

THE NEVADA MINERAL INDUSTRY 2021

Metals
Industrial
Minerals
Geothermal
Oil and Gas

Exploration
Development
Mining
Processing



NEVADA SYSTEM OF HIGHER EDUCATION 2021

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2021

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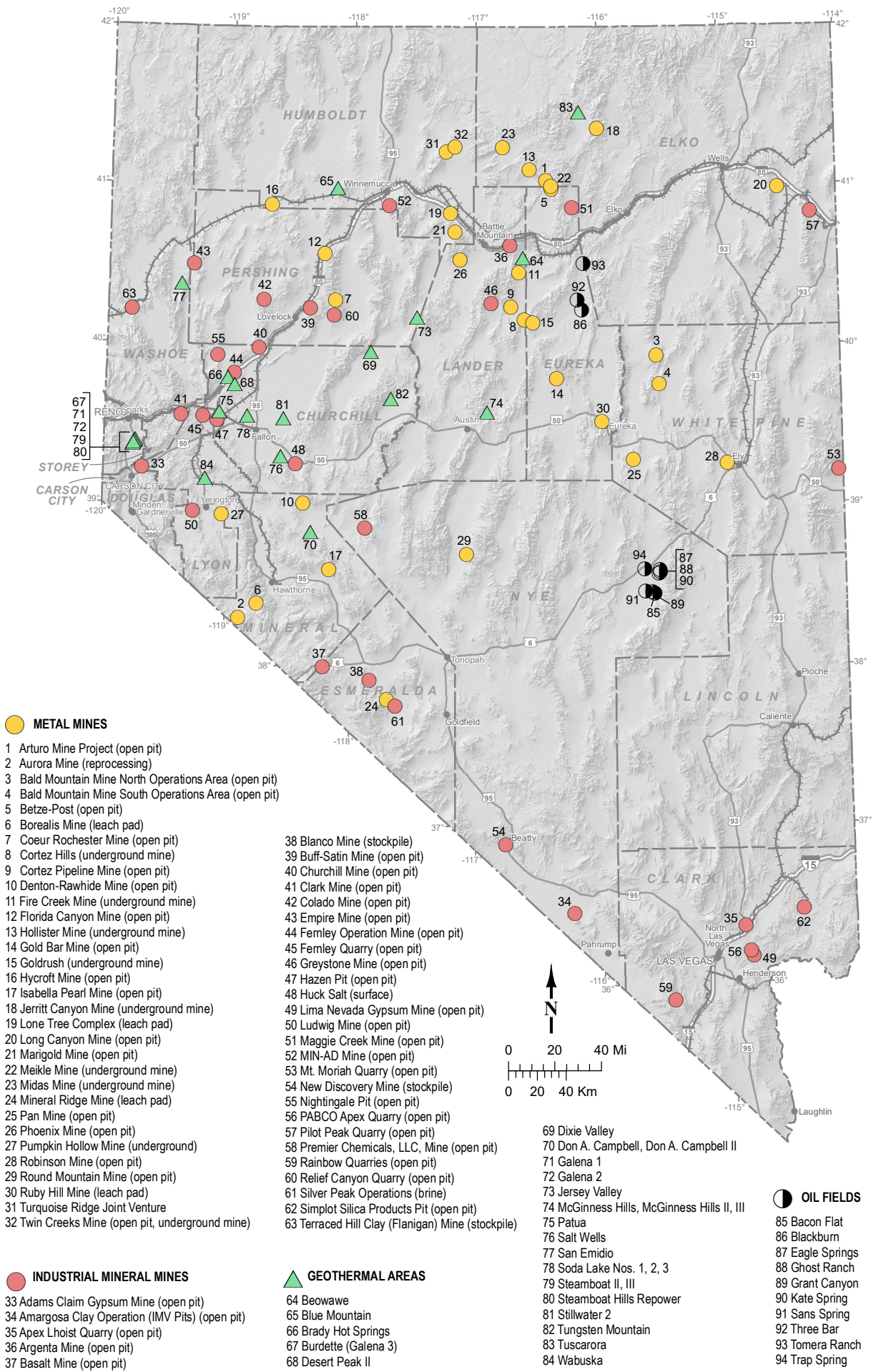


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Major mines, oil fields, and geothermal areas, 2021.

OVERVIEW

by John L. Muntean and Rachel Micander

This report highlights activities in 2021 in the exploration and production for metals, industrial minerals, geothermal energy, and petroleum. Once again Nevada led the nation in the production of gold (\$8.098 billion) and barite (\$27.288 million). It was also the only state that produced lithium compounds (\$41.692 million), magnesite (\$8.058 million), and the specialty clays, sepiolite and saponite (\$11.839 million). Other commodities mined and produced in Nevada in 2021, in order of value, included copper (\$687.677 million), geothermal energy (\$318.748 million), aggregate (sand, gravel, and crushed stone) (\$235 million), silver (\$155.709 million), diatomite (\$51.282 million), limestone and dolomite (mainly for cement, \$36.488 million), gypsum (\$49.643 million), silica (\$18.174 million), and petroleum (\$12.759 million). Locations of many of the sites mentioned in the text of this report are shown on NBMG Open-File Report 2021-01, Nevada Active Mines and Energy Producers, which is available at <https://pubs.nbmgs.unr.edu/NV-active-mines-and-energy-2021-p/of2021-01.htm>.

Nationwide, Nevada was second to Arizona in terms of value of overall nonfuel commodities (excluding oil, gas, coal, uranium, and geothermal). The USGS estimates the value of Nevada's nonfuel mineral production to be \$9.35 billion. This accounts for 10.3% of the total value of nonfuel mineral production nationwide in 2021. (U.S. Geological Survey, Mineral Commodity Summaries 2022, <https://pubs.usgs.gov/periodicals/mcs2022/mcs2022.pdf>). Arizona was first in nonfuel production, given it produces the most copper in the U.S. Texas was third, mainly due to its demand for aggregate and cement; California was fourth due to aggregate, diatomite, and borates; and Minnesota was fifth due mainly to production of iron ore. The contributions that mining makes to the economies of Nevada and the U.S. are significant in terms of jobs, commerce, taxes, improvements to the infrastructure, and lowering of the U.S. trade deficit.

Gold production in Nevada in 2021 was just over 4.502 million ounces (140 metric tons; table 1), a 2.8% decrease from 2020. The average gold price rose from \$1,773.73/oz in 2020 to \$1,798.61/oz in 2021, a 1.4% increase (figs. 1, 2, and 3). Nevada alone accounted for 4.6% of the world's gold production in 2021 (Nevada Mining Association: <https://www.nevadamining.org/mining-in-nevada/data-analysis/>), which was approximately 108 million ounces (3359 metric tons). Only the nations of China, Australia, Russia, and Canada produced more gold than the state of Nevada.

The section on Metals provides details on exploration, new deposit discoveries, new mine openings, mine closures, additions to reserves, and mine expansions. As has been the

case for many years, gold continues to be the leading commodity produced in Nevada. Production of gold in 2021 came mainly from 10 major mining operations that each produced greater than 100,000 ounces (2.83 metric tons). The share of Nevada's gold production from the Carlin trend increased from 16.76% in 2020 to 18.4% in 2021.

The World Gold Council and U.S. Geological Survey estimate that total world gold production, since the beginning of civilization, has been approximately 7.239 billion ounces (225,158 metric tons). Nevada and the U.S. have produced a significant portion of the world's gold. Cumulative U.S. production, primarily since 1835, is approximately 628 million ounces (19,533 metric tons), which is 8.7% of total world production. Nevada's total production of 249 million ounces (7,745 metric tons) accounts for 39.6% of total U.S. production and approximately 3.4% of total world production. Remarkably, 89% of Nevada's gold production has been produced since the Carlin Mine began production in 1965. By the end of 2021, cumulative production from the Carlin trend was 97.9 million ounces (3,045 metric tons), assuring its place as one of the most productive gold-mining districts in the world.

Nevada continues to be in the midst of the biggest gold boom in U.S. history, as the graph of historical U.S. gold production illustrates (fig. 2). The recent surge in production in the U.S. is largely the result of discoveries of Carlin-type gold deposits and other deposits in which gold occurs primarily in grains that are too small to be visible to the naked eye. These deposits are particularly common in Nevada. The U.S. production so far in the current boom, the period since 1981, has been 308 million ounces (9,580 metric tons). This is significantly greater than the total U.S. production during several past eras, including 1) the California gold rush (1849 to 1859, with 29 million ounces or 902 metric tons), although some estimates of unreported production may bring that figure up to 70 million ounces (2,177 metric tons); 2) the Comstock (Nevada) era from 1860 to 1875 with 34 million ounces (1,058 metric tons); and 3) the period from 1897 to 1920, when Goldfield (Nevada), the Black Hills (South Dakota), Cripple Creek (Colorado), and byproduct gold production from copper mines in Arizona and Utah contributed to cumulative production of 95 million ounces (2,955 metric tons). Gold production in the U.S. in the last decade from 2010 through 2021 alone was 83.8 million ounces (2,607 metric tons). The current boom is larger than previous booms not only in terms of cumulative production but also in terms of peak annual production and duration. The current boom has lasted at least 42 years versus no more than 24 years for any of the earlier booms.

Table 1. Quantity and Value of Mineral, Geothermal Power, and Petroleum Production in Nevada.

Commodity	2021		2020 (revised)		% Change 2020 to 2021	
	Quantity	Gross Value	Quantity	Gross Value	Quantity	Gross Value
Gold	4,502,365 oz	\$8,097,998,713	4,632,690 oz	\$8,198,192,912	-2.8%	-1.2%
Copper	163,732,694 lbs	\$687,677,315	154,264,931 lbs	\$431,941,807	6.1%	59.2%
Silver	6,218,415 oz	\$155,709,112	6,127,438 oz	\$125,888,212	1.5%	23.7%
Molybdenum	240,000 lbs	\$1,992,000	426,538 lbs	\$3,868,700	-43.7%	-48.5%
Aggregate	29,400,000 tons	\$235,000,000	24,700,000 tons	\$197,000,000	19.0%	19.3%
Geothermal	3,971,982 MWh net	\$318,747,661	3,961,951 MWh net	\$313,956,383	0.3%	1.5%
Barite (shipped from mills)	283,779 tons	\$27,288,230	166,136 tons	\$23,850,943	70.8%	14.4%
Petroleum (sold)	288,342 barrels	\$12,759,077	218,372 barrels	\$7,329,877	32.0%	74.1%
Gypsum	2,538,598 tons	\$49,643,160	2,416,743 tons	\$41,371,950	5.0%	20.0%
Lithium	12,963,995 lbs	\$41,691,698	6,902,966 lbs	\$28,540,089	87.8%	46.1%
Diatomite	311,700 tons	\$51,282,304	419,893 tons	\$50,859,212	-25.8%	0.8%
Dolomite	39,175 tons	\$3,917,743	37,075 tons	\$4,346,029	5.7%	-9.9%
Limestone	3,241,577 tons	\$32,570,285	3,220,860 tons	\$34,676,174	0.6%	-6.1%
Magnesium compounds	129,252 tons	\$8,057,512	124,088 tons	\$8,584,903	4.2%	-6.1%
Perlite	3,728 tons	\$767,906	2,715 tons	\$668,199	37.3%	14.9%
Specialty Clays	46,548.1 tons	\$11,839,493	191,689 tons	\$11,152,387	-75.7%	6.2%
Salt	16,495 tons	\$560,830	15,042 tons	\$511,428	9.7%	9.7%
Silica sand	657,796 tons	\$18,173,927	570,097 tons	\$14,323,690	15.4%	26.9%
Total Value (\$)		\$9,755,676,965		\$9,497,062,895		

Notes:

\$ Values as reported from Department of Taxation to the Nevada Division of Minerals in 2021 and 2020, except for the six commodities listed below.

