meadows-Amargosa Flat area of Nye County. The clay occurs in shallow, flat-lying deposits in Pliocene lacustrine rocks and was processed at a plant in Amargosa Valley, where clay products were exported worldwide. The sepiolite and saponite deposits have unusual geology and are considered to have originated in a Pliocene playa with an area of at least 57 square kilometers (km²). The sepiolite, which yields most of the profits for the operation, occurs in an almost continuous bed with an average thickness of about 2 m. IMV Nevada is the only commercial producer of sepiolite and saponite in North America. Two companies campaign mine and ship relatively minor amounts of Nevada clay from several sites for use in high-value specialty products. At its White Caps Mill near Beatty in Nye County, Vanderbilt Minerals Co. processes small amounts of clay stockpiled from several deposits in Nevada, Arizona, and California. In 2008, Vanderbilt did not actively mine but did ship smectite from the New Discovery Mine just south of Beatty, the Blanco Mine about 64 km west-southwest of Tonopah in the Coaldale Mining District in Esmeralda County, and the Buff and Satin Mines about 16 km northeast of Lovelock in the Willard Mining District in Pershing County. The American Colloid Co. mined and shipped white bentonite from its Nassau property in Coal Canyon in the Willard Mining District for use in specialty clay products. The clay was in altered rhyolite tuff-breccia of probable Miocene-Pliocene age. American Colloid also mines several thousand tons of hectorite every few years from its Disaster Peak Mine in the Disaster Mining District, about 48 km west of McDermitt in Humboldt County. The hectorite is in moat deposits of the McDermitt Caldera, which are discussed further in the section on lithium. The Disaster Peak Mine did not produce in 2008.

The Art Wilson Company mined halloysite on an as-needed basis for the Nevada Cement Co., which owns the pit in the Terraced Hills about 13 km northwest of Pyramid Lake. Because of its high alumina content, it is used in the production of portland cement at the Nevada Cement Co. plant at Fernley. The BLM released the plan of operations for the Barrett Springs Project of Calico, LLC, about 16 km northwest of Winnemucca. An environmental assessment is planned for the near future. Calico proposed to deepen an existing clay pit on their group of five placer claims by about 3 m to take in an additional 17,000 cubic meters of montmorillonite clay, which would be mined as needed over the next 20 years. The pit was last mined from the early 1980s through the early 1990s. Kent Exploration, Inc., in a joint venture with Senator Minerals, Inc. (both of Vancouver, British Columbia), explored the Ivanhoe Creek bentonite property in Elko County. The property consists of lode and placer claims covering 57 ha in sections 17 through 20, T38N, R48E and sections 13 and 14, T38N, R47E in the Ivanhoe District about 19 km southeast of Midas. In 2008, seven placer claims were located and the reclamation bond was filed for a drill program to be conducted in 2009.

Diatomite.—About two-thirds of the diatomite produced in Nevada was used in filtration, and the remainder was largely used in absorbents, fillers, and cement. Emerging small-scale uses include pharmaceutical processing and nontoxic insecticides. EP Minerals, LLC, a subsidiary of EaglePicher

Corp., and the second ranked diatomite producer in the world, produces most of Nevada's diatomite. EP Minerals' Colado operation in Pershing County is the company's most productive Nevada operation. It consists of a plant at Lovelock that mostly makes filtration products from diatomite mined about 24 km to the northwest in the Velvet Mining District. The diatomite occurs in thick beds interbedded with fresh-water tuffaceous sedimentary rocks of probable Miocene age. The company also produces diatomite used in fillers and absorbents at its Clark plant and mine in the Clark Mining District, Storey County, about 32 km east of Reno, 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, and about 90% consists of the diatom *Melosira granulata*. The Celite Corp. operated a mine at Hazen and plant in Fernley that produced diatomite fillers. The company started mining at its Nightingale deposit north of Fireball Ridge in Churchill County in 2008. Celite is a subsidiary of World Minerals Inc., the world's largest diatomite producer and a subsidiary of Imerys, a large French industrial minerals company. The Moltan Company ships absorbent products, cat litter, and soil conditioner under several labels from a mine and plant complex in Churchill County about 32 km northeast of Fernley in the Desert Mining District. Diatomite deposits in western Churchill County are interbedded with Pliocene lacustrine tuffaceous shale, sandstone, and limestone and siliceous tuff. The Grefco Minerals, Inc. diatomite operation near the Esmeralda/Mineral County line was small relative to other Nevada diatomite companies but has been producing diatomite for many years for fillers. The deposit is in Miocene-Pliocene lacustrine sedimentary rocks consisting of diatomite, argillaceous and calcareous diatomite, clay, sand, and volcanic ash. Since 2004, production has been from stockpiled ore.

