UNIVERSITY OF NEVADA, RENO
MACKAY SCHOOL OF MINES

NEVADA BUREAU OF MINES & GEOLOGY SPECIAL PUBLICATION MI-1990

THE NEVADA MINERAL INDUSTRY 1990

Metals
Industrial Minerals
Oil and Gas
Geothermal

Exploration
Development
Mining
Processing
Directories of Operations

GOLD
OIL
SILVER
SAND & GRAVEL
BARITE
DIATOMITE
MERCURY
CRUSHED ROCK
CEMENT
LITHIUM
LIME
MAGNESITE
GEOTHERMAL
SILICA
CLAY
FLUORSPAR
TURQUOISE
ASPHALT
PERLITE
PUMICE
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NEVADA BUREAU OF MINES & GEOLOGY
SPECIAL PUBLICATION MI-1990

THE NEVADA MINERAL INDUSTRY–1990

This report, twelfth of an annual series, describes 1990 mineral and geothermal activities and accomplishments in Nevada: production statistics, exploration and development including drilling for petroleum and geothermal resources, discoveries of orebodies, new mines opened, and expansion and other activities of existing mines. Statistics of known bulk-mineable gold and silver deposits, and directories of mines and plants are included.

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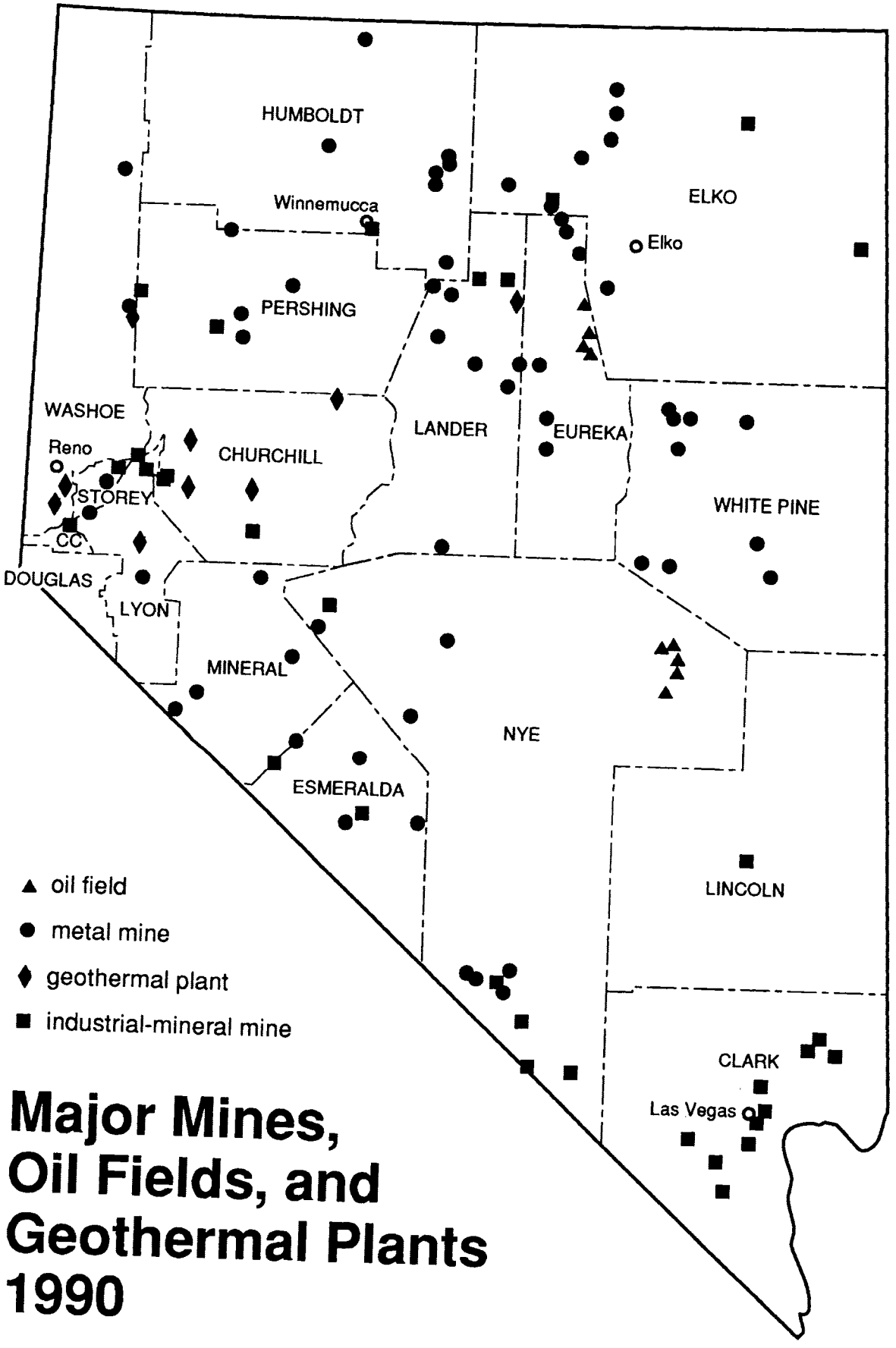


Major Mines, Oil Fields, and Geothermal Plants 1990

Summary

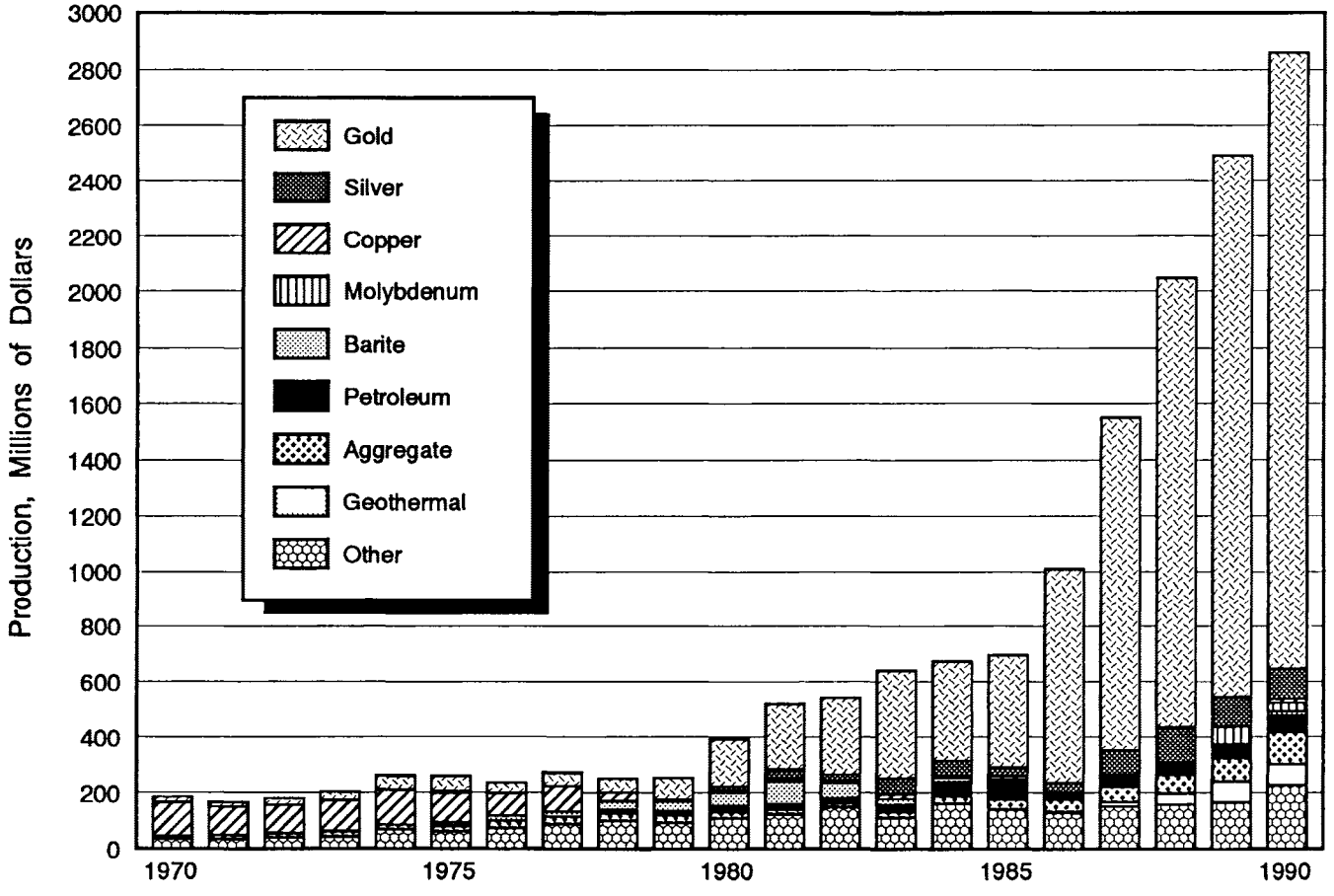
by Jonathan G. Price

Nineteen hundred ninety was a banner year for Nevada mineral production. Record gold production boosted the total mineral value to an all-time high of nearly $2.9 billion. Nevada led the nation in population growth with a 51% increase from 1980 to 1990. Influx of new residents and new construction for the tourism industry, particularly in southern Nevada, required a record year for aggregate (sand, gravel, and crushed stone) production. In response to demand from the higher populations in both Nevada and California, geothermal energy production in Nevada reached an all-time high. As a result of continued wildcat and infield-development drilling successes and in response to higher prices, Nevada oil production jumped to a record high in 1990.

This report highlights recent activities through 1990 in metals, industrial minerals, petroleum, and geothermal energy. For quick inspection of the data and trends, numerous tables and charts are included in this summary and throughout the individual chapters.

Through a survey conducted in January 1991, the Nevada Department of Minerals collected data for Nevada Bureau of Mines and Geology Special Publication 11, *Major Mines of Nevada 1990*. The publication includes, in handbook form, small-scale location maps, names and telephone numbers of operators, numbers of employees, and preliminary, nonproprietary 1990 production figures for most mines in Nevada. The data from the survey of mines are used, along with information from other sources, in the figures in this publication and will be used to update, revise, or check preliminary statistics collected and released by the U.S. Bureau of Mines. The Nevada Bureau of Mines and Geology also maintains a computer database of active mines and publishes a computer-drawn map of active mines at a scale of 1:1,000,000.

The **Metals** chapter in this report summarizes exploration and mining activities throughout the state, including 7 major discoveries, mostly near producing mines, and 10 new deposits brought into production



Nevada mineral, petroleum, and geothermal production, 1970–1990.

MINERAL, PETROLEUM, AND GEOTHERMAL POWER PRODUCTION IN NEVADA[1]

Minerals	1989		1990		% change from 1989 to 1990	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value
Barite (thousand short tons)	203	$10,000	405	$15,200	99	52
Clays (thousand short tons)	44	9,900	52	15,900	18	61
Copper (thousand pounds)	2,375	3,088	11,067	13,723	366	344
Geothermal power (thousand megawatt-hours)	827	72,790	884	73,120	7	0
Gold (thousand troy ounces)	5,055	1,946,375	5,813	2,209,080	15	13
Molybdenum (thousand pounds)	17,938	63,143	11,250	31,950	−37	−49
Petroleum (thousand 42-gallon barrels)	3,218	39,705	4,012	63,196	25	59
Sand, gravel, crushed stone (thousand short tons)	20,000	85,000	26,000	117,000	30	38
Silver (thousand troy ounces)	19,867	110,147	21,529	107,643	8	−2
Other minerals[2]	—	155,135	—	209,986	—	35
Total	—	2,495,283	—	2,856,798	—	14

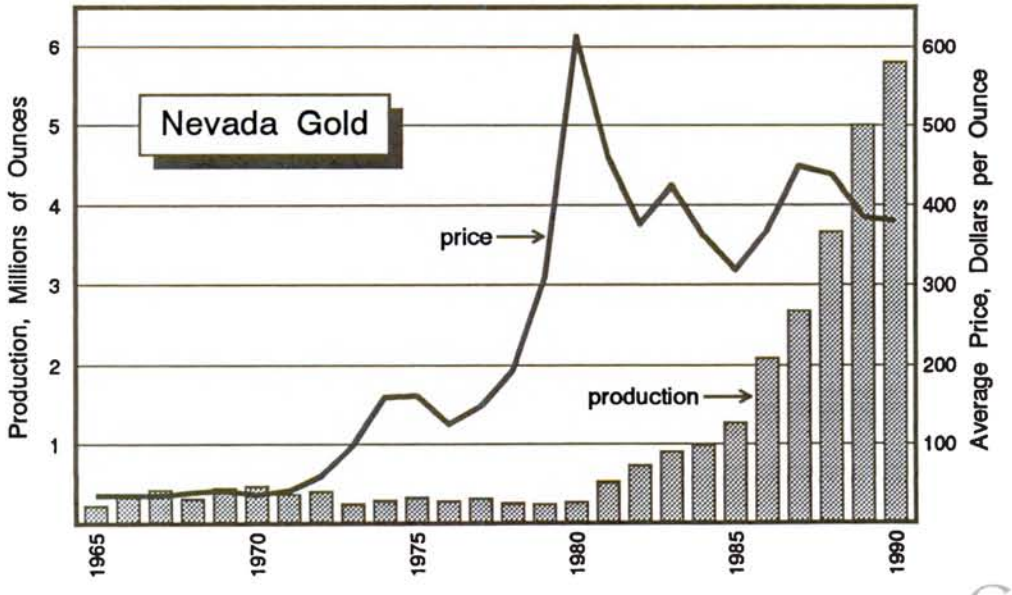
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers); compiled by the Nevada Bureau of Mines and Geology, the Nevada Department of Minerals, and the U.S. Department of Interior, Bureau of Mines.
[2]Production data for cement, certain clays, diatomite, dimension stone, fluorspar, gemstones, gypsum, lead, lime, lithium carbonate, magnesite, mercury, perlite, salt, silica sand, certain crushed stones, and zinc are combined. See text for details of some of the commodities.

Products milled or processed in Nevada but mined from deposits in California are not included. Specifically, 102,000 ounces of gold and 43,800 ounces of silver from the Buckskin Leach Plant in Douglas County, colemanite from the Lathrop Mill in Nye County, and zeolite from the Ash Meadows plant are excluded from these totals.

in 1990. The table on **Bulk-Mineable Precious Metal Deposits** lists reserves and resources, grades, and other pertinent information on deposits for which information has been publicized.

Gold continues to lead the long list of mineral commodities produced in Nevada. For the eleventh straight year, the record for annual gold production has been broken: 5.8 million ounces in 1990. The 15% increase in production from 1989 to 1990 was lower than the 38% increase from 1988 to 1989. Gold prices continued a general weakening trend from 1987 into 1990, although a temporary boost was seen as a result of the Iraqi invasion of Kuwait. Despite a drop in average selling price from $385 per troy ounce in 1989 to $380 in 1990, the production increase led to a record annual value of $2.2 billion.

Nevada accounted for approximately 8% of total world gold production in 1990. With 60% of national production, Nevada helped make the United States a net exporter of gold. According to the U.S. Bureau of Mines, the United States surpassed the Soviet Union in 1990 to become the second leading gold producer in the world. The Republic of South Africa produced approximately twice as much gold as did the U.S. in 1990. Nevada alone had less production than the Soviet Union and Australia, but exceeded Canada, Brazil, China, and other countries.



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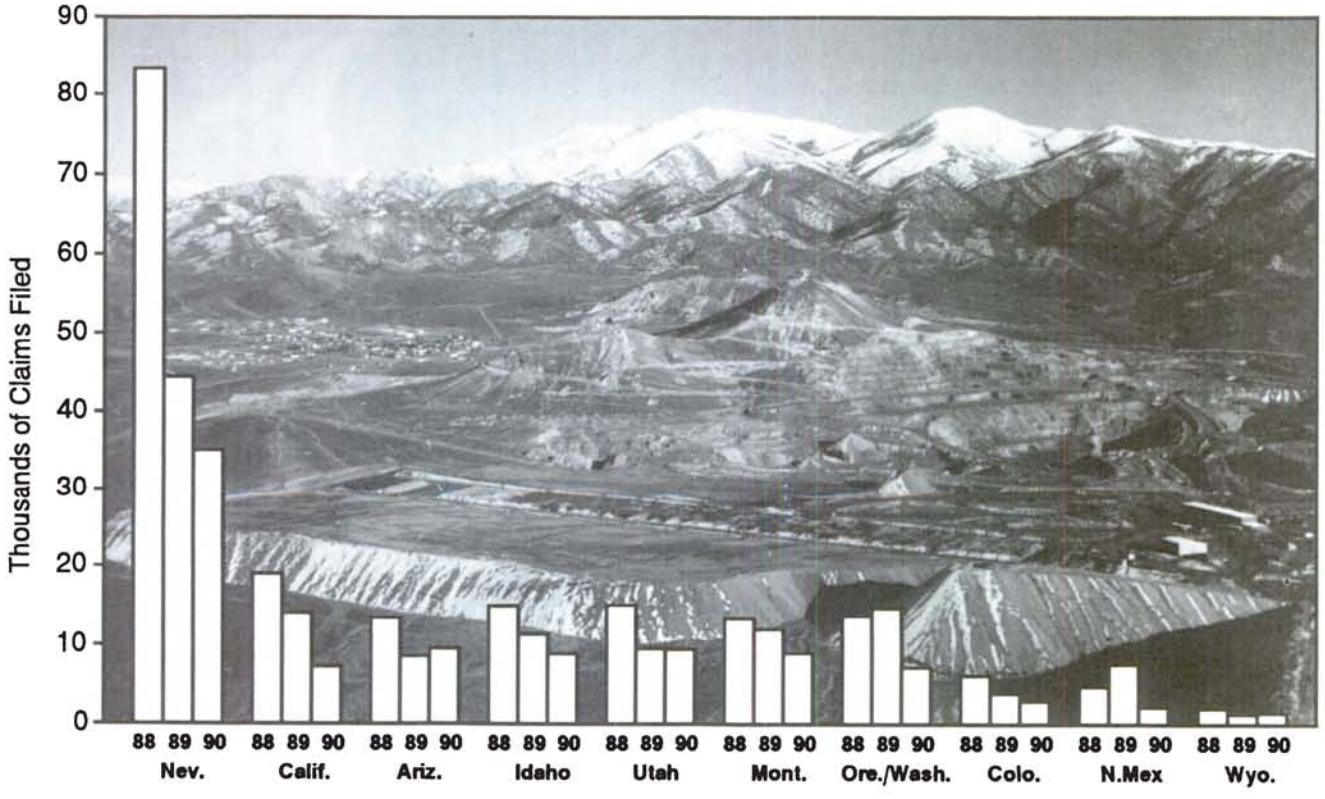
Although many companies with producing mines and major land positions continue vigorous exploration programs in Nevada, general exploration activity within the state has slowed down. The decline can be seen in decreases in the number of new claims filed with the U.S. Bureau of Land Management and in sales of various publications that are mostly purchased by exploration geologists. For example, the *Nevada Exploration Index,* which is based on annual sales of USGS topographic maps by the Nevada Bureau of Mines and Geology, showed a steady, significant decline since the 1988 peak. A parallel decline could be seen in the sales of other NBMG exploration-related publications. Numerous reasons have been suggested for the decline in exploration activity in Nevada: relatively soft gold prices, uncertainties about the fate of the federal mining law of 1872, difficulty of discovering buried deposits, increasing environmental regulations at both federal and state levels, new ownership arrangements for mining in Mexico, and a general tendency for exploration companies to follow one another.

Low international gold prices may limit the production of some low-grade deposits, but reserves of relatively high-grade ores should assure that Nevada gold production will continue at significant levels for at least two decades. The Nevada Bureau of Mines and Geology maintains a computer database on *Nevada Mineral Reserves and Resources,* which includes current reserves, resources, annual and total production figures, and references (company annual and quarterly reports and clippings from newspapers and mining trade journals) for mineral deposits in Nevada. Near year-end, the total identified Nevada gold resources, which range from measured, economic reserves to inferred, perhaps subeconomic resources, stood at approximately 120 million ounces, slightly more than the previous year.

CLAIMS FILED WITH THE U.S. BUREAU OF LAND MANAGEMENT

State	1976–1989	1990	Total active claims
Nevada	583,907	35,078	422,297
California	232,104	7,260	160,358
Arizona	300,376	9,554	113,888
Idaho	154,499	8,915	88,259
Utah	328,528	9,458	79,564
Montana	172,585	8,995	84,189
Oregon/Wash.	125,617	7,196	54,089
Colorado	265,777	2,863	79,768
New Mexico	156,264	2,158	31,593
Wyoming	239,433	1,405	36,089

Sustaining gold production at current levels will depend on the ability to mine deposits at greater depths, either with deeper pits or with underground workings, and to process refractory ores (ores for which carbon and/or sulfides must be oxidized prior to gold extraction). Excellent results have been reported from the refractory ore roaster at the Big Springs Joint Venture, operated by Independence Mining Company, and from the autoclave at American Barrick's Goldstrike mine. The commercial viability of bioleaching, wherein bacteria are used to oxidize refractory ores, has yet to be demonstrated.



New claims filed with the U.S. Bureau of Land Management, 1988–1990.

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Nevada Exploration Index, 1986 through 1990. This index is the annual sales of USGS topographic maps by NBMG, normalized to a value of 100 for 1986.

In 1990 Nevada, the Silver State, continued to lead the nation in not only gold but also silver production. Three mines, NERCO Metals' Candelaria mine in Mineral County, FMC's Paradise Peak mine in Nye County, and Coeur-Rochester's mine in Pershing County, accounted for approximately 72% of total silver production in 1990. Most of the remainder of the production came as a by-product of gold production.

Annual silver prices have been steadily declining since 1987. According to the U.S. Bureau of Mines, the average sales price for Nevada silver dropped from $5.54 per troy ounce in 1989 to $5.00 in 1990. Although production actually increased by 8% from 1989 to 1990, the drop in price caused a decline of 2% in the total value of silver produced.

Near year-end the price of silver had dropped to near $4.00 per ounce, and the ratio of the price of gold to the price of silver exceeded an all-time high of 90 to 1. At this ratio, even Paradise Peak, with a silver-to-gold production ratio of 28 to 1, and Rochester, with a silver-to-gold ratio of 83 to 1, produce more value in gold than in silver. The Candelaria mine, which has a silver-to-gold ratio of approximately 400 to 1, closed late in the year.

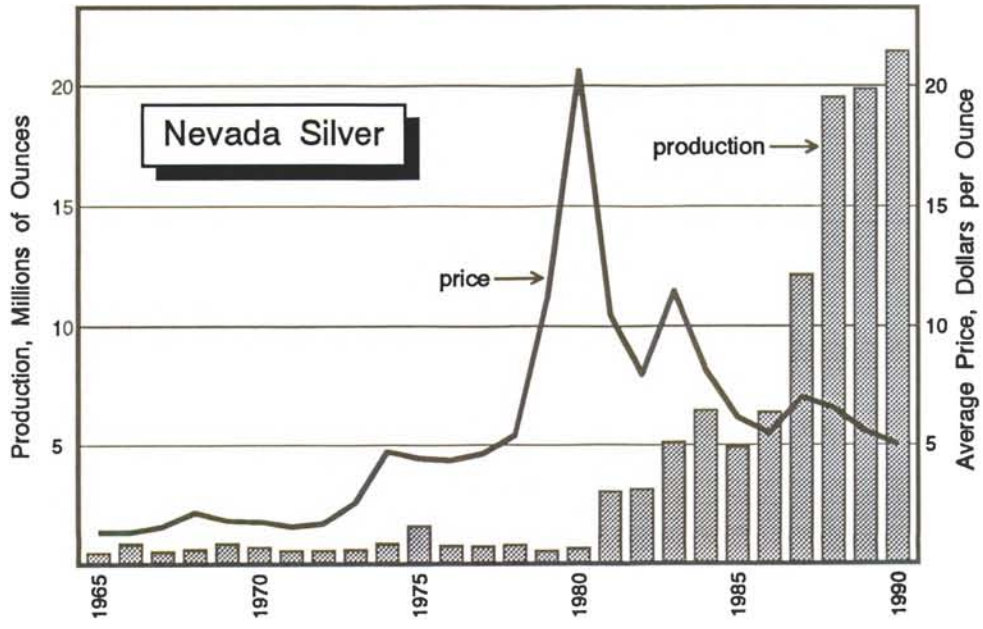
Although closure of the Candelaria mine will have a negative impact on silver production, gold mining will continue to yield significant amounts of by-product silver. The total identified silver resources in Nevada at year-end were 496 million ounces.

Nevada ranked third in the nation in total value of nonfuel mineral production in 1990, according to figures provided by the U.S. Bureau of Mines. Arizona was first because of the continued high price of copper. California ranked second because its growing population needs large quantities of construction materials (cement and aggregate).

Although Nevada copper production increased dramatically from 1989 to 1990, declining metal prices are likely to result in lower production next year. As a result of low zinc and other metal prices, Alta's Ward Mountain mine in White Pine County, which began producing silver, lead, zinc, and copper in 1990, closed by the end of the year. In response to low molybdenum prices, Cyprus closed its Tonopah (Hall) molybdenum-copper mine in Nye County at the end of the year. Copper continues to be produced from oxide dumps at the Copper Tek (formerly Yerington) mine in Lyon County.

Depressed mercury prices forced the closure of the McDermitt mine in Humboldt County. Several gold mines produced mercury as a by-product.

Industrial mineral production in Nevada has increased considerably in recent years, largely because growth in the gaming, tourism, retirement, and mining industries has led to construction of new facilities, infrastructure, and homes for an expanding population. Clark County's population has increased 59% in the last decade. Winnemucca, Elko, and



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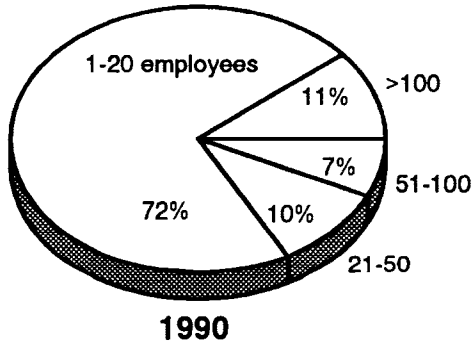
NUMBER OF MINES AND EMPLOYEES IN NEVADA'S MINERAL INDUSTRY

(Data for 1978–1987 are from the State Mine Inspector's Reports; 1988–89 data were compiled from the Directory of Mining and Milling Operations in NBMG Special Publications MI-1988 and MI-1989; 1990 data are from NBMG Special Publication 11 and the State Mine Inspector's Report.)

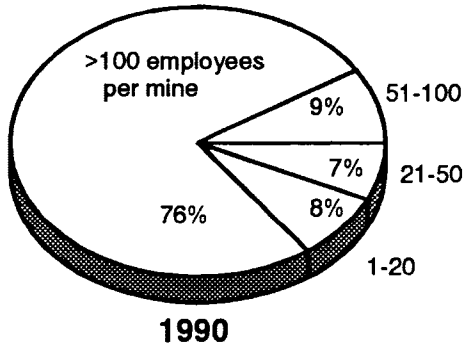
NUMBER OF MINES BY WORK-FORCE SIZE

Year	Work-force size (employees/mine)				
	1-20	21-50	51-100	> 100	Total
1978	306	18	9	9	342
1979	340	25	10	7	382
1980	392	30	11	17	450
1981	383	34	12	16	445
1982	312	22	8	14	356
1983	315	22	8	15	360
1984	325	24	12	18	379
1985	289	24	16	15	344
1986	250	26	14	21	311
1987	260	26	16	24	326
1988	155	25	22	33	235
1989	148	24	23	30	225
1990	226	31	21	36	314



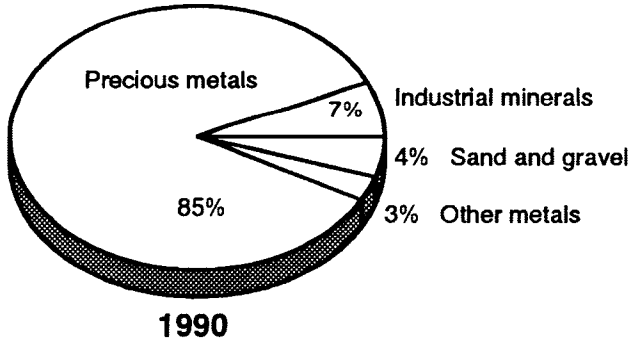
NUMBER OF EMPLOYEES BY WORK-FORCE SIZE

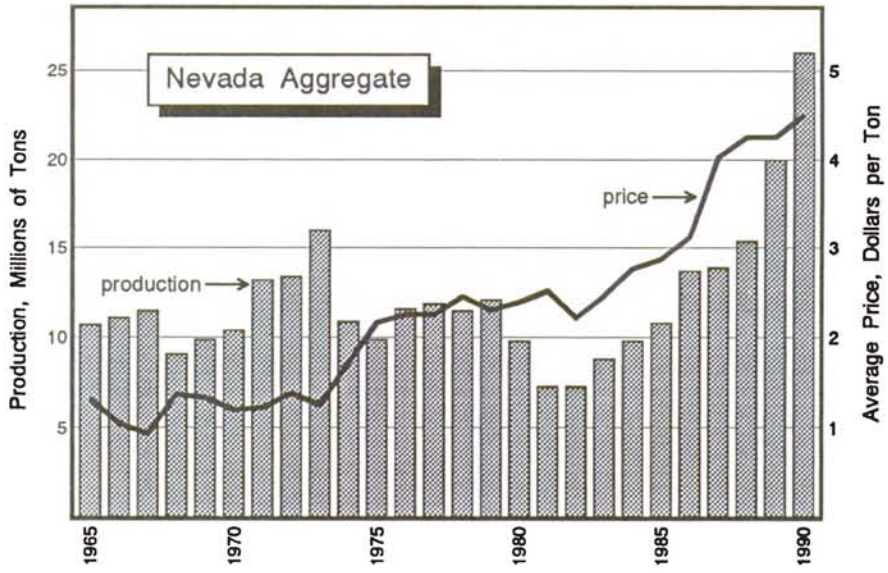
Year	Work-force size (employees/mine)				
	1-20	21-50	51-100	> 100	Total
1978	1,544	609	626	2,205	4,984
1979	1,738	791	588	1,311	4,428
1980	2,139	1,037	799	4,195	8,170
1981	2,124	1,128	884	4,400	8,536
1982	1,640	716	533	2,632	5,521
1983	1,635	742	561	2,812	5,750
1984	1,437	767	887	3,127	6,218
1985	1,279	722	1,129	3,310	6,440
1986	1,315	848	921	5,171	8,255
1987	1,376	799	1,166	6,973	10,314
1988	941	832	1,483	9,441	12,697
1989	945	854	1,821	9,936	13,556
1990	1,243	1,019	1,314	11,643	15,219



NUMBER OF EMPLOYEES BY COMMODITY

Year	Precious metals	Other metals	Industrial minerals	Sand & gravel	Total
1978	1,096	1,859	1,479	550	4,984
1979	1,503	833	1,604	488	4,428
1980	3,808	1,918	1,804	640	8,170
1981	4,263	2,018	1,760	495	8,536
1982	2,905	867	1,357	392	5,521
1983	3,616	598	1,104	432	5,750
1984	4,097	646	1,049	426	6,218
1985	4,595	256	1,046	543	6,440
1986	6,460	175	976	644	8,255
1987	8,636	160	901	617	10,314
1988	10,638	412	1,090	557	12,697
1989	11,088	510	1,448	510	13,556
1990	12,957	492	1,132	638	15,219





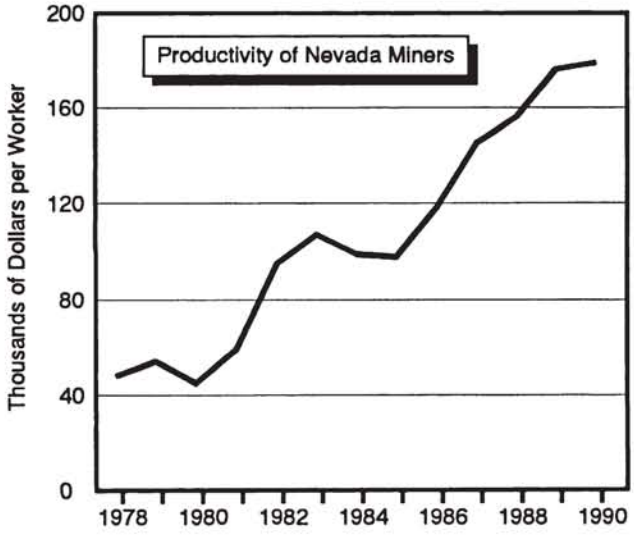
Carlin experienced population increases of 48, 68, and 80%, respectively, since 1980. Although the nationwide recession has caused a decline in demand for some construction products, such as wallboard produced from Nevada gypsum for the California market, growth in southern Nevada has continued to be strong. Aggregate production in 1990 was boosted by construction of a new runway at McCarran International Airport in Las Vegas.