1. Gold = NDOM # times 2021 avg. price \$1,798.61/oz. (Kitco)
2. Silver = NDOM # times 2021 avg. price \$25.04/oz. (Kitco)
3. Copper = NDOM # times 2021 avg. price \$4.20/lb avg. (USGS)
4. Molybdenite = NDOM # times 2021 avg. price \$8.3/lb (USGS)
5. Aggregates = Source USGS Mineral Industry Survey
6. Geothermal gross revenue as reported from Taxation

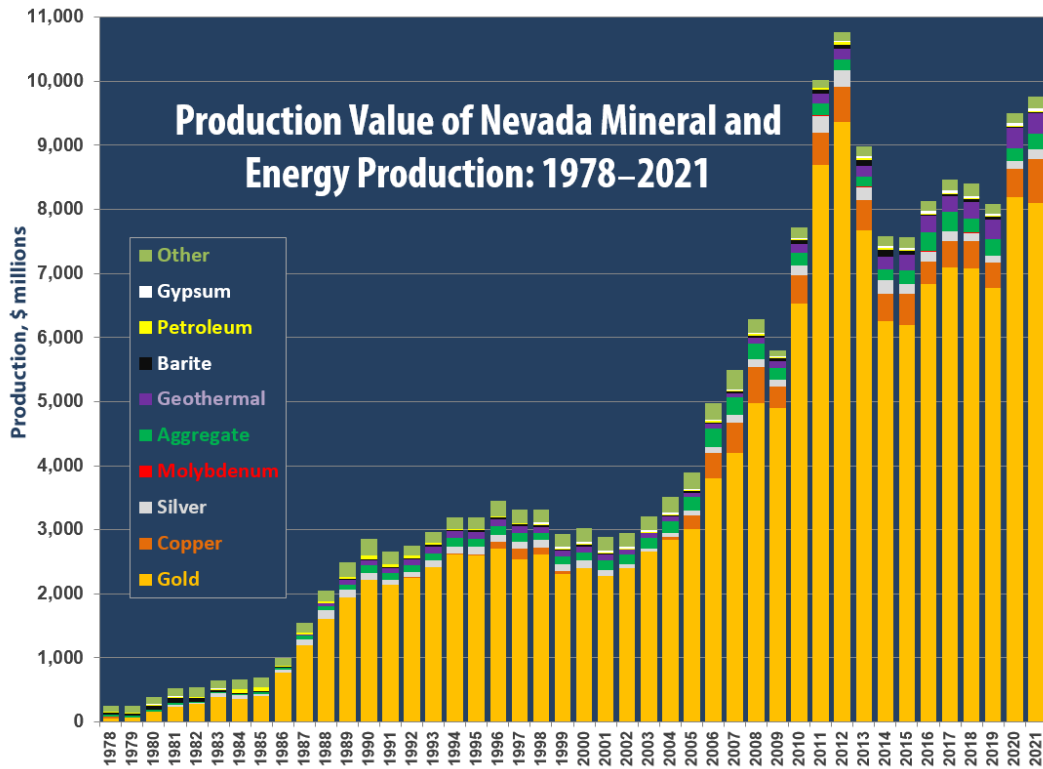


Figure 1. Chart showing relative values of Nevada production of gold, copper, silver, molybdenum, aggregate, geothermal energy, barite, petroleum, gypsum, and other minerals from 1978 to 2021. Molybdenum production is only shown for 2011 to 2021.

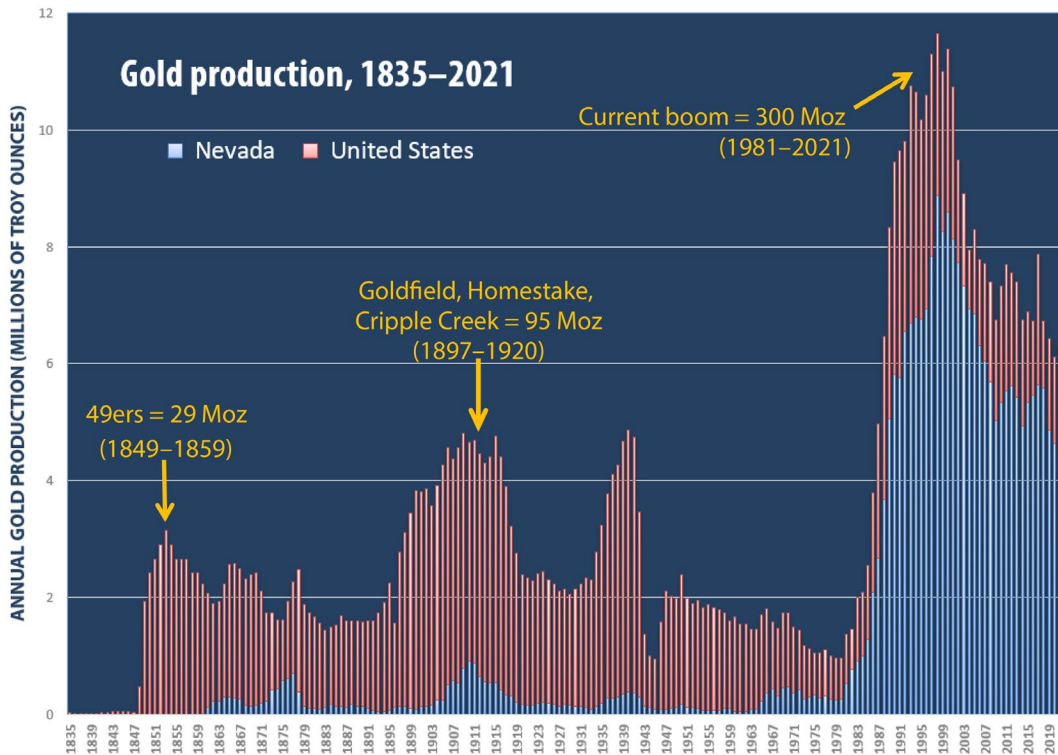


Figure 2. Chart comparing U.S. and Nevada gold production from 1835 to 2021.

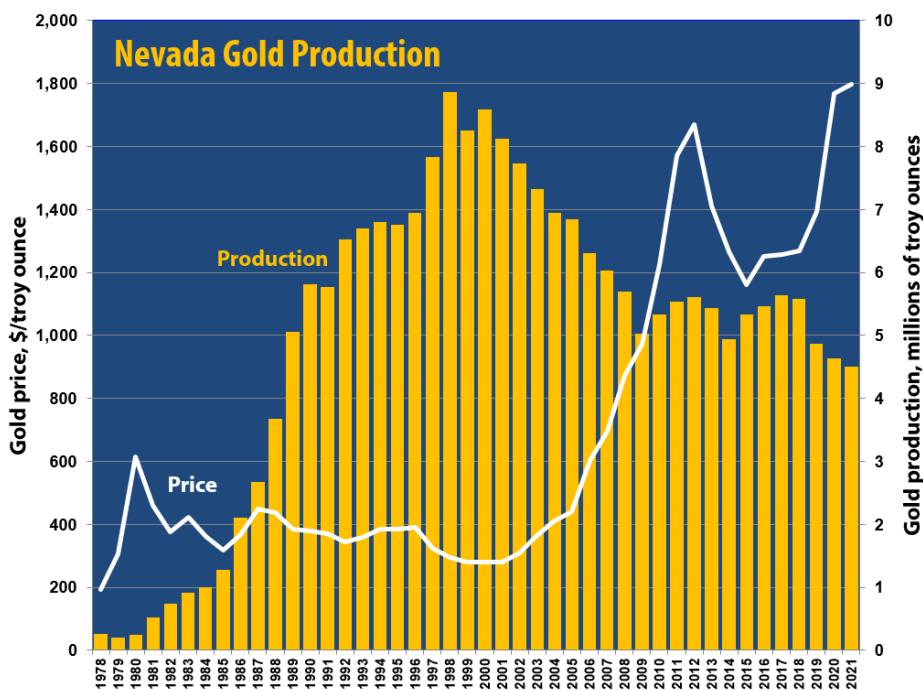


Figure 3. Chart showing Nevada gold production compared to the price of gold from 1978 to 2020.

Barrick Gold Corp. and Newmont Mining Corp. have accounted for the vast majority of Nevada gold production for the last 42 years, particularly from mines in the Carlin trend in northeastern Nevada. The two companies recently merged into Nevada Gold Mines LLC, a joint venture where Barrick holds 61.5% and Newmont holds 38.5% interest. In all, Nevada Gold Mines, LLC operates 11 mines in northeastern Nevada.

Nevada Gold Mines (NGM) produced 3,354,029 ounces (104.3 metric tons) of gold in 2021. 784,521 ounces (24.4 metric tons) of gold were produced from underground and open-pit operations at Cortez, including the Cortez Hills open pit and underground mines and the Pipeline open-pit complex. Nevada Gold Mines produced 860,404 ounces (26.8 metric tons) in the Carlin trend operations that included multiple open pits and underground operations. NGM's Twin Creeks and Turquoise Ridge mines in Humboldt County produced 536,806 ounces of gold (16.7 metric tons).

Other large gold operations include Kinross Gold Corp.'s Round Mountain Mine that produced 313,454 ounces (9.75 metric tons) in Nye County and SSR Mining's Marigold Mine in Humboldt County, which produced 234,443 ounces (7.29 metric tons).

Nevada silver production in 2021 totaled 6,128,814 ounces (190.63 metric tons), a 0.02% increase from 2020 (fig. 4). 49% of silver production was a byproduct of gold and copper mining. With a ratio of value (average price of gold [\$1,798.61] to average price of silver [\$25.04]) of ~72:1 in 2021, only those deposits with more than 72 times as

much silver produced as gold can be truly considered primary silver deposits. Only one such mine operated in Nevada in 2021, the Coeur Mining Inc.'s Rochester Mine in Pershing County, with total silver production amounting to 3.158 million ounces (98.23 metric tons) in 2021, which was 50.78% of the total silver produced in Nevada during 2021. Additionally, the Hecla (Klondex) Fire Creek Mine in Lander County produced 26,214 ounces (0.82 metric tons).

Nevada copper production in 2021 was dominated by the Robinson copper-gold-molybdenum mine, operated by KGHM International Ltd. near Ely in White Pine County. It produced 123.7 million pounds (56,109 metric tons) of copper (fig 5). Copper was also produced at NGM's Phoenix Mine near Battle Mountain in Lander County, where 36.74 million pounds (16,663 metric tons) of copper was produced. At Phoenix, copper is produced on site with a solvent extraction-electrowinning (SX-EW) plant, as well as producing concentrates that are shipped to smelters outside Nevada, similar to KGHM's Robinson Mine. In addition, Nevada Copper produced 3.297 million pounds (1,495 metric tons) of copper from their Pumpkin Hollow Mine outside of Yerington, Nevada. KGHM also produced 240,000 pounds (108.9 metric tons) of byproduct molybdenum from the Robinson Mine, the only reported molybdenum production in Nevada in 2021.

Mineral exploration activity in 2021 is summarized in the chapters on **Metals** and **Industrial Minerals**. Most exploration focused on gold; however, companies also explored for lithium, copper, and silver.