Gemstones.—Precious opal is produced from several mines in the Virgin Valley area of northern Humboldt County. The best-known mines in the Virgin Valley are the Royal Peacock, Rainbow Ridge, Bonanza, and Hidden Valley Mines. 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 were produced in a single year.

Gypsum.—In 2008, Nevada fell from third to fifth in the list of eight States that produce 77% of the Country's total gypsum. According to data from the Nevada Division of Minerals, Nevada's gypsum production decreased by 17% to an estimated 1.27 Mt, which is the fifth consecutive annual decline. PABCO Gypsum in Clark County northeast of Las Vegas was the largest Nevada producer in 2008. PABCO Gypsum processed the gypsum into wallboard at its plant adjacent to its mining operation. Processing yields about 70% by weight gypsum from the ore, which is in a nearly flat-lying late Miocene gypsite blanket atop a 13-km² mesa. Drilling indicates the gypsum is at least 36 m thick in the area of current mining. USG, the Nation's leading wallboard producer, was the second ranked Nevada producer in 2008. The company mined gypsum in western Pershing County and processes it into wallboard and plaster at a plant at Empire in Washoe County. The gypsum was of Triassic or Jurassic age and forms several masses in a 5.2-km² area. The largest mass, the Selenite orebody, contains 85 to

95% gypsum. The Pioneer Gypsum Mining Company produced gypsum from the Pioneer Mine about 16 km east of Las Vegas. Material from these two smaller operations was used in cement and agricultural applications. The Adams deposit is a folded body associated with marble in Triassic metavolcanic rocks. The Pioneer Mine exploits the same late Miocene gypsum deposit as the PABCO operation about 8 km to the north.

In 2008, CertainTeed Gypsum, which has a plant near Blue Diamond and is a subsidiary of the Saint-Gobain Corporation, located five mill sites near the old Blue Diamond gypsum mine formerly owned by BHP Gypsum, Inc. Georgia-Pacific Gypsum, LLC operated a plant at Apex using synthetic gypsum and crude gypsum imported from St. George, UT, for the production of drywall and related products. In 2008, Georgia-Pacific Gypsum, LLC located seven lode claims in the vicinity of placer claims and the Weiser Ridge quarry owned by the company about 16 km west of Overton. Georgia-Pacific Gypsum, LLC has not actively mined the quarry since 1995 but planned to resume mining to provide crude gypsum for its Apex plant. Existing operations have disturbed 48 ha, and the proposed resumption of mining is expected to disturb another 51 ha. The Weiser Ridge quarry exploits gypsum interbedded with limestone of the Permian Toroweap and Kaibab Formations.

Lime (Limestone, and Dolomite).—Nevada was sixth in the list of seven States with annual production of more than 1 Mt of lime, which in total accounted for more than 60% of domestic production. Although Nevada's production is confidential, it fell between 1.13 Mt produced in Pennsylvania and 1.50 Mt produced in Texas. Nevada's leading producer, the Pilot Peak high-calcium lime operation of Graymont Western US, Inc. (formerly Continental Lime, Inc.) was in Proctor Mining District in the Toano Range about 16 km northwest of Wendover in Elko County. The plant has three kilns with a combined capacity of more than 635,000 t of quicklime per year and a hydrated lime plant capable of producing 317 t/d. Pilot Peak mainly markets lime to gold-mining operations for use in cyanide-solution pH control. In addition to lime, Pilot Peak also shipped crushed limestone. Production is mainly from the Middle to Late Devonian Devils Gate Limestone, which generally consists of interbedded limestone and dolomite. Nevada's other large producer, Chemical Lime Co., produces lime at Apex in the Apex Mining District about 32 km northeast of Las Vegas. The operation makes high-calcium quicklime used in metallurgical processing, paper manufacturing, and environmental markets. The company also produces 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 using quicklime produced at Apex. In addition to lime, Chemical Lime also shipped crushed limestone. In an effort to conserve nonrenewable resources at the Henderson plant, mainly plain paper bags, Chemical Lime Co. started a long-term program to convert customers from bagged to bulk product, which was estimated to approach 50% of their shipments in 2009. Because of the decline in demand from the drop in the housing market, Chemical Lime announced in 2008 that it would be idling its plant in Grantsville, UT, but the production capacity at its Apex and Henderson operations would be adequate to cover the closing. Production is from the Middle to

Late Devonian Sultan Limestone. The Sultan Limestone generally consists of a dolomitic lower member (Ironside Dolomite), a middle member that ranges from limestone- to dolomite-dominated (Valentine Limestone) and a nearly pure limestone upper member (Crystal Pass Limestone).