In response to demand for lime to control the pH of cyanide-leach solutions used to extract gold, Continental Lime, Inc. increased its Elko County production by 400%.

Nevada leads the nation in barite mining. Production nearly doubled from 1989 to 1990, in part because of quality and delivery problems with barite imported to the United States from mainland China. Most Nevada barite is shipped to the Rocky Mountain region and to the Gulf Coast for use in oil and gas drilling.

The chapter on **Industrial Minerals** highlights these and other commodities, including cement, clays, diatomite, a new dimension-stone operation, fluorspar, lithium carbonate, magnesia, perlite, silica sand, salt, and zeolites.

The Nevada metals and industrial minerals industries in 1990 employed approximately 15,200 individuals at 314 mines. These data were summarized from this report's **Directory of Mining and Milling Operations**, which lists the significant mines



Total value of mined product per worker in Nevada (exclusive of petroleum and geothermal energy).

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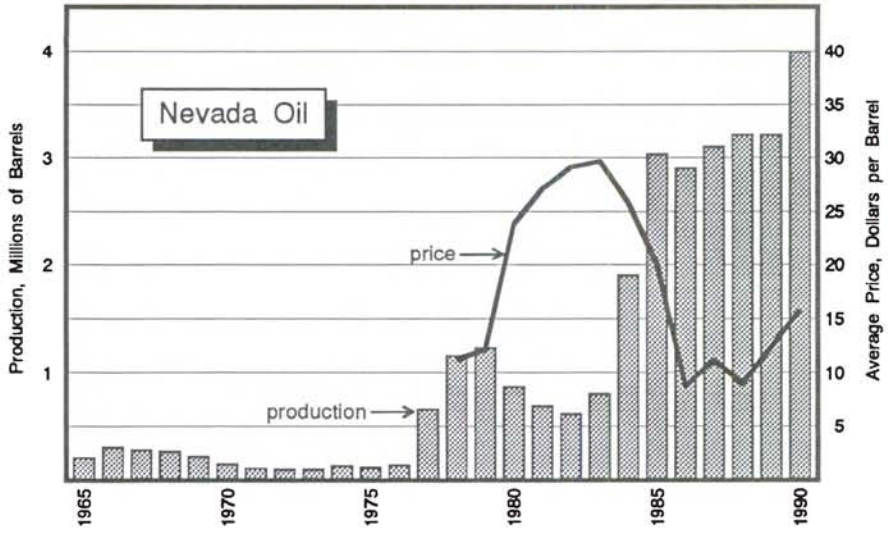


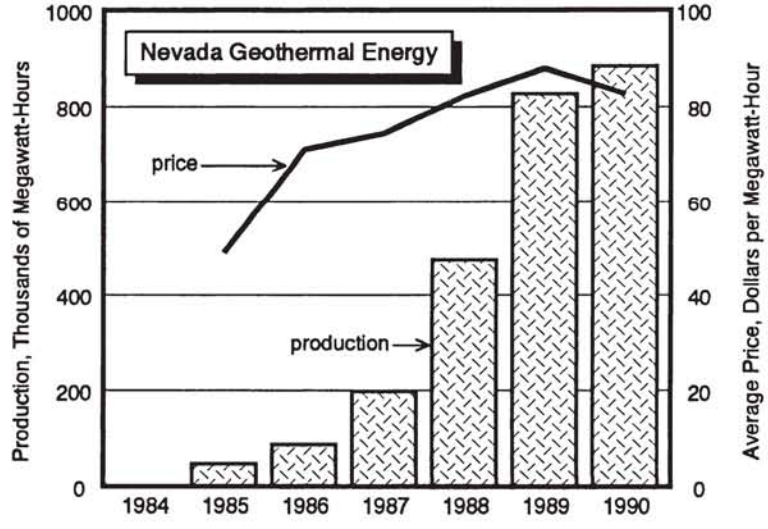
and plants throughout the state. On the average, each person in the nonfuels mineral industry in Nevada produced approximately $179,000 in mined products in 1990, a slight increase over the figure for 1989. The employment totals include only the company employees and contractors at the mines and do not include vendors who sell supplies to the mines or exploration groups who find the mineral deposits that will be mined in the future.

The oil industry in Nevada continues to buck the trend of declining production in the rest of the United States. Nevada production jumped 25% from 1989 to 1990, to just over 4 million barrels. The increase came largely from new wells in the Trap Spring and Kate Spring fields and from increased production from the Grant Canyon field, all in Railroad Valley, Nye County. Wildcat exploration and infield development drilling continue at a pace of approximately 30 new wells per year. One new field, with production from a reservoir in fractured, Tertiary volcanic rock, was discovered in Railroad Valley. Production from a shallow (1,155-foot depth), Tertiary alluvial sand represents a new pool discovery at the Tomera Ranch field in Pine Valley, Eureka County.

Details of significant wells drilled in 1990 are given in the chapter on **Oil and Gas**. The Nevada Bureau of Mines and Geology maintains the *Nevada Oil and Gas Well Catalog,* a computer database on all wells drilled in the state and publishes a computer-generated 1:1,000,000-scale map showing the locations of wells.

Geothermal power capacity in Nevada reached a record level of 132 megawatts and geothermal energy production reached a record level of 884,000 megawatt-hours 1990. Production comes from nine plants, mostly in northwestern Nevada. An additional 196 megawatts of geothermal capacity is planned for production by 1996. Some of the electricity is sold to California. In addition to generation of electricity, geothermal energy is used in Nevada for aquaculture, enhanced recovery of gold at heap-leaching operations, and heating of homes, schools, one hotel, and one county courthouse. Details of geothermal activities in Nevada in 1990 are provided in the chapter on **Geothermal Energy**.

The mining, petroleum, and geothermal industries pay certain taxes and fees directly or indirectly to the State of Nevada. Approximately 86% of the land in Nevada is managed by the federal government. The State receives a percentage of the revenues from federal oil and gas and geothermal leases, mining claim fees, and oil production taxes. Additional mining-related revenues are received by the State through reclamation and other permitting fees and through sales taxes paid on supplies purchased by



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ANNUAL TAX ON NET PROCEEDS OF MINERALS

Year	Annual net proceeds[1] (thousands)	Annual tax (thousands)
1982	159,999	$1,800
1983	245,688	4,152
1984	184,987	3,222
1985	198,263	3,527
1986	374,664	6,091
1987	627,330	12,084
1988	798,253	13,568
1989	748,052	36,238
1990	887,035	42,737

[1]Net proceeds are gross income minus direct costs incurred at the mine site.
Source: Nevada Department of Taxation "1990–91 net proceeds of minerals, based on 1990 calendar year report," June 10, 1991.

MINERAL LEASING REVENUES PAID TO THE STATE OF NEVADA BY THE U.S. GOVERNMENT
(as provided by Section 35 of the Mineral Leasing Act of 1920)

Fiscal Year[1]	Revenue (thousands) Oil and Gas	Geothermal	Other	Total
1982	$11,618	$934	$44	$12,596
1983	9,538	639	21	10,198
1984	8,013	432	39	8,484
1985	9,533	301	69	9,903
1986	6,966	367	81	7,414
1987	4,214	377	147	4,738
1988	4,866	858	542	6,266
1989	7,048	1,156	1,078	9,282
1990	7,870	1,080	331	9,281

[1]October 1 through September 30.
Source: U.S. Bureau of Land Management annual progress reports for Nevada.

OTHER REVENUE TO THE STATE OF NEVADA FROM THE MINERAL INDUSTRY

Fiscal Year[1]	Mining claim fee[2] (thousands)	Oil production tax[3] (thousands)
1983	$158	NA
1984	158	$52
1985	160	129
1986	160	155
1987	175	146
1988	337	158
1989	402	161
1990	408	178

[1]July 1 through June 30.
[2]The State receives a fee of $1.25 for each new claim and each assessment report.
[3]Does not include drill permit fee: $.05 per barrel of oil produced.
Source: Nevada Department of Minerals.

the mines, on travel and other expenditures by exploration crews, and on purchases made by employees.

The Nevada mineral industry is vital to the state and national economies. Mineral and energy production, along with agriculture, provide the basic needs of society. Virtually everything we use, including the food that we eat, either contains mineral products or requires minerals to make it. Concerns for the environment will dictate increased conservation, recycling, and use of renewable energy resources. Nonetheless, mining, quarrying, and fossil, nuclear, and geothermal energy production will be necessary for the foreseeable future to provide a substantial portion of the basic needs of an expanding world population. These activities can be done using cost-effective, energy-efficient, and environmentally sound methods.

As the Nevada population grows, and as needs arise to improve and repair our roads, schools, and other facilities, demand for locally derived, inexpensive construction raw materials, such as aggregate, cement, and gypsum, will remain strong. Mining of some commodities, like gold and silver, will provide balance to the state economy and will help strengthen the national economy by reducing the foreign trade deficit.

Nevada and the United States are clearly part of the world economy. Except for some low-value commodities, like sand and gravel, the prices that we pay for minerals are dictated by world, rather than local or national markets. In other words, minerals that are not mined in Nevada will be mined elsewhere. Whereas we can regulate mining in Nevada to be environmentally responsible, we have little means of controlling environmental degradation in foreign countries. With proper environmental controls, mining should be encouraged in Nevada. Nevada is endowed with immense and diverse mineral resources. Under favorable economic and regulatory conditions, Nevada's mineral industry will remain a key component of our state, national, and world economies.

Metals

by Richard B. Jones

The information in this section was compiled primarily from news releases in Rocky Mountain Pay Dirt and in the Mining Record, Northern Miner, and Reno Gazette-Journal newspapers. Some information was extracted from company annual reports. Production costs given in this section are direct mine production costs and do not include exploration, development, start-up, or overhead costs.

Churchill County

Tenneco Minerals' Fondaway gold mine (S1,T22N,R33E), which began operation in September 1989, produced 4,468 ounces of gold in 1990 before being closed at mid-year due to a variety of problems. This open-pit, heap-leach operation was to have had an annual production of 12,000 ounces of gold per year for 2 to 3 years. The property evidently has potential for underground development where a larger, higher-grade, refractory orebody is present but cannot be mined by open-pit methods. Grade and tonnage figures have not been published.

At the beginning of 1990 Horizon Gold Corp. announced the purchase of the **Dixie Comstock** property (S6,T22N,R35E) from **Santa Fe Pacific Minerals**, who had explored the property since 1986 and had drilled 111 holes. Based on assay data from this work, the geologic resource totals 4.04 million tons grading 0.047 ounces of gold per ton. Beginning in 1991, Horizon plans to produce 25,000 ounces gold per year for 4 years.

Clark County

Durvada Resources began processing old dumps in the **Keystone mine** area (S19,T24S,R58E). First gold was poured in June 1990 from the heap-leach operation. The grade of this dump material is estimated to be 0.10 ounces of gold per ton. Late in 1990 **Crimson Star** signed an agreement with Durvada whereby they can earn a 50% interest in the area by paying Durvada $50,000 and financing a $1.7 million, three-phase exploration and development program.

Elko County

By mid-year **FMC Gold Co.** had earned a 50% interest in the **Rossi** gold (barite) property (S15,21,22,T37N,R49E) by spending $1 million on exploration within the 12 square mile property. FMC drilled 52 holes and encountered gold mineralization in 24 of them. Drilling continued throughout 1990. FMC's joint venture partner is **Baroid Drilling Fluids, Inc.**

At the end of the third quarter the **Purple vein deposit** (S13,T36N,R49E), owned by **American Barrick Resources**, had announced reserves of 13 million tons grading 0.40 ounces of gold per ton. A second gold zone has been discovered 3,000 feet north of the Purple vein. No grade or tonnage has been announced for this area but it is speculated that the Purple vein and this new area are one continuous mineralized zone.

The **Dee gold mine** produced 48,095 ounces of gold and 64,650 ounces of silver during 1990. The operation has 12 square miles of land, a mill capacity of 1,250 tons/day, a heap-leach capacity of 500,000 tons/year, and enough reserves at the end of 1990 to sustain production for another 4 years or so.

During 1989 the **REN deposit**, located 2 miles east of the Dee mine, was developed as a small satellite heap-leach operation; 150,000 tons were placed on the leach pad and produced 2,863 ounces of gold. In 1990 the remaining ore reserve of 242,000 tons, grading 0.040 ounces of gold per ton, was mined and leached. The 1990 exploration budget was $316,000 and was to be spent on drilling to test geophysical targets and newly discovered mineralization northwest of the main pit.

Development began at the **Hollister mine** (S20,T37N,R48E) in March of 1990 and the first gold was poured during the fourth quarter of 1990. By year-end the mine had produced 6,000 ounces of gold. The mine is a joint venture (50-50) between **Galactic Resources Ltd.** and **Cornucopia Resources Ltd.** It is a typical open-pit, heap-leach operation with mining and leach pad work performed by a contractor, **Leadcor Industries**. Capital costs for this phase I operation were $11.2 million and estimated direct production costs are around $220/ounce of gold. When in full production the property is expected to produce about 60,000 to 70,000 ounces of gold per year. Mining began on the **USX** East and West zones which have reserves of 4 million tons grading 0.047 ounces gold per ton. Mine life is projected to be 10 years.

The Hollister property encompasses 107,000 acres and to date 664 holes have been drilled, totaling more than 328,000 feet. This drilling has outlined reserves containing approximately 2.8 million ounces of gold. Results of exploration during 1990 were encouraging. Deep drilling in the **Hatter** area, located 1 mile east of the Hollister mine, encountered gold mineralization. Four holes, totaling 6,400 feet, were drilled in this area. Two of the

holes hit anomalous, but uneconomic, gold mineralization associated with pyrite. One hole, drilled to a depth of 1,905 feet, hit a quartz-veined porphyritic intrusive between 1,740 feet and 1,760 feet that averaged 0.736 ounces of gold per ton over the 20-foot interval. Within this 20-foot interval, one 5-foot interval assayed 2.07 ounces of gold per ton, and another 5-foot interval assayed 0.85 ounces of gold per ton. The 1991 exploration budget is expected to be $1 million and will be spent on geophysics as well as drilling.

Announced mineable reserves for a phase II development in the **Clementine** area, which is divided into two zones, are 4.3 million tons grading 0.036 ounces of gold per ton in zone 1 and 2.7 million tons grading 0.040 ounces of gold ton in zone 2. Announced reserves for the **Velvet** and **Butte No. 1** zones, which have not been scheduled for mining, total 3.1 million tons grading 0.040 ounces of gold per ton.

A development decision on the **Kinsley Mountain** property was deferred due to low gold prices. The property consists of 7,000 acres and is a joint venture between **USMX** (40%) and **Cominco American Resources** (60%). Current mineable reserves, based on a 1988 feasibility study, are 2.6 million tons grading 0.046 ounces of gold per ton. During 1990 a deep drilling program was conducted to test deep gold mineralization below the oxide zone. Results have not been published.

The **Big Springs joint venture**, 60% **Independence Mining Co.** (formerly **Freeport-McMoRan Gold Co.**) and 40% **Bull Run Gold Mines**, produced 73,240 ounces of gold and 3,060 ounces of silver during 1990. During the first full year of operation, the mine's oxygen roasting process averaged 980 dry tons/day and ended the year at 15% above the design capacity of 1,000 dry tons/day. Gold recovery was excellent, averaging 0.179 ounces/ton of ore, which is almost what the head assays averaged. Environmental performance of the roaster was also excellent with emission levels well below the state-mandated requirements; and operating costs were lower than estimated. Approximately 96% of 1990 production came from processing refractory ore through this roaster.

At mid-year it was announced that Bull Run and Independence Mining had begun talks whereby Independence would end up owning the Big Springs property. Bull Run shareholders voted for the proposal and by year-end the deal was basically finalized. Terms of the agreement were: 1) Bull Run would receive $16 million in cash, 2) Independence would forfeit any monies owed it by Bull Run, related to the joint venture agreement and 3) Bull Run would receive certain royalty interests in the Big Springs property.

Also during the year the Big Springs mine was designated a locatable minerals showcase by the U.S. Forest Service—the first such mine in the U.S. to be so named on national forest lands.

The **Jerritt Canyon joint venture** produced 323,000 ounces of gold in 1990. Continued drilling on the gold discovery made in 1989, located about 2,500 feet south of the current mining area, has identified a geologic resource of 3.2 million tons grading 0.284 ounces of gold per ton. This resource has yet to be delineated and drilling will continue in 1991.

Eureka County

The **Gold Bar mine** complex, owned by **Atlas Gold Mining Inc.**, produced 81,263 ounces of gold during fiscal 1990, 23% more than 1989 production. Cash production costs were $161/ounce of gold produced compared to $159/ounce in 1989. Non-cash production costs were an additional $76/ounce. Average realized gold price in 1990 was $397/ounce compared to $428/ounce in 1989. This was the first full year of production since the mill was expanded to 3,000 tons/day. To help increase recovery of sulfide ores, $3.4 million was spent on the installation of a refractory circuit in the mill. This work was started and completed during 1990.

Mining began at the **Goldstone deposit**, the first of three known satellite deposits to be mined. Based on a $400/ounce gold price, announced reserves in the last quarter of the year for these three satellite deposits were 9.7 million tons grading 0.057 ounces of gold per ton. These reserves are approximately 80% oxide ore and 20% refractory ore. With these reserves the mine should be able to produce through 1996.

The **Tonkin Springs gold mine**, owned by **U.S. Gold Corp.**, produced 2,068 ounces of gold in 1990. During the first quarter U.S. Gold announced that it had significant liquidity problems stemming from cost overruns and delays at the mine. At end of the third quarter it was announced that U.S. Gold had reached an agreement with **Homestake Mining Co.** to enter into a joint venture. Homestake would own majority interest (51%) and become operator of the mine. The mine was placed on standby status pending transfer of responsibilities. U.S. Gold reported a net loss of $20 million at the end of the third quarter.

The new mill, which cost $31 million, has a design capacity of 1,500 tons/day and includes a bio-oxidation circuit (first in the U.S.). The first gold was produced from this mill in the second quarter of the year. However, economic viability of the mill has not been demonstrated.

During the first part of 1990, **Royal Gold, Inc.** purchased **Golden Bounty Resources'** interest in the **Crescent Valley Gold Venture** and now holds a 20% interest in the venture; **Cortez Gold Mines** holds the other 80%. Exploration began in 1988 on the 4,000-acre claim block, located between Gold Acres and the Cortez Gold mine (~T27N,R47E). The property is leased from **ECM, Inc.** of Billings, Montana. Results have been encouraging from the beginning and during 1990 several drill intercepts over 20 feet in length assayed more than 0.10

ounces of gold per ton. Mineralization appears to be sediment hosted.

Newmont Gold Co., the largest gold producer in North America, sold 1.68 million ounces of gold in 1990, compared to 1.47 million ounces in 1989. Average price received in 1990 was $384/ounce, compared to $381/ounce in 1989. Cost of production in 1990 averaged $218/ounce, compared to $227/ounce in 1989.

Proven and probable gold reserves of Newmont's deposits in the Carlin trend as of December 27, 1990 were:

Deposit	Tonnage	Oz/ton	Ounces
Gold Quarry	212,585,000	0.042	8,845,000
Tusc	13,278,000	0.062	826,000
Capstone/Bootstrap	18,254,000	0.044	803,000
Carlin	1,350,000	0.066	90,000
Genesis/Blue Star	32,030,000	0.047	1,513,000
North Star	3,945,000	0.052	203,000
Pete	4,289,000	0.036	153,000
Post	40,149,000	0.147	5,895,000
Rain (Elko County)	8,996,000	0.063	564,000
TOTAL	334,876,000	0.056[2]	18,892,000

[1]Includes material in stockpiles. All reserves based on $400 gold price. Cutoffs: oxide leach ≥ 0.070 oz/ton; oxide mill varies.
[2]Weighted average grade. The stated average grade (oz/ton) may not correspond to that determined by direct calculation due to the rounding of total tons and grades.

Total proven and probable gold reserves at the end of 1990 were 18.9 million ounces, compared to 20.7 million ounces at the end of 1989. Total gold resources were reported at 36.4 million ounces at the end of 1990, compared to 40.5 million ounces at the end of 1989. Excluded from the current resource valuation was over 4 million ounces of refractory material grading between 0.01 and 0.03 ounces of gold per ton. This material had previously been included in the total gold reserve announced for 1989.

Newmont's announced exploration and development budget for 1990 was $22 million with exploration concentrated on infill drilling of known orebodies and on finding new, near surface, oxide bodies on properties controlled by Newmont in the Carlin belt.

Newmont's $11 million robotic gold analytical laboratory at its Carlin facility, said to be the largest and most advanced laboratory operated by any gold company worldwide, performed more than 2 million assays in 1990.

The **Barrick Goldstrike mine**, owned and operated by **American Barrick Resources**, produced 352,880 ounces of gold and 20,112 ounces of silver in 1990. This was 145,616 ounces more gold than in 1989. Through the first nine months of the year, Barrick received an average price of $441/ounce. Cash cost for this period was $332/ounce gold produced. The heap-leach operation made a significant contribution this year by generating more than 150,000 ounces of gold.

The first autoclave was officially commissioned in February 1990 and was expected to be operating at full design capacity of 1,500 tons/day by March; it was averaging 1,800 tons/day by year-end. The unit achieved 95% oxidation of ore with a tail grade of 0.02 ounces of gold per ton and the mill averaged 90% recovery of gold for the year. Design and engineering work began on two additional autoclaves and a second mill, scheduled for completion in 1992.

Humboldt County

The **Sleeper mine**, owned by **Amax Gold, Inc.**, produced 250,131 ounces of gold and 391,886 ounces of silver in 1990. Cash production costs were around $291/ounce of gold produced. Through the first 9 months of the year Amax realized $410/ounce of gold sold, $25 higher than the COMEX average price. The mine began operation in 1985 and poured its one-millionth ounce of gold in October 1990. At year-end the property had announced reserves of 2 million ounces of gold.

First gold was poured in June at the **Adelaide Crown mine**. The property is currently under the control of **Gold King Consolidated, Inc.** By year-end the property had produced 3,068 ounces of gold and 37,537 ounces of silver. Gold King leased the property from **Icarus Exploration Co.** at the end of 1989. At that time the property had proven reserves of 585,000 tons grading 0.043 ounces of gold and 1.313 ounces of silver per ton. In addition, Gold King estimated that a second area on the property had proven reserves of 165,000 tons grading 0.015 ounces of gold and 1.10 ounces of silver per ton. Other exploration targets have been identified on the property. The mine ceased production in the fourth quarter due to a contract dispute with the mining contractor. The mine is an open-pit, heap-leach operation.

The **Marigold mine** produced 60,750 ounces gold and 1,600 ounces of silver during 1990, its first full year of production. The mine is a joint venture of four firms: **Santa Fe Pacific Minerals Corp.** holds a 30% interest and the remaining 70% is held equally by **Rayrock Yellowknife Resources**, the operator; **Placer Dome U.S., Inc.**; and **Corona Gold, Inc.** Heap-leaching began in March 1990 and initial recoveries were 74%. Mill recoveries have been greater than 92%. Ore reserves are contained in three deposits and at mid-year were 12.3 million tons grading 0.055 ounces of gold per ton. At current production rates this amounts to a 10-year mine life. Marigold had a $2 million exploration budget for 1990 and most of it was to have been spent on the **Stonehouse deposit**.

The Stonehouse gold deposit, located on the **Marigold** property, underwent a 100-drill-hole, $2.2 million valuation in 1990. Mineralization appears to be concentrated along a major northwest structure, located on the west side of the deposit, and along a series of more northerly trending fault zones to the east of the northwest structure. Preliminary estimates of resources are: 3.6 million tons oxide ore grading 0.81 ounces of gold per ton, 2.5 million tons of mill-leach ore grading 0.103 ounces of gold

per ton, and 1.6 million tons of heap-leach ore grading 0.029 ounces of gold per ton.

Announced reserves at year-end on the **Lone Tree deposit**, immediately adjacent to the Stonehouse deposit, were 5.4 million tons of oxide mill ore grading 0.159 ounces of gold per ton at a cutoff of 0.05 ounce/ton, and 5.7 million tons of heap-leach ore grading 0.025 ounces of gold per ton at a cutoff of 0.01 ounce/ton. In addition there is a sulfide resource which, at year-end, amounted to 1.2 million ounces of gold. The property is expected to be in production by the end of 1991 at a rate of 100,000 ounces of gold per year.

By the end of 1989 **Queenstake Resources** had earned a 60% interest in the **Buckskin** joint venture (~S11,T45N,R39E). The second participant, **ASARCO**, has a 40% interest. Over the past 6 years $1 million has been spent on surface and underground mapping, geophysics, geochemistry and diamond drilling on the property. At the beginning of 1990 announced geologic reserves were 138,000 tons, grading 0.36 ounces of gold and 3.40 ounces of silver per ton. Metallurgical testing indicates that over 95% recovery of the sulfide ore can be expected using conventional flotation-cyanidation methods. Reserves are confined to the Bell vein system. The 1990 program, estimated at $600,000, consisted of drilling beneath the sinter cap on Buckskin Peak to test for an epithermal vein system and to expand ore reserves in the Bell vein system.

The **McDermitt mine**, the nation's only primary producer of mercury, closed in November due to poor market conditions. Since 1988 the mine has produced about 12,000 flasks of mercury per year. The mine did, however, reach a milestone in July when it produced its 300,000th flask. The first 100,000 flasks were produced between 1975 and 1979; the second 100,000 were produced by April 1983. The price at the time of closure was about $200/flask. If the price had been in the $400/flask range the mine probably could have operated for another 3 to 4 years. The closure resulted in the loss of 20 jobs.

The **Pinson mine** produced 56,382 ounces of gold during its tenth year of operation in 1990. The property occupies 30 square miles along the Getchell-Pinson trend, has a current mill capacity of 1,500 tons/day, and has a heap-leach capacity of 500,000 tons/year. Final leaching at the **Preble mine** was completed and produced 1,161 ounces of gold during 1990.

Loss of production from Preble will be partially offset by production from the newly developed **Kramer Hill** deposit. The Kramer Hill deposit began production during the year and produced 3,112 ounces of gold by year-end. The heap-leach facilities at the Preble mine were used to process this ore. Ore reserves are only 340,000 tons grading 0.044 ounces of gold per ton. A 2-year mine life is projected for the deposit.

Announced reserves in the **MAG** deposit at the end of 1989 were 6.2 million tons grading 0.064 ounces of gold per ton. This amounts to only about 35% of the deposit, the remaining mineralization being deep, refractory, and too low-grade to be treated economically. Development and expansion in this area will require relocating the truck maintenance shop and crushing plant. This will be accomplished by the end of 1991.

Additional known ore reserves on the Pinson land package includes the **C**, **CX**, and **Felix deposits** which total a little over 1 million tons grading 0.076 ounces of gold per ton. The 1990 exploration budget was $815,000 and was to have been spent on drilling geophysical and geological targets.

The company also received special recognition from the State during the year for its excellent reclamation practices at the mine and for the development of new reclamation techniques and concepts.

The **Getchell mine**, owned and operated by **FirstMiss Gold, Inc.**, produced 172,079 ounces of gold in 1990. The mine is expected to maintain this production level through 1992. Then for the following 5 years the mine is expected to produce about 122,000 ounces of gold per year, at which time current known ore reserves will be mined out. Currently the mine encompasses more than 33,000 acres and has proven and probable reserves of 1.32 million ounces of gold. The average sales price of gold for fiscal year ending in June 1990 was $401/ounce versus $393 per ounce in 1989. Average cash production cost for the year was $277/ounce of gold versus $185 per ounce in 1989. This large increase in production cost was due to increased operating costs and problems with the new mill/autoclave system. The 1990 exploration budget was $1.7 million.

Exploration drilling continued below and adjacent to known ore zones and on new targets throughout the property. Both heap-leach reserves and sulfide reserves were increased at year-end. Proven and probable reserves at year-end were 7.3 million tons sulfide ore grading 0.149 ounces of gold per ton and 1.33 million tons of oxide ore grading 0.042 ounces of gold per ton, enough for 7 years of mill operation. Additional geologic reserves include 7.1 million tons of sulfide mineralization grading 0.103 ounces of gold per ton and 1.64 million tons of oxide mineralization grading 0.046 ounces of gold per ton.

The **Rabbit Creek gold mine**, owned and operated by **Santa Fe Pacific Gold Corp.**, began production at the end of the third quarter in 1990 and by year-end had produced 25,000 ounces of gold. Head grade in the mill averaged 0.25 ounces of gold per ton and was as high as 0.50 ounces of gold per ton. Development and construction costs were given as $77 million. By the fourth quarter an expansion program was already underway to double production from the original 100,000 ounces/year to 200,000 ounces of gold per year by 1992. The budget for this work is $60 million.

The deposit is hosted in sedimentary rocks that were completely covered by valley fill. Stratigraphy consists of shale, siltstone, limestone, chert, lava flows, tuff, and intrusive sills. It is believed that a

series of northwest and northeast trending faults were the conduits for mineralizing fluids. The deposit, as currently known, is 5,000 feet long in a north-south direction and 1,500 to 2,000 feet wide. Known mineralization extends downward at least 1,200 feet.