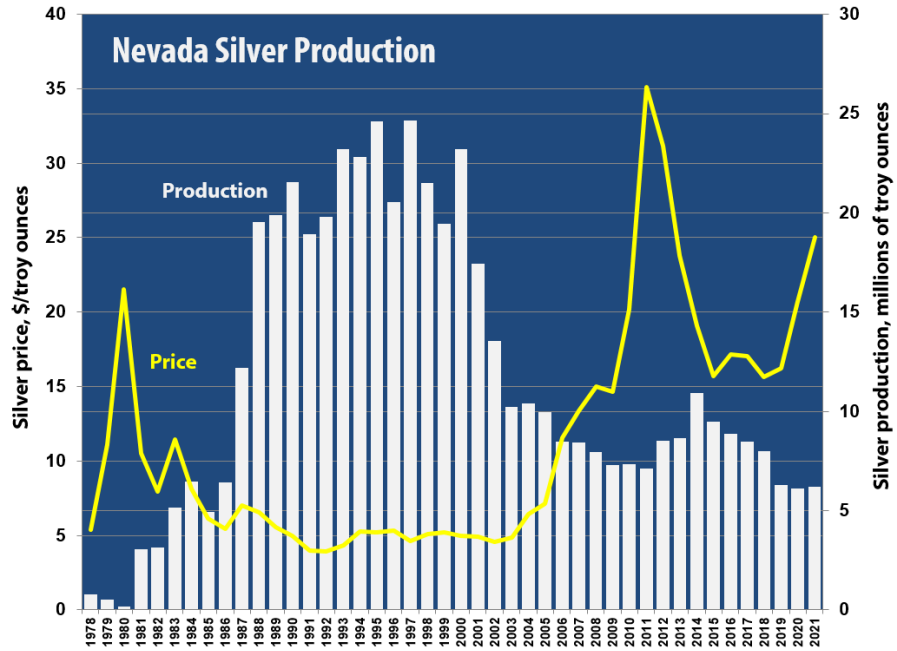


Figure 4. Chart showing Nevada silver production compared to the price of silver from 1978 to 2021.

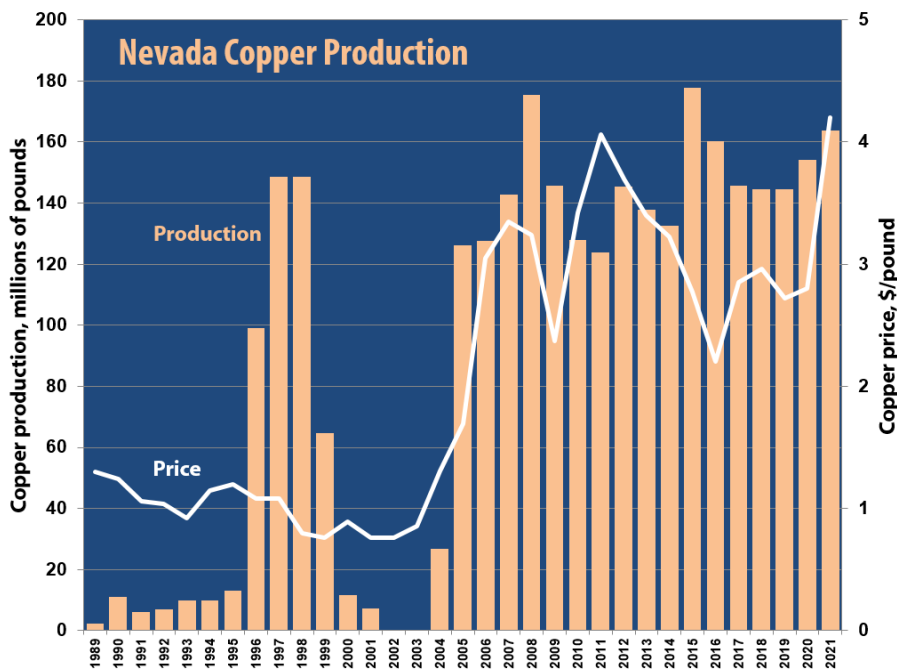


Figure 5. Chart showing Nevada copper production compared to the price of copper from 1989 to 2021.

Global exploration budgets increased 35% to \$11.24 billion in 2021 from \$8.35 billion in 2020. Gold accounted for 38% or over \$4.3 billion of the total global exploration budget.

The number of drill projects for metals in Nevada increased from 84 projects in 2020 to 99 in 2021 (fig. 6). Advanced exploration projects show promise for major developments, particularly for gold along the Carlin and Battle Mountain-Eureka (Cortez) trends in Eureka, Elko, and Lander counties. This includes Nevada Gold Mines'

large Goldrush deposit and Nevada Gold Mines' new high-grade Fourmile discovery near its Cortez Mine. Anglo Gold Ashanti drilled its Silicon project, though it was not a major drill program. Anglo Gold Ashanti has yet to release any results of its drilling at Silicon. Gold Standard Ventures Corp. continued to advance its Railroad-Pinion project near the town of Carlin. NuLegacy Gold continued to drill at its Red Hill project located just south of NGM's Cortez property, drilling some of the highest-grade intervals ever encountered at the Red Hill project.

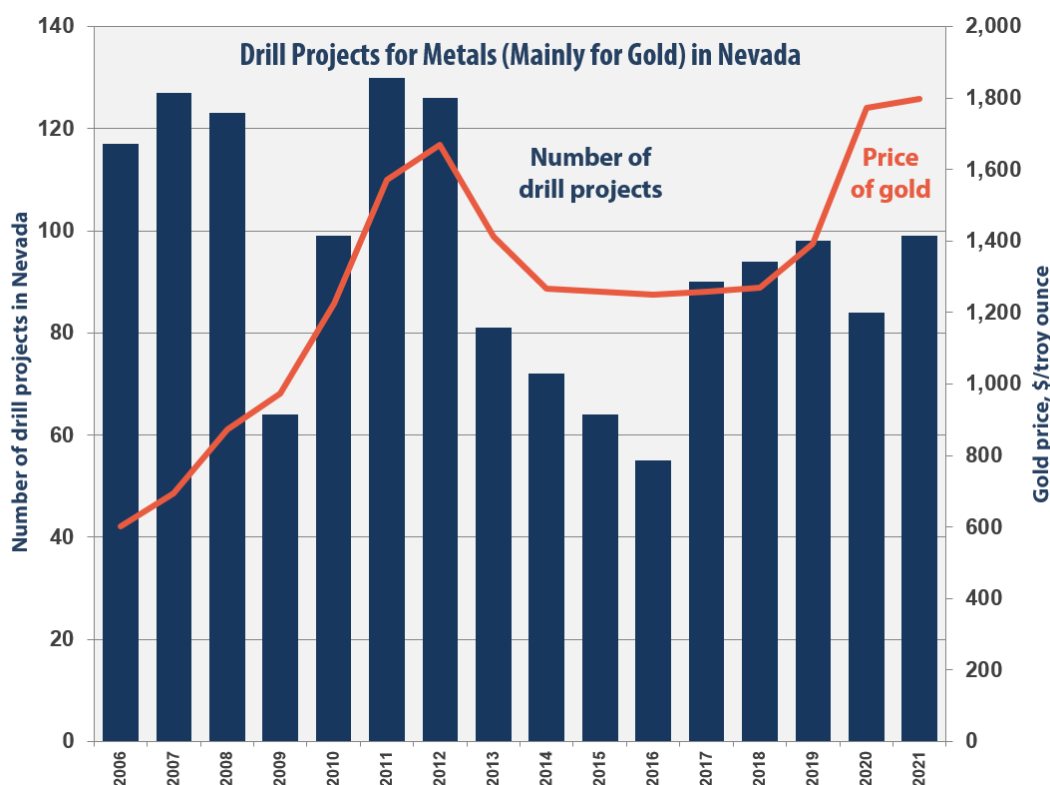


Figure 6. Chart showing number of drill projects targeting metals, mainly gold from 2006 to 2021. For comparison, the chart also shows the average annual price of gold during that period. The number of drill projects shown is a minimum, given that mining companies and privately held companies are not required to report whether they drilled.

The section on **Industrial Minerals** covers developments during 2021 and provides details about important commodities produced from or processed in Nevada, including aggregate (fig. 7), barite, cement, clays, diatomite, gemstones (opal, turquoise), gypsum, lime, limestone, dolomite, lithium, magnesia, perlite, pozzolan, rare-earth elements, salt, and silica. Demand for raw materials for construction will likely grow in the future because of Nevada’s increasing population and its need for additional highways and housing. Nevada’s estimated population in 2021 was 3.144 million, a 1.3% increase from 2021 (www.census.gov).

Albemarle Corp.’s Silver Peak operation in Clayton Valley in Esmeralda County, where subsurface brines are evaporated on a playa, is the only producer of lithium in the U.S. Most exploration projects for industrial minerals in Nevada were focused on lithium, both in brines and in clay deposits. The majority of this exploration was in southwestern Nevada, mainly in Clayton Valley and other nearby playas. Companies that conducted exploration drilling in 2021 included Cruz Battery Metals, American Lithium Corp., American Battery Technologies Company, Enertopia Corp. (using a man-portable drill), and Noram Lithium Corp.

Lithium Americas Corp. continued to move forward in the development of its lithium-rich clay resource at Thacker Pass in the moat sediments of the McDermitt caldera in northern Nevada, near the border with Oregon.

Ioneer Ltd. also continued to move forward with development of its Rhyolite Ridge lithium-rich clay deposit, located 25 km (16 miles) west of Albemarle’s Clayton Valley lithium in brine operation. The Rhyolite Ridge deposit also includes significant borate-bearing beds. In October 2021, Ioneer announced an agreement with Sibanye-Stillwater to develop a joint venture, whereby Sibanye will contribute \$490 million for a 50% interest in the Rhyolite Ridge property (Ioneer, 2022).

Nevada was also a leader in the production of several other industrial minerals. For example, Nevada was once again the leading domestic producer of barite, of which 95% is used for drilling muds in oil wells. Production increased 70.8% in 2021 (table 1, fig. 8). The barite price is directly tied to the price of oil and gas. Nevada is the leading producer of diatomite, accounting for 36% of national production. Nevada was ranked as the fourth largest gypsum producing state, behind California, Iowa, and Kansas. Premier Magnesia’s Gabbs Mine in Nye County is currently the nation’s only hard-rock producer of magnesite.

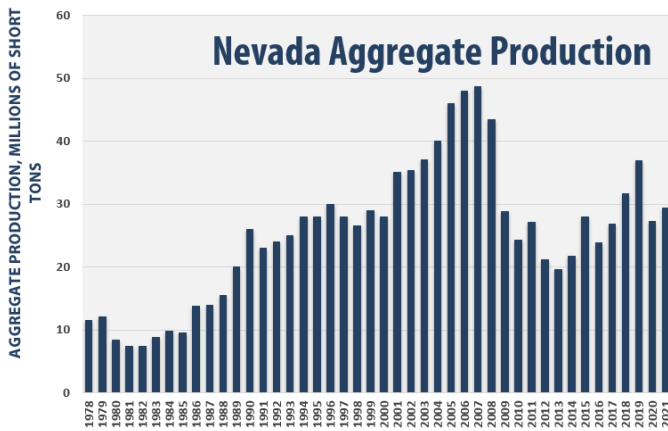


Figure 7. Chart showing Nevada aggregate production from 1978 to 2021.