Of Nevada's small limestone producers, the Nutritional Additives Corp. produces agricultural and nutritional dolomite products along the northwest edge of the Sonoma Range about 8 km south of Winnemucca. Production is from the Late Triassic Dun Glen Formation, which consists mainly of massive black dolomite with minor limestone and shale in its lower section. Min-Ad, Inc. a subsidiary of Inter-Rock Minerals Inc. of Toronto, Ontario, Canada, also produced dolomite from the Dun Glen Formation about 5 km south of the Nutritional Additives Corp. operation. Min-Ad's dolomite was mostly sold into the midwestern United States and as far as New York State and Alberta, Canada, for use in beef and dairy feed. Along with gypsum and anhydrite, the Art Wilson Company of Carson City also produced some pure calcitic limestone from the Adams Mine. The limestone is used for soil pH control and reportedly contains no detectable magnesium. In 2008, Ireland, Inc. merged with Columbus Brine, Inc. to acquire the Columbus Project at the Columbus Salt Marsh in Esmeralda County, about 72 km west of Tonopah. The project consists of about 17,000 ha of placer mining claims, 24 ha of mill sites, an approved Plan of Operations to mine and process 154 of these hectares, and a 1,400-m² processing plant. The current permit allows for mining down to 7.6 m and annually processing up to 71,000 t of calcium carbonate and precious metals. Ireland, Inc., however, has concentrated on the precious metals potential and conducted a drilling program to that end in 2008. Graymont Western US, Inc. kept current 15 lode claims in section 6, T32N, R37E, in the Sierra District in Pershing County. These claims are underlain by massive limestone and dolomite of the Triassic Natchez Pass Formation in the East Range.

Lithium.—Nevada was the only State with domestic production of lithium raw materials, and as this production was from one company, actual production and consumption figures are kept confidential to protect company proprietary data. Subsurface brines have become the dominant raw material for lithium carbonate production worldwide because of low production costs as compared with the mining and processing costs for hard-rock ores. Lithium was produced as a byproduct from brine in California since 1938; however, the Nevada operation, initiated at Silver Peak in Esmeralda County in 1966 by Cyprus Mines, was the first to extract lithium as the sole commercial product from brine. This operation was the world's dominant brine-based lithium producer until the mid-1980s, when a Chilean lithium brine operation started up. Chemetall Foote Co., a subsidiary of Chemetall GmbH, owns and operates the Silver Peak facility. The company produces lithium carbonate, lithium hydroxide monohydrate, and lithium hydroxide anhydrite. The lithium chemicals are produced by solar evaporation preconcentration and subsequent refining techniques from brine that is pumped from beneath the Clayton Valley playa. The brine varies between 100 and 300 parts per million lithium. In 2008, Western Lithium Corp. conducted exploration and evaluation of the lithium resources in its Kings

Valley Project, Nevada. Western Lithium has leased over 11,000 ha through almost 1,400 lode claims, mainly in the Disaster Mining District in northern Humboldt County, from Western Energy Development Corporation for lithium exploration. The claims are within the McDermitt Caldera, and cover several areas containing inferred uranium resources and broader zones of uranium, molybdenum, and lithium mineralization. The lithium largely occurs in high-lithium clays with significant amounts of hectorite in the moat deposits in the western part of the caldera. These lithium-bearing moat deposits extend north through the western Montana Mountains and Disaster Peak into Oregon. Significant lithium mineralization has been defined in five areas referred to as North Lens, North Central Lens, South Lens, South Central Lens, and PCD. In 1985, Chevron estimated a total resource of about 2.1 Mt of lithium (11 Mt of lithium carbonate equivalent; non-NI 43-101 compliant) with a 0.25% cutoff grade and minimum 1.5-m thickness for these areas. In each area, hectorite occurs in thick, apparently continuous accumulations, with the zones of mineralization varying between about 1 and 91 m thick. The hectorite is thought to be from hydrothermal alteration of the volcanoclastic sedimentary rocks making up the moat deposits. The 2008 drilling program on the PCD deposit reportedly showed it contained resources of 48 Mt grading 0.27% lithium (668,000 t lithium carbonate equivalent) and inferred resources 43 Mt grading 0.27% lithium (606,000 t lithium carbonate equivalent), both with a 0.2% cutoff grade. Black Pearl Minerals Consolidated, Inc., now Canada Lithium Corp., formed an alliance with Gold Summit Corp. USA, headquartered in Reno, NV, to explore for lithium brine deposits in the Great Basin in parts of California, Nevada, and Utah. This includes a joint venture to explore and drill the Paymaster property in Esmeralda County. The Paymaster property covers about 31 km² about 16 km northeast of the Chemetall Foote Co. operation at Silver Peak.