The **Crofoot-Lewis mine**, operated by **Hycroft Resources and Development**, produced 92,000 ounces of gold and 110,000 ounces of silver in 1990. Current reserves will last another 2 to 3 years. During the fourth quarter of the year Hycroft announced that it had sold forward 83,000 ounces of gold through December of 1992 for a price of $428/ounce.

Geophysical and geological studies were expanded in 1990 and by the end of the first quarter exploration drilling indicated new gold mineralization of 7.1 million tons grading 0.021 ounces of gold per ton, based on a cutoff of 0.01 ounces of gold per ton. This mineralization occurs along the East Fault (Brimstone), approximately 4,000 feet east of the current mining operations. Mineralization is open in all directions. Later in the year $500,000 was budgeted for 4,000 feet of deep drilling to test for high grade gold zones in and around the current mining area. The first hole had to be abandoned due to drill stem failure but it intersected two narrow gold-silver veins about 200 feet below the surface. One vein was 1.6 feet wide and assayed 0.033 ounces gold and 2.0 ounces of silver per ton. The second vein was 3 feet wide and assayed 0.071 ounces gold and 19.8 ounces of silver per ton. Results from the second drill hole were insignificant. Partial results from the third drill hole assayed 0.14 ounces gold and 1.02 ounces of silver per ton over a 20-foot interval.

Lander County

At the beginning of 1990 **Coral Gold Corp.** and **Amax Gold, Inc.** completed an agreement to explore Coral's 11,000-acre **Robertson** property (~S8,T28N,R47E). Amax is the project operator and is to spend $11.5 million in a four-phase program. If all conditions are met, Amax will own 70% of the venture. The initial phase, which began in March, was budgeted at $1 million, and consisted mostly of deep drilling, down to 2,500 feet, to test for major deep gold deposits. Some of those funds were spent on testing for near-surface heap-leach reserves. The first deep drill hole had detectable gold from the surface down to 1,900 feet. One 5-foot interval at 1,100 feet assayed 1.52 ounces of gold per ton and another 5-foot interval at 1,845 feet assayed 0.17 ounces of gold per ton. However, the program had a number of delays due to mechanical problems and hard rock. Toward the end of the third quarter deep drilling was suspended and work shifted to drilling for shallow heap-leach material.

The **Elder Creek mine** began production at the beginning of 1990 and produced 17,400 ounces of gold during the year. The mine is a 50-50 joint venture between **Alta Gold Co.**, the operator, and **NERCO Minerals Co.** NERCO made the initial discovery in 1985. The property encompasses 2,850 acres and at start-up announced reserves were 1.8 million tons grading 0.046 ounces of gold per ton. However, due to problems with carbonaceous material, these reserves were revised downward to 1.5 million tons grading 0.041 ounces of gold per ton. The mine is an open-pit, heap-leach operation. The cost to bring the mine into production was $1.3 million and cash production costs are estimated at $183/ounce of gold produced. Recovery is expected to be 60% and mine life is projected to be 2 years.

The joint venture has a second promising gold property in **Slaven Canyon**, approximately 11 miles north of Elder Creek. In the second quarter of the year it was announced that this property had a geologic reserve of 1.2 million tons grading 0.025 ounces of gold per ton. Drilling continued on the property throughout 1990.

The **Toiyabe mine** produced 11,700 ounces of gold and 9,100 ounces of silver in 1990. The mine is a 50-50 joint venture between **Inland Gold and Silver Corp.** and **N.A. Degerstrom**, the operator. Exploration during 1990 for deep refractory ore was encouraging. The property is said to have a similar geologic setting and the same type of mineralization as gold deposits in the Carlin belt. The property encompasses 34,000 acres and 80% to 90% of it is currently unexplored.

Mineral County

The **Aurora gold mine**, operated by **Nevada Goldfields, Inc.**, produced 12,973 ounces of gold and 18,162 ounces of silver in 1990. Cash cost per ounce of gold produced was $267. A little over 80,000 tons of ore was milled, at an average grade of 0.170 ounces of gold per ton. Mill recovery was slightly greater than 95%. The **Prospectus** open pit supplied 32% of the ore, the Prospectus underground supplied about 5%, and the **Juniata** open pit supplied the rest. In March a new mine plan was completed for the Prospectus pit which will enable it to continue being economically mined. The exploration program for the year consisted of 12,800 feet of surface drilling and 2,230 feet of underground drilling. As a result of exploration drilling and geophysical and geochemical work, a 32% expansion in land position was undertaken. The property now encompasses 6,573 acres. In 1991 exploration drilling will concentrate on this new block of ground. Announced proven and probable reserves in the fourth quarter were 433,000 tons grading 0.19 ounces of gold per ton.

The **Candelaria silver mine**, owned and operated by **NERCO Metals, Inc.**, produced 4,891,464 ounces of silver and 11,796 ounces of gold in 1990. However, in the fourth quarter NERCO announced it was suspending operation at the mine due to depressed silver prices. By year-end approximately 170 jobs had been terminated. Silver prices are at a 15-year low and NERCO officials stated that

the mine would not reopen until silver prices increased substantially for a sustained period.

The **Borealis mine**, owned by **Echo Bay Minerals Co.**, was mined out late in 1989. Production in 1990 was 18,435 ounces of gold and 15,396 ounces of silver. Production ceased about the end of the third quarter of 1990. Final site reclamation began in the fourth quarter of 1990 will continue through mid-1993. Echo Bay received a State Reclamation Award in 1990 for its previous outstanding reclamation work at Borealis.

The **Denton-Rawhide mine**, a joint venture of **Kennecott Corp.** (51%), **Kiewit Mining Group, Inc.** (24.5%), and **Plexus Resources Corp.** (24.5%), began commercial production in April 1990 and by year-end had produced 39,000 ounces of gold and 170,000 ounces of silver. Yearly production is projected at 81,000 ounces of gold and 377,000 ounces of silver for the first 5 years of the mine's expected 15-year mine life. The mine has an estimated recoverable reserve of over 1 million ounces of gold and 4 million ounces of silver. The mine is a typical open-pit, heap-leach operation. The ore contains 10 times more silver than gold but silver recovery is low, averaging only 25%. Gold recovery averages about 80%. Capital costs for mine development and leach facilities were about $15 million. Estimated cash costs are $200 to $225 per ounce of gold including silver credits.

Mineralization occurs in several pod-type ore zones in a northwest-trending area about 8,000 feet long and 1,200 feet wide. Host rocks are intensely altered andesites, rhyolites, tuffs, and volcaniclastic sediments. Oxidation extends to depths of 700 feet with sulfide mineralization below the oxidation zone. Current mining areas are **Crazy Hill** and **Murray Hill**. Current exploration target is **Hooligan Hill**, where mineralization may merge with that in the Murray Hill pit. A 42,500-foot drilling program is planned for 1991.

Nye County

Newmont Exploration and **Miramar Mining Corp.** entered into an agreement at the end of 1988 whereby Newmont can earn a 51% interest in the **Bruner project** (T14N,R37E) by funding and conducting all exploration. The property encompasses 12 square miles with gold mineralization concentrated along a 2.5-mile north-trending zone that is about 3,000 feet wide. This zone includes five former producing gold mines. The area appears to be a large epithermal gold-silver system similar to those in the Rawhide and Round Mountain districts. During 1990 Newmont drilled five anomalies which they have identified within the land package. One drill program consisting of 49 holes totaling about 23,000 feet was completed in July 1990. A second drill program consisting of 80 holes totaling 40,000 feet was begun in October. A geophysics and geochemistry program completed in 1990 added drilling targets. No tonnage or grade figures have been announced.

The **Sterling mine**, 52% owned by **Cathedral Gold Corp.** and operated by **Saga Exploration Co.**, completed the transition from 50% underground to 100% underground mining in 1990. Ore reserves were increased during the year and in the fourth quarter were 519,000 tons grading 0.21 ounces of gold per ton. This will provide enough mineable ore for the next 6 years. The ore zone is open at depth. The mine produced 7,499 ounces of gold in 1989 at a cash production cost of $232/ounce. Production in 1990 was expected to be 11,000 ounces of gold at a cost of $230/ounce.

The **Mother Lode mine** produced 30,000 ounces of gold and 3,100 ounces of silver during 1990 at a cash production cost of around $200/ounce. At mid-year **U.S. Precious Metals** (40%) was appointed exploration and development manager of the 19,000 acre property. **N.A. Degerstrom** is still the mine operator. In conjunction with U.S. Precious Metals' appointment, a $1.6 million exploration budget was approved. Exploration consisted of geological and geophysical work with follow-up drilling. Drilling began in September 1990 based on targets defined by previous work. No results have been reported.

During early December 1990 the last of the oxide ore from the **Mother Lode** pit was mined. There is sulfide mineralization below the oxide zone in the Mother Lode deposit that is calculated at over 3 million tons and is still open. However, it grades only 0.057 ounces of gold per ton which is considered too low to offset the expected high production costs.

Drilling was continued throughout most of 1990 on the **SNA (Sunday Night Anomaly) deposit**. Over 4 million tons of mineralization has been identified but because of grade and a 5:1 stripping ratio (waste to ore) only about 500,000 tons grading 0.033 ounces of gold per ton may be feasible to mine.

Cyprus produced 11.2 million pounds of molybdenum and 5.5 million pounds of copper in 1990 from its **Tonopah (Hall) molybdenum mine** before closing it because of declining molybdenum prices.

Pershing County

As a result of reconnaissance geochemical work in mid-1989 **Queenstake Resources Ltd.** located a block of 36 claims in the southern part of the Farrell district (T31N,R29E). In 1990 Queenstake acquired an additional 147 claims. The property, known as the **Snowsquall**, currently encompasses 4,760 acres and includes an area of strong hydrothermal alteration that extends over a strike length of 7,000 feet and is 3,600 feet wide. Within this zone geochemical work has identified several areas having high gold, antimony, arsenic, and mercury values. Gold values have been as high as 1.57 ounces of gold per ton. The geologic setting has been described as a collapsed Tertiary caldera with mineralization associated with ring structures along the east margin. The best gold mineralization known

Mother Lode pit. *S. B. Castor photo.*

to date is in breccia pipes and linear structures associated with ring fractures. A 10,000-foot drilling program was to have been completed in 1990. Results of this work have not been reported. In December it was announced that **Amax Gold Exploration, Inc.** had entered into an agreement with Queenstake and could earn a 60% interest in the property by spending $1 million over the next 4 years.

Continued drilling on the **Rosebud property** in 1990 (~S13,T34N,R29E) has partially defined a high-grade gold zone over 1,000 feet long, 70 feet wide, and about 300 feet deep. Mineralization begins approximately 200 feet below the surface and appears similar to that at the **Sleeper mine**. Some of the more significant intercepts assayed as follows:

Intercept ft	Width ft	Gold oz/ton	Silver oz/ton
520-655	135	0.222	0.35
550-585	35	0.768	1.23
380-450	70	0.074	0.44
415-430	15	0.261	1.85
505-575	70	0.036	1.08
675-780	105	0.024	0.08
335-420	85	0.038	0.75
400-480	80	0.045	1.69
400-415	15	0.151	6.63
560-595	35	0.020	0.03
555-605	50	0.016	0.02

The project is a joint venture between **LAC Minerals Ltd.** and **Equinox Resources Ltd.** LAC is the project operator and can earn 51% ownership. Drilling began in two other areas within the claim block, one to the north of the above area and one to the east of it. Mineralization has been encountered in both areas.

White Pine County

At the northeast end of the Bald Mountain district the **Casino mine** began production in October and by year-end had produced 7,000 ounces of gold. This typical open-pit, heap-leach operation is a joint venture between **USMX** (51%) and **Pegasus Gold, Inc.** (49%). At the end of 1989 mineable reserves were 624,000 tons grading 0.059 ounces of gold per ton. The **Winrock deposit**, part of the same land package, underwent a feasibility study in 1990 and is projected to begin operation in late 1991. Mineable reserves are 915,600 tons grading 0.043 ounces of gold per ton. This property is located about 4 miles south of the Casino mine.

In May 1990 **USMX Inc.** announced that it was negotiating with both **Kennecott Corp.** (50%) and **NERCO Metals, Inc.** (50%) for the **Alligator Ridge gold mine** and 33,000-acre property package. Acquisition agreements were completed by June and USMX became sole owner of the property. Kennecott received $1.5 million plus $300,000 working capital considerations. NERCO received a 11% net smelter royalty on 1990 production, plus a

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net smelter royalty not to exceed 4% of future production. The land package is about 25 miles long in a north-south direction and about 8 miles wide. After the property was acquired $700,000 was budgeted for exploration.

Nine high priority targets had been identified and further work consisting of soil sampling, mapping, and drilling was conducted. By the end of 1990 eight target areas had been drilled, five of which have potential to become mines. Three of these areas, **Poker Flats**, **Repeat**, and **Horseshoe**, are located along the east flank of the Tognini Mountains, southeast of the **Casino deposit** (S25,T24N,R58E), and are probably associated with basin and range faults. The other two, **Sky** and **East Top**, are near Placer Dome's Top deposit on Big Bald Mountain. None of these deposits is fully delineated and no tonnage or grade figures have been announced. Cuttings from drill holes are oxidized and mineralization is shallow in depth (surface to 150 feet). Known assays range from 0.025 to 0.108 ounces of gold per ton. In 1990 the Alligator Ridge mine produced 18,000 ounces gold and 4,000 ounces of silver at a cash operating cost of around $225/ounce.

At the end of 1990 it was announced that **Magma Copper Co.** and **Alta Gold Co.** had purchased the 12,000-acre **Robinson mining district** from Kennecott Corp. for $20 million. Magma holds 51% and will be the operator and Alta Gold holds 49%. Studies completed by Magma indicate a potential 200 million tons of ore containing 0.68% copper and 0.012 ounces of gold per ton which would yield over 2.5 billion pounds of copper and 1.2 million ounces of gold over an 18-year mine life.

Magma paid $10.5 million to Alta Gold (60%) and **Echo Bay Mines** (40%) to obtain a 51% interest in the ongoing gold operations at Robinson. Echo Bay exchanged its 40% working interest in its joint venture with Alta Bay for royalties of 6% on all future gold produced from the Robinson gold operations and 2% of all gold produced from the copper operations up to a maximum of $12.5 million.

Robinson produced 75,000 ounces gold and 55,000 ounces of silver in 1990. The existing shallow gold deposits have known reserves to support operations for another 4 to 5 years at a rate of 50,000 to 70,000 ounces of gold annually. Earliest projected copper production at Robinson will be sometime in 1993.

The **Ward Mountain zinc mine** and **Taylor mill** reached full production in May 1990 and by year-end had produced 21.4 million pounds of zinc, 2.9 million pounds of copper, 1.8 million pounds of lead, and 230,868 ounces of silver. At start-up proven and probable reserves were 1.7 million tons grading 6% zinc, 0.8% copper, 0.7% lead, and 2 ounces of silver per ton. Due to depressed metal prices at year-end and poor-quality mill products the mine has been temporarily closed.

Bulk-Mineable Precious-Metal Deposits

by Harold F. Bonham, Jr. and Ronald H. Hess

The information in this compilation was obtained from the Nevada Department of Minerals and from published reports, articles in mining newsletters, and company annual reports and press releases. The Nevada Department of Minerals supplied most of the 1989 and 1990 production data for the large mines. Locations of most of these deposits are shown on NBMG Map 91.

Deposit name	Reserves/resources	Production	Host rock	Mineralization age
CHURCHILL COUNTY				
Bell Mountain	1989: *reserves*—30,000 oz Au, 125,000 oz Ag	no production	rhyolitic tuff	Miocene
Dixie Comstock	1990: 4 million tons, 0.047 oz Au/ton	1989: development	Tertiary rhyolite	Miocene?
Fondaway Canyon	1988: 400,000 tons, 0.06 oz Au/ton 1990: 400,000 tons, 0.06 oz Au/ton	1989: 1,065 oz Au, 87 oz Ag 1990: 12,000 oz Au	Triassic slate and phyllite	Cretaceous
CLARK COUNTY				
Goodsprings (Keystone)	1990: *estimated geologic resource* 64 million tons, 0.05 oz Au/ton	1990: ~1,000 oz Au	lower Paleozoic carbonate rocks	Cretaceous
ELKO COUNTY				
Big Springs (Sammy Creek)	1989: 1.55 million tons, 0.172 oz Au/ton	1987–88: ~106,000 oz Au 1989: 60,376 oz Au, 4.416 oz Ag 1990: 73,224 oz Au, 3,060 oz Ag	Mississippian to Permian overlap assemblage	Cretaceous or Tertiary
Bootstrap/ Capstone	1989: *geologic resource*—25.1 million tons, 0.039 oz Au/ton 1990: 18.3 million tons, 0.044 oz Au/ton	1988–90: NGO	dacitic dikes, Paleozoic siltstone and laminated limestone/ chert	~37 Ma
Burns Basin	Reserves and production included in Jerritt Canyon figures		Roberts Mountains and Hanson Creek Formations	Cretaceous or Tertiary
Cobb Creek	1988: *geologic resource*—3.2 million tons, 0.045 oz Au/ton			
Dee	1990: 4.5 million tons, 0.059 oz Au/ton	1987–88: ~97,000 oz Au 1989: 44,500 oz Au, 45,000 oz Ag 1990: 48,095 oz Au, 64,650 oz Ag	Vinini Formation Devonian carbonates, dacitic dikes	Cretaceous or Tertiary
Emigrant Springs	1989: 30.3 million tons, 0.021 oz Au/ton	exploration	lower Paleozoic sedimentary rocks	Cretaceous or early Tertiary
Hollister (Ivanhoe)	1989: *oxide*—18.4 million tons, 0.035 oz Au/ton; estimated mineral inventory 83.5 million tons, 0.034 oz Au/ton, with 52.8 million tons of oxide and 30.7 million tons of sulfide	1990: 6,000 oz Au	rhyolitic tuff, flows, volcaniclastic rocks	Miocene
Jerritt Canyon (includes Saval Canyon)	1989: 21.6 million tons, 0.143 oz Au/ton mill ore; 6.5 million tons, 0.043 oz Au/ton leachable 1990: new discovery south of current mine has a geologic resource of 3.2 million tons, 0.284 oz Au/ton	1981–89: ~2.3 million oz Au 1990: 323,000 oz Au	Hanson Creek and Roberts Mountains Formations	Cretaceous or Tertiary
Kinsley Mountain	1988: 2.1 million tons, 0.048 oz Au/ton	pre-production	upper Paleozoic carbonate rocks	Oligocene?
Rain	1989: *geologic resource*—22.6 million tons, 0.052 oz Au/ton 1990: 9 million tons, 0.063 oz Au/ton	1988: 29,000 oz Au	Webb Formation	36–37 Ma
SMZ	1989: *geologic resource*—1.6 million tons, 0.019 oz Au/ton			

NGO: Newmont Gold Operations (Bootstrap/Capstone, Blue Star, Genesis, and Gold Quarry mines) reported 895,500 oz Au produced in 1988, 1,467,800 oz Au and 117,400 oz Ag produced in 1989, and 1,676,000 oz Au produced in 1990.

continued

BULK-MINEABLE PRECIOUS-METAL DEPOSITS (continued)

Deposit name	Reserves/resources	Production	Host rock	Mineralization age
ELKO COUNTY (continued)				
Trout Creek	1988: 1.5 million tons, 0.04 Au/ton	1988: exploration	lower Paleozoic	Cretaceous or Tertiary
Tuscarora (Dexter)	1987: 2 million tons, 0.039 oz Au and 1.9 oz Ag/ton 1988: 1.8 million tons, 0.037 oz Au and 0.74 oz Ag/ton	1896–1902: 29,940 oz Au, 28,543 oz Ag 1987–89: 33,000 oz Au, 143,000 oz Ag 1990: 1,163 oz Au, 41,865 oz Ag	Eocene rhyolitic ignimbrite and andesite	38 Ma
Winters Creek	1986: 1.4 million tons, 0.146 oz Au/ton	evaluation, exploration	lower Paleozoic carbonate rocks	Cretaceous or Tertiary
Wood Gulch	1988: 500,000 tons, 0.098 oz Au and 0.4 oz Ag/ton	1989: 19,810 oz Au, 31,122 oz Ag 1990: 14,926 oz Au, 35,374 oz Ag	lower Paleozoic sedimentary rocks, andesite-dacite dikes and sills	Cretaceous or Tertiary
Wright Window	1986: 1.3 million tons, 0.095 oz Au/ton	evaluation, exploration	lower Paleozoic carbonate rocks	Cretaceous or Tertiary
ESMERALDA COUNTY				
Boss mine	1987: 500,000 tons, 0.07 oz Au/ton	1989: W	Ordovician sedimentary rocks	Miocene?
Boss property	1990: *reserves*—637,500 tons, 0.023 oz Au/ton 1990: *geologic resource*—31,000 oz Au			
Divide	1988: 500,000 tons, 0.04 oz Au and 0.40 oz Ag/ton	evaluation	Miocene silicic tuff	16 Ma
Goldfield	1983: 1.75 million tons, 0.087 oz Au/ton	1903–45: 4.19 million oz Au, 1.45 million oz Ag 1989: 1,987 oz Au, 200 oz Ag	andesite, rhyodacite, rhyolite	21 Ma
Hasbrouck	1986: 12.9 million tons, 0.0291 oz Au and 0.59 oz Ag/ton	exploration	Siebert Formation tuff and volcaniclastic rocks	16 Ma
Top	1986: *geologic resource*—5.2 million tons, 0.093 oz Au/ton			
Weepah	1986: 200,000 tons, 0.1 oz Au and 0.4 oz Ag/ton	1986–87: 58,000 oz Au 1988–90: idle	Wyman Formation	Cretaceous
EUREKA COUNTY				
Blue Star	1989: *geologic resource*—22.2 million tons, 0.030 oz Au/ton 1990: 32 million tons, 0.047 oz Au/ton (includes Genesis)	1974–84: intermittent 1988–90: NGO	lower Paleozoic sandy siltstone and carbonate rocks, granodiorite	Cretaceous or early Tertiary
Bobcat	1988: *geologic resource*—17.7 million tons, 0.029 oz Au/ton		lower Paleozoic rocks	Cretaceous or Eocene
Buckhorn	1990: 700,000 tons, 0.05 oz Au/ton; *geologic resource*—200,350 oz Au	1988: 28,730 oz Au, 151,832 oz Ag 1989: 28,892 oz Au, 86,155 oz Ag 1990: 19,300 oz Au, 65,500 oz Ag	basaltic andesite, sinter, silicified sedimentary rocks	14.6 Ma
Bullion Monarch	1987: 1 million tons, 0.10 oz Au/ton	exploration, evaluation	lower Paleozoic sedimentary rocks	Tertiary or Mesozoic
Carlin	1989: *geologic resource*—20.8 million tons, 0.029 Au/ton 1990: 1.4 million tons, 0.066 oz Au/ton	1965–84: 4.3 million oz Au 1988: 25,320 oz Au 1989: idle	Roberts Mountains Formation	Cretaceous or early Tertiary
Cortez/Gold Acres/ Horse Canyon	1989: 499,530 oz Au	1990: 53,945 oz Au, 10,150 oz Ag		Cretaceous
Genesis	1989: *geologic resource*—35.8 million tons, 0.044 oz Au/ton 1990: 32 million tons, 0.047 oz Au/ton (includes Blue Star)	1986: production commenced 1988–89: NGO	Ordovician-Devonian limestone, argillite chert	Cretaceous or early Tertiary
Gnome	1988: 2.7 million tons, 0.048 oz Au/ton	exploration	Paleozoic sedimentary rocks	Cretaceous or early Tertiary

W: withheld

NGO: Newmont Gold Operations (Bootstrap/Capstone, Blue Star, Genesis, and Gold Quarry mines) reported 895,500 oz Au produced in 1988, 1,467,800 oz Au and 117,400 oz Ag produced in 1989, and 1,676,000 oz Au produced in 1990.

BULK-MINEABLE PRECIOUS-METAL DEPOSITS (continued)

Deposit name	Reserves/resources	Production	Host rock	Mineralization age
EUREKA COUNTY (continued)				
Gold Bar	1988: 2.75 million tons, 0.10 oz Au/ton 1989: *geologic resource*—1.45 million oz Au 1990: mined out in December	1987–88: 91,000 oz Au 1989: 66,000 oz Au 1990: 81,263 oz Au	Devonian Nevada Formation	Eocene?
Gold Pick	1988: 10 million tons, 0.06 oz Au/ton 1990: 9.7 million tons, 0.057 oz Au/ton, includes Gold Ridge and Goldstone	exploration	Paleozoic sedimentary rocks	Eocene?
Gold Quarry	1987: 197.8 million tons, 0.042 oz Au/ton 1988: *geologic resource*—503 million tons, 0.04 oz Au/ton 1990: 212.6 million tons, .042 oz Au/ton, *geologic resource*—534.3 million tons, 0.037 oz Au/ton	1985: 170,000 oz Au 1988–90: NGO	Ordovidian to Devonian chert, shale, siltstone, and impure carbonates, in part, Vinini Formation	Cretaceous or early Tertiary
Gold Ridge	1988: 4 million tons, 0.06 oz Au/ton 1990: *see* Gold Pick	exploration, evaluation production scheduled for 1991	Paleozoic sedimentary rocks	Eocene?
Goldstone	1988: 1.7 million tons, 0.08 oz Au/ton 1990: *see* Gold Pick	exploration, evaluation	Paleozoic sedimentary rocks	Eocene?
Goldstrike (Betze, Post)	1988: 128.4 million tons, 0.095 oz Au/ton 1989: *geologic resource*—18.4 million oz Au	1980–88: 440,000 oz Au 1989: 207,264 oz Au, 15,500 oz Ag 1990: 352,880 oz Au, 20,112 oz Ag	Ordovician to Devonian chert, shale, siltstone, and impure carbonates, in part, Vinini Formation	Cretaceous or early Tertiary
Horse Canyon	1984: 3.94 million tons, 0.055 oz Au/ton 1988: included in Gold Acres figures	1984: 40,000 oz Au 1988–89: included with Gold Acres	Vinini Formation, Wenban Limestone	34 Ma?
Lantern	1988: *geologic resource*—15.45 million tons, 0.028 oz Au/ton	exploration	lower Paleozoic sedimentary rocks	Cretaceous or early Tertiary
Maggie Creek	1988: *geologic resource*—303,000 tons, 0.092 oz Au/ton	1984: 1,250,000 tons 1986: intermittent production 1988: no production reported	Ordovician to Devonian siltstone, chert, sandstone, impure limestone	Cretaceous or early Tertiary
North Star	1989: *geologic resource*—6.9 milion tons, 0.052 oz Au/ton 1990: 3.9 million tons, 0.052 oz Au/ton	1988: 4,250 oz Au	lower Paleozoic sedimentary rocks	Cretaceous or early Tertiary
Pete	1988: *geologic resource*—15.7 million tons, 0.030 oz Au/ton 1989: 4.3 million tons, 0.036 oz Au/ton, *geologic resource*—15.8 million tons, 0.030 oz Au/ton	exploration	Roberts Mountains Formation	Cretaceous or early Tertiary
Post/Deep Post	Newmont Gold Co. holdings only— 1989: *geologic resource*—195 million tons, 0.064 oz Au/ton 1990: 40.1 million tons, 0.147 oz Au/ton	1988: 4,930 oz Au	Vinini Formation lower Paleozoic carbonate rocks	Cretaceous?
Project Glister		1989: 8,450 oz Au, 23,519 oz Ag		
Ratto Canyon	1984: ~200,000 oz Au	exploration	Dunderberg Shale, Hamburg Dolomite	Oligocene
Rock Creek	1988: 30,000 oz Au			
Tonkin Springs	1987: *oxide*—1.5 million tons, 0.05 oz Au/ton; *sulfide*—2.5 million tons, 0.09 oz Au/ton	1987: ~9,700 oz Au 1988: 565 oz Au 1989: 1,753 oz Au, 1,402 oz Ag 1990: 2,068 oz Au, 470 oz Ag	Vinini Formation, dacitic dikes	Oligocene?
Tusc	1989: *geologic resource*—15.8 million tons, 0.059 oz Au/ton 1990: 13.3 million tons, 0.062 oz Au/ton	exploration	lower Paleozoic sedimentary rocks	Cretaceous or early Tertiary
Windfall	1988: 3 million tons, 0.03 oz Au/ton	1908–16: 24,000 oz Au 1975–84: 90,000 oz Au 1988: 6,380 oz Au, 59 oz Ag	Hamburg Dolomite	Eocene or Oligocene
Zeke	1989: 2 million tons, 0.056 oz Au and 0.224 oz Ag/ton			
HUMBOLDT COUNTY				
Adelaide Crown	1989: *south pit*—585,000 tons, 1.313 oz Ag and 0.043 oz Au/ton; *additional area*—165,000 tons, 0.015 oz Au and 1.10 oz Ag/ton	1990: 3,068 oz Au, 37,537 oz Ag	Preble Formation	Tertiary
Ashdown	1988: 1 million tons, 0.11 oz Au/ton	exploration	Mesozoic granitic rocks	Mesozoic
Chimney Creek	1988: *proven, probable*—26.9 million tons, 0.068 oz Au/ton; *inferred in south pit*—2.1 million oz Au 1989: *geologic resource*—4.6 million oz Au	1987–88: 300,000 oz Au 1989: 222,556 oz Au, 55,953 oz Ag 1990: 220,000 oz Au	upper Paleozoic sedimentary rocks	~90 Ma

continued

BULK-MINEABLE PRECIOUS-METAL DEPOSITS (continued)

Deposit name	Reserves/resources	Production	Host rock	Mineralization age
HUMBOLDT COUNTY (continued)				
Crofoot/Lewis	1988: 25 million tons, 0.025 oz Au/ton 1990: 12 million tons, 0.020 oz Au/ton	1988: 75,800 oz Au 1989: 82,000 oz Au, 123,000 oz Ag 1990: 92,000 oz Au, 110,000 oz Ag	Camel conglomerate, rhyolite dikes	1-2 Ma
Getchell	1989: 8.1 million tons, 0.154 oz Au/ton mill grade and 1.43 million tons, 0.049 Au/ton heap-leach ore; *additional geologic resource*—5.7 million tons, 0.092 oz Au/ton sulfide and 2.6 million tons, 0.055 oz Au/ton oxide 1990: 7.26 million tons, 0.149 oz Au/ton sulfide and 1.33 million tons, 0.042 oz Au/ton oxide	1938-50, 1962-67: 788,875 oz Au 1987-88: ~35,000 oz Au 1989: 120,730 oz Au, 9,407 oz Ag 1990: 172,029 oz Au	Comus and Preble Formations, granodiorite dikes, granodiorite	90 Ma
Lewis	1984: 10 million tons, 0.04 oz Au/ton 1987: 9 million tons, 0.032 oz Au/ton	1984: 3,500 tons/day 1987: ~8,800 oz Au 1988-90: included in Crofoot/Lewis	Camel conglomerate rhyolite dikes	1-2 Ma
Lone Tree	1990: 5.4 million tons oxide mill ore, 0.159 oz Au/ton, 5.7 million tons heap-leach ore, 0.025 oz Au/ton and 1.2 million oz Au in sulfide ore		Havallah Formation and dacite porphyry	38 Ma
Marigold	1990: 4.325 millon tons, 0.105 oz Au/ton mill ore, 7.644 million tons, 0.026 oz Au/ton heap-leach ore	1989: 16,000 oz Au, 484 oz Ag 1990: 60,750 oz Au, 1,600 oz Ag	Paleozoic chert, argillite, and carbonate	early Oligocene
Pinson	1989: 480,000 oz Au	1980:56,000 oz Au 1986-88: 189,864 oz Au 1989: 72,489 oz Au (includes Preble) 1990: 56,382 oz Au	Comus Formation	90 Ma
Preble	1989: 15,110 oz Au	1985: 17,000 oz Au 1987: 28,000 oz Au 1988: 18,828 oz Au 1989: included with Pinson 1990: 1,161 oz Au	Preble Formation	90 Ma?
Rabbit Creek	1989: 4.1 million oz Au; *additional geologic resource*—1 million Au in refractory material	1990: 25,000 oz Au	Valmy Formation	Cretaceous?
Sleeper	1989: 1,975,000 oz Au	1986: 128,000 oz Au, 94,000 oz Ag 1987: 158,696 oz Au 1988: 230,410 oz Au 1989: 256,000 oz Au, 339,650 oz Ag 1990: 250,131 oz Au, 391,886 oz Ag	Miocene "latite" flows and dikes, silicic ash-flow tuff, Triassic slate and phyllite	Miocene
Trout Creek	1989: 50,000 oz Au			
LANDER COUNTY				
Austin Gold Venture	1989: mined out	1986-88: 141,000 oz Au 1989: 50,000 oz Au	Antelope Valley Limestone	Cretaceous or Tertiary
Buffalo Valley	1988: 1.5 million tons, 0.05 oz Au/ton	1988: 9,238 oz Au 1989: 14,660 oz Au 1990: 15,770 oz Au		Eocene?
Cortez	mined out	1968-82: 1.0 million oz Au	Roberts Mountains Formation	Cretaceous or early Tertiary
Elder Creek Project/ Shoshone	1989: 91,500 oz Au 1990: 1.5 million tons, 0.041 oz Au/ton	1990: 17,400 oz Au	Valmy Formation	Cretaceous or Eocene
Fire Creek	1982: 350,000 tons, 0.06 oz Au/ton	1983-84: 767 oz Au	basaltic andesite	Miocene
Fortitude (Copper Canyon) (Battle Mtn.)	1989: *proven, probable*—6.7 million tons, 0.13 oz Au and 0.47 oz Ag/ton (includes Surprise and Labrador)	1986: 259,000 oz Au, 902,000 oz Ag 1987: 255,000 oz Au 1988: 243,000 oz Au, 675,000 oz Ag 1989: 254,507 oz Au, 301,272 oz Ag 1990: 261,338 oz Au, 458,143 oz Ag (1988-90 production includes Surprise)	Battle Formation, Antler Peak Limestone, Pumpernickel Formation	37 Ma
Gold Acres and Little Gold Acres	1987: 4.8 million tons, 0.105 oz Au/ton 1988: 5.4 million tons, 0.093 oz Au/ton	1942-84: 2.4 million tons, 0.13 oz Au/ton; 2 million tons, 0.041 oz Au/ton leached. *Little Gold Acres:* 800,000 tons, 0.124 oz Au/ton 1988: 42,322 oz Au (includes Horse Canyon) 1989: 39,993 oz Au, 12,234 oz Ag (includes Horse Canyon)	Roberts Mountains Formation, Wenban Limestone, Valmy Formation, quartz porphyry dikes	92.8-94 Ma and 36 Ma
Hilltop	1984: 10.5 million tons, 0.073 oz Au/ton 1989: 10 million tons, 0.049 oz Au/ton	no production	Valmy Formation	Oligocene?