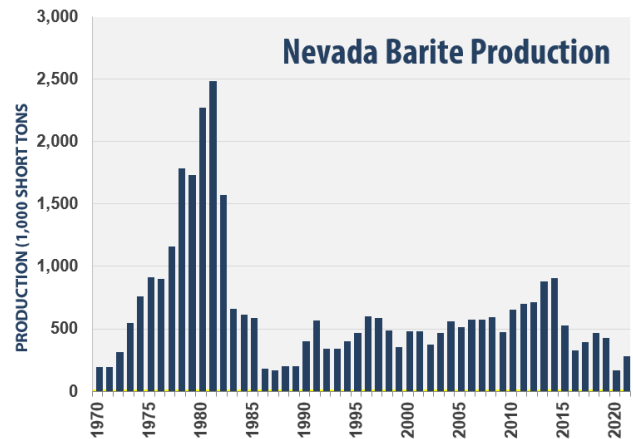


Figure 8. Chart showing Nevada barite production from 1970 to 2021.

The section on **Geothermal Energy** covers updates on exploration, development, and production of geothermal energy in the state in 2021. The total installed geothermal energy capacity in Nevada grew to ~808 MWe (megawatts electric) in 2021, representing a 22 MWe increase from 2020 (fig. 9). This small increase was associated with the completion of the McGuinness Hills Phase III Expansion Project. The total geothermal power generation in Nevada in 2021 was 5,165,318 megawatt-hours (MWh) gross and 3,942,594 MWh net, representing an insignificant increase (~1%) from generation in 2020. Data obtained from the Nevada Department of Taxation indicate that the total gross 2021 proceeds from geothermal operators in Nevada were \$318,747,661 (approximately \$5.4 million greater than in 2020). In 2021, the estimated average price for geothermal electricity is 8.08 cents(c)/kilowatt-hour (kWh) (calculated by dividing the total gross proceeds by the annual net electricity production)—almost identical to 2020 (8.05 c/kWh). The share of geothermal electricity generation in the state was ~9.4% in 2021, representing a relative decline compared to 2020 and likely associated with the continued rapid annual growth in establishing more solar generation in Nevada.

In August 2021, the U.S. Bureau of Land Management (BLM) held a geothermal lease sale, with 32 parcels offered equating to 85,543 acres. 26 of the parcels were sold for a total acreage of 73,631. In addition to the competitive lease sale, a non-competitive lease sale was held the day after the competitive sale (and is hence known as the ‘day after’ sale), with six parcels nominated for offers and one parcel receiving an offer for a total of 629 acres. Between the competitive and non-competitive lease sales, 74,260 acres were taken up for geothermal exploration in the state in 2021, which is approximately three times the acreage sold in 2020. Despite the increase in acreage taken up in 2021, drilling activity was very low with only one geothermal well drilled during the year. Areas of interest for parcels leased in 2020 include:

- The Lahontan Valley north of the town of Fallon;
- Leases north and east of Ormat’s McGuinness Hills geothermal area;
- Dixie Valley south of Sou Hills;
- Northwest of the town of Wells in the Tabor Flat area; and
- Northwestern Gabbs Valley.

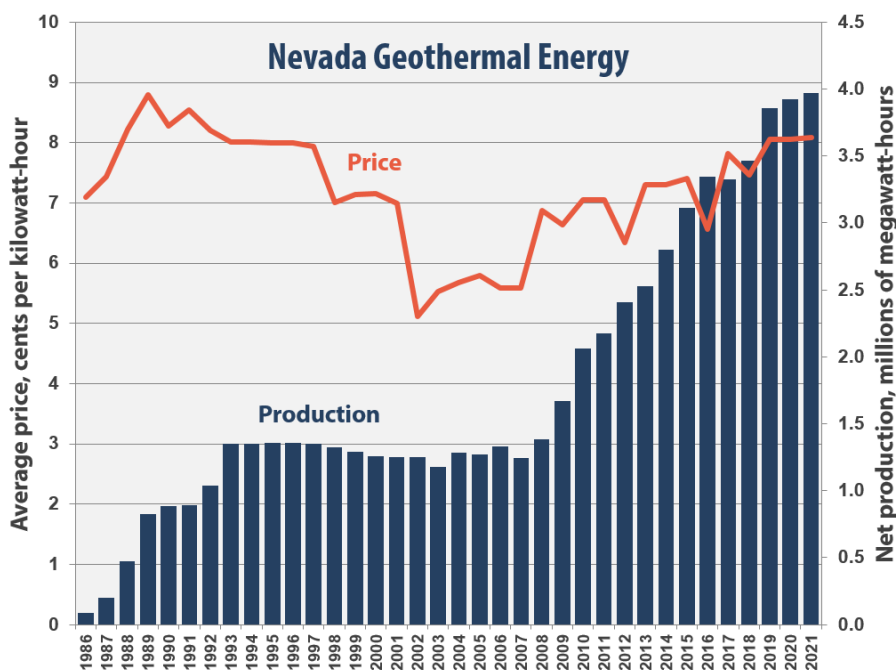


Figure 9. Chart showing net geothermal production in megawatt-hours in comparison to the average price of geothermal power in cents per kilowatt-hour for the period from 1986 to 2021. Note that the average price is based on the total MWh produced and total receipts. Actual price for any individual power plant may vary and is held confidential by the state energy office.

The section on **Oil and Gas**, covers updates on exploration, development, and production of oil and gas in Nevada in 2021. According to the Nevada Division of Minerals, Nevada’s net oil production was 223,229 barrels in 2021, an increase of 1.3% from 2020 (fig. 10). Nevada’s production accounted for less than 0.01% of total domestic production in 2021. Production came from 66 actively producing wells from ten fields in Railroad Valley, Nye County, and two fields in Pine Valley, Eureka County. A total of 288,342 barrels of oil were sold during 2021. The sales volume (or gross proceeds) increased 74% in 2021 to \$12,759,077 from \$7,329,877 in 2020 (Nevada Department of Taxation, 2022). The average price of domestic oil

increased 73% to \$67.99 in 2021 per barrel from an average of \$39.23 per barrel in 2020.

Local economies benefit from the Nevada minerals and geothermal industry. Construction of new homes, hotels, casinos, other businesses, schools, and roads requires local sources of sand, gravel, crushed stone, gypsum, and raw materials for cement, all of which are abundant in Nevada. According to the Nevada Department of Employment, Training, and Rehabilitation, the Nevada mining and natural resources industry employed an average of 15,024 people in 2021. The average pay for mineral industry employees during this time was \$103,000/year.

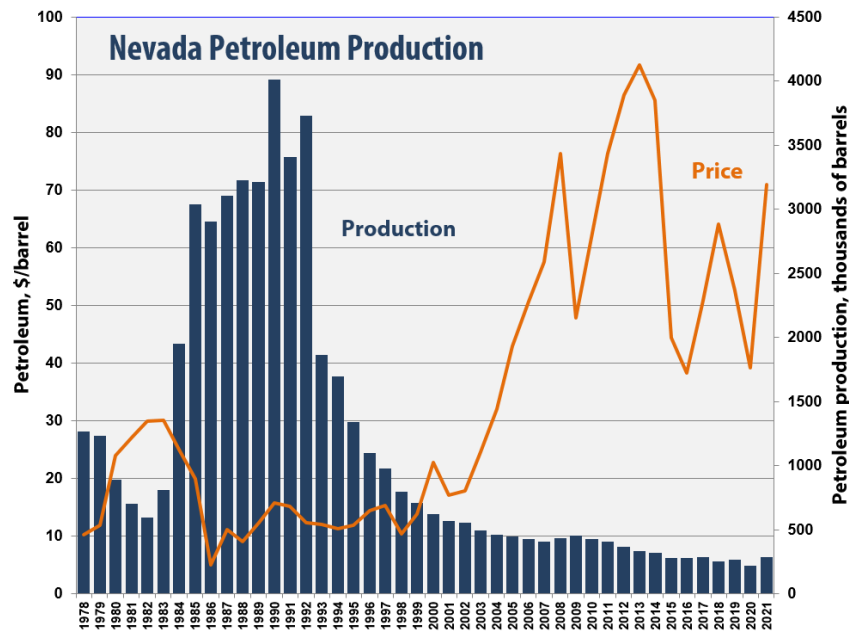


Figure 10. Chart showing Nevada petroleum production from 1978 to 2021.

Additional information about the Nevada mineral industry and the U.S. gold industry, including the contents of selected publications, is readily available on line through the Nevada Bureau of Mines and Geology (www.nbmgs.unr.edu/) and the Nevada Division of Minerals (<http://minerals.state.nv.us/>, <https://data-ndom.opendata.arcgis.com/>). Useful national and international data on nonfuel minerals and energy can be obtained from the U.S. Geological Survey (<http://minerals.usgs.gov/minerals/>) and the U.S. Energy

Information Administration (www.eia.doe.gov), which provides data on oil and gas, geothermal, solar, wind, hydroelectric, and other energy sources. The Nevada Bureau of Mines and Geology supports several interactive maps on the Web that are backed by periodically updated databases on mineral and energy resources as well as potential exploration activity, land ownership and restrictions, and other geographic information (<https://data-nbmgs.opendata.arcgis.com/>).

CONVERSION FACTORS

- 1 metric ton = 1.1023113 short ton = 1,000 kilograms = 2,204.6226 pounds = 32,150.7 troy ounces.
- 31.1035 metric tons = 1 million troy ounces (31.1035 grams = 1 troy ounce).
- 453.592 grams = 1 pound (avoirdupois) = 16 ounces (avoirdupois) = 14.5833 troy ounces.
- 34.2857 grams per metric ton = 34.2857 parts per million by weight = 1 troy ounce per short ton.

METALS

by John L. Muntean and Rachel Micander

PRODUCTION

In 2021, Nevada produced 4,502,365 troy ounces (140,039 kg) of gold, 6,218,415 troy ounces (193,414 kg) of silver, 163,732,694 pounds (74,268 metric tons) of copper, and 240,000 pounds (109 metric tons) of molybdenum from 27 active mines, as well as minor production from residual leaching from two inactive mines and very small reported production from one placer operation. Table 1 shows the production of gold, silver, copper, and molybdenum in 2021 by the producing companies, and table 2 shows the production from each of the mines that were active in 2021. The data are what was reported to the Nevada Division of Minerals and/or what was reported in the companies' annual reports. Remaining mine reserves at the end of 2021 are shown in table 3. The average price of gold in 2021 was \$1,798.61/oz, a 1.6% increase from 2020 ([Kitco.com](https://www.kitco.com)).

The Nevada Gold Mines joint venture between Barrick and Newmont produced 3,354,029 troy ounces (104,322 kg) of gold, 1,600,225 troy ounces (49,773 kg) of silver and 36,736,179 lbs (16,663 metric tons) of copper. Nevada Gold Mines operated 11 active gold mines, which accounted for 75% of Nevada's gold production in 2021. The all-in sustaining cost for all of Nevada Gold Mines' production in 2021 was \$1,040/oz and the total cash cost was \$730-\$790/oz.

Nevada Gold Mines' Carlin trend operations produced 1,511,227 ounces (47,004 kg) of gold, which accounted for 45% of Nevada's 2021 gold production. The all-in sustaining cost was \$1,087/oz and the total cash cost was \$782/oz in 2021, compared to approximately 1,687,812 ounces of gold at all-in sustaining costs of \$1,041/oz and total cash costs of \$790/oz, in 2020. By the end of 2021, cumulative production from the Carlin trend was 96.8 million ounces (3,012 metric tons) since the original Carlin Mine went into production in 1965.

Nevada Gold Mines' production from the Cortez Mine, which includes the Pipeline open pit, the Cortez Hills open pit, and the Cortez Hills underground mine totaled 830,513 ounces (25,831 kg) of gold. The all-in sustaining cost for all production from Cortez was \$1,013/oz and the total cash cost was \$763/oz.