Magnesium (Magnesite).—About 43% of the U.S. magnesia production came from seawater and natural brines in 2008, and the rest was produced from magnesite (Nevada), brucite (Texas), and olivine (North Carolina and Washington). Premier Chemicals, LLC of Cleveland, Ohio, owned the Gabbs magnesia operation in Nye County, which was the only magnesite mine in the United States. Magnesite and some brucite (<5%) 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, mining and processing was by Basic Industries, a major producer of refractory magnesia. During the 1990s, the availability of cheap foreign refractory magnesia caused production at Gabbs to be switched to light-burned (caustic-calcined) magnesia that is mainly marketed for wastewater treatment and agricultural uses. In 2008, Premier Chemicals, located 3 millsites, 23 lode claims, and 26 placer claims in the area around its mining operations. Premier also expanded its capacity for producing light-burned magnesia and magnesium hydroxide with the startup of the third Herreshoff furnace. Citing the increased costs of raw materials, labor, energy, and freight, Premier raised its prices for all grades of magnesium oxide and magnesium hydroxide between 4% and 12% in January 2008. Although production of magnesia at Gabbs was still substantially below its peak in 1981, magnesia shipments

from the Gabbs operation increased steadily between 1996 and 2005. Production then decreased in 2006, increased in 2007, and decreased again in 2008. Production is confidential, but the plant capacity is rated at about 136,000 tons per year (t/yr). Premier Chemicals, LLC had an annual production of about 270,000 t of oxide and slurry products from its mine at Gabbs and its seawater extraction plant at Port St. Joe, FL. The magnesite and brucite occur as complex replacement bodies in Triassic dolomite in an area of about 526 ha in the Paradise Range just east of the town of Gabbs. The resource was estimated to be about 12 Mt in 1973 and is thought to be sufficient for more than 50 years of production at present mining rates.

Perlite.—Nevada has large perlite resources and several deposits of perlite that have been mined extensively; however, the State now produces only minor amounts of perlite. Current perlite production in Nevada is restricted to relatively small-scale mining of two deposits for niche markets, and the State produces less than 1% of the domestic total. Wilkin Mining and Trucking Inc. mines perlite from the Tenacity Perlite Mine in the South Pahroc Range Mining District, about 40 km west of Caliente in Lincoln County. The company has been mining perlite in the area for more than 25 years. It has a small popping plant in Caliente, and present sales are almost exclusively of expanded perlite that is used for horticultural purposes. The deposit consists of a large, flat-lying, 6-m-thick perlite flow with obsidian pellets in Tertiary rhyolitic volcanic rocks, and in the 1950s, was estimated to contain reserves of over 14 Mt. Noble Perlite, LLC produced expanded perlite from a plant in Fallon. Noble has eight placer claims about 32 km south-southeast of Fallon on the south side of the White Throne Mountains, but these claims were not mined in 2008. Noble purchased ore in New Mexico, which was brought in by truck and train. Most of its processed perlite were microspheres used for fillers. EP Minerals, LLC produced a small amount of expanded perlite that is marketed as a filter aid from its Colado diatomite plant in Pershing County. Plant capacity was about 7,300 t/y. The crude perlite comes from the Popcorn Mine about 24 km south of Fallon in Churchill County, which is usually mined a week or two per year.

Potash.—A small amount of potassium alum (kalinite) was shipped by Rulco, LLC in 2008 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 marketed for horticultural use.

Pozzolan.—Nevada Cement Co. proposed to start an operation referred to as the Mustache Pozzolan Quarry on 10 ha of BLM land about 5 km southwest of Fernley in section 28, T20N, R24E. The quarry was proposed to operate for 25 years and produce up to 91,000 t of material. The site is largely in the Miocene to lower Pliocene Chloropagus Formation, which mainly consists of basaltic and andesitic lava flows and breccias interbedded with rhyolitic tuffs and minor sedimentary rocks. Shale would be mined at the rate of up to 20 dump truck loads at 18 to 27 t/d, 6 days per week, and hauled to the Nevada Cement Co. plant to be heated and turned into pozzolan. This locally produced pozzolan would reduce costs by negating the need to bring in the fly ash from coal-fired powerplants presently being used as pozzolan. The proposal was sent to the BLM and was to be brought before the Fernley Planning Commission in 2009. Advanced Pozzolan Products Company,

LLC was developing a pozzolan deposit on seven placer claims in sections 25 and 36, T1S, R67E, in Lincoln County, about 11 km south of Caliente. Advanced Pozzolan Products took over the claims from the now defunct Natural Pozzolan of Nevada, LLC. The claims were adjacent to those of the Silver Bells Project of David Free. The Silver Bells project proposed to mine pozzolanic volcanic ash, which occurred as a layer up to 4.6 m thick in lacustrine rocks of the Pliocene Panaca Formation. The claims of the Silver Bells Project were dropped in 2008.