BULK-MINEABLE PRECIOUS-METAL DEPOSITS (continued)

Deposit name	Reserves/resources	Production	Host rock	Mineralization age
LANDER COUNTY (continued)				
Klondike Property	1989: 100,000 oz Au equivalent			
McCoy/Cove	1989: *proven and probable reserves*—2.9 million oz Au, 128 million oz Ag *geologic resource*—3.5 million oz Au, 1.50 million oz Ag	1986: 50,000 oz Au 1987: 200,000 oz Au, 5 million oz Ag 1988: 100,000 oz Au, 700,000 oz Ag 1989: 214,566 oz Au, 2.26 million oz Ag 1990: 255,044 oz Au, 1.98 million oz Ag	Panther Canyon Formation (conglomerate, sandstone), Augusta Mountain Formation (limestone), granodiorite	39.5 Ma
Robertson	1988: 11 million tons, 0.04 oz Au/ton	1989: 3,700 oz Au	Valmy Formation	early Oligocene
Surprise	1987: 225,000 oz Au 1988–90: production and reserves included in Fortitude figures	1987: 2,000 oz Au	skarn	37 Ma
Toiyabe	1988: 813,400 tons, 0.066 oz Au/ton	1988: 32,000 oz Au, 10,300 oz Ag 1990: 11,700 oz Au, 9,100 oz Ag	lower Paleozoic calcareous siltstone	Eocene?
LINCOLN COUNTY				
Atlanta	1980: 1.1 million tons, 0.08 oz Au and 1.6 oz Ag/ton	1980: 88,000 oz Au, 1,710,000 oz Ag 1987–89: idle	Pogonip Group, Ely Springs and Laketown Dolomites, Oligocene silicic tuff, dacite dikes	early Miocene
Delamar	1988: 200,000 tons, 0.079 Au/ton	1988: exploration	Cambrian quartzite	Miocene
LYON COUNTY				
Fire Angel	1989: 5,600 oz Au, *geologic resource*—148,500 oz Au			
Talapoosa	1988: 2.5 million tons, 0.041 oz Au and 0.53 oz Ag/ton *oxide* 14.9 million tons, 0.03 oz Au and 0.49 oz Ag/ton *sulfide* 1989: *additional resources delineated*—2.7 million tons, 0.054 oz Au and 0.654 oz Ag/ton	pre-production	Kate Peak Formation	Miocene
MINERAL COUNTY				
Aurora mine	1989: 347,000 tons, 0.253 oz Au/ton 1990: 433,000 tons, 0.21 oz Au/ton	1989: 12,683 oz Au, 16,400 oz Ag 1990: 12,973 oz Au, 18,162 oz Ag	andesite, rhyolite	10 Ma
Aurora Partnership	1983: 1.5 million tons, 0.129 oz Au 0.3 oz Ag/ton 1990: 816,880 tons, 0.103 oz Au/ton	1930s: 100,000 oz Au 1983: 10,000 oz Au 1988: 10,302 oz Au 1989: 27,825 oz Au, 26,000 oz Ag 1990: 31,000 oz Au, 47,000 oz Ag	andesite, rhyolite	10 Ma
Borealis	1988: 1.792 million tons, 0.046 oz Au/ton	1981–84: 170,000 oz Au 1986–88: 116,256 oz Au 1989: 89,060 oz Au, 37,032 oz Ag 1990: 18,435 oz Au, 15,396 oz Ag, production ceased	rhyolite flow dome, andesite flows, breccias, volcaniclastic rocks	5 Ma
Candelaria	1988: 24 million tons, 1.267 oz Ag and 0.011 oz Au/ton	1982: 1.7 million oz Ag, 9,000 oz Au 1987: total production was 10 million oz Ag as of June 1987 1988: 3.8 million oz Ag, 11,000 oz Au 1989: 4.36 million oz Ag, 13,800 oz Au 1990: 4.89 million oz Ag, 11,796 oz Au, production suspended	Candelaria Formation serpentinite, granitic dikes	Cretaceous
Denton-Rawhide	1989: *reserves*—29.4 million tons, 0.040 oz Au and 0.368 oz Ag/ton; *geologic resource*—59.3 million tons, 0.0274 oz Au and 0.298 oz Ag/ton	1990: 39,000 oz Au, 170,000 oz Ag	rhyolite plugs, flows, tuffs, breccias	16 Ma
Mindora	1988: 1.0 million tons, 0.037 oz Au and 1.78 oz Ag/ton	1988: exploration		
Santa Fe	1990: 6.8 million tons, 0.035 oz Au and 0.241 oz Ag/ton	1989: 60,000 oz Au, 150,000 oz Ag 1990: 64,336 oz Au, 177,244 oz Ag	Luning Formation	Miocene

continued

BULK-MINEABLE PRECIOUS-METAL DEPOSITS (continued)

Deposit name	Reserves/resources	Production	Host rock	Mineralization age
NYE COUNTY				
Baxter Springs	1988: 1 million tons, 0.050 oz Au/ton 1990: *geologic resource*—5 million tons, 0.050 oz Au/ton			
Bullfrog	1989: 18.6 million tons, 0.097 oz Au/ton	1989: 50,011 oz Au, 40,905 oz Ag 1990: 220,00 oz Au, 229,000 oz Ag	rhyolite ash-flow tuff	9.5 Ma
Cuervo (Sullivan)	1987: 10.2 million tons, 0.039 oz Au and 0.086 oz Ag/ton and 0.37% Cu 1988: *proven*—10.8 million tons, *probable*—2.7 million tons, 0.025 oz Au/ton	exploration	Mesozoic granodiorite	Mesozoic
Gold Bar	1987: 1.23 million tons Au ore	1989–90: W	silicic volcanic rocks	Miocene
Ketchup Flat	1989: 300,000 oz Au, 3.1 million oz Ag	pre-production	Miocene volcanic rocks	Miocene
Longstreet property	1989: 4 million tons, 0.024 oz Au/ton, *geologic resource*—9.6 million tons, 0.024 oz Au/ton		rhyolitic volcanic rocks	Oligocene
Manhattan	1988: 22.4 million tons, 0.021 oz Au/ton 1989: 1.7 million tons, 0.017 oz Au/ton	1905–59: 500,000 oz Au 1983: 26,000–27,000 oz Au 1986: 3,000 tons/day 1987: 24,855 oz Au 1988: 4,752 oz Au 1989: 32,389 oz Au, 17,611 oz Ag 1990: included with Round Mountain	Gold Hill Formation	16 Ma
Manhattan property	1989: *geologic resource*—100,000 tons, 0.50 oz Au/ton			
Montgomery Shoshone	1988: 3.1 million tons, 0.072 oz Au and 0.240 oz Ag/ton	1989: pre-production	rhyolitic ash-flow tuff	9.5 Ma
Mother Lode (includes Sunday Night Anomaly)	1989: *reserves, proven and probable*—4.9 million tons, 0.054 oz Au/ton, of which 1.8 million tons, 0.048 oz Au/ton are in the Sunday Night Anomaly 1990: Sunday Night Anomaly *oxide reserves*—927,372 tons, 0.047 oz Au/ton; *sulfide ore reserves*—65,217 tons, 0.042 oz Au/ton	1989: 1,000 oz Au, 150 oz Ag 1990: 30,000 oz Au, 3,100 oz Ag	lower Paleozoic rocks, Tertiary dacite porphyry	14 Ma
Northumberland	1988: 12 million tons, 0.06 oz Au/ton	1939–42: 327,000 oz Au 1981–84: 950,000 tons/year 1988: 29,667 oz Au, 130,394 oz Ag 1989: W	Roberts Mountains and Hanson Creek Formations, granodiorite, tonalite, quartz porphyry dikes	85 Ma
Paradise Peak	1989: 5.22 million tons, 0.09 oz Au and 3.62 oz Ag/ton, mill ore; 11.52 million tons, 0.036 oz Au and 0.445 oz Ag/ton, leachable	1986–88: 560,000 oz Au, 8.5 million oz Ag 1989: 228,000 oz Au, 5.17 million oz Ag 1990: 198,800 oz Au, 5.42 million oz Ag	rhyolite and andesite flows, ash-flow and air-fall tuffs	Miocene
Round Mountain (Smoky Valley)	1989: *geologic resource*—271 million tons, 0.032 oz Au/ton	1977–84: 313,480 oz Au, 160,419 oz Ag 1984: 70,000 oz Au 1987: 190,600 oz Au 1988: 233,700 oz Au 1989: 386,227 oz Au, 211,297 oz Ag 1990: 483,192 oz Au, 236,600 oz Ag (includes Manhattan)	rhyolite ignimbrite	25 Ma
Sterling	1989: 469,000 tons, 0.21 oz Au/ton 1990: 519,000 tons, 0.209 oz Au/ton	1983–88: 75,900 oz Au 1989–90: W	Wood Canyon and Bonanza King Formations	14 Ma
Tellis Claims	1988: 850,000 tons, 0.053 oz Au/ton			
PERSHING COUNTY				
Bunce	1989: *geologic reserve*—600,000 tons, 0.04 oz Au/ton 1990: 500,000 tons, 0.04 oz Au/ton	exploration		
Florida Canyon	1988: 37 million tons, 0.023 oz Au/ton	1987–88: 109,300 oz Au 1989: 81,484 oz Au, 24,721 oz Ag 1990: 83,200 oz Au, 19,300 oz Ag	Grass Valley Formation	Cretaceous or Tertiary
Relief Canyon	1988: ~1.3 million tons, 0.03 oz Au/ton	1984: 24,500 oz Au 1987–88: 82,000 oz Au 1989: 30,266 oz Au, 32,835 oz Ag 1990: 4,000 oz Au, 6,400 oz Ag	Natchez Pass Limestone, Grass Valley Formation	Cretaceous

W: withheld

BULK-MINEABLE PRECIOUS-METAL DEPOSITS (continued)

Deposit name	Reserves/resources	Production	Host rock	Mineralization age
PERSHING COUNTY (continued)				
Rochester	1989: *geologic resource*—94.5 million tons, 0.012 oz Au and 1.40 oz Ag/ton	1986–88: 122,400 oz Au, 13 million oz Ag 1989: 76,032 oz Au, 4.63 million oz Ag 1990: 59,000 oz Au, 4.8 million oz Ag	Koipato Group, Weaver Rhyolite	Late Cretaceous
Standard	mined out	1932–51: 46,602 oz Au, 102,721 oz Ag	Natchez Pass Limestone, Grass Valley Formation	73 Ma
Tag-Wildcat	1989: *geologic resource*—1.5 million tons, 0.043 oz Au/ton 1989: 416,000 tons, 0.076 oz Au/ton	1989: exploration	Tertiary volcanic rocks	Miocene
Trinity	1988: 1 million tons, 5.25 oz Ag/ton	1988: mining ended August 1988, heap-leaching continuing 1989: 718,714 oz Ag, 70 oz Au	rhyolite plugs	Miocene
Willard	1989: 3.61 million tons	1989: pre-production	Triassic siltstone	Cretaceous
STOREY COUNTY				
Flowery	1989: 1 million tons, 0.037 oz Au/ton 1990: 6.3 million tons, 0.043 oz Au/ton, *geologic resource*—1.16 million oz Au	1988: 836 oz Au, 9,473 oz Ag 1990: 6,000 oz Au, 70,000 oz Ag	Alta Formation	12 Ma
Oliver Hills project	1990: 3.37 million tons, 0.054 oz Au/ton, 1.2 oz Ag/ton			
WASHOE COUNTY				
Western Hog Ranch	1988: *reserves, proven and probable*—5.5 million tons, 0.064 oz Au/ton; *geologic resource*—20.1 million tons, 0.029 oz Au/ton	1986: 50,000 oz Au 1988: 30,000 oz Au 1989: 25,000 oz Au, 4,000 oz Ag 1990: 25,000 oz Au, 4,500 oz Ag	rhyolite, explosion breccia, sinter	15–16 Ma
Wind Mountain	1988: 15 million tons, 0.021 oz Au and 0.42 oz Ag/ton	1989: 30,900 oz Au, 335,000 oz Ag 1990: W	Tertiary sedimentary rocks	late Tertiary or Quaternary
WHITE PINE COUNTY				
Alligator Ridge	1989: 1 million tons, 0.064 oz Au/ton 1990: 624,000 tons, 0.059 oz Au/ton, *geologic resource*—2.1 million tons, 0.043 oz Au/ton	1981–88: 560,000 oz Au, 70,000 oz Ag 1989: 54,057 oz Au, 10,188 oz Ag 1990: 18,000 oz Au, 4,000 oz Ag	Pilot Shale	Eocene
Bald Mountain (Top)	1989: 6.7 million tons, 0.069 oz Au/ton 1990: 8.7 million tons, 0.062 Au/ton	1986: 50,000 oz Au 1988: 48,619 oz Au 1989: 55,112 oz Au 1990: 60,000 oz Au, 5,000 oz Ag	quartz porphyry, Cambrian shale and limestone	35–38 Ma
Bellview	1988: 277,000 tons, 0.04 oz Au/ton, *geologic resource*—1 million tons, 0.036 oz Au/ton			
Casino/ Winrock	1989: **Casino**—804,000 tons, 0.054 oz Au/ton; **Winrock**—1.3 million tons, 0.037 oz Au/ton 1990: **Winrock**—993,000 tons, 39,000 oz Au	1990: 7,000 oz Au	late Paleozoic sedimentary rocks	Eocene
Easy Junior (Nighthawk Ridge)	1989: 5.68 million tons, 0.031 oz Au/ton	1990: 11,500 oz Au, 900 oz Ag	Devonian and Mississippian rocks	Eocene
Golden Butte	1989: 4.23 million tons, 0.031 oz Au/ton	1989: 12,187 oz Au, 1,448 oz Ag 1990: 22,362 oz Au, 7,700 oz Ag	Chainman Shale	Cretaceous or Eocene
Green Springs	1988: 1.25 million tons, 0.06 oz Au/ton *additional possible resource*—500,000 tons, 0.036 Au/ton	1988: ~12,000 oz Au 1989: 30,000 oz Au, 5,000 oz Ag 1990: 16,000 oz Au, 4,000 oz Ag	Paleozoic sedimentary rocks	Eocene?
Illipah	1988: mined out	1987: ~25,000 oz Au/year 1988: 25,324 oz Au, mining ended 1989: 3,874 oz Au, heap-leached	Paleozoic sedimentary rocks	Eocene?
Little Bald Mtn.	1989: 200,000 tons, 0.13 oz Au/ton; *geologic resource*—260,000 tons, 0.127 oz Au/ton	1985–88: 21,700 oz Au 1989: 5,500 oz Au, 1,500 oz Ag	Antelope Valley Formation	35-38 Ma
Mt. Hamilton	1988: 7.7 million tons, 0.05 oz Au and 0.5 oz Ag/ton	1988: pre-production	Dunderberg Shale	Cretaceous
Pan	1989: 241,000 oz Au			

continued

W: withheld

BULK-MINEABLE PRECIOUS-METAL DEPOSITS (continued)

Deposit name	Reserves/resources	Production	Host rock	Mineralization age
WHITE PINE COUNTY (continued)				
Robinson	1989: 46.0 million tons, 0.019 oz/ton; *geologic resource*—1 million oz Au	1986: 48,000 oz Au, 96,000 oz Ag 1987: 50,207 oz Au 1988: 38,750 oz Au 1989: 78,828 oz Au, 66,340 oz Ag 1990: 75,000 oz Au, 55,000 oz Ag	Rib Hill Sandstone Riepe Spring Limestone	Cretaceous
Sunnyside	1988: 32,000 oz Au at 0.187 oz/ton gold equivalent			
Taylor	1980: 10 million tons, 3 oz Ag/ton	1980: 1,200 tons/day	Guilmette and Joana Limestones, rhyolite dikes	Eocene or Oligocene
White Pine	1989: 63,000 oz Au, 0.04 oz Au/ton	1989: 20,654 oz Au	Pilot Shale	Oligocene?
Yankee		1990: ~15,000 oz Au	Pilot Shale	36–38 Ma?

Basic's magnesite mine and magnesia plant near Gabbs. *S. B. Castor photo.*

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Industrial Minerals

by Stephen B. Castor

Industrial minerals produced in Nevada in 1990 had an estimated value of about $306 million, an increase of nearly 20% over 1989. Increases in production and dollar values of aggregate, barite, cement, clay, gypsum, and lime in 1990 made up for decreases in diatomite, lithium carbonate, and silica. The most important Nevada industrial minerals produced in 1990, in order of estimated dollar value, were aggregate, diatomite, cement, gypsum, lithium carbonate, lime, clay, barite, silica, and magnesia. Data used for these estimates, and data reported for individual commodities below, were obtained from the U.S. Bureau of Mines, the Nevada Department of Minerals, the Mine Inspection Division of the Nevada Department of Industrial Relations, and individual producers of industrial minerals.

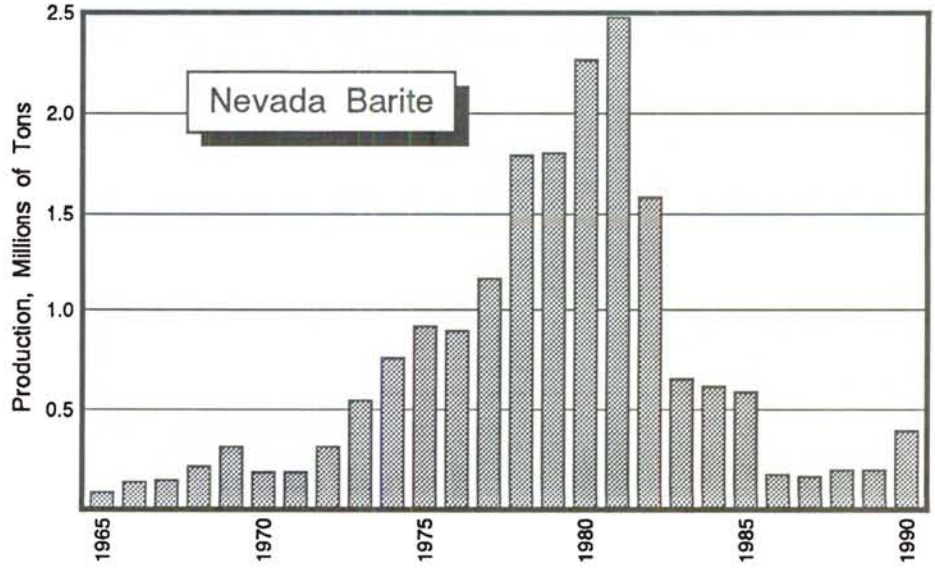
AGGREGATE (sand, gravel, and crushed stone). For 1990, Nevada's aggregate production is estimated at 26 million tons. The Las Vegas area, which accounted for more than half of this production, had an increase of about 25% over 1989, while production in the Reno-Sparks-Carson City area declined slightly.

More than 90% of the aggregate produced in the Las Vegas area comes from unconsolidated alluvial fan deposits. However, large tonnages of crushed limestone from the **Chemstar, Inc.** Sloan operation were used by **Frehner Construction Co.** as base for a new runway at McCarran International Airport. Other large producers of aggregate in the Las Vegas area in 1990 were **Nevada Ready Mix Corp., Bonanza Materials, Inc., WMK Transit Mix, Inc., Las Vegas Paving Corp.**, and **Wells Cargo, Inc.** Although residential construction has slowed somewhat in Las Vegas, aggregate needed for a major highway project in Henderson and for further work on airport runways will support continued large production in 1991.

About 70% of the aggregate produced in the Reno-Sparks-Carson City area comes from unconsolidated deposits, mainly located along the Truckee and Carson Rivers. **Robert L. Helms Construction Co.**, was the largest producer in the area in 1990. Other large aggregate producers in the area in 1990 were **Granite Construction Co., Paiute Pit Aggregates, Inc.**, and **Eagle Valley Construction Co.**

Rhyolitic lightweight aggregate accounts for more than 20% of the aggregate mined in the Reno-Sparks-Carson City area. **All-lite Aggregate Co.** is the area's largest producer, followed by **Rilite Aggregate Co.** and **Naturalite Aggregate Corp.** Crushed stone accounts for the balance of aggregate production in the area. In the Las Vegas area lightweight aggregate accounts for less than 3% of the market. **Southern Nevada Lightweight, Inc.** mines rhyolitic lightweight aggregate from a deposit about 20 miles south of Las Vegas, and **Cind-R-Lite Co.** mines volcanic cinders 100 miles north of Las Vegas.

BARITE. Although Nevada barite production is considerably lower than that of the early 1980s, when over 2 million tons per year were produced for 2 years, increases in shipments to the Gulf Coast sponsored a mild comeback in 1990, and further increases are expected for 1991. Nevada barite shipments in 1990 totalled 404,000 tons, about twice the amount shipped in 1989. However, about 70% of barite shipped in 1990 was low-value crude



Annual production of barite in Nevada, 1965–1990. Production figures are from the U.S. Bureau of Mines (1965–1987) and the Nevada Bureau of Mines and Geology (1988–1990).

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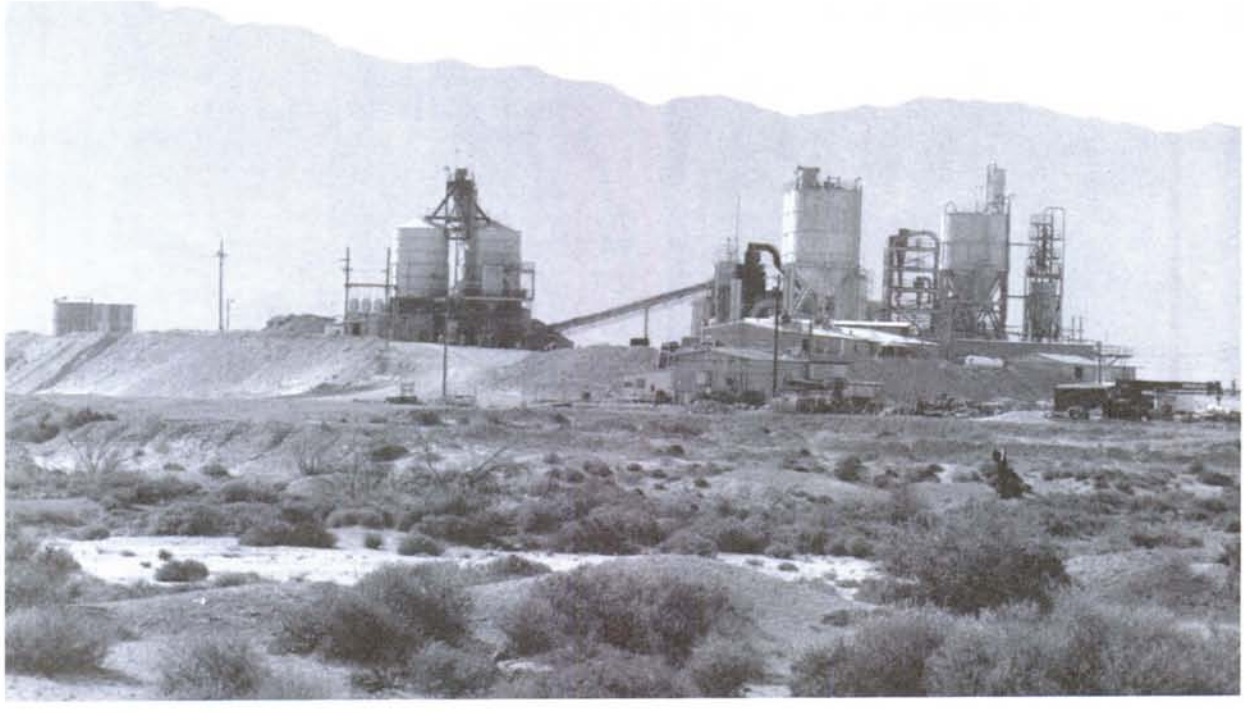
barite, compared with 50% in 1989, so the total value of Nevada barite shipped in 1990 was not double the 1989 value. Low-cost, high-grade Chinese barite significantly impacted Gulf Coast markets during the 1980s; but lower quality, shipment delays, and higher costs of Chinese barite have recently made domestic barite sources more competitive.

At least five Nevada barite producers were active in 1990. **M.I. Drilling Fluids Co.** was the largest producer, operating entirely from stockpiled material and shipping large amounts of crude barite from Beowawe as well as smaller amounts of finished barite from Battle Mountain. **Milpark, Inc.** mined and milled barite at its Argenta operation. Milpark processed barite at Argenta for **N L Baroid, Inc.** which also shipped crude barite from stockpile. Although Baroid did not mine any ore in 1990, stripping was performed at its Rossi mine in Elko County in preparation for mining in 1991. **Circle-A Construction** shipped relatively small amounts of barite from Elko County, while the **Standard Magnesium Co.** produced paint-grade barite from the P & S mine in Nye County. All Nevada barite produced in recent years has come from bedded barite deposits. Most of the productive barite deposits are in the Devonian Slaven Chert, but barite mined in Elko County is in Ordovician rocks.

BORATES. The **American Borate Co.** continued to produce colemanite from mill tailings at its Amargosa Valley plant in 1990. The plant originally treated ore from nearby borate deposits in Death Valley, California, but no borate ore has been produced from these deposits since 1986. In late 1990 the American Borate operation was purchased from **Owens-Corning Fiberglas Corp.** by **Newport Minerals Ventures**. In 1991, Newport Minerals plans to begin small-scale production from the Billie mine in Death Valley. Because the ore was not originally mined in Nevada, borate is not included in the estimate of total value of Nevada industrial minerals.

CEMENT. The **Nevada Cement Co.** plant at Fernley, about 30 miles east of Reno, produces about 400,000 tons of portland cement per year. Construction of the **Las Vegas Cement Co., Inc.** plant at Logandale in Clark County was said to be 99% complete at the end of 1990, and production is slated to begin in 1991.