Nevada Gold Mines' production from Turquoise Ridge and Twin Creeks Open Pit totaled 543,123 oz, (16,893 kg). The all-in sustaining cost was \$892/oz and the total cash cost was \$749/oz. Nevada Gold Mines' gold production from the Phoenix Mine amounted to 173,067 ounces (5,382 kg). The all-in sustaining cost was \$533/oz (\$1,428/oz on a co-product basis) and the total cash cost was \$398/oz (\$1,563/oz on a co-product basis).

After Nevada Gold Mines, Nevada's next largest gold producers were Kinross Gold Corp. (Round Mountain Mine), SSR Mining (Marigold Mine), and First Majestic Silver (Jerritt Canyon Mine), which cumulatively produced over 784,000 ounces (24,385 kg) of gold in 2021.

In 2021, Coeur Mining was again the leading silver producer in Nevada at 3,158,017 ounces (98,225 kg), a 0.5% decrease from 2020. All its production came from its low-grade open-pit Rochester Mine, the only primary silver mine in Nevada. Nevada Gold Mines' Phoenix Mine was the second largest producer, mining 1,322,700 ounces (41,141 kg) of silver in 2021. Kinross Gold's Round Mountain Mine was the third largest silver producer at 666,411 ounces (20,728 kg). Reported silver reserves from the nine mines that reported silver production at the end of 2021 totaled 199,871,885 ounces (6,216,711 kg), a 9.6% decrease over reserves reported in 2020. The average price of silver in 2021 was \$25.04/oz, a 21.9% increase from the average price in 2020.

KGHM International's Robinson Mine produced 76% of Nevada's copper. Production in 2021 amounted to 123,700,000 pounds (56,109 metric tons), an increase of 12.8% from 2020. KGHM International also produced 240,000 pounds (109 metric tons) of molybdenum from Robinson in 2021, a 68.7% decrease from 2020.

Nevada Gold Mines' Phoenix Mine and Nevada Copper's underground Pumpkin Hollow Mine made up the balance of Nevada's copper production. The Phoenix Mine produced 36,736,179 pounds (16,663 metric tons), a 20% increase from 2020. The Pumpkin Hollow Mine produced 3,296,515 pounds (1,495 metric tons) of copper in 2021.

Table 1. 2021 Metallic Mine Production for Nevada by Operating Company

(Nevada Division of Minerals Annual Status and Companies Annual Reports)

Operator	Gold 2021 ounces (kg)	Silver 2021 ounces (kg)	Copper 2021 pounds (metric tons)	Molybdenite 2021 pounds (metric tons)
Nevada Gold Mines LLC (61.5% Barrick Gold, 38.5% Newmont Mining)	3,354,029 (104,322)	1,600,225 (49,773)	36,736,179 (16,663)	
Kinross Gold	450,567 (14,014)	808,072 (25,134)		
SSR Mining	235,282 (7,318)	4,285 (133)		
First Majestic Silver	98,303 (3,057)	1,809 (56)		
Hycroft Mining	56,045 (1,743)	397,546 (12,365)		
Florida Canyon Mining (Argonaut Gold)	51,175 (1,592)	27,681 (861)		
Fortitude Gold	46,459 (1,445)	44,551 (1,386)		
Calibre Gold	45,783 (1,424)	None Reported		
McEwen Mining	43,881 (1,365)	None Reported		
KGHM International	41,050 (1,277)	None Reported	123,700,000 (56,109)	240,000 (109)
Coeur	27,985 (870)	3,158,017 (98,225)		
Rawhide Mining	23,209 (721)	126,510 (3,935)		
I80 Gold	17,442 (543)	3,500 (109)		
Gold Acquisition Corp.	5,388 (168)	12,773 (397)		
Borealis Mining	3,936 (122)	6,473 (201)		
Mineral Ridge Gold	1,827 (57)	1,154 (36)		
Nevada Copper		None Reported	3,296,515 (1,495)	
Geo-Nevada	3 (0.09)	4 (0.12)		
Hecla (Klondex)		26,214 (815)		
Totals	4,502,364 (140,038)	6,218,814 (176,300)	163,732,694 (74,267)	240,000 (109)

EXPLORATION

Exploration activity in Nevada in 2021 appeared to maintain the pace set in 2020. The vast majority of exploration projects targeted gold. The sustained increase in gold price appears to be the main cause. Of the 75 projects that were known to have been drilled in 2021, 82% targeted gold. One project targeted vanadium. One project targeted cobalt. Four projects focused on copper, including small programs at Nevada Copper’s Pumpkin Hollow project, by KGHM at its Robinson Mine, the Majuba Hill project by Bam Bam Resources, the MacArthur project by Lion Copper and Gold Corp, and by Nevada Gold Mines where it targeted copper and gold at its Phoenix Mine.

The resurgence in silver exploration continued in 2021. Eight drill projects targeted silver, including Coeur Mining at its Rochester Mine, Ridgeline Minerals at its Selena project, Nevada Silver Corp at its Cocoran Canyon project, Suma Silver at its Hughes project, and Silver One Resources, Inc. at its Candelaria project.

The most exciting silver projects in 2021, though, were in the rejuvenated Tonopah and Candelaria districts. Blackrock Silver Corp. continued to discover high grade silver-gold veins at its Tonopah West project and Silver One Resources intercepted alteration suggesting potential for a deeper porphyry system.

First Vanadium Corp. 2021 drilling efforts at its Carlin vanadium project near the town of Carlin successfully expanded the extent of mineralization. Nevada sunrise carried out a small 2021 drill program at its Lovelock Cobalt Mine.

Exploration activity, including new claims staked, were reported in most of Nevada’s 17 counties. As of September 1, 2022, there were 261,039 active, filed, and submitted mining claims within the state.

Table 5 shows the breakdown of the 2021 drill projects by size of company and drill program. At least 75 projects were drilled in 2021, compared to at least 84 projects in 2020. Major to mid-tier companies drilled at least 28 projects in 2021, including Nevada Gold Mines, Kinross, Anglo Gold Ashanti, Newcrest, Coeur Mining, KGHM, Silver Standard Resources, Hecla Mining, i-80 Gold, and Gold Springs Resource Corp. The remaining 47 projects were drilled by at least 42 junior companies. Large companies are not required to release much of their exploration results because exploration commonly does not have a material impact on their businesses. Therefore, there could have been more than 28 projects drilled.

Exploration projects are summarized below by county and mining district. Projects that were drilled in 2021 are emphasized.

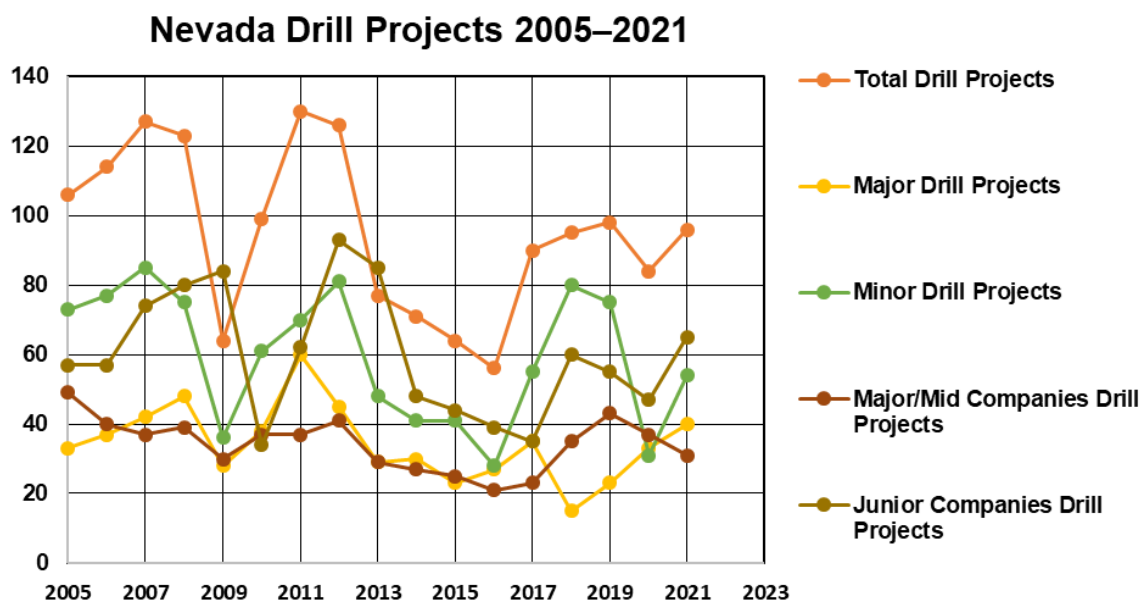


Figure 1. Number of drill projects in Nevada from 2005 to 2021.

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

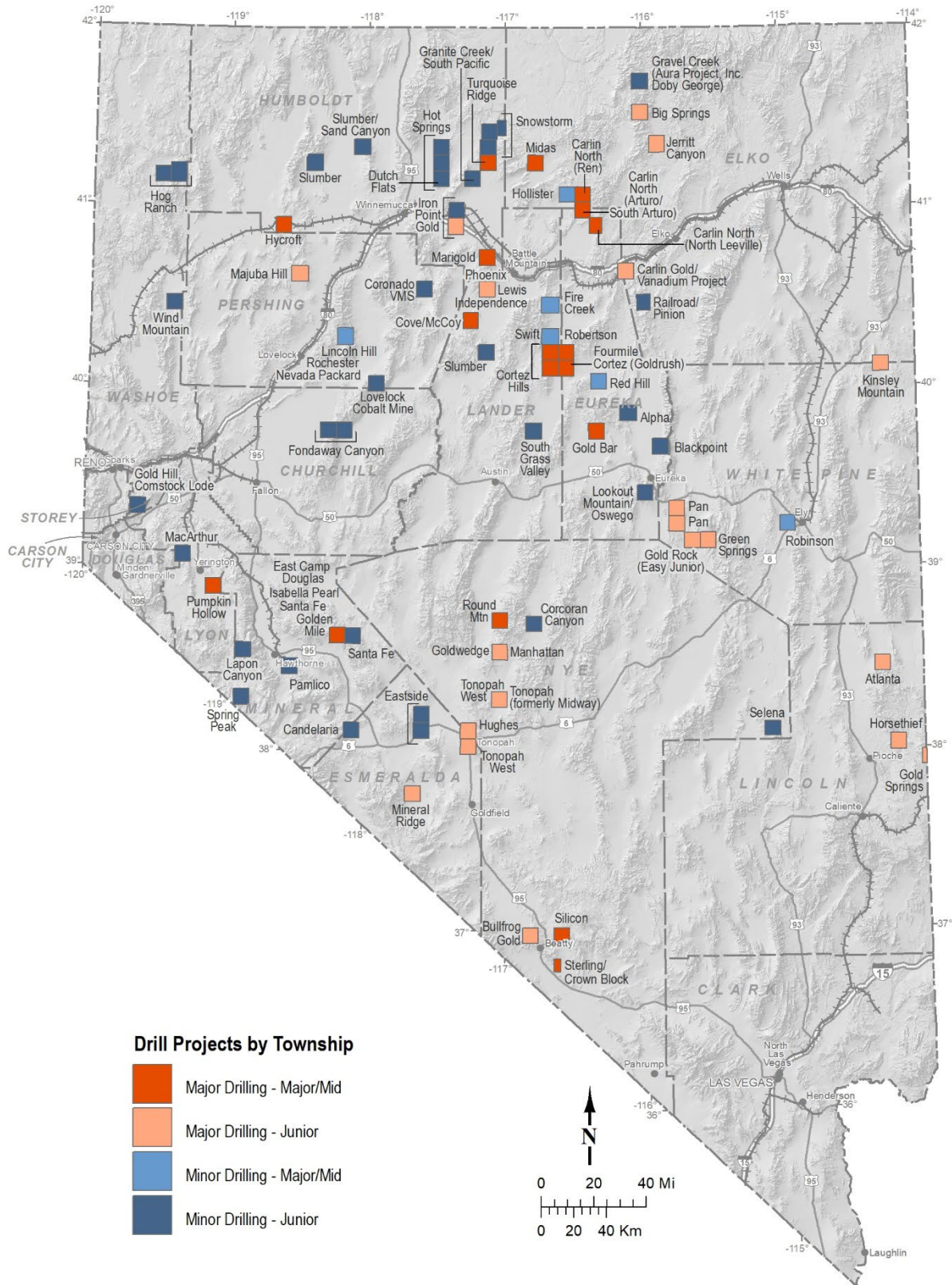


Figure 2. Map showing location of drill projects in 2021 by township.