Salt.—According to data from the Nevada Division of Minerals, the Huck Salt Company produced 24,000 t of salt in 2008, up 63% from that of 2007. The salt was mainly used for deicing roads, and production levels are dependent on weather. The salt was mined from a playa on Fourmile Flat about 40 km southeast of Fallon in Churchill County, where it has been harvested almost continuously since the 1860s, when it was hauled to the mills that processed Comstock silver and gold ore.

Sand and Gravel, Construction, and Stone, Crushed.—Production from sand and gravel deposits accounted for about 78% of aggregate production statewide, with crushed stone and lightweight aggregate making up the balance. The total production value of almost \$225 million makes construction aggregate the third most valuable commodity produced in the State in 2008—well below the value of Nevada's gold production and about 40% of the value of second ranked copper production, but nearly double that of fourth ranked silver.

Construction aggregate produced in the Las Vegas area in 2008, estimated at about 25 Mt, was about 35% lower than in 2007. Sand and gravel operations accounted for about 75% of the aggregate used in the Las Vegas metropolitan area in 2007. As in past years, the Lone Mountain area in northwest Las Vegas remained the most important source of sand and gravel aggregate. The Lone Mountain area produced more than 9 Mt in 2005 and 2006, but is estimated to have fallen below that in 2007 and 2008. 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 area is under pressure on its eastern and southeastern flanks from residential development. Recent meetings and discussions involved plans that included looping Clark County Route 215 along the eastern edge of the mining area and closing portions of the eastern part of the mining area by 2012. Mining would be allowed to continue and expand farther to the west away from the residential development. Companies in the Las Vegas area that produced more than 900,000 t of aggregate in 2008 were Aggregate Industries, Diamond Construction, Inc., Impact Sand and Gravel, Las Vegas Paving Corp., and Nevada Ready Mix Corp. Companies with production in excess of 450,000 t/yr were American Sand and Gravel, LLC, CEMEX S.A.B. de C.V., and Wells Cargo Corp. American Sand and Gravel and Wells Cargo each had produced over 900,000 t in 2006 but dropped below that in 2007. Hollywood Sand and Gravel Co., which produced more than 450,000 t in 2006, produced less than that in both 2007 and 2008. Las Vegas Paving Corp., a major producer of asphalt concrete, mostly produced sand and gravel from its Blue Diamond and Lone Mountain pits. The company also

produced crushed stone from the Apex landfill about 16 km northeast of Las Vegas. Nevada Ready Mix Corp., a subsidiary of Mitsubishi Corporation, 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., a subsidiary of Aggregate Industries, mined and crushed limestone from its Sloan property a few miles south of Las Vegas. Rinker Materials Corp., a subsidiary of CEMEX of Mexico, produced crushed granite from the El Dorado pit near Railroad Pass. 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. Lightweight aggregate was also shipped to the Las Vegas market by the Cind-R-Lite Block Co. from a cinder operation near Amargosa Valley in Nye County. Community pits and other aggregate mining facilities administered by the BLM and operated by a number of companies, including some of those already mentioned, contributed about 7 Mt to the total production of the Las Vegas and adjacent southern Nevada area in 2008.

In 2007, CEMEX submitted an application to build and operate an aggregate pit called the Mohave Minerals Project in the S/2, section 29, T23S, R61E. The mining from two pits, expected to eventually grow into one large 760-m-deep pit covering about 260 ha, is proposed to produce 900,000 t of mostly limestone and dolomite during a 20- to 30-year period. Since the volume of the projects exceed the Federal limits for noncompetitive sales, the BLM will auction off the two parcels on a competitive basis. The public scoping meetings ended in January 2008 with a draft environmental impact statement tentatively scheduled to be completed in October 2009. Following a period of public comment, a final environmental impact statement was anticipated for June 2010, a record of decision in August 2010, and operations beginning about 2011. Residents in several housing developments within 8 km of the proposed pits are opposing the projects.