CLAY. The Amargosa Valley operation of **IMV Division of Floridin Co.** is the largest clay producer in Nevada, producing more than 20 different specialty and commodity products from sepiolite, bentonite, saponite, and hectorite clays. Total production at this Nye County operation increased slightly in 1990 over that in 1989. Sepiolite products, which constitute most of the production, are in strong demand



American Borate's plant in Amargosa Valley. *S. B. Castor photo.*

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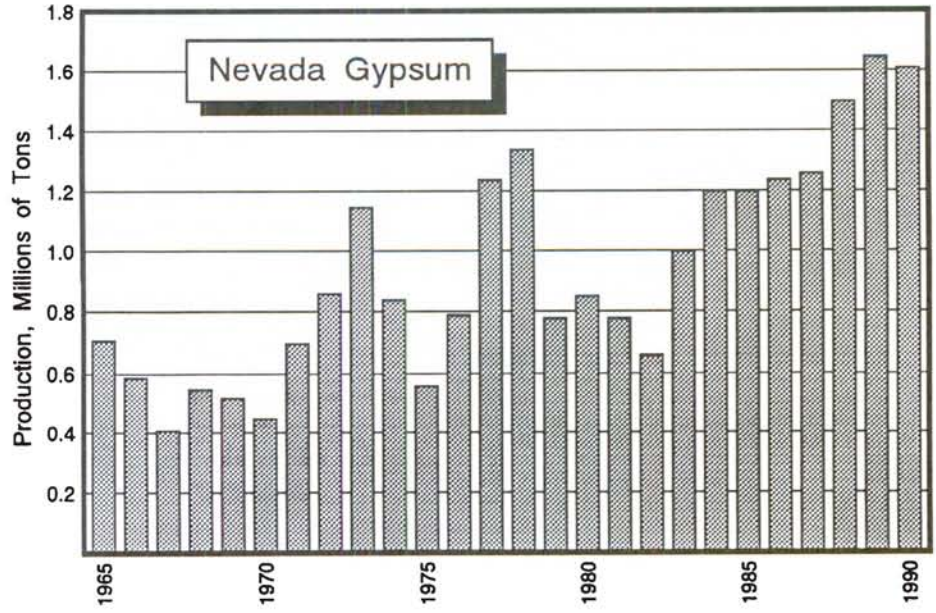

Annual Nevada gypsum production, 1965–1990. Production figures are from the U.S. Bureau of Mines (1965–1986), Nevada Bureau of Mines and Geology data (1987–1988), and Nevada Department of Minerals data (1989–1990).

in the Far East. Sepiolite is used in salt water drilling mud, seed coatings, and decorative ceiling tiles.

American Colloid Co. mines about 5,000 tons per year from a montmorillonite deposit near Lovelock in Pershing County and about 500 tons per year from a hectorite deposit near Disaster Peak in Humboldt County. Clay from both deposits is shipped to South Dakota for processing. Most of the montmorillonite is used to make water-washed white bentonite for ceramic, cosmetic, and laundry products. The hectorite is mostly blended with montmorillonite to make a pharmaceutical product trade-named "Magnabrite." **Vanderbilt Minerals Co.** produced montmorillonite used in pharmaceutical and cosmetic products from Nevada operations in 1990. Most of this production came from the company's New Discovery mine near Beatty in Nye County. Minor clay production in 1990 came from Lyon County where **Tuttle's Golden Minerals** shipped small amounts of montmorillonite for use in livestock feed from stockpile and the **Art Wilson Co.** mined and shipped montmorillonite for aquacultural uses. In addition, the Art Wilson Co. mined halloysite in Washoe County as a **Nevada Cement Co.** contractor. **J. M. Huber Corp.** continued to evaluate its hectorite property in northern Humboldt County in 1990.

DIATOMITE. Nevada diatomite production in 1990 was about 10% higher than in 1989. **Eagle-Picher Industries, Inc.**, the largest Nevada producer, mines diatomite at three locations in northern Nevada, processes the material at two plants, and ships products worldwide. Filtration-grade diatomite is produced at the Colada operation in Pershing County, absorbent and filler grade diatomite comes from the Clark mine in Storey County, and crude diatomite used in the manufacture of calcium silicate is shipped from a pit in Lyon County. Asbestos litigation developments in 1990 did not impact the company's Nevada diatomite operations which produced at levels comparable to 1989.

Other companies that mined diatomite in Nevada in 1990 are **Moltan Co.** which produced absorbent-grade diatomite and **Canyon Resources** which produced absorbent- and filler-grade diatomite, both from operations in the Fernley area. In addition, **Grefco, Inc.** produced filler-grade diatomite from a mine on the Esmeralda/Mineral county line.

DIMENSION STONE. **Nevada Neanderthal Stone**, a subsidiary of **D & H Mining**, quarries Tertiary tuff from nine sites in Nye County. Quarried blocks weighing up to 25 tons are hauled to a cutting shop near Beatty. The company makes a variety of products, including tile, wall cladding, stone columns, and stone molding, from 12 different rock types. The shop has the capacity to produce 2,000 square feet of tile per day. Products were originally sold through brokers, but the company has begun its own marketing, and has sold stone in markets as far away as Hawaii.

FLUORSPAR. **J. Irving Crowell, Jr. and Son**, operator of the Daisy mine, the last remaining fluorspar mine in the western U.S., discontinued mining operations in 1989. Minor sales were made from stockpiled material in 1990.

GYPSUM. Nevada gypsum production decreased slightly in 1990 from its high in 1989 due to lower demand for construction products. Most of the gypsum produced is used in the manufacture of wallboard at Nevada plants. In 1990, **PABCO Gypsum** near Las Vegas was the largest producer in Nevada. The company mines gypsum from a friable low-grade ore and removes impurities (mostly clay)

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by washing. Approximately 90% of the gypsum produced is used to make wallboard at a plant adjacent to the mine. Other major Nevada producers in 1990, in order of tons of gypsum used or shipped, were **U.S. Gypsum Corp.** at Empire in Washoe County, **James Hardie Gypsum** and **Georgia Pacific Corp.** near Las Vegas, and **Art Wilson Co.** in Lyon County near Carson City. Other companies with minor 1990 gypsum production were **Nevada Gypsum and Mining** and **White Grow Gypsum Co.** in Clark County.

LIME, LIMESTONE, AND DOLOMITE. Nevada lime production increased substantially in 1990. The **Continental Lime, Inc.** Pilot Peak high-calcium lime operation in Elko County, which started production in 1989, increased production from 22,300 tons in 1989 to 103,000 tons in 1990 in response to strong demand for lime used to control pH in gold extraction in northern Nevada. Raw material for this operation comes from the Devonian Devils Gate Limestone.

Chemstar, Inc. remained the most important Nevada lime producer, producing dolomitic lime in Henderson from Mississippian dolomite mined about 10 miles south of Las Vegas, and high-calcium lime from Devonian limestone at Apex about 15 miles northeast of Las Vegas. High-calcium lime production at Apex reached an all-time high in 1990, but Henderson dolomite lime production sagged due to softening construction markets. In June 1990, Chemstar announced plans to build a plant capable of producing 400 tons of high-calcium lime per day in Pershing County to take advantage of increased demand for the product in gold extraction. Initially the plant was to be located about 7 miles northeast of Oreana, adjacent to a resource of Triassic high-calcium limestone in the Humboldt Range. However, subsequent discoveries of large amounts of high-calcium limestone closer to Winnemucca in the East Range have resulted in reevaluation of plant site locations. In 1990, **Min-Ad, Inc.** and **Nutritional Additives Corp.**, both located near Winnemucca, produced dolomite for sale to agricultural users.

LITHIUM CARBONATE. **Cyprus Foote Mineral Co.** decreased production of lithium carbonate from brine at Silver Peak in Esmeralda County in 1990 because of increased production from a similar operation that it owns in Chile. Silver Peak production is expected to be maintained at about 14 million pounds for a number of years; reserves are estimated at more than 300 million pounds.

MAGNESIA. Overall 1990 magnesia production at the **Basic, Inc.** magnesite mine and magnesia plant at Gabbs was approximately equal to 1989 production, but sales of higher-priced refractory magnesia decreased. It is likely that production of refractory magnesia will cease altogether at Gabbs in the future. The parent company, **Asea Brown Boveri**, is proceeding with plans to sell off all mining operations, including the Gabbs facility, that it acquired through its acquisition of **Combustion Engineering, Inc.** in 1989.

PERLITE. The **Wilkin Mining and Trucking Co.** ships both crude and expanded perlite from mines in Lincoln County. "Onion skin" perlite is mined underground at the Delamar mine and hauled about 35 miles to a popping plant in Caliente. Shipments of crude perlite from the Mackie mine decreased in 1990. Both mines are in a 10- to 100-foot-thick perlite layer in Tertiary tuffs in the Pahroc Range. The company may reactivate the Hollinger perlite mine near Pioche, formerly the largest Nevada perlite producer. Wilkin acquired the Hollinger property after **Kerr-McGee** dropped it in the early 1980s.

SALT. The **Huck Salt Co.**, which harvests salt from a dry lake near Fallon, decreased production in 1990 relative to 1989. Most sales are to state and local government highway departments.

SILICA. **Simplot Silica Products** produced about 610,000 tons of silica sand in 1990 from an operation at Overton about 40 miles northeast of Las Vegas, nearly 15% less than the 1989 production. Although California's new bottle bill did not appear to have the expected negative impact in 1990, declines in the construction and automotive industries caused demand for window glass to decline. In addition, the **Owens-Illinois Inc.** Ione operation, the largest silica sand producer in California, renewed production in 1990 after a temporary shutdown.

At Simplot's Nevada operation, sand is mined from an open pit in Cretaceous Baseline Sandstone, beneficiated by washing in the pit, and piped as a slurry about 4 miles to a screening plant and railhead. The final product contains 99.2% silica, along with 0.2% alumina and 0.07% iron oxide. About 75% of the production is used in glass manufacture and most of the rest is used as foundry sand.

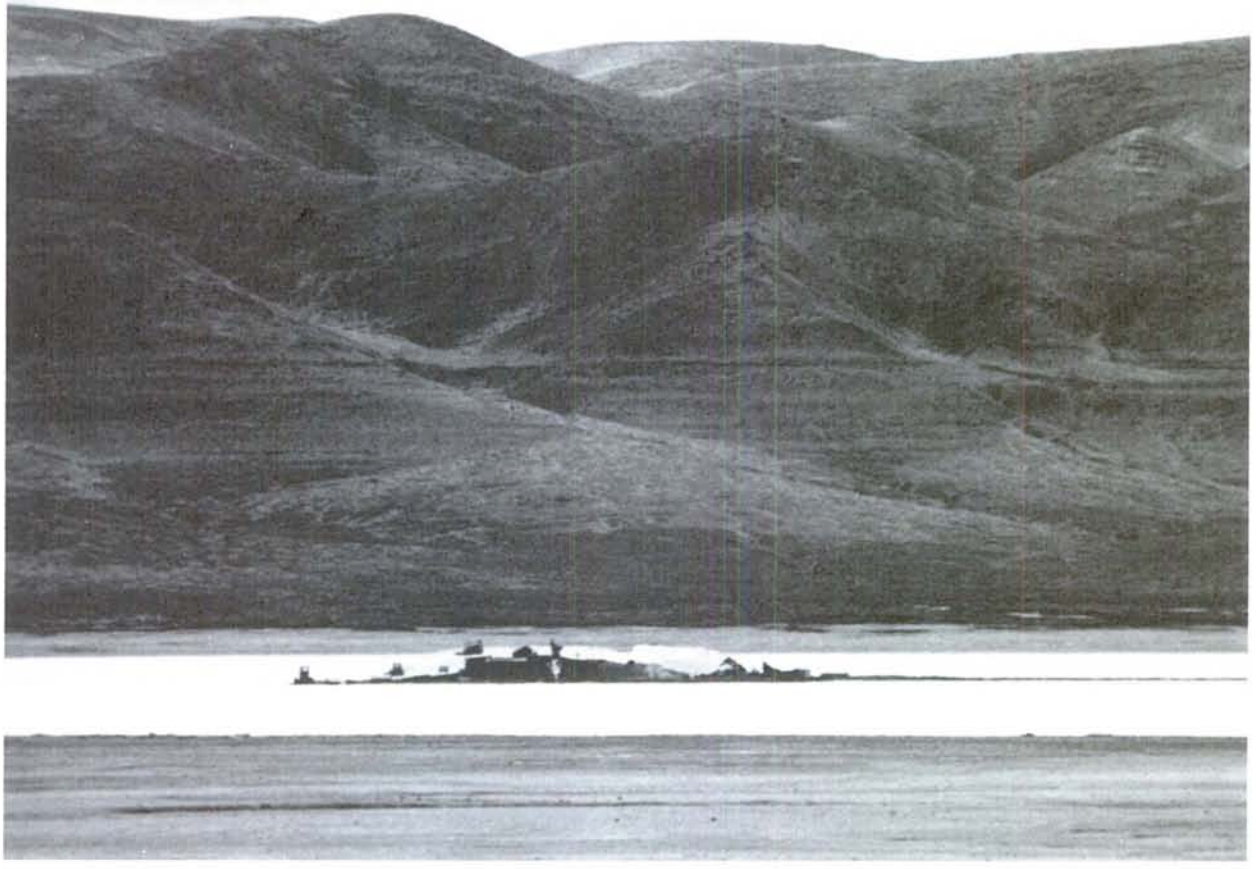
The **Aztec Glass Sand Co.** was formed to mine silica sand from a deposit in Clark County about 15 miles southwest of Overton. The deposit is in nearly white Jurassic Aztec Sandstone, which is typically red-brown to buff in southern Nevada. The company performed drilling and quality testing in 1990, but no mining was done.

VERMICULITE. Following the closure of the **Manville Corp.** vermiculite deposit in Montana, rumors have circulated regarding development of the Gold Butte vermiculite deposit about 50 miles east of Las Vegas. The deposit consists of friable mica-rich areas in a 1,000- by 5,000-foot exposure of Precambrian hornblende pyroxenite.

WOLLASTONITE. In late 1989, **Sikaman Gold Resources, Ltd.** announced the discovery of a major deposit of wollastonite in the Gilbert mining district of Esmeralda County. The deposit contains substantial reserves of rock containing more than 50% wollastonite. In 1990, Vancouver-listed **White Plains Resources Corp.** purchased a 25% interest in the property and announced its intention to purchase the remaining 75%. White Plains plans to mine 100,000 to 200,000 tons per year beginning in 1992.

Wollastonite has been mined since the 1930s, mainly for use in ceramics. Developing markets as an asbestos substitute and as fibrous filler in plastics have stimulated interest in the commodity. New York state is presently the site of the world's largest wollastonite production, but worldwide production capacity is being expanded. Considerable competition for markets in the Pacific rim area, which would be served by a Nevada deposit, is anticipated from deposits in India, China and Mexico.

ZEOLITES. At its Ash Meadows plant in Nye County, **East West Minerals, Inc.** processes clinoptilolite that is mined nearby in California. Production in 1990 was comparable to that in 1989. East West's mordenite operation at Eastgate in Churchill County remained idle, but negotiations regarding its sale or a possible joint venture took place in 1990.



Huck Salt's plant near Fallon. *S. B. Castor photo.*

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Directory of Mining and Milling Operations

by Ronald H. Hess

Compiled from information supplied by the Nevada Division of Mine Inspection, Nevada Department of Minerals, and U.S. Mine Safety and Health Administration. Only sand and gravel operations with production of more than 300,000 tons listed.

EX = exploration, HL = heap leach, ML = mill, OP = open-pit mine, OS = other surface, PL = placer, UG = underground mine.

Mine/plant name	Operator	Location	Commodity	Type	Process/ activity	Employees	Address
CARSON CITY							
Orestima mill	Comstock Mining and Refining Co.	S14,T15N,R21E	gold silver	OP	mill	1	Rocky Conner, Owner-Operator 999 Pinion Hills Drive Carson City, NV 89701
CHURCHILL COUNTY							
Amelia mill #1	Sage Brush Resources, Inc.	S30,T19N,R29E	gold silver	ML	testing	5	Bob Lain, Operations Manager 111 Freeport Circle Fallon, NV 89406
Fondaway mine	Tenneco Minerals	S1,3,T22N,R33E	gold silver	OP,HL	cyanide	29	Gary L. Beahm, Mine Manager P.O. Box 1017 Fallon, NV 89406
	J.D. Welsh and Associates, *contractor*	S1,T22N,R33E		ML	leaching		Lon Armstrong, Vice President 5301 Longley Lane Reno, Nv 89408-0860
	RAMCO, Inc., *contractor*	S1,T22N,R33E		ML	leaching		Gene Ranstrom, Owner General Delivery Imlay, NV 89418
Huck Salt	John Huckaby	S12,T16N,R31E	salt	OS	solar evaporation	3	John Huckaby, Owner 895 Harrigan Road Fallon, NV 89406
Iron mine	Art Wilson Co.	S16,T24N,R34E	magnetite iron ore	OP	loader in stockpile	2	Art Wilson, Owner P.O. Box 1160 Carson City, NV 89701
Landsources	L & C Venture	S26,T24N,R29E	gold silver	OP	single bench	14	Bob Lain, Operations Manager 316 California Street, Suite 461 Reno, NV 89509
Mill site, Sunlite No. 1	Fallon Mining Co.	S14,T19N,R29E	gold silver	ML	development	9	Douglas C. Boseman, President 2641 Trento Lane Fallon, NV 89406
Moltan mine and plant	Moltan Co.	S28,29,32,33, T23N,R27E	diatomaceous earth	OP,ML	single bench crushing screening	31	W. M. Gurley P.O. Box 860 Fernley, NV 89408-0860
CLARK COUNTY							
Airway pit #1	Airway Rock Products Co.	S14,T20S,R62E	sand gravel	OS,ML	single bench crushing screening	5	Thomas Childs, Vice President 5000 E. Bonanza, Box 8451 Las Vegas, NV 89110
Apex plant	Chemstar, Inc.	S26,T18S,R63E	limestone	OP,ML	multiple bench calcining hydrating	42	Art Reber P.O. Box 3598 North Las Vegas, NV 89036
Blue Sky #1	American Asphalt, Inc.	S1,T20S,R59E	sand gravel	OS,ML	single bench screening crushing	6	Dan Andress, President 3624 Goldfield Avenue North Las Vegas, NV 89030
Bonanza Materials pit and plant	Bonanza Materials, Inc.	S9,T22S,R62E	sand gravel	OS,ML	single bench crushing screening	22	Joe McDonough, Vice President 565 Lalif Road Henderson, NV 89015
Buffalo Road pit and mill	W.M.K. Transit Mix, Inc.	S20,T21S,R60E	sand, gravel	OS,ML	single bench crushing screening	12	Jeff Flannigan P.O. Box 14697 Las Vegas, NV 89114
Coyote mine and mill	Coyote Mines, Inc.	S22,23,T28S,R63E	gold	ML	gravity	4	Sanford A. Shuler, Jr., President P.O. Box 9 Searchlight, NV 89046

DIRECTORY OF MINING AND MILLING OPERATIONS (continued)

Mine/plant name	Operator	Location	Commodity	Type	Process/ activity	Employees	Address
CLARK COUNTY (continued)							
Dolomite plant	Chemstar, Inc.	S18,T22S,R63E	dolomitic lime	ML	calcining	31	Dave Johnson, President 2551 North Green Valley Parkway, Suite 201-B Henderson, NV 89015
Eldorado mine	Brookline Mining Co.	S2,T27S,R63E	precious metals	OP	single bench	12	C. Ray Kerby, Superintendent P.O. Box 61620 Las Vegas, NV 89160
Geneva mill	Geneva Minerals, Inc.	S36,T28S,R63E	gold	ML	heap leach	4	T. D. Barnes, President P.O. Box 963 Searchlight, NV 89046
Georgia-Pacific quarry	Georgia-Pacific Corp.	S10,11,14-16, T16S,R66E	gypsum	OP	single bench crushing	75	J.P. Wassenberg P.O. Box 30006 North Las Vegas, NV 89030
Golden Dawn's mine	Snowbird Resources	S2,T29S,R63E	gold	OP,ML	single bench gravity concentration	3	M. R. Vandergrift, President 3355 Spring Mountain Road Las Vegas, NV 89102
Henderson pit and mill	Nevada Ready Mix Corp.	S10,T21S,R62E	sand gravel	OS,ML	single bench crushing screening	19	Richard Thornton General Manager-Vice President P.O. Box 42755 Las Vegas, NV 89104
Henderson quarry	Whiting Brothers, Inc.	S34,35,T21S,R62E	landscape rock	OP	screening	7	Mark C. Whiting 6418 E. Vegas Valley Drive Las Vegas, NV 89122
James Hardie Gypsum	James Hardie Gypsum, Inc.	S20,29-31,32, T21S,R59E; S5,T22S,R59E S24-26,T21S,R58E	gypsum	OP	grinding calcining	100	Dave Kessner, Works Manager HCR 89033, Box 2900 Las Vegas, NV 89124
Las Vegas cement plant	Las Vegas Cement, Inc.	S10,T15S,R67E	cement	ML	construction	31	Aldo Dinardo, Owner and President P.O. Box 380 Logandale, NV 89021
Lone Mountain Stocks pit	Southern Nevada Paving	S11,T20S,R59E	sand gravel	OS	single bench	35	Floyd Meldrum, President 3555 Polaris Avenue Las Vegas, NV 89102
Micron mine and mill	Micron Minerals Corp.	S6,T13S,R64E	gold	OP,ML	single bench construction	30	Gordon Lee, President 2245D Renaissance Drive Las Vegas, NV 89118
Money pit	Southern Nevada Liteweight	S9,16,T25S,R61E	lightweight aggregate	OP	crushing screening	25	Spencer Apple 4675 Wynn Road Las Vegas, NV 89103
Nevada Gypsum mine	Nevada Gypsum & Mining	S27,33,34, T28S,R63E	gypsum	OP,ML	drilling blasting crushing	9	Richard Thornton 928 S. Valley View Las Vegas, NV 89107
Oro Plata mine	Oro Plata Resources, Inc.	S17,T26S,R63E	silver	UG	rehabilitation	6	Floyd Robertson, President 5130 E. Charleston Boulevard, Suite 5125 Las Vegas, NV 89122
PABCO Gypsum-Apex	Pacific Coast Building Products, Inc.	S7,8,17,18, T20S,R64E	gypsum	OP	wash plant	80	Stanley L. Asbell 1973 N. Nellis Boulevard #328 Las Vegas, NV 89115
Rare Metals Corporation mill	Rare Metals Corp.	S33,T29S,R64E	gold	ML	cyanidation	8	Frank Snyder Sr., President P.O. Box 80 Searchlight, NV 89046
Simplot Silica Products #3 pit and mill	Simplot Industries	S30,T16S,R68E	silica sand	OP,ML	flotation multiple bench drying screening	43	W. J. Sandoval, Manager P.O. Box 308 Overton, NV 89040
Sloan quarry	Chemstar, Inc.	S13,T23S,R60E	dolomite	OP	crushing sizing	15	Earl Gillian HCR31, Box 2300 Las Vegas, NV 89124
	Frehner Construction Co. *contractor*	S13,T23S,R60E	sand gravel	OS,ML	single bench crushing screening	10	Dave Yoeman, Superintendent 124 West Brooks Avenue N. Las Vegas, NV 89030

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DIRECTORY OF MINING AND MILLING OPERATIONS (continued)

Mine/plant name	Operator	Location	Commodity	Type	Process/ activity	Employees	Address
CLARK COUNTY (continued)							
Spring Mountain pit and millpit and mill	Wells Cargo, Inc.	S4,T21S,R60E	sand gravel	OS,ML	single bench crushing screening	16	Howard Wells, General Manager P.O. Box 14037 Las Vegas, NV 89114
Sunrise pit	Southern Nevada Paving, Inc.	S14,T20S,R62E	sand gravel	OS,ML	single bench crushing screening	8	Floyd Meldrum, President 3555 Polaris Avenue Las Vegas, NV 89102
Treasure Hawk mine and mill	Eddie Bounsall	S34,T19S,R70E	gold silver	OP,ML	single bench gravity concentration cyanidation	3	Eddie and Billy Bounsall, Owners P.O. Box 357 Logandale, NV 89021
Wallboard plant	Georgia Pacific, Inc.	S24,T18S,R63E	gypsum	ML	calcining	11	Jean Wassenberg, Manager P.O. Box 30006 North Las Vegas, NV 89030
White-Grow Gypsum Co.	GKB Nevada Holdings, Inc.	S30,T15S,R67E	gypsum	OP,ML	single bench crushing screening	6	Jerry Morrison, General Manager 300 Crescent Court, Suite 1300 Dallas, TX 75201
White Rock 5 pit and mill	Basic Rock & Sand	S21,T21S,R61E	sand gravel	OS,ML	single bench screening washing	10	Charles Thompson, President 911 Athens Henderson, NV 89015
DOUGLAS COUNTY							
Buckskin leach plant	Sonora Mining Corp.	S13,T13N,R23E	gold silver	HL	cyanide	27	George Newell P.O. Box 546 Yerington, NV 89447
Eureka mine and mill	Cave Bear Mining Corp.	S27,34,T9N,R23E	gold silver copper	UG	mill	2	Garth Frehner, Owner P.O. Box 2921 Gardnerville, NV 89410
ELKO COUNTY							
Big Ledge mine	Circle A Construction	S26,T42N,R61E	barite	OP	multiple bench	3	James Madsen, Superintendent Star Route Jackpot, NV 89825
	Dale Aslett, *contractor*	S26,T40N,R57E		OP	stockpile crush		Dale Aslett, Owner P.O. Box 105 Jackpot, NV 89825
Big Springs mine and mill	Independence Mining Co., Inc.	S1-3,11,12, T42N,R53E	gold silver	OP,HL	cyanide fluid-bed roasting	118	Tom Porter Mountain City Star Route Elko, NV 89801
	Gibbons & Reed Co., *contractor*	S11,12,T42N,R53E		OP	multiple bench		C. David Baer, Project Manager 1111 Brickyard Road Salt Lake City, UT 84130
	Lang Drilling, *contractor*	S10,T42N,R53E		EX	rotary drilling		Jim Collard, Project Manager 439 West Commercial Elko, NV 89801
	The Industrial Co. of Steamboat Springs, *contractor*	S11,12,T42N,R53E		OP	construction		Stan Palmer, Superintendent Rural Route 42144 Elko, NV 89801
Dee gold mine	Rayrock Mines, Inc.	S34,T37N,R49E	gold silver	OP,HL, ML	cyanide	102	David S. Cook, General Shop Manager P.O. Box 1193 Elko, NV 89801
Hollister mine	Ivanhoe Gold Co.	S3,10,T37N,R48E	gold	OP	multiple bench heap-leach	40	Rachal Lewis, Jr., Vice President and General Manager 623 Fairgrounds Road Winnemucca, NV 89445

DIRECTORY OF MINING AND MILLING OPERATIONS (continued)

Mine/plant name	Operator	Location	Commodity	Type	Process/ activity	Employees	Address
ELKO COUNTY (continued)							
Jerritt Canyon joint venture	Independence Mining Co., Inc.	S33,T41N,R53E	gold	OP,ML, HL	cyanide grinding fluid bed roasting	562	J. W. Murray Mountain City Star Route Elko, NV 89801
	Blatzer Construction Co., *contractor*	S33,T41N,R53E		ML,HL			John Blatzer, President P.O. Box 4460 Medford, OR 97501
	George Delong Construction, *contractor*	S16,T40N,R53E		EX	exploration, rotary drilling		833 East 4th Street Winnemucca, NV 89445
	Hackworth Drilling, *contractor*	S21,T40N,R53E		EX	exploration, rotary drilling		Royce Hackworth, President 850 West Main Street Elko, NV 89801
	Idaho Resources, Inc., *contractor*	S34,35,T41N,R53E		ML,HL			Mark Cook, Superintendent P.O. Box 84340 Vancouver, WA 98684-0340
	The Industrial Co. of Steamboat Springs, *contractor*	S33,T41N,R53E		OP	multiple bench		Doug Green, Construction Manager Rural Route 4213 & Freeport Road Elko, NV 89801
	Transystems, Inc., *contractor*	S33,T41N,R53E		OP	multiple bench		J. Michael Rice, President P.O. Box 399 Black Eagle, MT 59414
Pilot Peak lime plant	Continental Lime, Inc.	S14,T34N,R68E	lime	OP	multiple bench roasting grinding rotary kiln	26	Norman Tupper P.O. Box 2520 Wendover, NV 89883
Rossi mine	N. L. Industries, Baroid Division	S15,21,22, T37N,R49E	barite gold	OP,ML	multiple bench crushing gravity concentration	12	August V. Castelli, Manager P.O. Box 231 Battle Mountain, NV 89820
	John Davis Trucking Co., *contractor*	S15,21,22, T37N,R49E		OP	multiple bench		John N. Davis, Owner 165 West Front Street Battle Mountain, NV 89820
Snoose Creek mine	Circle A Construction Co.	S26,T42N,R61E	barite	OP	multiple bench	1	James Madsen, Superintendent Star Route Jackpot, NV 89825
	Dale Aslett, *contractor*	S26,40,R57E			stockpile crush	2	Dale Aslett, Owner P.O. Box 105 Jackpot, NV 89825
Tuscarora gold mine	Horizon Gold Corp.	S2,3,T39N,R51E	gold silver	OP,HL	cyanide	48	Bob Jones P.O. Box 37 Tuscarora, NV 89834
	RAMCO, Inc., *contractor*	S3,T39N,R51E		OP	crushing		Gene Ranstrom, President/Owner P.O. Box 37 Tuscarora, NV 89834
Wood Gulch	Homestake Mining Co.	S23-26,T44N,R53E	gold silver	OP,HL	cyanide	19	Fred Craft, Project Manager P.O. Box 277 Mountain City, NV 89831
ESMERALDA COUNTY							
Basalt mine & mill	Grefco, Inc.	S29,T2N,R34E	diatomaceous earth	OP,ML	grinding	12	Robert A. Poelvoorde, Plant Manager P.O. Box 288 Mina, NV 89422
Blanco mine	Vanderbilt Minerals Corp.	S22,T1N,R37E	clay	OP	grinding bagging	6	Jerry W. Lease 2320 Viking Road Las Vegas, NV 89109
Boss mine	EBCO Enterprises	S4,5,T02N,R38.5E; S19,30-33, T03N,R39E	gold silver	OP,HL	cyanide	2	Jack T. Watterson, General Manager P.O. Box 3719 Tonopah, NV 89049

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DIRECTORY OF MINING AND MILLING OPERATIONS (continued)