Table 2. 2021 Metallic Mine Production by Operating Company for Nevada

(Data from Nevada Division of Minerals Annual Status Reports and Company Annual Reports)

Operator	Mine	Gold (2020) (ounces)	Gold (2021) (ounces)	Silver (2020) (ounces)	Silver (2021) (ounces)	Copper (2020) (pounds)	Copper (2021) (pounds)	Molybdenite (2020) pounds	Molybdenite (2021) pounds
Borealis Mining	Borealis	310	3,936	896	6,473				
Calibre	Pan	46,516	45,783	NR	NR				
Coeur Rochester	Rochester	27,147	27,985	3,174,529	3,158,017				
Florida Canyon Mining	Florida Canyon	46,866	51,175	27,490	27,681				
Geo-Nevada	Spring Valley	18	3	11	4				
Gold Acquisition Corp.	Relief Canyon Mine	5,072	5,388	14,330	12,773				
Goldcorp DEE/I80 Gold	Lone Tree Complex	12,602	8,789	5,291	NR				
Hecla (Klondex)	Aurora	0	0	0	0				
Hecla (Klondex)	Fire Creek	31,800	0	37,400	26,214				
Hecla (Klondex)	Hollister	0	0	0	0				
Hecla (Klondex)	Midas	0	0	0	0				
Hycroft Mining	Hycroft	27,392	56,045	178,836	397,546				
Jerritt Canyon Gold LLC	Jerritt Canyon	112,749	98,303	NR	1,809				
KGHM International	Robinson	38,801	41,050	199,382	NR	109,639,248	123,700,000	426,538	240,000
Kinross Gold	Bald Mountain	190,496	202,905	64,555	141,661				
Kinross Gold	Round Mountain	313,454	247,662	933,702	666,411				
Manhattan Gulch LLC	Manhattan Gulch	745	0	NR	0				
McEwen Mining	Gold Bar	27,910	43,881	NR	NR				
Mineral Ridge Gold	Mineral Ridge	2,800	1,827	1,358	1,154				
Nevada Copper	Pumpkin Hollow	293	NR	10,757	NR	2,667,827	3,296,515		
Nevada Gold Mines	Arturo JV	58,877	53,303	NR	NR				
Nevada Gold Mines	Betze Post	418,195	377,082	21,632	28,268				
Nevada Gold Mines	Carlin Trend Operations	860,404	755,016	9,875	7,767				
Nevada Gold Mines	Cortez Hills OP/Pipeline	421,700	451,736	34,613	112,785				
Nevada Gold Mines	Cortez Hills UG	362,821	378,777	30,800	8,841				
Nevada Gold Mines	Goldrush	0	35,175	0	NR				
Nevada Gold Mines	Long Canyon	260,650	260,924	NR	531				
Nevada Gold Mines	Meikle	350,336	325,826	18,122	24,425				
Nevada Gold Mines	Phoenix	187,607	173,067	1,169,367	1,322,700	41,957,856	36,736,179		
Nevada Gold Mines	Turquoise Ridge	287,144	543,123	NR	94,908				
Nevada Gold Mines	Twin Creeks	249,662	0	NR	0				
Rawhide Mining	Denton-Rawhide	24,078	23,209	159,049	126,510				
Ruby Hill Mining (I80 Gold)	Ruby Hill	3,252	8,653	5,153	3,500				
SSR Mining	Marigold Mine	234,443	235,282	3,329	4,285				

Sunrise Minerals	Sunrise Placer	0	0	0	0				
Toquima Gold	East Manhattan	8	0	NR	0				
Walker Lane Minerals	Isabella Pearl	28,542	46,459	26,961	44,551				
Totals		4,632,690	4,502,364	6,127,438	6,218,814	154,264,931	163,732,694	426,538	240,000
		-2.8%		1.5%		6.1%		-43.7%	
		YOY Change		YOY Change		YOY Change		YOY Change	

Table 3. Nevada Mine Reserves (Proven and Probable) Reported for End of Year 2021

Company	Mine	Gold ounces	Silver ounces	Copper pounds
NV Gold Mines	Carlin Operations (Gold Strike/Arturo) (61.50%)	19,512,195		
NV Gold Mines	Phoenix (61.50%)	2,926,829	34,146,341	845,528,455
NV Gold Mines	Turquoise Ridge & Twin Creeks (61.50%)	12,520,325		
NV Gold Mines	Long Canyon (61.50)	357,724		
NV Gold Mines	Cortez & Goldrush (61.50%)	9,756,098		
Argonaut Gold	Florida Canyon	921,000		
Coeur	Rochester	1,080,000	161,245,000	
Kinross	Round Mountain	3,037,000	1,146,000	
Kinross	Bald Mountain	798,000		
SSR	Marigold	3,410,000		
Hecla	Fire Creek	61,000	128,000	
Hecla	Hollister	51,000	217,000	
Hecla	Midas	33,000	444,000	
KGHM	Robinson	263,000		716,000,000
GRC	Isabella Pearl	109,700	954,100	
McEwen	Gold Bar	302,000		
Nevada Copper	Pumpkin Hollow	419,000	14,544	6,503,000
Fiore Gold	Pan	190,000		
Gold Acquisition	Relief Canyon	584,000	1,577,000	
	Totals	56,331,871	199,871,885	1,568,031,455

*All numbers from 2021 annual reports or other regulatory financial filings. Turquoise Ridge now includes Twin Creeks. Carlin now includes Goldstrike and South Arturo.

Table 4. Breakdown of 2021 Drill Programs for Metals in Nevada

	Total Drill Programs	Major Drill Programs	Minor Drill Programs	Major/Mid-tier Companies Drill Programs	Junior Companies Drill Programs
2005	106	33	73	49	57
2006	114	37	77	40	57
2007	127	42	85	37	74
2008	123	48	75	39	80
2009	64	28	36	30	84
2010	99	38	61	37	34
2011	130	60	70	37	62
2012	126	45	81	41	93
2013	77	29	48	29	85
2014	71	30	41	27	48
2015	64	23	41	25	44
2016	56	27	28	21	39
2017	90	35	55	23	35
2018	95	15	80	35	60
2019	98	23	75	43	55
2020	84	33	31	37	47
2021	75	33	42	28	47

Major programs are arbitrarily defined as >25 drill holes.

EXPLORATION SUMMARIES BY COUNTY

(Sourced from public financial filings, press releases, and company websites)

CHURCHILL COUNTY

Shady Run District

Lovelock Cobalt. On January 15, 2019, Nevada Sunrise Gold Corp. signed an option agreement with Global Energy Metals Corp. (GEMC), which granted GEMC the option to acquire working interest in the Lovelock Cobalt Mine and Treasure Box copper project.

In April 2020, Nevada Sunrise agreed to an accelerated agreement, which provided, among other things, that GEMC can purchase an 85% interest in the properties, with Nevada Sunrise retaining a 15% interest.

Highlights from Nevada Sunrise Gold Corp.'s 2021 drill program at the Lovelock Cobalt Mine included 16.21 m of 875 ppm cobalt, 6,393.5 ppm copper, 2,276.7 ppm nickel, 1,659.4 ppm antimony and 25.30 ppm silver (Nevada Sunrise Gold Corp. website).

Fondaway Canyon. Getchell Gold Corp. provided the results for its 2021 drill program, consisting of eight holes totaling 3,064 m, at its Fondaway Canyon gold project in Nevada. Key highlights included: Hole FCG21-10 intersected the North Fork gold zone mineralization over 82.2 m that included 3.0 g/t gold over 41.6 m with 47.0 g/t gold over 1.5 m (the highest-grade gold intercept in the 40+ year drilling history of the project); 4.6 g/t gold over 9.8m; and 1.0 g/t gold over 14.3 m. Drill holes FCG21-09 and 10 targeted the North Fork gold zone, respectively, above and below the discovery hole drilled in 2020, FCG20-04, that graded 2.5 g/t gold over 58.0 m within a broader zone of mineralization. Hole FCG21-10 intersected the North Fork zone mineralization over an 82.2 m drill interval and represents a 35–50 m up-dip step-out from the FCG20-04 discovery intercept.

Getchell Gold commented on the latest results being a prime example of why the gold mineralizing system at the Fondaway Canyon gold project is so compelling. The project is host to an enviable setting comprised of very high-grade gold-bearing structures that are themselves hosted within broader and thicker zones of mineralization. “The grades and thicknesses that have become apparent at Fondaway Canyon rival many of our peers in a world class gold district”, as stated by Mike Sieb, President, Getchell Gold Corp. (<https://getchellgold.com/news/>).

ELKO COUNTY

Aura District

Aura Project. On December 22, 2021, Western Exploration Inc. announced the successful completion of its agreement with Crystal Peak Minerals Inc. through which it went public through a reverse takeover of Crystal Peak Minerals Inc. As part of the reverse takeover, Western agreed to sell subscription receipts of Crystal Peak Minerals for gross proceeds of approximately \$6 million. The launch of Western Exploration Inc. marks the company's establishment as a Nevada-based precious metals exploration and development company. The Aura Project will be the company's only property, covering approximately 6,128 ha in northern Elko County, Nevada.

In 2021 Western Exploration released a new estimated and inferred gold and silver resource of its Gravel Creek, Wood Gulch, and Doby George projects. Combined these projects have an indicated resource of 14,237,000 metric tons grading 1.33 g/t for 607,000 ounces of gold and 75 g/t for 3,169,000 ounces of silver. The inferred resource is 12,102,000 metric tons grading 1.48 g/t for 578,000 ounces of gold and 15.74 g/t for 6,115,000 ounces of silver (2021 Updated Resource Estimates and Technical Report: Aura Gold-Silver Project, Nevada, Crystal Peak Minerals, Inc. and Western Exploration LLC).

Carlin Trend (Bootstrap District)

Arturo/South Arturo. Nevada Gold Mines carried out a significant underground drill program on its Arturo and South Arturo deposits at the northeastern end of the Carlin trend. In 2021, Nevada Gold Mines exchanged its Lone Tree and Buffalo Mountain properties and infrastructure, which includes an autoclave, with i-80 Gold for its 40% interest in South Arturo (Barrick 2021 Annual Report).

Carlin Trend (Lynn District)

North Leeville. At North Leeville, Nevada Gold Mines' resource delineation program delivered a maiden inferred resource of 1.9 million metric tons at 11.5 g/t for 700,000 ounces of gold. The bulk of the high-grade mineralization occurs in a 200 m by 135 m area, with significant growth opportunities along prospective northwest and north-northeast structures. Additional assay results from hole NLX-00010 extend a previously reported intercept to a final intercept of 56.7 m at 28.39 g/t gold (Barrick 2021 Annual Report).