About 7.2 Mt of construction aggregate was produced in the Reno-Sparks-Carson City area in 2008, about 27% less than in 2007. Production from Granite Construction Inc., which produced over 900,000 t of aggregate in 2007, fell below that in 2008, but was still more than 450,000 t. Granite Construction operates several pits in the area, but the bulk of the company's production was of crushed andesite and crushed granitic rock from its Lockwood and Hidden Canyon pits, respectively. Production from A and K Earthmovers Inc., which was more than 900,000 t in 2007, fell below 450,000 t in 2008. Its production was from two pits, but much of this was fill. Production from Martin Marietta Materials Inc., which was more than 900,000 t in 2006 and fell below that in 2007, was more than 450,000 t in 2008. Most of Martin Marietta's production came from the Rocky Ridge Quarry north of Sparks, which produces crushed granite. Other companies with production between 450,000 t and 900,000 t/y were Rilite, Inc., and Western Nevada Materials LLC. Production from CEMEX dropped below 450,000 tons in 2008. CEMEX owns the former All-Lite Aggregate crushed rhyolite pit and also operates the sand and gravel operation at the Paiute pit, which is leased from the Pyramid Lake Paiute Tribe. Crushed rock accounted for over

60% of the aggregate used in 2008 in the Reno-Sparks-Carson City area. Lightweight aggregate, an important component of crushed rock production in the area, was produced by CEMEX, Rilite, and Basalite Concrete Products, LLC. Cinderlite Trucking, Inc. produced a small amount of decorative rock and sand and cinder for deicing from their Black and Red Cinder pits northeast of Carson City.

About 3.6 Mt of aggregate was produced outside of the major metropolitan areas in Nevada in 2008. Operators in Nye County together produced over 540,000 t of aggregate in 2008, mostly in the Pahrump area. Churchill County produced over 680,000 t, and Douglas County produced a little over 490,000 t. Lyon County produced almost 432,000 t and Humboldt and Pershing Counties produced between 320,000 t and 36,000 t each. Elko County produced about 180,000 t, and Lander County produced about 102,000 t. Esmeralda, Eureka, Lincoln, Mineral, and White Pine Counties produced less than 91,000 t of aggregate each in 2008. In 2008, Reck Brothers, LLC proposed to renew its contract with the BLM for operations at its Highline Gravel Pit in the SW/4, section-6, T16N, R64E, about 3 km northeast of Ely. The operation is proposed to expand to 11 ha. Previous operations had been authorized under a categorical exclusion, but the proposed expansion will require an environmental assessment that was in the process of being prepared. Sterling Construction Company, Inc. of Houston, Texas, acquired RHB (Road and Highway Builders, LLC, and Road and Highway Builders, Inc.) of Reno, Nevada, to expand their operations in Nevada. RHB had acquired the Mound House Pit in Lyon County from Aggregate Industries in late 2007.

Silica.—Simplot Silica Products Inc. at Overton, Clark County, was Nevada's major silica producer. The sand was mined from a large open pit in the relatively friable Cretaceous Baseline Sandstone, washed in the pit, and transported via a 8-km slurry pipeline to a plant where it was screened and bagged. The facility produces four grades of sand based on coarseness, AFS 55, 60, 70, and 100. AFS 70, which was used mainly in manufacturing glass, was the main product. American Silica, Inc., a subsidiary of Fitch Industries, shut down its Mercury Mine about 5 km southeast of Mercury in Nye County in April 2007. The mine produced silica sand until then but was closed through 2008. The product, which contains about 98% silicon dioxide (SiO_2), was mainly used as construction sand and was mined from the Ordovician Eureka Quartzite. American Silica, Inc. kept current 11 lode claims located in 2005 in the Arrow Canyon District about 24 km north of Apex in Clark County. These claims were also underlain by the Ordovician Eureka Quartzite. According to the BLM LR2000 database, James Hardie Building Products, Inc. produced 9,100 t of high-purity silica quartzite from their Kramer Hill Quartzite Quarry about 2 km south of Golconda in Humboldt County. The quartzite was used as feed for the company's fiber-cement siding manufacturing plant in the Tahoe-Reno Industrial Park east of Sparks, Nevada. The quarry was in the Cambrian Osgood Mountain Formation, which generally consists of white to light gray, thinly bedded to massive, medium-grained quartzite.

Stone, Dimension.—Mt. Moriah Stone Quarries, LLC quarries 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. Las Vegas Rock produced flagstone, ashlar, boulders, and crushed landscape rock from its Rainbow Quarries near Goodsprings, about 52 km southwest of Las Vegas at the base of Mount Potosi. The operation consists of a main quarry and a number of satellite quarries located according to the color of the stone. The stone is mined from the Jurassic Aztec Sandstone. D and H Mining's pits, which normally mine spicerite and crushed stone about 8 km north of Beatty, were inactive in 2008, owing to the major drop in demand because of the recession. Spicerite is a strong, bright white, hydrothermal altered tuff used to make bricks and blocks, and is marketed in southern Nevada and southern California. D and H Mining had proposed to expand operations at their four pits referred to as the Chocolate, Gold, Orange, and Red Quarries. The disturbed area was proposed to be expanded from about 21 ha to a total of about 24 ha, with a crushing and screening plant to accommodate all the pits to be constructed in the Gold Quarry. An environmental assessment was due for review in 2009.