Mine/plant name	Operator	Location	Commodity	Type	Process/ activity	Employees	Address
ESMERALDA COUNTY (continued)							
Cyprus Foot Mineral	Cyprus Minerals	S22,T2S,R39E	lithium carbonate	OS	evaporation precipitation	61	E. Joel Christophersen General Delivery Silver Peak, NV 89047
Goldfield operation	Red Rock Mining (USA), Inc.	S25,35,T02S,R42E	gold	OP,HL	cyanide	77	John Webster P.O. Box 160 Goldfield, NV 89013
McLean mine	Kinkaid Exploration and Mining Co. II	S15,T4N,R38E	gold silver	OP,ML, HL	single bench cyanide	1	William Pautler, Manager P.O. Box 1531 Tonopah, NV 89049
Silver Peak	Homestead Minerals, Corp.	S1,2,T3S,R38E	gold silver	OP,ML		70	Earl Haldeman Nivlok Road Silver Peak, NV 89047
	Parsons Construction Co., *contractor*	S6,T2S,R39E		OP	multiple bench		Elton Parson, Owner P.O. Box 2658 Silver Peak, NV 89047
EUREKA COUNTY							
Barrick Goldstrike mine	American Barrick Resources	S12,20,29,30, T36N,R50E; S23-26,T36N,R49E	gold silver	OP,ML, HL	cyanide milling	1,210	John T. McDonough P.O. Box 29 Elko, NV 89801
	J. S. Redpath Corp., *contractor*	S23,T36N,R49E		UG	exploration development		Scott McIntosh, General Manager P.O. Box 3094 Elko, NV 89801
	Liggett Industries, Inc., *contractor*	S30,T36N,R50E		OP			Wayne M. Liggett, President 7003 W. Banff Peoria, AZ 85345
	Ledcor Construction, Inc., *contractor*	S26,T36N,R49E		OP	multiple bench		George Hoar, Vice President P.O. Box 2808 Elko, NV 89801
	United Drilling Inc., *subcontractor*	S26,T36N,R49E		OP	construction		Al Volking, President
	Western States Energy, *subcontractor*	S26,T36N,R49E		OP	multiple bench		Vern Long, President P.O. Box 1386 Elko, NV 89801
Buckhorn mine	Cominco American Resources Inc.	S30,31,T27N,R49E	gold silver	OP,HL	cyanide multiple bench Merrill Crowe	81	Warren R. Hood P.O. Box 847 Carlin, NV 89822
	A & K Earth Movers, Inc., *contractor*	S30,31,T26N,R45E		OP,HL	multiple bench cyanidation		K. Bart Hiatt, Vice President P.O. Box 1059 Fallon, NV 89406
Gold Bar mine	Atlas Gold Mining, Inc.	S26,27,T22N,R49E	gold	OP,ML, HL	multiple bench crushing grinding cyanidation	215	C. W. Diercks, III P.O. Box 282 Eureka, NV 89316
	CEC Construction Co., *contractor*	S26,27,T22N,R49E		OP	multiple bench		Phil Rothstein, President P.O. Box 784 Eureka, NV 89316
	Selland Construction Co., *contractor*	S26,27,T22N,R49E		OP	multiple bench		Brad Selland, President 1285 S. Wenatchee Wenatchee, WA 99223
Newmont Gold operations	Newmont Gold Co.	T31N-36N, R49E-53E	gold silver	OP,ML, HL	carbon-in-leach carbon-in-pulp cyanide	2,250	Eric Hamer, Resident Manager P.O. Box 669 Carlin, NV 89822-0669
	Ames Construction, Inc., *contractor*	T33-36N,R50-51E					Russ Harvey, Project Manager P.O. Box 489 Carlin, NV 89822
	Liggett Industries, Inc., *contractor*	T33N-36N, R50E-51E		OP			Wayne M. Liggett, President 7003 W. Banff Peoria, AZ 85345

DIRECTORY OF MINING AND MILLING OPERATIONS (continued)

Mine/plant name	Operator	Location	Commodity	Type	Process/ activity	Employees	Address
EUREKA COUNTY (continued)							
Project Glister	USSRAM Exploration Company	S9-11,14-16,21-23, 27,28,T19N,R53E	gold silver	OP,HL	cyanide carbon adsorption	12	Ron Palmer P.O. Box 693 Eureka, NV 89316
	Charles Joseph Trucking, Inc., *contractor*	S22,T19N,R53E		OP,HL			Wayne Joseph, President P.O. Box 437 Eureka, NV 89316
SR278 gravel plant	Las Vegas Paving Corp.	S33,T29N,R52E	sand gravel	OP	single bench screening crushing	7	Bob Mendenhall, President 1770 Industrial Road Las Vegas, NV 89102
Tonkin Springs gold mine	U.S. Gold Corp.	S2-6,T23.5N,R49E	gold silver	OP,ML, HL	bio-oxidation cyanide	40	William B. Williams P.O. Box 671 Elko, NV 89801
HUMBOLDT COUNTY							
Adelaide Crown mine	Gold King Nevada, Inc.	S13,14,T34N,R39E	gold silver	OP	heap-leach cyanide	42	Stephen Tibbals P.O. Box 1434 Winnemuuca, NV 89445
Bonanza opal mine	Lloyd H. Olds	S13,T45N,R25E	precious opal	OP	single bench	3	P.O. Box 13 Denio, NV 89404
Chimney Creek mine	Gold Fields Operating Co.	S5-8,T39N,R43E	gold silver	OP,ML, HL	grinding cyanide	220	Jim H. Gourdie, Manager P.O. Box 69 Golconda, NV 89414
	Lang Exploratory Drilling, *contractor*	S5,T39N,R43E			exploration rotary drilling		Alan Lang, Zone Manager 2286 West 1500 South Salt Lake City, UT 84104
Crofoot/Lewis mine	Hycroft Resources & Development, Inc.	S24?,T35N,R29E; S19,20?,T35N,R30E	gold silver	OP,HL	crushing cyanide	185	P.O. Drawer M Winnemucca, NV 89445
Getchell mine	FirstMiss Gold Inc.	S3,4,T38N,R42E; S33,T39N,R42E	gold silver	OP,ML, HL	multiple bench fluid-bed roasting cyanide	306	Q. Allen Neal P.O. Box 220 Golconda, NV 89414
	Brown & Root USA, Inc., *contractor*	S3,4,T38N,R42E; S32-34,T39N,R42E		OP	multiple bench		Larry Kuhlman, Project Manager P.O. Box 1560 Winnemucca, NV 89445
	Gilbert Western Corp., *contractor*	S22,T39N,R42E		OP	bench		Tait Johnson, President P.O. Box 2217 Winnemucca, NV 89445
	Stebbins Engineering & Manufacturing Co., *contractor*	S3,4,T38N,R42E; S32-34,T39N,R42E		OP	construction		A. I. Calligaris, President, CEO P.O. Box 129 Golconda, NV 89414
	The Industrial Co., *contractor*	S3,4,T38N,R42E; S32-34,T39N,R42E		OP	multiple bench		Ken Dean, Project Superintendent P.O. Box 1880 Winnemucca, NV 89445
Gold Run mine	Marlon H. Thompson	S28,T34N,R40E	gold	OP,ML	single bench gravity concentration	3	Marlon H. Thompson, Owner/Operator 422 West Haskill Box 8 Winnemucca, NV 89445
Golden Sands project	Bronco Minerals, Inc.	S25,26,30, 31,36,T37N,R31E	gold	OP,ML	single bench gravity concentration	10	Donald Holder, President P.O. Box 1885 Winnemucca, NV 89445
	Micon, Inc., *contractor*	S25,26,30, 31,36,T37N,R31E	gold	OP,ML	single bench gravity concentration		John Rice and Gene Pridemore, Managers P.O. Box 1940 Winnemucca, NV 89445
Gold Run/ Oro Fino (testing program)	Camm-Tex International, Inc.	S17,18T34N,R40E	placer gold	OP,ML	sampling gravel concentration	5	Burliegh Miller, Sr., President P.O. Box 1906 Winnemucca, NV 89445
Hectorine mill	J.M. Huber Corp.	S24,T45N,R34E	hectorite clay	OP,ML	single bench sizing	6	David Durham, Senior Research Scientist 4500 Jungo Road Winnemucca, NV 89445

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DIRECTORY OF MINING AND MILLING OPERATIONS (continued)

Mine/plant name	Operator	Location	Commodity	Type	Process/ activity	Employees	Address
HUMBOLDT COUNTY (continued)							
Kelley mine	C. George Hewitt	S30,T45N,R26E	precious opal	OP		1	C. George Hewitt, Owner P.O. Box 33 Denio, NV 89404
Lone Tree mine	Lone Tree Mining, Inc.	S11,T34N,R42E	gold	OP		10	Edward R. Sherwood, Vice President/ Operations P.O. Box 3442 Winnemucca, NV 89445
Marigold mine	Marigold Mining Co.	S8,9,17-19, T33N,R43E	gold silver	OP,ML, HL	grinding multiple bench cyanide	161	Jerry Harrington, General Manager P.O. Box 9 Valmy, NV 89438
McDermitt mine	Placer Dome US, Inc.	S27,28,33,34, T47N,R37E	mercury	OP,ML	flotation retorting	W	Randy Powell P.O. Box 497 McDermitt, NV 89421
MIN-AD mine and mill	MIN-AD, Inc.	S25,T36N,R37E; S28,T35N,R38E	limestone	OP	grinding	18	Charles Evans, Mill Superintendent 4210 W. Jungo Road Winnemucca, NV 89445
Pinson mine	Pinson Mining Co.	S28,29,32,33, T38N,R42E	gold	OP,ML, HL	cyanide grinding	140	K. M. Belingheri P.O. Box 192 Winnemucca, NV 89445
Rabbit Creek mine	Santa Fe Pacific Gold Corp.	S19,29,31, T39N,R43E	gold silver	OP,HL	carbon-in-leach multiple bench	225	Michael L. Surratt, Project Manager P.O. Box 552 Winnemucca, NV 89445
	Gilbert Western Corp., *contractor*	S19,T39N,R43E		OP	multiple bench		Tait Johnson, President P.O. Box 2217 Winnemucca, NV 89445
	The Industrial Co., *contractor*	S19,T39N,R43E		OP	plant construction		Ken Dean, Project Superintendent P.O. Box 1880 Winnemucca, NV 89445
Rainbow Ridge opal mine	Rainbow Ridge Opal Mines, Inc.	S6,7,22,23, T45N,R26E	precious opal	OP,UG	multiple bench	W	G. Keith Hodson, Owner P.O. Box 97 Denio, NV 89404
Royal Peacock opal mine	Royal Peacock Opal Mines, Inc.	S19,20,T45N,R26E	precious opal	OP	hand digging	W	Walter Wilson 10 Virgin Valley Road P.O. Box 55 Denio, NV 89404
Sleeper mine	Amax Gold, Inc.	S16,17,20,21, T40N,R35E	gold silver	OP,ML, HL	multiple bench cyanide gravity grinding	228	Thomas E. Irwin, Manager P.O. Box 1820 Winnemucca, NV 89445
	The Industrial Co. of Steamboat Springs, *contractor*	S16,17,20,21, T40N,R35E		ML	construction		Ray Dix, Project Manager P.O. Box 366 Winnemucca, NV 89445
LANDER COUNTY							
Argenta mine and mill	Milpark Drilling Fluids	S13,24,T32N,R46E	barite	OP	gravity grinding	35	Keith S. Olson P.O. Box 277 Battle Mountain, NV 89820
Austin gold venture	Westgold Expl. & Mining Co.	S27,36,T18N,R43E	gold	UG,OP, ML	multiple bench flotation cyanide	94	Robert A. Prescott, Project Manager P.O. Box 502 Austin, NV 89310
	American Mine Services, Inc., *contractor*	S25,26,36, T18N,R43E		UG	drifting		John C. Folinsbee P.O. Box 59 Austin, NV 89310
Battle Mountain grinding plant	M-I Drilling Fluids Co.	S18,T32N,R45E	barite	ML	gravity grinding	30	Garry Thielen P.O. Box 370 Battle Mountain, NV 89820
Buffalo Valley mine	Horizon Gold Corp.	S33,34,T32N,R42E	gold	OP,HL	cyanidation	12	P.O. Box 358 Valmy, NV 89438
	Ranstrom Construction, Inc., *contractor*	S33,34,T32N,R42E		ML	crushing screening		Larry Lundy, Superintendent P.O. Box 15395 Boise, ID 89642

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DIRECTORY OF MINING AND MILLING OPERATIONS (continued)

Mine/plant name	Operator	Location	Commodity	Type	Process/ activity	Employees	Address
LANDER COUNTY (continued)							
Cortez Gold Mines	Placer Dome U.S., Inc.	S13,21,24, T27N,R47E; S36,T28N,R46E	gold silver	OP,ML, HL	cyanide grinding	199	Alvin L. Crandell Cortez, NV 89821
	Engineered Structures, Inc., *contractor*	S13,28,T28N,R47E		OP	multiple bench		Jim Eckardt, President 723 E. Karcher Road Nampa, ID 83651
Dean mine	St. George Metals, Inc.	S36,T30N,R45E	gold silver	UG,OP	exploration development	11	Frank Varseveld, President 1140 Chukar Lane Battle Mountain, NV 89820
	M.C.O. Mine Services, *contractor*	S36,T30N,R45E		UG	exploration drifting		Frank Montonati, Owner 135 E. Second Street Battle Mountain, NV 89820
Elder Creek mine	Alta Gold Co.	S12,13,T28N,R45E; S7,18,T28N,R46E	gold silver	OP,HL	multiple bench	8	Robert C. Hedlund P.O. Box 1413 Battle Mountain, NV 89820
	S M & S Nielsen Exploration, *contractor*	S12,13,T28N,R45E		OP,HL	multiple bench		Steve and Dianne Nielsen, Owners P.O. Box 310 Battle Mountain, NV 89820
Fortitude complex	Battle Mountain Gold Co.	S21,22,T31N,R43E; S28,T32N,R44E	gold silver	OP,HL	cyanide flotation gravity grinding	370	R. H. DePaoli, Operations Manager P.O. Box 1627 Battle Mountain, NV 89820
Kingston mine and mill	Nevada Goldfields Inc.	S27,T16N,R43E; S5,6,T15N,R44E	gold silver	UG,ML	carbon-in-leach cyanide grinding	10	Joe Kircher Kingston Box 119 Austin, NV 89310
McCoy/Cove mine	Echo Bay Minerals Co.	S1,2,11,T28N,R42E; S36,T28N,R43E	gold silver	OP,ML, UG,HL	cyanide grinding	561	David C. Naccarati, Manager P.O. Box 1658 Battle Mountain, NV 89820
	Davy McKee Corp., *contractor*	S2,T28N,R42E		ML	plant construction		Tom Turk, Project Manager P.O. Box 400 Battle Mountain, NV 89820
	Dynatec Mining Corp., *contractor*	S1,2,11,T28N,R42E		UG	drifting		Alan R. Walsh, President 12567 West Cedar Drive, Suite 100 Lakewood, CO 80228
	Neilsons, Inc., *subcontractor*	S2,T28N,R42E		ML	plant construction		Clyde Rule, Project Manager P.O. Box 385 Battle Mountain, NV 89820
	Plateau Electrical Contractors, Inc., *subcontractor*	S2,T28N,R42E		ML	plant construction		Tom A. Martinez, President P.O. Box 836 Battle Mountain, NV 89820
	Western Central Concrete, Inc., *contractor*	S2,T28N,R42E		OP,ML	mill construction		Del Cornella, Manager P.O. Box 409 Winnemucca, NV 89445
Robertson mine	Coral Resources, Inc.	S12,13,24,25, T28N,R46E; S3-10,16-21, T28N,R47E	gold silver	OP,HL	cyanide multiple bench	3	David C. Arnold P.O. Box 796 Battle Mountain, NV 89820
	Vaughn Construction, *contractor*	S8,T28N,R47E		OP,HL	multiple bench		Otis Vaughn, President P.O. Box 679 Fernley, NV 89408
Toiyabe mine	N.A. Degerstrom	S5,6,T25N,R47E; S31,32,T26N,R47E	gold silver	OP,HL	cyanide	37	Bill Cleland P.O. Box 29 Crescent Valley, NV 89821
12 Mile pit	Robert L. Helms Construction Co.	S23,T29N,R43E	sand gravel	OP	single bench crushing screening	6	Robert L. Helms, President 790 E. Lincoln Way Sparks, NV 89431
LINCOLN COUNTY							
Mackie perlite mine	Wilkin Mining & Trucking Co.	S7,T4S,R67E; S33,34,T4S,R62E	perlite	UG,ML	room pillar crushing expansion	6	Joseph D. Wilkin, Owner P.O. Box 472 Panaca, NV 89042

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DIRECTORY OF MINING AND MILLING OPERATIONS (continued)

Mine/plant name	Operator	Location	Commodity	Type	Process/ activity	Employees	Address
LYON COUNTY							
Adams mine	Art Wilson Co.	S25,T16N,R20E	gypsum/ anhydrite	OP,ML	grinding	55	Art Wilson P.O. Box 1160 Carson City, NV 89702
Anderson pit and mill	Eagle Valley Construction Co.	S23,T16N,R21E	sand gravel gold	OS,ML	multiple bench crushing screening	8	Ivan Farnsworth, Partner 5894 Sheep Drive Carson City, NV 89701
Basalite	Basalite	S16,T17N,R22E	aggregate	OP	crushing screening	10	Henry Williams 2600 Boeing Way Carson City, NV 89706
Comstock Bonanza shaft (Patent #56 Alham)	Comstock Mining and Refining Co.	S17,T16N,R21E	gold silver	UG		2	Linda Banks and Rick Anderson, Owners 999 Pinion Hills Drive Carson City, NV 89701
Copper Tek mine	Copper Tek Corp.	S16,T13N,R25E	copper	OP,HL		53	Gary Snyder 102 Burch Drive Yerington, NV 89447
Dayton Sand & Gravel, Inc.	Dayton Sand & Gravel, Inc.	S23,T16N,R21E	sand & gravel gold	OP,ML	gravity crushing multiple bench screening	17	Robert O. Foster P.O. Box 193 Dayton, NV 89403
Gold Bug placer	Gold Bug Mining, Inc.	S21,T16N,R21E	gold silver	PL	gravity modified vat leach	12	Robert W. Craig 13-B Affonso Drive K-27 Carson City, NV 89706
Haywood leach facility/Amazon pit	Oliver Hill Mining Co., Inc.	S17,18,20, T16N,R21E	gold silver	ML,OP HL	cyanide leaching multiple bench	2	Scott Jolcover, President P.O. Box 1298 Carson City, NV 89702
Hazen pit - Clark	Eagle-Picher Minerals, Inc.	S8,17,T18N,R25E	diatomite	OP	crushing drying calcining	2	Thomas A. Buchanan P.O. Box 10480 Reno, NV 89510
LeBoeuf exploration drift	Asamera Minerals (U.S.), Inc.	S35,T19N,R23E	gold silver	UG	exploration	10	Ed Morrow, Exploration Manager 6121 Lakeside #130 Reno, NV 89511
	General Mine Services Corp., *contractor*	S35,T19N,R23E		UG	drifting		Jerry Stacey, Mining Contractor 5787 Reno Hwy. #39 Fallon, NV 89406
Limestone mine	Nevada Cement Co.	S4,6,19,25, T19N,R25E	limestone	OP	multiple bench	10	David Dalton, President P.O. Box 840 Fernley, NV 89408
Nevada Cement Company	Nevada Cement Co.	S31,32,33, T20N,R25E; S2,3,10,11,36, T20N,R24E	limestone clay cement	OP	rotary kiln	156	D.L. Dalton P.O. Box 840 Fernley, NV 89408
Section 8 mine	CR Minerals Corp.	S8,17,T19N,R26E S11,T20N,R24E	diatomaceous earth	OP,ML	grinding	7	Chris Harris 100 Front Street Fernley, NV 89408
Six Mile Canyon mine and mill	Gold Bug joint ventures	S31,T17N,R22E	gold silver	OP,ML	single bench leaching	4	Pete Haggart, President P.O. Box 333 Dayton, NV 89403
	Graham Equipment Co., *contractor*	S31,T17N,R22E		OP	development		Virgil Graham, Owner 1690 Industrial Way Sparks, NV 89431
Tuttle mine	Tuttle's Golden Minerals	S20,21,29, T7N,R27E	montmorillonite	OP	single bench screening	2	James B. Tuttle, Owner P.O. Box 519 Hawthorne, NV 89415

DIRECTORY OF MINING AND MILLING OPERATIONS (continued)

Mine/plant name	Operator	Location	Commodity	Type	Process/ activity	Employees	Address
MINERAL COUNTY							
Aurora mine	Nevada Goldfields, Inc.	S17,18,T05N,R28E	gold silver	OP,UG, ML	multiple bench	43	Rick Dye, Project Manager P.O. Box 3070 Hawthorne, NV 89415
Aurora Partnership	Minerex Resources, Ltd.	S17,T5N,R28E	gold silver	OP,HL	multiple bench cyanide	53	James Burt P.O. Box 1628 Hawthorne, NV 89415
	Lost Dutchman Construction, Inc., *contractor*	S17,T5N,R28E		OP,ML	multiple bench crushing		J. R. Barkley, President P.O. Box 129 Hawthorne, NV 89415
Borealis mine	Echo Bay Minerals Co.	S17,18,T6N,R29E	gold silver	OP,HL	cyanide	14	Greg Earle P.O. Box 2310 Hawthorne, NV 89415
	Lost Dutchman Construction, Inc. *contractor*	S16,17,T6N,R29E		OP	multiple bench		J. R. Barkley, President P.O. Box 1538 Hawthorne, NV 89415
Candelaria mine	NERCO Metals, Inc.	S32-34,T4N,R35E; S3-5,T3N,R35E	silver gold	OP,HL	cyanide	W	Ralph L. Van Arsdale P.O. Box 1240 Hawthorne, NV 89415
Denton-Rawhide mine	Kennecott Rawhide Mining Co.	S4,5,8,16,17, T13N,R32E	gold silver	OP,HL	development	150	Dennis Kerstiens P.O. Box 2070 Fallon, NV 89406
	Kiewit Mining Group, Inc., *contractor*	S3,10,15,18, T13N,R32E		OP			Steve Anderson, Project Manager P.O. Box 1647 Fallon, NV 89406
Mina gold mine	Pischel Mining Co.	S20,T9N,R17E	gold	OP,UG	development	2	Harold Pischel, Mine Manager P.O. Box 436 Mina, NV 89422
Prospectus mine and mill	Nevada Goldfields, Inc.	S18,T5N,R28E	gold	OP	multiple bench crushing	40	Rick Dye, Project Manager P.O. Box 3070 Hawthorne, NV 89415
	H. E. Hunewill Construction Co., *contractor*	S18,T5N,R28E					H. E. Hunewill, Owner 315 Artist View Wellington, NV 89444
Santa Fe mine	Corona Gold Inc.	S6,T8N,R35E; S36,T9N,R34E; S31,T9N,R35E	gold silver	OP,HL	multiple bench cyanide	107	Gregory A. Lang, Resident Manager P.O. Box 3220 Hawthorne, NV 89415
	Brown & Root USA, Inc., *contractor*	S31,T9N,R35E		OP	multiple bench		Dean Domsten, Project Manager P.O. Box 3220 Hawthorne, NV 89425-2570
Spot deposit	N. A. Degerstrom, Inc.	S11,T7N,R36E	gold silver	OP,HL	cyanide	3	Floyd L. Miller, Manager P.O. Box 185 Mina, NV 89422
NYE COUNTY							
Ash Meadows plant	East West Minerals, Inc.	S1,T18S,R51E	zeolite	ML	screening drying bagging	4	Valerie Shelton State Route 15 P.O. Box 7006 Amargosa Valley, NV 89020
Basic Inc.	AB & B	S26,34,T12N,R36E	magnesite	OP,ML	calcining dead burning sizing separation	90	Don Pressey, Works Manager P.O. Box 177 Gabbs, NV 89409
Bullfrog mine	Bond Gold Corp.	S15,T12S,R46E	gold silver	OP,HL	multiple bench cyanide grinding	310	Jack Bingham, Project Manager P.O. Box 519 Beatty, NV 89003
	Industrial Contractors Corp., *contractor*	S15,T12S,R46E		OP	multiple bench		Iradj Azimi P.O. Box 909 Beatty, NV 89003
	The Industrial Co. of Steamboat Springs, *contractor*	S15,T12S,R46E		OP	construction		Robert Dusbabek, Construction Manager P.O. Box 100 Beatty, NV 89003

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DIRECTORY OF MINING AND MILLING OPERATIONS (continued)

Mine/plant name	Operator	Location	Commodity	Type	Process/ activity	Employees	Address
NYE COUNTY (continued)							
Cinder Cone pit	Cind-R-Lite Block Co.	S28,T14S,R49E	cinder	OP	gravity	2	E.L. Selman 3333 Cinder Lane Las Vegas, NV 89103
Crowell fluorspar mine	J. Irving Crowell & Son	S14,15,22,23, T12S,R47E	fluorspar	UG	crushing	W	Jack I. Crowell P.O. Box 96 Beatty, NV 89003
Cyprus Tonopah mine	Cyprus Tonopah Mining Corp.	S5-8,T5N,R42E	molybdenum copper	OP	grinding flotation	234	W. A. Gibson, Vice President/ General Manager P.O. Box 1569 Tonopah, NV 89049
Gold Bar mine	Angst, Inc.	S36,T11S,R45E	gold silver	OP,HL	cyanide	36	Britt T. Johnson P.O. Box 1030 Beatty, NV 89003
IMV Div. of Floridin Co.	Floridin Co.	S29,T17S,R49E	clay	OP	grinding drying	74	Joseph Wujcik, Plant Manager Route Box 549 Amargosa Valley, NV 89020
Keystone mine	Nevada Goldfields, Inc.	S28,29,32,33, T8N,R44E	gold silver	OP		42	Louis Pulley and Fred R. Pulley, Owners Kingston Box 119 Austin, NV 89310
	Lost Dutchman Construction Co., *contractor*	S28,29,32,33, T8N,R44E	gold	OP,ML	multi-bench crushing screening		William Valerio, Project Manager P.O. Box 85 Manhattan, NV 89022
Lathrop mill	American Borate Co.	S36,T17S,R49E	calcium borate	ML	flotation calcination	26	Darrell Cypert Star Route 15 Box 610 Amargosa Valley, NV 89020
Manhattan mine and mill	Round Mountain Gold Corp.	S19,20,29,30, T8N,R44E	gold silver	OP,HL	gravity flotation cyanide leach crush/grind	74	Andre Douchane, Project Manager P.O. Box 56 Manhattan, NV 89022
	W.E. Vining, *contractor*	S20,T8N,R44E		OP	multiple bench		W.E. Vining, Owner P.O. Box 2499 Carson City, NV 89702
Mother Lode mine	N. A. Degerstrom, Inc.	S7,8,T12S,R48E	gold silver	OP,ML, HL	multiple bench	46	William G. Stotts, Mine Manager P.O. Box 40 Beatty, NV 89003
New Discovery mine and mill	Vanderbilt Minerals Corp.	S13-24,T12S,R46E; S18,19,T12S,R47E	clay	UG,ML	grinding bagging	8	Jerry W. Lease 2320 Viking Road Las Vegas, NV 89109
Northumberland mine	Western States Minerals Corp.	S24,T13N,R45E	gold silver	OP,HL	cyanide	50	Gaylen Cropper P.O. Box 109 Kingston Village Austin, NV 89310
P & S barite mine	The Standard Magnesia Co.	S11,14,15, T13N,R45E;	barite	OP	multiple bench	3	Sergio M. Jaramillo P.O. Box 10477 Reno, NV 89510
Paradise Peak mine	FMC Gold Co.	S7,12,13,24, T10N,R36E; S3-22,T10N,R35E	gold silver mercury	OP,ML, HL	grinding cyanide Merrill Crowe retorting	240	E. Woody Wayland, General Manager P.O. Box 145 Gabbs, NV 89409
Smoky Valley Common Operation	Round Mountain Gold Corp.	S19,20,29,30, T10N,R44E; S12,24,25,36, T10N,R43E	gold silver	OP,HL, ML	cyanide	615	Andre J. Douchane P.O. Box 480 Round Mountain, NV 89045
	Gibbons & Reed Co., *contractor*	S19,T10N,R44E		ML	construction		Jack Huff, Superintendent P.O. Box 369 Round Mountain, NV 89045
	J.S. Redpath Corp., *contractor*	S19,T10N,R44E		UG	development		Bruce McKinstry, Senior Manager for Contracting P.O. Box 480 Round Mountain, NV 89045

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DIRECTORY OF MINING AND MILLING OPERATIONS (continued)

Mine/plant name	Operator	Location	Commodity	Type	Process/ activity	Employees	Address
NYE COUNTY (continued)							
Smoky Valley Common Operation (continued)	Patrick Harrison Mining Corp., *contractor*	S19,T10N,R44E		UG	exploration decline development		Larry Twerdun, Superintendent P.O. Box 2020 Round Mountain, NV 89045
	The Industrial Co. of Steamboat Springs, *contractor*	S19,T10N,R44E		ML	construction		Cal Brown, Project Superintendent P.O. Box 449 Round Mountain, NV 89045
	Utah Construction & Development, *contractor*	S19,T10N,R44E		ML	construction		Lloyd Grenshaw, Construction Superintendent P.O. Box 230 Round Mountain, NV 89045
Sterling mine	Saga Exploration Co.	S6,T13S,R48E	gold silver	UG,ML, HL	drifting cyanide	42	Greg Austin, President P.O. Box 6479 Reno, NV 89513
Summit project	Zephyr Resources, Inc.	S31,T12N,R40E	gold silver	OP	single bench	1	Rory Tibbals P.O. Box 768 Silver Peak, NV 89047
	J. D. Welsh and Associates	S31,T12N,R40E		OP	single bench		Murray N. Hutchison, General Manager P.O. Box 1236 Winnemucca, NV 89445
Zeolite mine	East West Minerals, Inc.	S1,T18S,R51E	zeolite	OP	single bench	4	Gordon Presley, Vice President c/o Ash Meadows Lodge, Star Route 15, Box 7006 Armagosa Valley, NV 89020
PERSHING COUNTY							
Buff mine	Vanderbilt Minerals Corp.	S2,T27N,R32E	clay	OP	grinding bagging	6	Jerry W. Lease 2320 Viking Road Las Vegas, NV 89109
Coeur Rochester mine	Coeur Rochester, Inc.	S15,16,21,22, T28N,R34E	silver gold	OP,HL	cyanide	300	Robert Martinez, Vice President P.O. Box 1057 Lovelock, NV 89419
Colado operations	Eagle-Picher Minerals, Inc.	S7,T28N,R29E; S6,T27N,R32E	diatomite	OP,ML	crushing drying classification grinding calcining	130	Jack P. Richards Drawer A Lovelock, NV 89419
Dusty mine	Dusty Mining Co.	S24,T32N,R31E; S20,30,T32N,R32E	gold	OP	gravity flotation	8	L. Edward Speir P.O. Box 1149 Lovelock, NV 89419
Florida Canyon mine	Florida Canyon Mining, Inc.	S1-3,10-12,37,38, T31N,R33E	gold silver	OP,HL	cyanide	172	John Leahy P.O. Box 330 Imlay, NV 89418
	N. A. Degerstrom, Inc., *contractor*	S2,T31N,R33E		OP	multiple bench		James J. Wolfe, Superintendent P.O. Box 1150 Lovelock, NV 89419
Nevada State pit	Frehner Construction Co., Inc.	S6,T25N,R30E	sand gravel	OS	crushing screening	7	Garth Frehner, Owner 124 West Brooks Avenue North Las Vegas, NV 89030
Relief Canyon mine	Florida Canyon Mining, Inc.	S18,T27N,R34E	gold silver	OP,HL	cyanide	W	John Leahy, General Manager P.O. Box 1150 Lovelock, NV 89419
	Morrison-Knudsen Co., Inc., *contractor*	S16,T27N,R34E		OP	multiple bench		John O'Laughlin, Project Manager P.O. Box H Lovelock, NV 89419
	N. A. Degerstrom, Inc., *contractor*	S16,T27N,R34E		ML	crushing		Robert Wallin, Area Manager P.O. Box 1150 Lovelock, NV 89419
Sexton mine and mill	W. Glen Sexton	S5,8,T34N,R38E	dolomite/ limestone	OP	grinding	3	W. Glen Sexton 1230k S. Bridge Winnemucca, NV 89445
Willard project	Western States Minerals	S35,36,T28N,R32E	gold silver	OP,HL, ML	cyanide multiple bench	75	Rick Fiddler P.O. Box K Lovelock, NV 89419