Exploration drifting continued from the south, with underground drilling successfully executing the drill program to infill the deposit along its southern extents. Overall, North Leeville is defined as a 1 by 1.2 km zone of stratiform mineralization, primarily hosted at or near the

contact of the Devonian Rodeo creek and Popovich formations, with high-grade centers focused on northwest and north-northeast-striking structures, defining epicenters of high-grade ore within a rough 200 by 250 m area. It is currently constrained only by drilling, but not to the south and southeast (Barrick 2021 Annual Report).

Post-Gen Fault Corridor. Along the Post-Gen fault corridor, beneath the southern margin of the Goldstrike stock, the final hole was completed at the Dogma target. While the hole intersected favorable breccia and alteration, the lithology was unfavorable and is expected to return only low-grade mineralization (Barrick 2021 Annual Report).

REN. Resource delineation drilling at REN was completed in the in the fourth quarter of 2021, with the addition of a metallurgical core hole to increase the understanding of recoveries within the JB zone. This program delivered a maiden resource of 50,000 ounces in the indicated category at a grade of 14.4 g/t gold and 1.2 million ounces in the inferred category (5.2 million metric tons at 7.3 g/t gold) and has further expanded the exploration upside potential (Barrick 2021 Annual Report).

Drilling completed in the fourth quarter of 2021 targeted high, upside potential areas outside the newly defined resource footprint and highlighted the potential for resource expansion, both on the eastern side of the drift, south of the JB zone and, on the western side of the drift, highlighting the high-grade potential of the Corona Corridor (Hole MRC21001: 16.8 m at 7.03 g/t gold towards the south). Mineralization in the west remains open to the north, south, and west. To the east, mineralization remains unconstrained by drilling up to 800 m to the south, at East Banshee (Barrick 2021 Annual Report).

Carlin District

Carlin Gold-Vanadium Project. Phenom Resources, (formerly First Vanadium Corp.) announced drilling results from eight reverse-circulation holes evaluating the gold system on its flagship Carlin Gold-Vanadium project on the Carlin trend. Drilling confirms that the gold system is at least 6.4 km (4 mi) in length, averaging 0.5–1 km (0.3–0.6 mi) wide, defined by the induced polarization (IP) anomaly and favorable geological rock units with favorable alteration, brecciation, sulfide, gold, and pathfinder metals. Extensive intercepts averaging of continuous elevated gold values have been encountered in every hole, indicating a vast amount of rock has been mineralized (Phenom Resources website, <https://phenomresources.com>).

Dave Mathewson stated, "We are encouraged that from this drilling we have gained sound building blocks to understand this favorable large system. With it, vectoring tools are evident to pursue high-grade sectors within it. The size of the system and extensive halo of gold within it, point

to potentially multiple high-grade feeders, like a string of beads, snuggled along the west side, i.e., horst side, of the north/south graben fault. From my experience, these large Carlin systems always have high-grade feeder zones. Often, they are in the order of 150–200 m in diameter, or smaller, collapse breccia "pipe-like features" so they are not always easy to find but the prize certainly can be worth the effort. We have plenty of high-priority areas to go after with persistence, good science, and superior exploration know-how."

Initial conclusions from the 2021 drilling for gold are 1) The system is immense, tracking at least 6.4 km (4 m) long averaging 0.5–1 km (0.3–0.6 mi) wide as defined by an IP anomaly. Drilling within the IP anomaly has confirmed that it reflects elevated sulfides encountered in every hole, thus confirming that it also expresses the overall size and shape of the system. 2) The system is bounded to the east by a vertical north-south major graben fault where Woodruff, Rodeo Creek, and Popovich stratigraphy is encountered, compared to the shelf facies carbonates to the east at Rain and Railroad. The nature of this north-south graben fault looks similar to major deep-seated faults within the Carlin trend such as the Post fault that influence large, locally high-grade, gold deposits. 3) The key limestone Popovich Formation occurs at about 610 m (2,000 ft) depth in some holes, whereas alteration and/or collapse brecciation impacts the unit in other holes. 4) Extensive drill intercepts averaging 0.5 km long (364–677 m) of continuous elevated gold values have been encountered in every hole, indicating a vast amount of rock has gold mineralization. 5) Accompanying alteration includes silicification, dolomitization, and brecciation along with the pathfinder metals—arsenic and mercury, typical of Carlin gold systems—were encountered in every hole. 6) Judging from varying intensities of multiple geological and geochemical components witnessed in drilling, vectoring is evident, favoring proximity to the north-south graben fault, north and south of RC20-01 and RC21-13. This points to large high-priority areas to test for high-grade feeder zones.

Recent drilling continues to visually expand the size of the target zone, and high-grade gold zones representing feeder conduits to the system are being sought. The company will continue to advance toward the discovery of high-grade zones by assessing incoming assays within the context of the broad zones of alteration that have been encountered within the drill holes. No gold assays from the 2021 holes were released (Phenom Resources, press release, November 23, 2021).

The accumulated drill data from holes RC20-01 through RC21-15, have provided valuable information to define and now zero in on better gold zones within the large gold system. Mr. Mathewson has determined that the stronger part of the system is within a corridor approximately 150 m (492 ft) wide on the west flank of the north-south oriented graben fault. The company now has three holes that are aligned within this corridor providing

further vectoring enhancement. From north to south, holes RC21-13, RC20-01, and now RC22-15 test an approximately 600 m (1,969 ft) of strike-length of the favored corridor. Hole RC22-15 was drilled 400 m (1,312 ft) south of hole RC20-01, and hole RC21-13 was drilled 200 m (656 ft) north of RC20-01.

Some of the vanadium intercepts from the drilling in 2021 included 51.82 m grading 0.76% V₂O₅ and 36.58 m grading 0.71% V₂O₅. Because the gold system is below the vanadium resource, the drilling conducted in 2021 passed through the vanadium deposit that resulted in the near surface vanadium intercepts (Phenom Resources, press release, November 23, 2021).

South Railroad District

Railroad-Pinion Project. Orla Mining Ltd. and Gold Standard Ventures Corp. completed a previously announced acquisition of Gold Standard by way of court-approved plan of arrangement.

In April, August, September, and November 2021, Gold Standard Ventures announced drill results at the Pinion, Dark Star, and POD/Sweet Hollow deposits, as well as the LT target. Highlights included step-out drilling at the Pinion SB zone with the goal of expanding mineralization at Pinion to support mine life extension, deeper reverse circulation (RC) drilling at Dark Star to define the transitional and sulfide ore directly below the contemplated oxide pit boundary, and definition drilling at the near-surface oxide gold LT target located near the Plan of Operations boundary of the South Railroad Project (SRP).

On February 23, 2022, the results of the Feasibility Study were announced for the SRP outlining a 10.5-year operating life producing an after-tax NPV₅ of US \$315 million, an IRR of 44%, and a 1.9-year payback period at a gold price of US \$1,650 per ounce (Orla Mining website, <https://orlamining.com>).

Gold Circle District

Hollister. Hecla Mining announced that the decline at Hollister had advanced and drilling in the Hatter Graben was clear to begin in the fourth quarter of 2021. President and CEO, Phillips S. Baker, Jr. commented that a third drill rig was added at Hollister. In addition, development drifting advanced and a drill station was made available for geotechnical and exploration drilling. Underground exploration drilling was planned to target additional veins south of the current resource model and intersect and confirm the upper portions of the veins in the current resource (Hecla Mining Corp. website, <https://www.hecla.com>, Hecla Mining press release, 9/14/2021).

Midas. At Midas, Hecla Mining had two core rigs focused on offsetting and expanding high-grade mineralization along strike as well as up and down dip at the

Green Racer Sinter. A third core rig arrived at Midas in July, and all three core rigs tested the Green Racer Sinter structure and additional East Graben Corridor targets including the South Green Racer and Green Racer Sinter structural intersection, and Little Opal target areas.

Drilling at Midas continued to intersect high-grade gold and silver mineralization along the Sinter structure with recent drillhole intersections including 1.99 oz/t gold and 8.2 oz/t silver over 1.7 ft estimated true thickness and 0.30 oz/t gold and 136.2 oz/t silver over 0.9 ft estimated true thickness. Mineralization is hosted in quartz and carbonate veining within the Sinter structure, which is locally fractured due to post-mineral fault movement. While still early in the exploration program, high-grade mineralization has been intersected over 610 m (2,000 ft) of strike length, 381 m (1,250 ft) of dip and continues to be open for expansion both along strike and dip.

Controls on mineralization at the Green Racer Sinter appear to be associated with a cymoid loop structural architecture, similar to the architecture controlling mineralization at the Colorado Grande and associated veins mined at Midas in the past. The geology of this architecture consists of narrow but high-grade en échelon vein segments that connect or intersect with a periodicity creating wider zones of high-grade mineralization. The current exploration program was designed to test this model (Hecla Mining Corp. website, <https://www.hecla.com>, Hecla Mining press release, 5/18/2021).

Independence Mountains

Big Springs. A 10-diamond hole drilling program was completed by Anova Metals with seven holes completed at North Sammy and three holes at South Sammy. 1,702 m (5,584 ft) were drilled for the purpose of resource extension and testing new exploration targets. 1,154 samples were sent to ALS laboratory for assay with 699 results that are still being awaited on. Results included: 1) 5.49 m at 15.23 g/t gold; 2) 4.54 m at 3.98 g/t gold; and 3) 10.85 m at 3.96 g/t gold.

A new high-grade lode was discovered at North Shoot (North Sammy). High-grade gold mineralization has been successfully extended at South Sammy and remains open along strike and down dip.

The results from the 10-hole program will provide important vectors for further discoveries. Follow-up drilling as part of an extensive 2021 exploration program is currently in planning. High resolution, 679 line-kms of drone magnetic survey data were acquired using 100 m flight line spacing 0.8 m between stations along survey flight lines. Preliminary data processing has identified linear magnetic anomalies caused by faults and igneous intrusive dikes running parallel to Carlin-style gold mineralization (First Majestic Silver Corp. website, <https://firstmajestic.com>).

Jerritt Canyon. First Majestic Gold acquired the Jerritt Canyon Mine from Jerritt Canyon Gold, LLC in 2021. First Majestic Gold is planning and carrying out a major drill program in 2022, which plans for 135,000 m (83.9 mi) of drilling to test 25 high-priority targets (First Majestic Silver Corp. website, <https://firstmajestic.com>).

Kinsley District

Kinsley Mountain. New Placer Dome Gold Corp. carried out several geophysical surveys in 2021 and tested multiple drill targets. Geophysics included mainly IP surveys:

- Chargeability highs associated with mapped jasperoid and arsenic-antimony in soil anomaly along north-trending fault structures in the center of the range.
- Nine Kinsley North IP/resistivity lines remain to be completed that cover a significant strike length of block-faulted Pogonip Group and upper Notch Peak Formation rocks on the east side of the Kinsley Mountain.
- Western Flank – West side resource expansion drilling yielded 10.22 g/t gold over 6.1 m within a broader zone grading 2.63 g/t gold (sulfide) over 38.10 m in KMR20-017.
- Western Flank – Central yielded second highest-grade intercept in Dunderberg Shale: 15.1 g/t gold (sulfide) over 7.6 m, including 24.1 g/t gold (sulfide) over 4.6 m in a lower zone.
- 9.08 g/t gold (sulfide) over 6.1 m in the upper zone in KMR20-026. Main pit North Oxide target yielded high-grade intercepts 75 m outside the current pit shell.
- 9.83 g/t gold over 7.6 m in the high grade shallow oxide Secret Spot target surface oxide New Discovery yielded multiple intercepts including 1.77 g/t gold over 25.3 m in new surface oxide discovery in KMD20-007B; 3.81 g/t gold over 11.6 m, including 11.3 g/t gold over 2.9 m in KMD20-006 (Copaur Minerals website, <https://copaur.com/>).