Zeolites.—Nevada contains large known resources of zeolite. In 2008, Zeox Mineral Materials Corp. operated the Ash Meadows plant which ships 900 t to 4,500 t annually of clinoptilolite used in water filtration, odor control, and nuclear cleanup from their plant in Amargosa Valley in Nye County. The plant, which has a 36,000 t/y capacity, also produces zeolite-based cement for building materials and oil and gas projects. The clinoptilolite was mined from a small open pit just over the State line in Inyo County, California, in a large area of zeolite deposits that extends into Nevada. KMI Zeolite, Inc. owns a plant in Sandy Valley about 52 km southwest of Las Vegas and a deposit reportedly containing about 54 Mt of largely clinoptilolite in California about 137 km northwest of the mill. The mill is capable of producing 50,000 t/y of clinoptilolite. In the past, the Moltan Company has mined small amounts of mordenite in the Trinity Range in Churchill County about 64 km northeast of Fernley, but none was mined in 2008. The company uses mordenite to make absorbent products at its Fernley plant. In 2008, Nevada Specialty Minerals, LLC was formed as a joint venture to explore and develop the Lovelock zeolite deposit 21 km northwest of Lovelock in the Trinity Range in the Gold Butte District of Pershing County. The new joint venture's managing companies were listed as Castle Park Minerals, LLC, of Holladay, UT; Steelhead Specialty Minerals, LLC, of Spokane, WA; and Trabits Group, LLC, of Wasilla, AK. The Nevada Specialty Minerals, LLC lease covers 518 ha. The Lovelock zeolite deposit contains ferrierite and mordenite with an outcrop area about 1,200 m long from north to south, averaging 610 m wide and up to 17 m thick near the center. The host rock is a series of Miocene or Pliocene unnamed sedimentary rocks and tuffs.

Metals

Gold and Silver.—Nevada produced about 180,000 kg (5.7 million troy ounces) of gold, about 250,000 kg (8 million

troy ounces) of silver, 80,000 t of copper, and about 130,000 t of molybdenum in 2008. Gold production was down 10,500 kg (339 thousand troy ounces), a 5.9% decrease from 2007. The decrease marked the eighth consecutive year of declining production. Nineteen mines in Nevada reported gold production in 2008. Fifty-four 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 89% of production in 2008. Barrick produced the most gold, with production from its Goldstrike, Bald Mountain, Ruby Hill, Cortez, 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 88,400 kg (2.8 million troy ounces) of gold, a 3.5% increase from that of 2007. In early 2008, Barrick purchased Kennecott Explorations Ltd.'s (a subsidiary of Rio Tinto LLC) 40% interest in the Cortez property, which includes the Pipeline and Cortez Hills Mines, for a total cash value of \$1.7 billion. Newmont produced 69,000 kg (2.2 million troy ounces), reporting production from its Carlin trend mines and from its Twin Creeks, Lone Tree, Phoenix, and Midas operations, plus its 25% share of the Turquoise Ridge Mine. Barrick reported its first production from the Cortez Hills Mine in 2008, and Allied Nevada Gold Corp. began production from the reopened Hycroft open pit mine late in 2008. Furthermore, Newmont was waiting on permits to put the Emigrant deposit into production. Old mines awaiting permits to reopen and begin production in the near future include the Reward Mine (Atna Resources Ltd.), the Relief Canyon Mine (Firstgold Corp.), and the Sterling Mine (Imperial Metals Corp.). On the other hand, the Jerritt Canyon Mine (Yukon-Nevada Gold Corp.) closed in August 2008, but the company intended to reopen the mine in 2009. From its startup late in 2007, Great Basin Gold Corp. increased its production from the underground Hollister Mine. Coeur d'Alene Mines Corp. produced 94,400 kg (3.03 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 were to continue until approximately 2014. Newmont was the second leading silver producer, producing 92,500 kg (3 million troy ounces), primarily from its Midas and Phoenix Mines.

Copper and Molybdenum.—Quadra Mining Inc.'s Robinson Mine produced 91% of Nevada's copper in 2008, amounting to 72,000 t. Newmont's Phoenix Mine made up the balance, producing 7,200 t. Golden Phoenix Minerals produced 92 t of molybdenum from its underground Ashdown Mine; however, it temporarily closed down the mine in November, 2008. Quadra's Robinson Mine, the only other molybdenum producer in Nevada, yielded 36 t of molybdenum.