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DIRECTORY OF MINING AND MILLING OPERATIONS (continued)

Mine/plant name	Operator	Location	Commodity	Type	Process/ activity	Employees	Address
STOREY COUNTY							
All-Lite pit and plant	All-Lite Aggregate	S33,34,T19N,R21E	lightweight aggregate sand gravel	ML	multi-bench crushing	18	Norman L. Dianda, Partner; Konrad Quade, Partner P.O. Box 10865 Reno, NV 89510
Clark operations (mine & mill)	Eagle-Picher Minerals, Inc.	S28,33,34, T20N,R23E; S35,T20N,R22E	diatomite	OP,ML	crushing drying calcining	64	M. S. Burdette P.O. Box 10480 Reno, NV 89510
Flowery mine	American Eagle Resources, Inc.	S22,23,24,26,27, T17N,R22E	gold silver	OP,HL	cyanide	30	Don Hopkins 324 South Wells Avenue Reno, NV 89502
Gooseberry mine and mill	Asamera Minerals (U.S.), Inc.	S25,T19N,R22E	silver gold	UG,ML, HL	flotation cyanide	40	Rick Karlson, Mine Manager 6121 Lakeside Drive Suite 130 Reno, NV 89511
	Selland Construction, Inc., *contractor*	S25,T19N,R22E		OP,ML	single bench		Norman J. Stevens, Operations Manager P.O. Box 2464 Elko, NV 89801
Lower Naturalite pit and plant	Naturalite Aggregate Corp.	S16,T17N,R22E	lightweight aggregate	OS,ML	multiple bench crushing screening	6	Don Forrester, General Manager 2600 Boeing Way Carson City, NV 89701
Lucerne mine	Oliver Hill Mining Co., Inc.	S8,T16N,R21E	gold silver	OP	multiple bench	4	Scott Jolcover, President P.O. Box 1298 Carson City, NV 89702
Meri's Con Virginia #1	Marshall Earth Resources, Inc.	S29,T17N,R21E	gold silver	UG	drifting	4	Hugh R. Marshall, President 720 Willow Reno, NV 89502
WASHOE COUNTY							
Clay mine	Art Wilson Co.	S13,T27N,R19E	clay	OP	single bench	4	Art Wilson, Operator P.O. Box 1160 Carson City, NV 89702
Empire mine and mill	United States Gypsum Co.	S31,T31N,R24E; S11,T31N,R23E	gypsum	OP	grinding calcination	122	Michael D. Phillips P.O. Box 130 Empire, NV 89405
Lower Olinghouse mine	New Gold, Inc.	S26,27,T21N,R23E	gold	OP,ML	placer	18	Thomas L. Robyn, Operations Manager 685 Concord Circle Fernley, NV 89408
Mira Loma pit	Robert L. Helms Construction Co.	S34,T19N,R20E	gravel	OP	crushing screening	7	Robert L. Helms, President P.O. Drawer 608 Sparks, NV 89432
102 Ranch pit	Robert L. Helms Construction Co.	S36,T20N,R22E	sand gravel	OS,ML	crushing screening	7	Robert L. Helms, President P.O. Drawer 608 Sparks, NV 89432
Patrick pit	Granite Construction Co.	S6,T19N,R22E	sand gravel	OS	single bench crushing screening	10	Jim Roberts, Branch Manager P.O. Box 2087 Sparks, NV 89432
Paiute pit	Nordic Industries	S22,27,34 T21N,R24E	sand gravel	OP	single bench	14	Dave Hamilton, Manager P.O. Box 159 Wadsworth, NV 89442
Rilite Aggregate	Rilite Aggregate Co.	S23,T18N,R20E	aggregate	OP	grinding crushing	12	Bruno Benna P.O. Box 11767 Reno, NV 89511
Sky Ranch pit	Rocky Ridge, Inc.	S15,T21N,R20E	sand gravel	OS,ML	multiple bench crushing screening	10	Pat Shane, President P.O. Box 2669 Truckee, CA 95737
Western Hog Ranch mine	Western Mining Corp. USA	S24,T38N,R22E	gold silver	OP,HL, ML	cyanide	70	C. A. Moore, Resident Manager P.O. Box 9 Gerlach, NV 89412
	Ledcor Construction, Inc., *contractor*	S24,T38N,R22E		OP,ML	multiple bench crushing screening		Don Hall, Project Supervisor P.O. Box 138 Gerlach, NV 89412
Wind Mountain mine	Amax Gold Inc.	S33,34,T30N,R23E	gold silver	OP,HL	cyanide	125	Andrew F. Pooler, General Manager P.O. Box 160 Empire, NV 89405

DIRECTORY OF MINING AND MILLING OPERATIONS (continued)

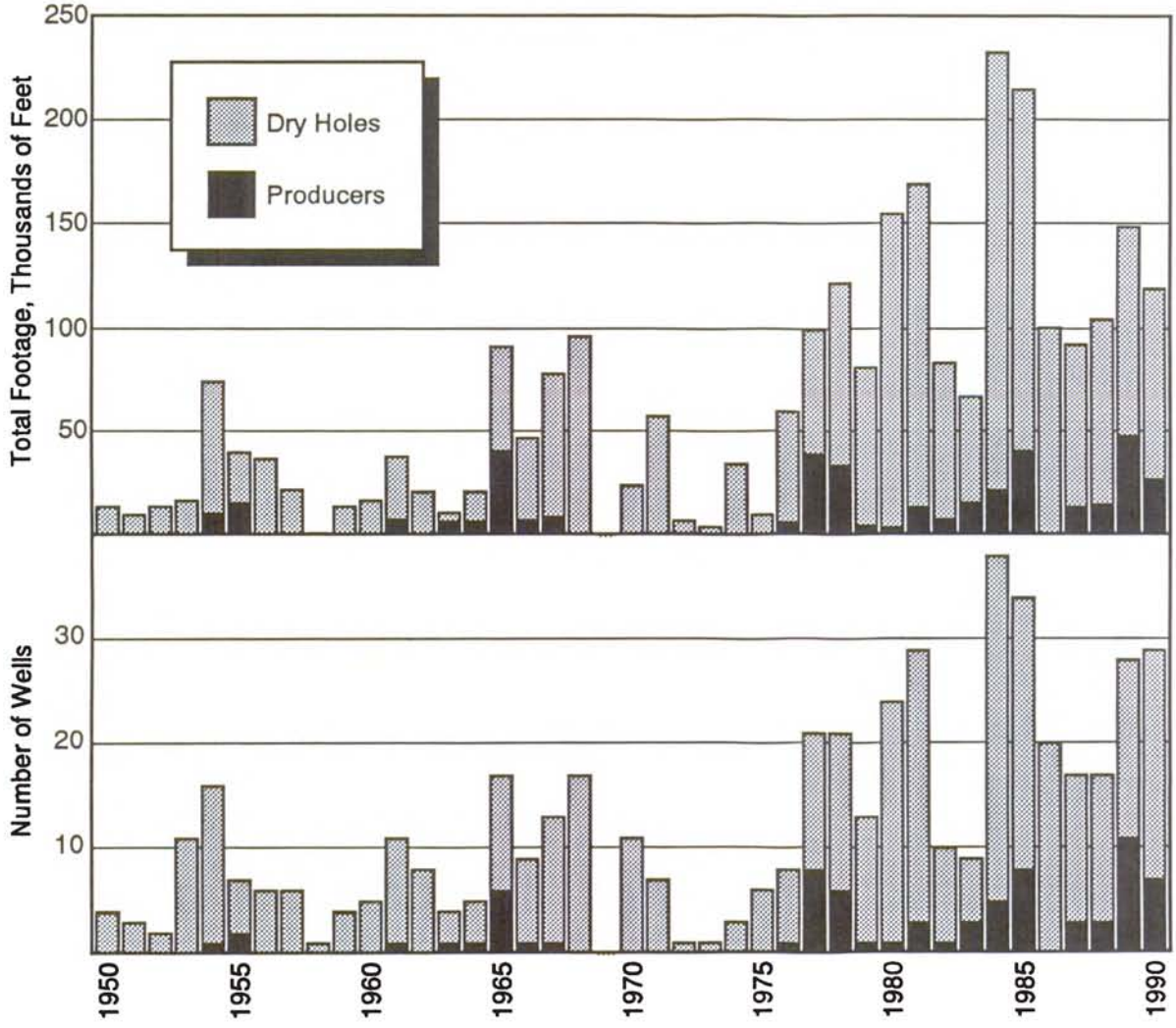
Mine/plant name	Operator	Location	Commodity	Type	Process/ activity	Employees	Address
WHITE PINE COUNTY							
Alligator Ridge mine	USMX, Inc.	S22-26,35,36, T22N,R57E	gold silver mercury	OP,ML, HL	CIL circuit cyanide	27	Jim Kentopp P.O. Box 809 Ely, NV 89301
Bald Mountain mine	Placer Dome U.S., Inc.	S24,T24N,R56E; T24N,R57E	gold	OP,HL	multiple bench cyanide	163	D. G. Bailey P.O. Box 2796 Elko, NV 89801
	Pollocks Drilling, *contractor*	S16,17,18, T24N,R57E		EX	rotary drilling		Oren Pollock, Owner P.O. Box 123 Ely, NV 89301
Casino mine	USMX, Inc.	S25,T24N,R58E	gold	OP	heap-leach multiple bench	14	Jim Kentopp, Manager P.O. Box 809 Ely, NV 89301
	Lost Dutchman Construction Co., *contractor*	S35,T24N,R57-58E				35	Glenn Neely, Sr. Vice President 1475 Greg Street Sparks, NV 89431
Easy Junior mine	Alta Gold Co.	S9,T18N,R55E	gold	OP,HL	carbon-in-leach	10	Joseph A. Pescio P.O. Box 120 Ely, NV 89301
Exchequer Canyon project	Intermountain Mine Services	S19,T24N,R63E	silver	UG	development decline	4	Bob Drips, President 7105 Highland Drive Salt Lake City, UT 84121
Golden Butte mine	Alta Gold Co.	S2,3,T23N,R61E	gold silver	OP,HL	development cyanide multiple bench	31	Joseph A. Pescio, Mine Superintendent P.O. Box 400 S.R. 1, Cherry Creek, NV 89301
Golden Eagle mine	Terra Mining & Processing, Inc.	S26,T14N,R67E	gold	OP,ML	single bench gravity	5	Don Shaffer, Superintendent 842 Avenue "F" Ely, NV 89301
Green Springs mine	USMX, Inc.	S28,T15N,R57E	gold silver	OP,HL	multiple bench cyanide carbon absorption	14	Jim Kentopp P.O. Box 809 Ely, NV 89301
Illipah mine	Alta Gold Co.	S9,17,T18N,R58E	gold	OP,HL	cyanide carbon in leach	10	Mike Iannacchione P.O. Box 120 Ely, NV 89301
	W. E. Vining Co., *contractor*	S4,T18N,R58E		OP	multiple bench		W. E. Vining, President P.O. Box 2499 Carson City, NV 89702
Little Bald Mountain mine	New Dynasty Mines (US), Inc.	S26,27,T24N,R57E	gold silver	OP,UG, HL	cyanide	19	Ronald D. Damele P.O. Box 314 Eureka, NV 89316
Mt. Hamilton	Westmont Gold, Inc.	S8,16,17, T16N,R57E	gold silver	OP	multiple bench	18	Bob Walish, Manager 685 Lyons Avenue Ely, NV 89301
Nevada State pit	Las Vegas Paving Corp.	S29,T25N,R65E	sand gravel	OS,ML	single bench crushing screening	7	Robert Mendenhall, President 1770 Industrial Road Las Vegas, NV 89102
Osceola mine and mill	Robert Ostlund	S12,T14N,R67E	gold	OP,ML	single bench gravity concentration	3	Robert Ostlund, Owner Baker Stage Route Ely, NV 89301
Robinson project	Alta Gold Co.	S10,11,15, T16N,R62E	gold silver	OP,ML, HL	CIL mill cyanide	187	Gary Cummings P.O. Box 382 Ruth, NV 89319
	Dan S. Halstead & Son, *contractor*	S11,T16N,R62E		OP	single bench		Dan Halstead, Owner State Route 2, Box 21 Ely, NV 89301
Ward/Taylor project	Alta Gold Co.	S11,T14N,R63E S3,4,8,10,15 T14N,R56E	silver lead zinc copper	UG,ML	development stoping flotation	125	Charles E. Nuanez P.O. Box 324 East Ely, NV 89315
White Pine gold mine	Western States Minerals Corp.	S1,T24N,R57E; S6,T24N,R58E; S36,T25N,R57E; S31,T25N,R58E	gold silver	OP,HL	cyanide carbon recovery	24	Gaylan Cropper P.O. Box 305 Ely, NV 89301

Oil and Gas

by Becky Weimer Purkey

Exploration

Oil and gas exploration activity remained strong in Nevada in 1990. Of the 30 wells spudded during the year, six were put in production in 1990. These six new producers had a combined total drilled depth of 23,457 feet. In addition, three wells that were drilled in 1989 began production in early 1990. These were **The Gary-Williams Co.**'s **Three Bar 25-A**, **Makoil Inc.**'s **Munson Ranch No. 12-32**, and **Western General, Inc.**'s **Kate Spring No. 1-A**. Another well, **Makoil, Inc.**'s **Munson Ranch No. 12-23**, was drilled to a total depth of 3,346 feet in 1990 and began production in January 1991. Twenty dry holes, totaling more than 86,192 feet (total depths on three The Gary-Williams Co. wells in Eureka County are still confidential), were plugged and abandoned. Five wells were drilled and temporarily abandoned in 1990, and three others were being evaluated at year-end, including the 6,718-foot **Western General, Inc.**'s **Kate Spring No. 1-B** which is being converted to a water injection well. Drilling was still in progress on two wells at year-end. From one to four drilling rigs were actively drilling for oil and gas at any given time from April through December 1990 in Nevada.



Number and total footage of Nevada oil wells completed as producers or plugged and abandoned, 1950–1990. Wells tempoarily abandoned or still being drilled at year-end are not included. Depths of the three wells drilled by The Gary-Williams Co. in Eureka County in 1990 are confidential and are not included in the total footage.

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OIL WELL DRILLING ACTIVITY IN NEVADA IN 1990

Company	Well	Permit no.	Location	Spud date	Depth (feet)	Status (31 Dec 90)
CHURCHILL COUNTY						
Terry F. Haskin	Reis Federal No. 1	561	SE¼ SE¼ S36,T18N,R30E	Dec 89	4,117	P&A
ELKO COUNTY						
J. R. Bacon Drilling, Inc.	Evans Flat No. 11-1	589	SE¼ SW¼ NW¼ S11,T30N,R52E	Jul 90	4,225	P&A
Mobil Oil Corp.	Petan Trust No. F-12-19-P	590	NW¼ S19,T32N,R53E	Sep 90	9,050	P&A
EUREKA COUNTY						
The Gary-Williams Co.	N. Kobeh Valley Fed. No. 13-10	526	NW¼ SE¼ S13,T21N,R49E	Dec 88	W	P&A
The Gary-Williams Co.	Lone Mountain No. 15-1	531	NE¼ NE¼ S15,T20N,R50E	Apr 89	W	P&A
Yates Petroleum Corp.	Three Bar Unit Fed. No. 24-13A	566	NE¼ SW¼ SW¼ S24,T28N,R51E	Apr 90	W	TA
Hanagan Petroleum Corp.	Jackpot Federal No. 1	570	SW¼ NW¼ NE¼ S20,T25N,R51E	May 90	8,325	P&A
The Gary-Williams Co.	Three Bar Unit Fed. No. 36-C	573	C, SW¼ S36,T27N,R51E	Aug 90	W	Drilled
Marathon Oil Co.	Black Point No. 6-41	581	NE¼ NE¼ S6,T21N,R54E	Oct 90	8,600	P&A
J. R. Bacon Drilling, Inc.	Tomera Ranch No. 33-1	591	SW¼ SW¼ S33,T31N,R52E	Sep 90	1,956	Producing
Mobil Oil Corp.	Table Mountain No. F-11X-6G	598	NW¼ NW¼ S6,T25N,R52E	Dec 90	W	Drilling
J. R. Bacon Drilling, Inc.	Tomera Ranch No. 32-1	599	SE¼ SE¼ SE¼ S32,T31N,R52E	Oct 90	1,952	P&A
J. R. Bacon Drilling, Inc.	Southern Pacific Land Co. No. 3-5	603	NE¼ SE¼ NE¼ S5,T30N,R52E	Dec 90	2,077	P&A
NYE COUNTY						
Makoil, Inc.	Munson Ranch No. 14-31	507	NW¼ NE¼ S14,T9N,R56E	1988	4,300	P&A
J. R. Bacon Drilling	Munson Ranch No. 14-33	513	C, NW¼ SE¼ S14,T9N,R56E	[1]	115	Producing
Makoil, Inc.	Duckwater Creek No. 19-11	542	NW¼ NW¼ S19,T9N,R57E	Mar 90	5,835	Producing
J. R. Bacon Drilling, Inc.	Munson Ranch No. 14-48	549	SW¼ SW¼ S14,T9N,R56E	Aug 89	3,912	P&A
J. R. Bacon Drilling, Inc.	Munson Ranch No. 14-49X	562	NE¼ SE¼ S14,T9N,R56E	Feb 90	4,395	Producing
Apache Corp.	Dry Lake Unit No. 1	563	NW¼ NW¼ S28,T8N,R56E	Dec 89	5,261	P&A
Western General, Inc.	Kate Spring No. 1-B	567	NE¼ NE¼ SW¼ S2,T8N,R57E	Jul 90	6,718	Drilled
J. R. Bacon Drilling, Inc.	Hanks No. 2	568	NW¼ SE¼ SW¼ S2,T8N,R57E	May 90	4,815	P&A
Diversified Operating Corp.	Highroller No. 4-23	569	NW¼ NW¼ NW¼ S23,T8N,R57E	May 90	7,066	P&A
Myjo Oil Corp.	Coffer No. 1	571	NE¼ SE¼ S31,T10S,R48E	Oct 90	W	TA
Makoil, Inc.	Munson Ranch No. 12-42	572	SE¼ NE¼ S12,T9N,R56E	May 90	3,532	Producing
Apache Corp.	Trap Spring No. 23-41	574	NE¼ NE¼ S23,T9N,R56E	June 90	4,416	Producing
Apache Corp.	Trap Spring No. 27-34	575	SW¼ SE¼ S27,T9N,R56E	June 90	4,093	P&A
J. R. Bacon Drilling	Munson Ranch No. 6-21	577	SW¼ NE¼ NW¼ S6,T9N,R57E	July 90	2,998	P&A
Dyad Petroleum Co.	Hanks No. 1401 re-entry	579	NW¼ NW¼ NE¼ S14,T8N,R57E	Sep 90	1,220	P&A
Marathon Oil Co.	Heath Canyon No. 15-14	580	SW¼ SW¼ S15,T7N,R57E	Aug 90	6,256	P&A
David M. Evans	Trap Spring No. 12-13	582	NW¼ SW¼ S12,T9N,R56E	Aug 90	3,323	Producing
Apache Corp.	Thorn Spring No. 29-34	584	SW¼ SE¼ S29,T7N,R57E	Sep 90	4,625	P&A
Apache Corp.	Munson Ranch No. 1-42	587	SE¼ NE¼ S1,T9N,R56E	Aug 90	3,300	P&A
Makoil, Inc.	Munson Ranch No. 12-22	595	SE¼ NW¼ S12,T9N,R56E	Oct 90	W	TA
Makoil, Inc.	Munson Ranch No. 12-23	596	NE¼ SW¼ S12,T9N,R56E	Oct 90	3,346	Drilled
Western General, Inc.	Western General/Roemer No. 1	602	SW¼ NW¼ S1,T8N,R57E	Dec 90	W	TA
True Oil Co.	True Bird Federal Unit No. 11-25	608	NE¼ NW¼ NW¼ S25,T9N,R56E	Dec 90	W	Drilling
WHITE PINE COUNTY						
Pioneer Oil & Gas	Patti Lou Puckett Dawkins Fed. No. 35-32	565	NW¼ SW¼ NE¼ S35,T23N,R58E	Apr 90	W	TA
				Total[2]	119,828	

W: Depth information withheld in accordance with company requests and Nevada regulations.
TA: Temporarily abandoned.
P&A: Plugged and abandoned.
Drilled: Drilling finished but production not begun in 1990.
Drilling: Drilling not finished in 1990.
[1]This well, completed in 1988, was deepened 115 feet in 1990.
[2]Does not include temporarily abandoned wells or wells still being drilled at the end of 1990, or the three wells drilled by The Gary-Williams Co. in Eureka County.

Nine wildcats and nine development wells were drilled in Railroad Valley; six wildcats and three development wells were drilled in the Pine Valley area; and single wildcat wells were drilled in Long, Diamond, and Amargosa Valleys. Drilling in Nevada had an overall success rate of 26% in 1990, which breaks down to a 6% wildcat success rate and a 50% development success rate (T. Flanigan and B. Ehni, Nevada Petroleum Society Newsletter, 3-26-90, p. 2). The drilling success rate in the 11-state Rocky Mountain region of the U.S. was 72% in 1990, but over 73% of the completed wells were drilled in established fields (Petroleum Information, Annual Review 1990, 2-22-91, p. 3).

Two new fields were added to Nevada's list of current producing areas bringing the total to ten producing fields in the state. The Currant field was permanently shut-in during 1983. All of the new producing wells are located on federal land.

Six unit agreements were approved and five development contracts were in effect with the Bureau of Land Management in Nevada during fiscal year 1990, one less in each category than in fiscal year 1989. There were 8,084,971 acres under 3,344 federal oil and gas leases in fiscal year 1990. This was over a third of a million acres less than in fiscal year 1989 (for more information on federal leases and development contracts see NBMG Special Publication MI-1988, p. 50–51.)

The Bureau of Land Management held four lease sales of Nevada lands during 1990, receiving high bonus bids totaling more than $1.6 million and averaging nearly $11 per acre for 151,639 acres. Only 20% of the nearly 2.5 million acres put up for lease in the state drew competitive bids, with the most interest shown for acreage near established production in Railroad Valley (Petroleum Information, 2-22-91, p. 17).

The average depth of the wells drilled in Nevada in 1990 was 4,438 feet (based on available information). The three deepest dry holes were **Mobil Oil Corp.**'s **Petan Trust No. F-12-19-P** at 9,050 feet in Elko County, **Marathon Oil Co.**'s **Black Point No. 6-41** at 8,600 feet in Eureka County, and **Hanagan Petroleum Corp.**'s **Jackpot Federal No. 1** at 8,325 feet in Eureka County. None of these wells had reported oil shows but several other nonproducers in Eureka and Nye Counties did.

In Eureka County, **J. R. Bacon Drilling, Inc.** reported oil shows from 1,620 to 1,928 feet in Oligocene Indian Well volcanics in the **Tomera Ranch No. 32-1** well. Total depth was 1,952 feet. Two **The Gary-Williams Co.** wells, which were reportedly setting production casing in 1989, were plugged and abandoned in 1990. The **N. Kobeh Valley Fed. No. 13-10** well was drilled to a total depth of about 7,100 feet and production casing was reportedly set to an undisclosed depth in March 1989. Testing was continuing and production was expected from five zones (Munger OILogram, 1-5-90). The **Lone Mountain No. 15-1** well also reportedly had production casing set to an undisclosed depth (Petroleum Information, 7-14-89). Information on these wells remains confidential as part of a continuous drilling program by The Gary-Williams Company.

In Nye County, **Apache Corp.** reported oil stains from 3,650 to 4,100 feet in Tertiary volcanics in the **Trap Spring No. 27-34** well. **J.R. Bacon Drilling, Inc.** encountered oil shows in three of its Nye County wells drilled in 1990. Shows were reported in

FEDERAL OIL AND GAS LEASES IN EFFECT IN FISCAL YEARS 1989 AND 1990[1]

County	NUMBER OF LEASES						ACREAGE					
	Competitive		Noncompetitive		Simultaneous		Competitive		Noncompetitive		Simultaneous[2]	
	FY89	FY90	FY89	FY90	FY89	FY90	FY89	FY90	FY89	FY90	FY89	FY90
Carson City	0	0	0	0	0	0	0	0	0	0	0	0
Churchill	0	0	15	14	3	3	0	0	27,379	25,459	3,148	3,148
Clark	0	0	26	23	30	21	0	0	23,751	20,926	27,069	21,086
Douglas	0	0	0	0	0	0	0	0	0	0	0	0
Elko	33	27	179	186	172	152	48,663	39,831	457,971	410,672	472,022	425,827
Esmeralda	0	0	1	0	0	0	0	0	0	0	0	0
Eureka	80	95	223	266	202	188	137,387	154,782	779,915	816,314	754,494	686,412
Humboldt	0	0	5	3	0	0	0	0	3,239	1,959	0	0
Lander	0	2	7	33	5	2	0	2,560	13,181	64,956	26,737	12,025
Lincoln	17	17	139	330	98	86	30,671	30,672	398,019	796,313	318,033	261,824
Lyon	0	0	0	0	0	0	0	0	0	0	0	0
Mineral	0	0	0	0	0	0	0	0	0	0	0	0
Nye	128	170	316	382	514	500	158,463	179,586	851,525	973,727	1,085,833	1,012,653
Pershing	0	0	10	7	1	0	0	0	18,025	8,705	0	0
Storey	0	0	0	0	0	0	0	0	0	0	0	0
Washoe	0	0	1	0	0	0	0	0	0	0	0	0
White Pine	102	148	281	319	397	370	179,977	230,529	709,883	769,708	3,910,189	1,135,296
TOTAL	360	459	1,201	1,563	1,421	1,322	555,161	637,960	3,282,888	3,888,739	3,910,189	3,558,271

[1]Data from the U.S. Bureau of Land Management FY88 = Oct. 1988–Sept. 1989; FY90 = Oct. 1989–Sept. 1990

[2]The simultaneous leasing program has been terminated due to the Dec. 22, 1987 amendment of the 1920 Mineral Leasing Act. These leases were issued under this now expired program.

PRODUCTION OF NEVADA'S OIL FIELDS[1]
(barrels)

Field	Thru 1982	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
Eagle Springs (1954)[2]	3,580,374	71,786	69,673	58,807	28,408	45,821	43,451	47,272	41,609	3,987,201
Trap Spring (1976)	4,694,630	492,759	522,830	582,822	498,996	432,690	441,832	629,281	939,910	9,235,750
Curant (1979)	635	6	0	0	0	0	0	0	0	641
Bacon Flat (1981)	64,414	13,795	10,855	47,942	72,643	84,156	20,855	0	0	314,660
Blackburn (1982)	34,933	67,600	135,541	284,013	441,163	318,553	351,582	272,119	238,240	2,143,744
Grant Canyon (1983)		163,189	1,168,711	2,065,747	1,862,784	2,221,642	2,280,323	2,076,272	2,345,858	14,184,526
Kate Spring (1986)					1,521	5,494	75,725	188,408	434,349	705,497
Tomera Ranch (1987)						1,032	5,221	225	2,605	9,083
N. Willow Creek (1988)							9,457	4,036	3,169	16,662
Three Bar (1990)									3,601	3,601
Duckwater Creek (1990)									3,095	3,095
TOTAL	8,374,986	809,135	1,907,610	3,039,331	2,905,515	3,109,388	3,228,446	3,217,613	4,012,436	30,604,460
Change		31%	136%	59%	−4%	7%	4%	0%	25%	

[1]Compiled from Producers' Monthly Reports filed with the Nevada Dept. of Minerals.
[2]Field discovery date.

Tertiary volcanics from 2,997 to 3,190 feet in the **Munson Ranch No. 14-48** well. The amount of oil was minor compared to the large volume of water produced. In the **Hanks No. 2** well oil shows were encountered from 4,550 to 4,808 feet in Paleozoic carbonates, and in the **Munson Ranch No. 6-21** well oil shows were recorded in two zones of Tertiary volcanic and sedimentary rocks from 2,492 to 2,510 feet and from 2,585 to 2,599 feet.

Western General, Inc. reported several oil zones while drilling the **Kate Spring No. 1-B** well in Nye County. The zones were from 4,540 to 4,600 feet, from 5,230 to 5,280 feet (in a slide block of undescribed stratigraphy), and from 6,000 to 6,500 feet. The top of the Mississippian Chainman Shale was reported at 6,551 feet. Production tests were being conducted on the 1-B well in December 1990, but it will be converted to a water injection well in 1991.

Makoil, Inc.'s **Munson Ranch No. 12-23** well encountered an oil zone from 3,081 to 3,346 feet (total depth) in Tertiary Garrett Ranch volcanics. This well was put into production in January 1991 and produced oil cut with 70 to 90% water the first five days of production.

New Producers

Of Nevada's nine wells that began producing in 1990, five are in the Trap Spring field in Railroad Valley (Nye County), one is in the Kate Spring field in Railroad Valley, one is in the Tomera Ranch field in Eureka County, and the remaining two wells are in newly discovered fields, the Three Bar field located three miles north-northwest of the Blackburn field in Eureka County, and the unofficially named Duckwater Creek field located less than a mile east of the Trap Spring field in Nye County. Seven of Nevada's ten current fields have production zones in Tertiary volcanics, four have production zones in Paleozoic carbonates, and three produce from non-volcanic Tertiary sands (T. Flanigan and B. Ehni, Nevada Petroleum Newsletter, 3-26-91, p. 2).

The Gary-Williams Co. Three Bar Unit Fed. No. 25-A well is the discovery well for the new Three Bar field. It was drilled to a depth of 7,221 feet in October 1989 and began production in April 1990. Oil and gas zones were tested within the Paleozoic, Mesozoic, and Cenozoic strata prior to putting the well into production. It was pumping an average of 360 barrels of 24.2° oil (and from 0 to 1,200 barrels of water) per month in 1990 through perforations between 4,344 and 4,384 feet in Miocene Humboldt Formation clastic sediments. There are reportedly three other pay zones (Petroleum Information, 6-1-90).

Makoil, Inc. has a new field discovery with its **Duckwater Creek No. 19-11** well. Production figures have been erratic since the first monthly reports were filed in May 1990, but cumulative production amounted to nearly 2,000 barrels of oil by the end of October. The oil and water is pumped from Tertiary Garrett Ranch volcanics from 5,676 to 5,835 feet (total depth).

Another new producer in the Kate Spring field is the **Western General, Inc. Kate Spring No. 1-A** well. It produces 10.5° oil and gas (no water) from 4,371 to 4,488 feet (total depth) in the Pennsylvanian Ely Limestone intermittently with the No. 1 Kate Spring well to keep the amount of water produced by each well at a minimum. The flowing No. 1-A well produced over 800 barrels per day during October.

J. R. Bacon Drilling has another new producer in the Tomera Ranch field in Eureka County with the **Tomera Ranch No. 33-1** well. First production was in October 1990 with the well pumping an average of 48 barrels of 21° oil (no water) per day from a shallow zone (1,155 to 1,246 feet) of valley fill sand in the Miocene Humboldt Formation or Oligocene Indian Well Formation. This well suggests a new

type of play—a shallow, relatively undisturbed valley fill sand reservoir trapped along a basin margin (T. Flanigan and B. Ehni, Nevada Petroleum Society Newsletter, 3-26-91, p. 2). This well is one of seven to be drilled by December 31, 1991 on the north side of Pine Valley by J. R. Bacon under a farmout agreement with Foreland Corp. (Petroleum Information, 5-3-90, p. 2).

The Trap Spring field in Nye County gained five new producers in 1990. **Apache Corp.**'s **Trap Spring No. 23-41** began pumping small amounts of 24° gravity oil (no water) in July 1990 from zones at 3,766 to 3,870 feet in the Tertiary Windous Butte volcanics and from 4,108 to 4,416 feet in the Tertiary Pritchards Station ignimbrite.

J. R. Bacon Drilling, Inc. is pumping 28° gravity oil and some water from the **Munson Ranch No. 14-49X** well from 3,882 to 4,395 (total depth) in the Tertiary Pritchards Station ignimbrites.

David M. Evans, Inc. is pumping 26.5° gravity oil and water from 3,145 to 3,323 feet (total depth) in the Pritchards Station ignimbrites at the new **Trap Spring No. 12-13** well. Production began in September 1990.

Makoil, Inc. has a new high-volume producer in the **Munson Ranch No. 12-32** well. This well is flowing oil at the rate of about 750 to 850 barrels per month since its first production in January 1990. Another new Makoil, Inc. producer in the Trap Spring field is the **Munson Ranch No. 12-42**. Almost equal parts of oil and water are being pumped from zones located from 3,152 to 3,532 feet (total depth) in unidentified strata since first production in July 1990.

Oil and Gas Production

Nevada oil production reached a record high in 1990. The total net oil produced was 4,012,436 barrels from ten fields, according to the Producer's Monthly Reports filed with the Nevada Department of Minerals. This is a 25% increase from the 1989 annual production of 3,217,613 barrels. Two Apache Corp. wells, the Grant Canyon Nos. 3 and 4, account for almost 60% of the state's annual production. The Grant Canyon field has contributed more than 45% of Nevada's total oil production, having produced nearly 13 million barrels of crude since the first production in September 1983 (Petroleum Information, 10-31-90).

The **Grant Canyon No. 3** well continues to be the most prolific onshore, free-flowing vertical well in the contiguous United States, capable of producing 4,100 barrels of 26° gravity oil per day from the Devonian Guilmette Formation.

Nevada crude oil is transported by tank trucks to several refineries: the Petro Source Refining Corp.'s 8,000-barrel/day refinery and asphalt storage plant at Currant in Railroad Valley; the Petro Source Refining Partners' asphalt storage facility and refinery (used only a few day a month for refining) at Tonopah; the Petro Source Refinery in Salt Lake City, Utah; and Crysen Refining, Inc. at Woods Cross, Utah (presently refining only Pine Valley crude oil). The average net wellhead price for Nevada crude was $15.75 per barrel in 1990 (John Snow, Bureau of Land Management, Reno office).

In the Kate Spring field, a total of 91,087 thousand cubic feet (MCF) of gas was produced in 1990 and either used or flared at the lease sites of Apache Corp., David M. Evans, Inc., and Western General, Inc. Several options for using the gas have been considered, but they continue to be economically unfeasible. Negotiations to sell the gas to Petro Source have been unsuccessful. A pipeline is too expensive and the gas produced may not continue at the rate and volume that it is currently being produced. Constructing a cogeneration unit would amount to double the cost of constructing a pipeline. As a third option, the gas could be injected into a disposal well, which would also be very expensive. The GOR (gas/oil ratio) for the Kate Spring No. 1-A well has dropped 68% (from 0.330 to 0.138) from January 1990 (first production) to January 1991. Thus, the gas may not continue to be produced at the current rate or volume to warrant such expensive recovery procedures.

Closures

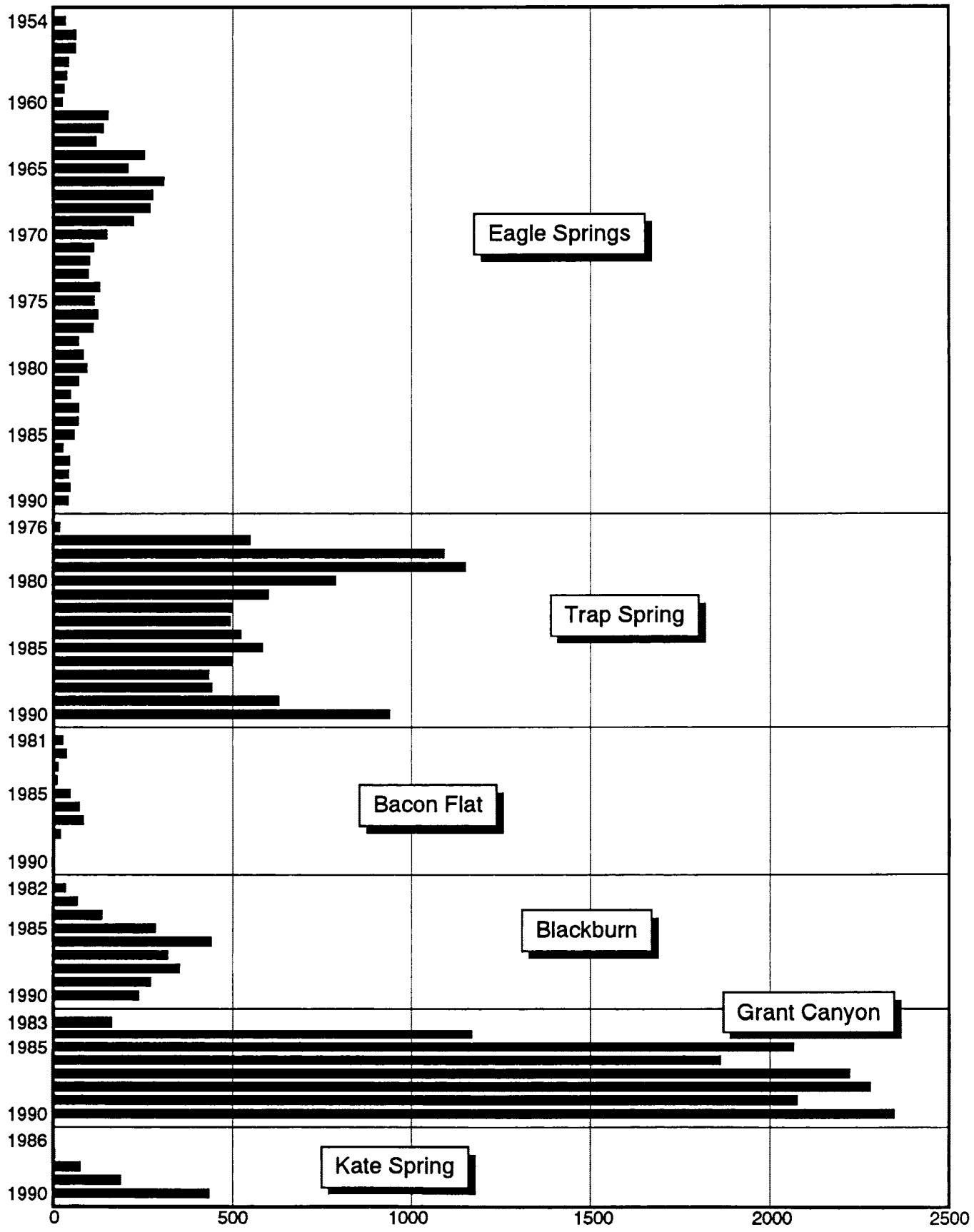
Of the 63 wells capable of producing, 13 were shut-in for 6 months or more during 1990. Several companies continued to suspend production on their leases in Railroad and Pine Valleys. Under a 1986 policy authorized by the Mineral Leasing Act of 1920, any oil and gas leaseholder with wells on federal land may opt to suspend production temporarily, rather than prematurely abandon the lease because of low domestic oil prices. This policy is meant to conserve domestic oil and gas reserves and provide for the collection of royalties and taxes on these leases in the future.

In the Trap Spring field, **Makoil, Inc.** suspended production for the entire year on the **Zuspann Nos. 24-1** and **24-3**, the **J. N. Fed. No. 1**, and the **Munson Ranch Nos. 12-33** and **13-24** wells. The **Britton No. 1** well produced only from August through December 1990.

Apache Corp. suspended production on the **Bacon Flat No. 1** well all year. It is the only producer in the Bacon Flat field.

In the Eagle Springs field, **John A. Lyddon** suspended production for the entire year on the **Eagle Springs Unit Nos. 15-35, 35-35** and **62-35**. **Draycutt Corp.** suspended production all year on the **No. 1-36** well, and all but 5 months on the **No. 74-35** well.

Western General, Inc. suspended production for the entire year on the **Kate Spring No. 1** well in the Kate Spring field; and **Foreland Corp.** suspended production for all but November and December on the **Southern Pacific No. 1-5** well in the Tomera Ranch field.



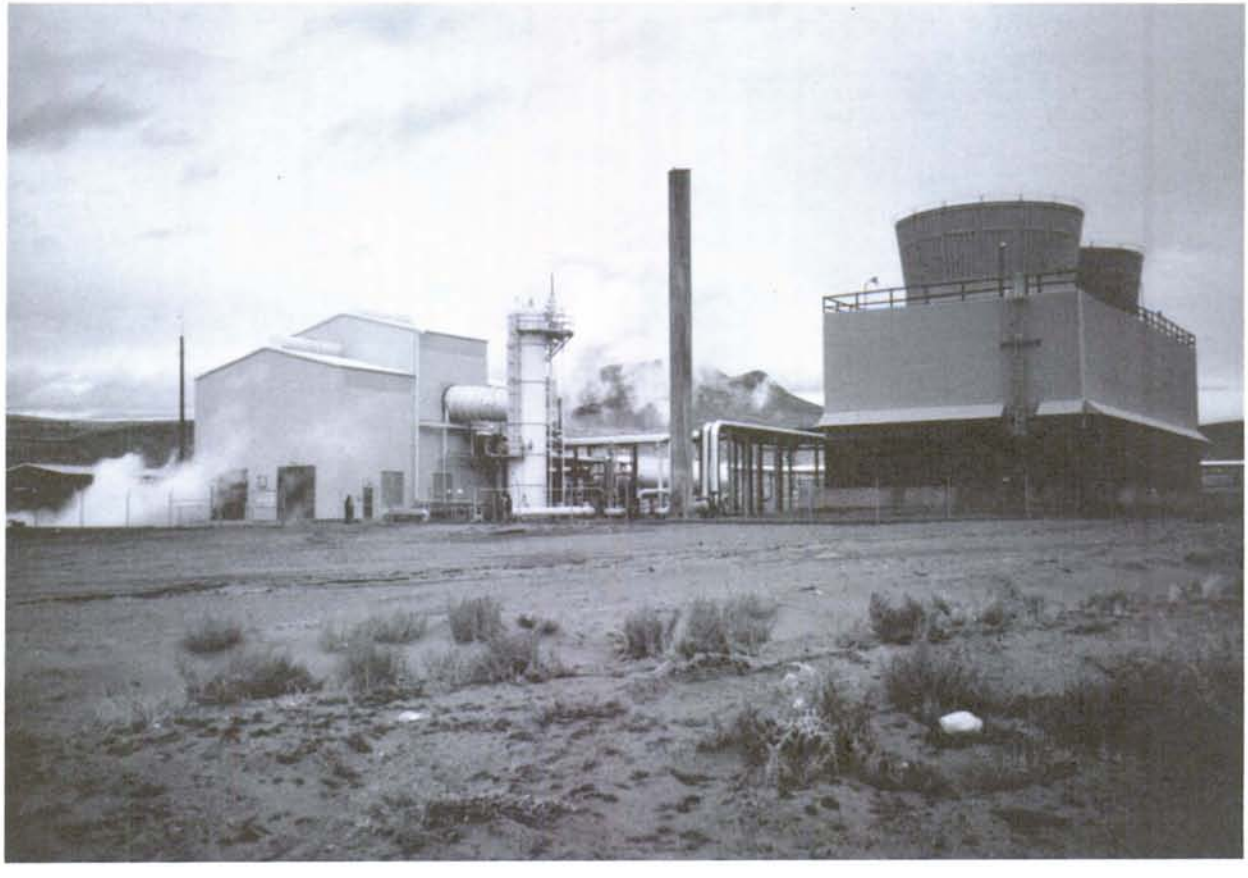
Oil production, in thousands of barrels.

U.S. Oil Production and Consumption

Domestic crude oil production continues to decline on a year-to-year basis, according to the American Petroleum Institute. Domestic production in 1990 was consistently 4% lower than in 1989 on a month-to-month basis. Many forecasters predict that the U.S. will be importing almost 60% of its oil for domestic consumption by the mid-1990s.

The effects of the war in the Persian Gulf caught up with the U.S. at the end of 1990. With transit times of a month or more, oil loaded in the Middle East prior to the international embargo was still arriving in the U.S. throughout the late summer at "normal" (4% higher than a year ago) import levels; however, the international boycott of oil shipments from Iraq and Kuwait caused world crude oil prices to jump from 30% to over 100% from June to September, and by the end of 1990 domestic demands for crude oil had dropped 7% from the same time a year ago (Petroleum Information, 9-25-90, p. 2). At the end of 1989, domestic demand for oil exceeded 18.0 million barrels per day. Late in 1990, U.S. demand had dropped to 16.75 million barrels a day. As the demand for higher priced crude dropped, so did the imports, by more than 11%. Imports accounted for approximately 42% of domestic supply at the end of 1990. The 1989 annual average was slightly more than 44% (Petroleum Information, 1-8-91, p. 2). Refineries in the U.S. operated at over 90% capacity during the year, a 4% increase over 1989.

The Nevada Department of Minerals and the U.S. Bureau of Land Management are gratefully acknowledged for their help in compiling the information in this section.



Desert Peak geothermal power plant, Churchill County. *Larry Garside photo.*

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Geothermal Energy

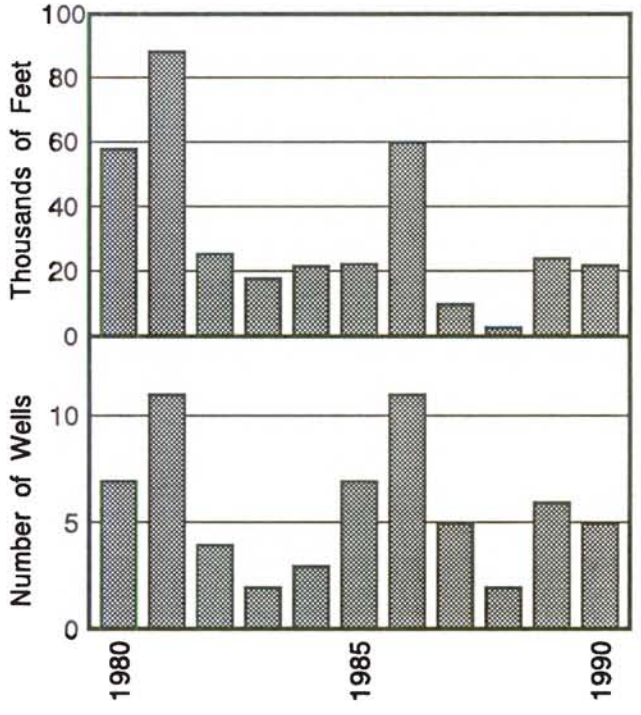
by Ronald H. Hess

Twenty-seven geothermal well permits were issued by the Nevada Department of Minerals during 1990: eight industrial class, two commercial class, five domestic class, nine observation class, and three injection class wells. Twelve geothermal wells are reported to have been drilled during 1990, with a total proposed footage of 37,700 feet. Five of the wells drilled were industrial class with a total footage drilled of approximately 22,000 feet.

During 1990 there were 143 noncompetitive and 51 competitive federal geothermal leases totaling 328,612 acres, a decrease of 32,776 acres from 1989. Federal leases generated $414,811 in rental fees, $207,405 of which was returned to the State of Nevada (State Office, U.S. Bureau of Land Management).

Gross geothermal energy production from federal lands in Nevada totaled 861,227 megawatt-hours in 1990; net production from federal lands was 775,182 megawatt-hours; the sales value of this production was $66,585,000. Federal production royalties generated $1,885,000 of which $942,500 was returned to the State.

Total geothermal electrical production from federal and fee lands in Nevada in 1990 was 996,000 megawatt-hours; net production was 884,000 megawatt-hours with an approximate sales value of $73,120,000. Rated capacity of the nine existing geothermal power plants in Nevada is 132.3 megawatts. It is expected that by 1996 nine new geothermal power plants will be on-line, with a rated capacity of 195 megawatts *(see table on next page)*. If all nine plants are completed, Nevada's geothermal electrical production capacity will be boosted to 323 megawatts by 1996, or about one-third of Sierra Pacific Power Company's 1990 summertime peak demand of 957 megawatts.



Industrial-class (power generating) geothermal wells drilled in Nevada, 1980–1990.

During 1990 **Chevron Resources Co.** announced the sale of its 50% interest in the **Beowawe** 16-megawatt geothermal plant, its 100% interest in the **Desert Peak** 10.5-megawatt geothermal plant, and Nevada leasehold interests of about 70,000 acres.

Chevron Resources President Bob Daniel stated that "the geothermal operations were sold as part

NONDOMESTIC GEOTHERMAL WELLS DRILLED IN NEVADA—1990

Area	Company	Well name	Proposed depth (ft)	Location	Type
Churchill County					
Brady Hot Spring	Hot Springs Power Company	Observation Well #77-1	2,500	SE¼ SE¼ S1,T22N,R26E	Observation well
Brady Hot Spring	Nevada Geothermal Power Partners	Test Well #57-1	3,000	SW¼ SE¼ S1,T22N,R26E	Observation well
Dixie Valley	Oxbow Geothermal Company	Production Well #28-33	10,000	SW¼ SW¼ S33,T25N,R37E	Industrial class
Soda Lake	Soda Lake Resources Partnership	Injection Well #33-28	1,500	NE¼ NW¼ S28,T20N,R28E	Injection well
Soda Lake	Soda Lake Resources Partnership	Observation Well #55-33	1,500	NE¼ SE¼ S33,T20N,R28E	Injection class
Soda Lake	Soda Lake Resources Partnership	Production Well #11-33	4,000	NW¼ NW¼ S33,T20N,R28E	Industrial class
Soda Lake	Soda Lake Resources Partnership	Production Well #64-33	4,500	SW¼ NE¼ S33,T20N,R28E	Industrial class
Soda Lake	Soda Lake Resources Partnership	Production Well #84-33A, redrill	4,500	SE¼ NE¼ S33,T20N,R28E	Industrial class
Soda Lake	Soda Lake Resources Partnership	Slim Hole #62-28	4,000	NW¼ NE¼ S28,T20N,R20E	Observation well
Soda Lake	Soda Lake Resources Partnership	Well #45-33	1,000	NE¼ SW¼ S33,T20N,R28E	Injection well
Washoe County					
Steamboat Springs	Far West Capital, Inc.	Hot Air Well No. 4	1,000	SE¼ SE¼ S29,T18N,R20E	Industrial class

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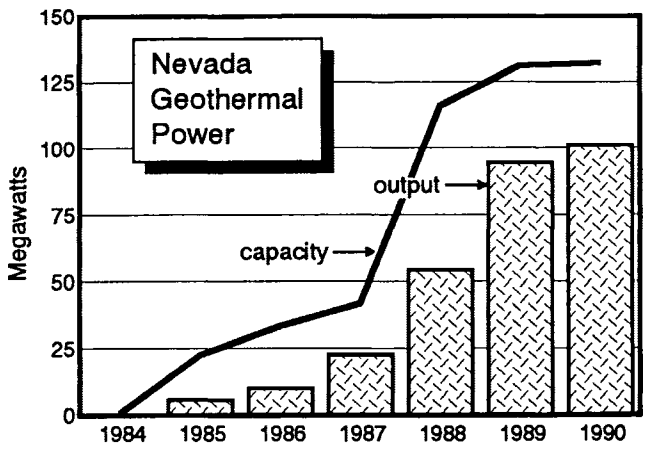
PLANNED GEOTHERMAL DEVELOPMENTS 1991 TO 1996

Developer	Location	Capacity (MW)	Estimated operation date
Nevada Geothermal Power Partners	Bradys	20.0	May 1992
Soda Lake II	Soda Lake	13.0	June 1991
Far West Capital	Steamboat II	13.5	November 1992
Far West Capital	Steamboat III	13.5	November 1993
OESI(A)	undetermined	14.3	March 1993
OESI(B)	undetermined	14.3	November 1993
San Emidio Resources	San Emidio Valley	5.4	November 1992
San Emidio Resources	San Emidio Valley	21.6	November 1995
U.S. Navy Air Station	Fallon	80.0	1992
	TOTAL CAPACITY (MW)	195.6	

Source: Nevada Public Service Commission, Summary of Executed Contracts (January 24, 1991) and NBMG Special Publication MI-1989.

of the corporation's ongoing program to concentrate on business lines and assets that fit Chevrons's long-term strategic outlook." The purchaser, **California Energy Co., Inc.**, announced that this purchase was part of a deal which encompassed other properties and interests in Utah and Oregon. Total purchase price was reported to be $51,000,000. (Chevron news release, May 4, 1990 and California Energy Co. Inc. news release, May 4, 1990 and March 29, 1991)

From 1985 to 1990 approximately 112 geothermal wells were drilled in Nevada to support direct use applications of geothermal energy. This includes 100 domestic geothermal wells drilled in the Reno area, two wells drilled to support the Round Mountain gold mining operation, one well drilled to support the Florida Canyon mining operation, one well drilled at the Jackpot Y3 Ranch catfish production facility, three wells drilled by hotels and apartment complexes in the Reno area, two wells drilled for Elko schools, two wells drilled for Wells schools, and one well drilled for Carlin schools.



Rated capacity (line) and average net output (bars) of Nevada geothermal plants, 1984–1990. Average net output is annual sales in megawatt-hours divided by the number of hours in a year (8,760).

Direct use applications include space heating, district heating, heat pump use, industrial processes, aquaculture, and swimming pools. In 1988, total output of direct use applications in Nevada was 844 billion Btu. It is estimated that the Round Mountain mine uses 197 billion Btu and the Florida Canyon mine uses 40 billion Btu of geothermal energy yearly to increase production and enhance recovery in their heap-leaching operations. The 300 residences in the Reno area that utilize geothermal energy for space heating use an estimated 39 billion Btu annually. (NBMG Special Publication MI-1988 and Geo-Heat Center Quarterly Bulletin, vol. 12, no. 1, and vol. 13, no. 1, winter 1990)

The **Oxbow Geothermal Corp. Dixie Valley** plant had a net production of approximately 487,000 megawatts during 1990. The plant has a rated capacity of 62 megawatts but over several periods during the summer of 1990 gross output from the plant exceeded 66 megawatts. The plant's average net output for 1990 was 55.6 megawatts. One new production well and one additional injection well were brought on-line during 1990. No new wells are currently planned for 1991.

OESI Power Corp., formerly **Ormat Energy Systems, Inc.**, has finalized financing on the **Soda Lake Geothermal No. 2** plant. This plant will consist of seven Ormat Energy Converters with a combined capacity of approximately 13 megawatts. It will be OESI's thirteenth geothermal power plant operation. Part of this project included the acquisition of 11,000 acres of geothermal leases from Chevron Resources Inc. (Geothermal Resources Council Bulletin, December 1990).

Yankee Caithness J.V.L.P. received approval of its permit to install new binary generation equipment that will increase the **Steamboat** plant capacity by 6 to 8 megawatts. The estimated cost of the expansion is $10,000,000. Current rated capacity is 12.5 megawatts, generated from three production wells. The increased production will be obtained by utilizing the new equipment to extract additional energy from the geothermal fluid after it is flashed at the existing plant. (Reno Gazette-Journal, June 6, 1990 and June 13, 1990).

Yankee Caithness geothermal power plant at Steamboat, Nevada. *Nevada Department of Minerals photo.*

DIRECTORY OF GEOTHERMAL POWER PLANTS

Plant name (year on line)	Rated capacity (MW)	Average net output[1] (MW)	Location	Operator	Address	Remarks
Beowawe (1985)	16.0	11.8	S13,T31N,R47E	Oxbow/California Energy Co.	Mike Kerna 200 S. Virginia St. Suite 450 Reno, NV 89501	Production from two wells—one at 8,300 feet, the other at 9,600 feet. Maximum bottom-hole temperature 410°F.
Desert Peak (1985)	10.5	9.0	S21,T22N,R27E	Western States Geothermal Co.	Von Maynard, Superintendent P.O. Box 2627 Sparks, NV 89432-2627	Resource temperature 400°F Well-head temperature 330°F
Dixie Valley[2] (1988)	62.0	55.6	S7,T24N,R37E S33,T25N,R37E	Oxbow	Don Wells, Plant Manager 200 South Virginia St., Suite 450 Reno, NV 89501	Estimated 30 to 60 year reservoir reserve with a 200+ MW production capacity. Now producing from six wells.
Empire (1987)	3.6	1.4	S21,T29N,R23E	OESI/AMOR II	Monte Morrison, Operations Coordinator 610 East Glendale Avenue Sparks, NV 89431	Producing from a liquid-dominated geothermal source at 265° to 278°F.
Soda Lake (1987)	3.6	2.0	S33,T20N,R28E	OESI/AMOR III	Monte Morrison, Operations Coordinator 610 East Glendale Avenue Sparks, NV 89431	Producing from a liquid-dominated geothermal source at 365°F.
Steamboat (1986)	9.8	5.7	S29,T18N,R20E	OESI/Far West	Monte Morrison, Operations Coordinator 610 East Glendale Avenue Sparks, NV 89431	Three production wells provide 340°F fluid to one plant. Owned by Far West.
Stillwater (1989)	13.0	6.0	S1,T19N,R30E S6,T19N,R31E	OESI/AMOR IV	Monte Morrison, Operations Coordinator 610 East Glendale Avenue Sparks, NV 89431	Producing from a liquid-dominated geothermal source at 310° to 340°F.
Wabuska (1984)	1.3	0.7	S15,16,T15N, R25E	Tad's	Grace Townsend Caldwell, Plant Manager 10 Julian Lane Yerington, NV 89447	Plant operates on geothermal fluids at 224°F from 350-foot depth.
Yankee Caithness (1988)	12.5	10.7	S5,6,T17N,R19E	Yankee Caithness J.V.L.P.	Ted De Long, General Manager P.O. Box 18160 Reno, NV 89511	Producing from three wells.
TOTAL	132.3	102.9				

[1]Average net output to the utility company grid. Power from the Beowawe and Dixie Valley plants is purchased by Southern California Edison Co.; power from the other plants is purchased by Sierra Pacific Power Co.
[2]Gross output of the Dixie Valley plant occasionally exceeded 66 MW during the summer of 1990.
Sources: NBMG Special Publication MI-1989; Operators, 1991; and NBMG files.

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For additional information on Nevada's mineral resources and mineral industries see the following NBMG publications:

Statewide Commodity Bulletins

Barite (B98)
Fluorspar (B93)
Gypsum (B103)
Montmorillonite, bentonite, and fuller's earth (B76)
Oil and gas (B104)
Radioactive minerals (B81)
Talcose minerals (B84)
Thermal waters (B91)
Tungsten (B105)
Zeolites (B79)

County Mineral Resource Bulletins

Carson City (B75)
Churchill (B83)
Clark (B62)
Douglas (B75)
Elko (B54)
Esmeralda (B78)
Eureka (B64)
Humboldt (B59)
Lander (B88)
Lincoln (B73)
Lyon (B75)
Mineral (B58)
Nye (B77, B99B)
Pershing (B89)
Storey (B70)
Washoe (B70)
White Pine (B85)

Special Publications

Oil and gas wells drilled in Nevada since 1986 (L-8)
Geothermal wells drilled since 1979 (L-5)
Nevada mining and you (SP8)
Economic impacts of Nevada's mineral industry (SP9)
Economic impacts of Nevada's mineral industry—1988 update (L-9)
Nevada ore and concentrate buyers, custom mills, and smelters available to mine operators (L-7)
Major mines of Nevada 1990 (SP11)

NBMG maintains an open-file office with the following information available to the public:

NBMG, USGS, BLM, USBM, and DOE open-file reports on Nevada geology and mineral resources
petroleum and geothermal exploration and production
mining district records and maps
mineral resources and reserves
mineral resource assessments
core and cuttings library
mining claim data
wilderness study area reports
general geologic studies
indexes and ordering information for maps, air photos, and remote sensing imagery

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The Nevada Bureau of Mines and Geology (NBMG) is part of the Mackay School of Mines at the University of Nevada, Reno and is the state geological survey. NBMG scientists conduct research and publish reports on mineral resources and various aspects of general, environmental, and engineering geology.

Current activities in mineral resources and general geology include detailed geologic mapping and stratigraphic studies in Nevada, comparative studies of bulk mineable precious-metal deposits, geochemical investigations of mining districts, resource assessments, igneous petrologic studies, hydrothermal experiments, research on the origin of hydrothermal platinum-group-element occurrences, and examination of the origin and distribution of borate deposits in Nevada.

Environmental, engineering, and urban geology projects include investigations of earthquake hazards and related aspects of neotectonics, examination of issues involved in siting nuclear and hazardous wastes, mapping of geomorphic features, radon hazard studies, studies of landslide hazards, and investigation of land subsidence in Las Vegas Valley.

Geologic information activities include creating and updating databases on mining districts, active mines and prospects, and geothermal and petroleum exploration and production; implementation and development of statewide geographic information systems; and maintenance of core and cuttings facilities, rock and mineral collections for research, aerial photographic imagery and maps, and extensive files on Nevada geology and resources.

NBMG cooperates with numerous state and federal agencies in providing geologic and resource information and in conducting research. Research results are published as NBMG bulletins, reports, maps, and special publications as well as in federal publications and scientific journals. In addition to addressing the needs for geologic information by conducting research, publishing reports and maps, and creating computer databases, staff members assist the public, industry, and government agencies by answering specific questions regarding Nevada geology and resources and by providing some chemical and mineralogical analyses.

Individuals interested in Nevada geology are encouraged to visit or write NBMG or call (702) 784-6691. NBMG offices are located in the west wing of the Scrugham Engineering-Mines Building on the University of Nevada, Reno campus. When visiting NBMG by car please stop at the information booth just inside the Center Street entrance on the south end of the campus. The attendant will issue you a temporary parking permit and give you directions to parking areas and the NBMG offices. Address mail to: Director/State Geologist, Nevada Bureau of Mines and Geology/178, University of Nevada, Reno, NV 89557-0088. A publication list will be sent upon request.

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