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

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2006		2007		2008		
	Quantity	Value	Quantity	Value	Quantity	Value	
Barite	W	W	W	W	641	29,500	
Gold ³	kilograms	206,000	4,010,000	186,000	4,170,000	178,000	5,000,000
Sand and gravel, construction		45,500	224,000	34,700	180,000	29,200	161,000
Silver ³	kilograms	260,000	97,200	243,000	105,000	235,000	113,000
Stone, crushed		10,500 ^r	90,200 ^r	12,700 ^r	111,000 ^r	9,320	86,800
Combined values of brucite (2007), cement (portland), clays (bentonite, fuller's earth, kaolin), copper, diatomite, gemstones (natural), gypsum (crude), lime, lithium carbonate, magnesite, molybdenum concentrates, perlite (crude), pumice and pumicite, salt, sand and gravel (industrial), stone (dimension), zeolites, and values indicated by symbol W		XX	722,000 ^r	XX	836,000 ^r	XX	909,000
Total		XX	5,140,000	XX	5,410,000	XX	6,300,000

^rRevised. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX not applicable.

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

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

³Recoverable content of ores, etc.

TABLE 2
NEVADA: CRUSHED STONE SOLD OR USED, BY TYPE¹

Type	2007			2008		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	8	4,060 ^r	\$36,600 ^r	7	3,520	\$36,300
Granite	7 ^r	2,840 ^r	22,500 ^r	7	1,290	7,650
Sandstone & quartzite	1	55	463	1	10	93
Miscellaneous stone	12 ^r	5,720 ^r	51,700 ^r	15	4,500	42,700
Total	XX	12,700 ^r	111,000 ^r	XX	9,320	86,800

^rRevised. XX Not applicable.

¹Data 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 2008, BY USE¹

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	W	W
Filter stone	W	W
Coarse aggregate, graded:		
Concrete aggregate, coarse	W	W
Railroad ballast	W	W
Fine aggregate (-¾ inch), screening (undesigned)	W	W
Coarse and fine aggregates:		
Graded road base or subbase	968	4,470
Unpaved road surfacing	W	W
Terrazzo and exposed aggregate	W	W
Crusher run or fill or waste	W	W
Other coarse and fine aggregates	228	3,510
Agricultural, other	W	W
Chemical and metallurgical:		
Cement manufacture	W	W
Lime manufacture	W	W
Other miscellaneous uses and specified uses not listed	7	128
Unspecified: ²		
Reported	3,170	28,300
Estimated	2,700	27,000
Total	9,320	86,800

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

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

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

TABLE 4
NEVADA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2008, BY USE AND BY DISTRICT¹

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch) ²	--	--	W	W
Coarse aggregate, graded ³	--	--	W	W
Fine aggregate (-¾ inch) ⁴	--	--	W	W
Coarse and fine aggregates ⁵	W	W	W	W
Agricultural ⁶	W	W	--	--
Chemical and metallurgical ⁷	W	W	W	W
Other miscellaneous uses	--	--	7	128
Unspecified: ⁸				
Reported	916	7,430	2,250	20,900
Estimated	131	1,300	2,600	26,000
Total	1,920	26,700	7,400	60,100

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

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

²Includes filter stone and riprap and jetty stone.

³Includes concrete aggregate (coarse) and railroad ballast.

⁴Includes screening (undesignated).

⁵Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

⁶Includes other agricultural uses.

⁷Includes cement and lime manufacture.

⁸Reported and estimated production without a break down by end use.

TABLE 5
NEVADA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2008,
BY MAJOR USE CATEGORY¹

Use	Quantity	Value (thousands)	Unit value
	(thousand metric tons)		
Concrete aggregate (including concrete sand)	3,820	\$33,900	\$8.86
Plaster and gunite sands	108	1,180	10.92
Asphaltic concrete aggregates and other bituminous mixtures	690	10,400	15.12
Road base and coverings ²	3,640	20,500	5.63
Fill	632	3,580	5.66
Snow and ice control	56	328	5.86
Other miscellaneous uses ³	194	4,340	22.36
Unspecified: ⁴			
Reported	8,490	23,200	2.73
Estimated	12,000	64,000	5.52
Total or average	29,200	161,000	5.52

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

²Includes road and other stabilization (lime).

³Includes filtration, golf course, railroad ballast, and roofing granules.

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

TABLE 6
NEVADA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2008, BY USE AND DISTRICT¹

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	385	4,650	3,440	29,200	--	--
Asphaltic concrete aggregates and road base materials ²	1,560	14,200	2,770	16,800	--	--
Fill	602	3,440	30	142	--	--
Other miscellaneous uses ³	186	3,740	171	2,100	--	--
Unspecified: ⁴						
Reported	1,180	7,620	240	1,160	7,070	14,400
Estimated	2,380	13,200	9,210	50,700	--	--
Total	6,290	46,800	15,900	100,000	7,070	14,400

-- Zero.

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

²Includes road and other stabilization (lime).

³Includes filtration, plaster and gunite sands, railroad ballast, roofing granules, and snow and ice control.

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