Pequop District

Long Canyon. No drilling was reported for Long Canyon in 2021, mainly because Nevada Gold Mines had been planning on selling the Long Canyon Mine (Barrick Gold Corp., 61.5%; Newmont Corp., 38.5%). However, they have since put the plan on hold (Barrick Gold Corp. 2021 Annual Report; Barrick Gold Corp. website, <https://www.barrick.com>).

ESMERALDA COUNTY

Gilbert District

Eastside. On May 26, 2021, Allegiant Gold announced it discovered bonanza gold and silver grades for the first time at its Eastside project. Highlights from a nine-hole

(3,673 m) RC program included 1) 2.55g/t gold over 147.7 m and 3.17 g/t gold over 117.3 m, 2) 111.3 m of 1.45 g/t gold, including 3.1 m of 39 g/t gold at the bottom of one of holes, 3) 6.1 m of 113.45 g/t silver, and 4) 44.2 m of 93.3 g/t silver (Allegiant Gold website, <https://allegiantgold.com/>).

Goldfield District

Gemfield. The Gemfield Mine site is located a half-mile (0.8 km) north of the small town of Goldfield, one of the most prolific and historic gold mining districts in Nevada. The property contains 563 patented and 586 unpatented mining claims across roughly 15,000 acres (6,070 ha). Already fully permitted and shovel-ready, the development is owned by Gemfield Resources, LLC, a portfolio company managed by Waterton Global Resource Management, Inc. (Waterton), a Toronto-based private equity firm. If and when the mine turns operational, it is expected to produce over 125,000 ounces of gold annually.

While no details have been released, the company reported that over the last five years, the project has undergone development and extensive optimization efforts, including multiple drilling programs, metallurgical test work, geotechnical engineering, and hydrological studies. The company proposed building and operating a conventional open-pit mine. The proposal includes building the open pit; crushing facilities, conveyors, and associated stockpiles; waste rock disposal areas; overburden stockpile; and related infrastructure. The pit will eventually be 1,070 m (3,500 ft) by 1,000 m (3,300 ft) by 160 m (525 ft) deep. The proposal also calls for 121 additional acres (49 ha) for exploration and drilling. The Bureau of Land Management (BLM) issued preliminary and final environmental impact statements and a record of decision approving the project. The project required the looping of 4 km (2.5 mi) of US 95 up to a 0.8 km (0.5 mi) to the west around the project area, which has been completed (BLM Gemfield Mine project, Environmental Impact Statement, Record of Decision, DOI-BLM-NV-B020-2018-0052-EIS, 7/26/2019).

Silver Peak District

Mineral Ridge Project. On June 4th, 2021, Titan Mining Corp. announced that it was terminating options at the Mineral Ridge property owned by Scorpio Gold Corp. based on exploration study results. Titan undertook an extensive exploration program that included 67 drill holes totaling 14,076 m (46,182 ft) in order to test the resource expansion potential of eight target areas. Titan also completed an internal scoping level study. The economic results did not meet Titan's requirements to advance the project (Titan Mining Corp. website, <https://titanminingcorp.com/>, Titan Mining Corp. press release, 6/4/2021).

EUREKA COUNTY

Alpha District

Alpha Project. Assay results from recent drilling at Sitka Gold's Alpha Gold project, located along the southeast projection of the prolific Cortez gold trend in Eureka County, approximately 135 km (84 mi) southwest of Elko, Nevada. Based on these results, Sitka has staked an additional 21 mining claims, expanding the project's land package to a total of 114 claims covering an area of approximately 2,280 acres (923 ha). The new claims complete coverage of a newly identified structural trend east and southeast of drill hole AG21-03. The results from holes AG21-02 and AG21-03 confirmed a gold enriched system associated with Carlin-type gold deposit mineralization. Broad intercepts of anomalous gold coincide with alteration and mineralization that is similar to what has been found at other gold deposits along the Cortez trend. The drilling has the fringe of a Carlin-type gold system that is moving in a wide-open direction in an undrilled area. In addition, recent surface reconnaissance has discovered another structural trend to the southeast of AG21-03 that exhibits the strongest and most extensive alteration seen on the project to date. Alpha Gold expanded the land package to cover this new target area and are looking forward to completing additional drilling immediately upon receiving BLM permits for the newly staked claim blocks.

Drilling at the Alpha Gold Project intercepted wide zones of highly anomalous gold mineralization in the lower part of the Devonian shale (Horse Canyon equivalent) just above the Devils Gate Limestone. Results support the premise of strengthening gold mineralization relative to surface exposures to the west. Drill results: AG21-02 results included 0.105 g/t gold over 93.0 m from 89.9 m to 182.9m. Subintervals included 0.162 g/t gold over 12.2 m from 89.9 m to 102.1 m, and 0.164 g/t gold over 27.4 m from 143.3 m to 170.7 m. Gold intercepts in AG21-03 also in the Horse Canyon equivalent were 0.100 g/t gold over 57.9 m from 64.0 to 121.9 m, including 0.147 g/t gold over 24.4 m from 64.0 to 88.4 m. Drill holes AG21-03 and AG21-02 returned elevated concentrations of trace elements that are commonly associated with Carlin-type deposits, including >10,000 mercury, up to 1,590 ppm arsenic and 50.9 ppm thallium within broad gold zones. The mineralized zones occur in asymmetric, east-vergent anticlines. A separate interval of 0.197 g/t gold over 4.6 m from 190.5 m to 195.1 m occurred in the Denay formation and is interpreted to reflect a mineralized north-south fault. These results have upgraded the project to what looks like the fringe of a strong Carlin-type gold system, moving in a wide-open direction. The northern target was always recognized as potentially important. The broad consistent gold zone close to it in the lower Horse Canyon equivalent section of AG20-02 upholds the importance of this north-northwest reverse fault and its related hanging wall anticline fracture set.

Surface work conducted after drilling was completed discovered a second, larger, north-northwest structural target to the south. These inferred targets have a potential strike length approaching 5 km and the intercept in AG21-02 suggests thickness potential of 100 m just in the Horse Canyon equivalent stratigraphy. The structural orientation is similar to that of the Goldrush-Fourmile deposit trend. The Alpha Gold targets are also uniquely shallow compared to similar high-grade, Carlin-type gold exploration plays (Sitka Gold website, <https://www.sitkagoldcorp.com>).

Antelope District

Gold Bar. The permitting process to access ore at the Gold Bar South satellite deposit is ongoing and anticipated to be received in the first quarter in 2022. The initiation of gold production from Gold Bar South is planned for the second half of 2022.

In 2021, McEwen Mining spent \$4.2 million on exploration activities, including metallurgical, geotechnical, and drilling programs for a cumulative 2,627 m (8,620 ft) at Ridge and Tonkin Rooster. Delineation drilling programs were conducted at Atlas pit, SW Pick Extension, and Cabin North, with a cumulative 2,632 m (8,629 ft) completed. Delineation drilling at Cabin North and the SW Pick Extension is ongoing. The Gold Bar exploration budget for 2022 is \$2.5 million.

Cash costs per GEO (gold equivalent ounce) sold from 100%-owned mines in 2021 were \$1,453/oz representing a decrease of 18% compared to 2020. All-in sustaining costs per GEO sold from McEwen's 100%-owned mines in 2021 were \$1,635, representing a decrease of 21% compared to 2020. McEwen Mining continued to invest aggressively in exploration with 5,300 m (17,500 ft) of drilling at Gold Bar in 2021 (McEwen website, <https://mcewenmining.com/>).

Carlin Trend

Carlin Complex. At North Leeville, results from the 2021 resource delineation program delivered a maiden, inferred resource of 1.9 million metric tons at 11.5g/t gold for 700,000 ounces. The bulk of high-grade mineralization occurs in a 200 m by 135 m area, with significant growth opportunity along prospective northwest and north-northeast structures. Additional assay results from hole NLX-00010 extend the previously reported 42.4 m with a further 14.3 m of high-grade mineralization, producing a final intercept of 56.7m at 28.39 g/t gold. A subsequent hole, NLX-00012, located approximately 60 m to the east returned two intercepts including 4.3 m at 8.88 g/t gold and 7.8 m at 26.03 g/t gold. The results confirm the continuity of mineralization along prominent low-angle structural and stratigraphic controls (Barrick Gold 2021 Annual Report, <https://www.barrick.com>).

Exploration drifting continued from the south, with underground drilling successfully executing the drill program planned to infill the deposit along its southern

extents. Overall, North Leeville is defined by a 1 by 1.2 km zone of stratiform mineralization, primarily hosted at or near the contact of the Devonian Rodeo creek and Popovich formations, with high-grade centers focused on northwest and north-northeast structures, defining epicenters of high-value ounces within a rough 200 by 250 m area, currently constrained only by drilling and open to the south and northeast.

Along the Post-Gen fault corridor beneath the southern margin of the Goldstrike stock, a final drill was completed at the Dogma target. While the hole intersected favorable breccia and alteration, the lithology was unfavorable and is expected to return only low-grade mineralization through the targeted zone. Focus along the fertile Post fault corridor has moved north of the Goldstrike stock, where down-dip extensions of several high-grade orebodies remain open.

Resource delineation at Ren was completed in the fourth quarter of 2021, with the addition of metallurgical core hole to increase the understanding of recoveries within the JB zone. On a 100% basis, this program delivered a maiden resource of 50,000 ounces of gold in the indicated category (0.11 million metric tons at 14.40 g/t gold) and 1.2 million ounces in the inferred category (5.2 million at 7.3 g/t gold towards the south). Mineralization in the west remains open to the north, south and west. While on the east, mineralization remains unconstrained by drilling up to 800 m to the south at East Banshee (Barrick 2021 Annual Report).

Cortez District

Cortez Hills. At Nevada Gold Mine's Cortez Hills underground mine, drill testing of a fertile fault and inferred feeder below the mine referred to as the Hanson Footwall target was successful. To date, multiple intersections (16.9 m at 11.24 g/t gold in the third quarter of 2021 and 22.6 m at 23.07 g/t gold in the fourth quarter of 2021), provide encouragement for expansion along strike and down-dip. Follow-up step-out drill testing is planned to start in early 2022. Follow-up drilling to grow the deposit westward at the Distal target intersected skarn alteration and quartz-sulfide veins that are associated with the previously encountered Distal mineralization. Further to the northwest, field mapping and sampling highlights additional potential mineralization associated with parallel structures containing strong alteration, and surface gold mineralization. Mapping and sampling are ongoing with drilling planned for 2022 in this new area of the deposit.

Fourmile. At Fourmile, drilling in 2021 was mainly northwest of the Dorothy breccia at the northern extent of known mineralization. Drilling led to continued growth of the Fourmile system. The underground Goldrush deposit was also drilled.

Barrick Gold Corp. carried out a drill program on its Fourmile project, located just north of its Goldrush

underground development project. The objective of the drilling included step-out drilling on the Sophia and Dorothy targets to the north-northwest of the Fourmile property. Gold intercepts drilled at Dorothy in 2021 included: 1) 9.6 m (31 ft) grading 2.6 oz/pt (80.1 g/t) gold; 2) 9.9 m (32 ft) grading 1.6 oz/t (48.4 g/t) gold; and 3) 8.4 m (27.5 ft) grading 0.7 oz/t (21.6 g/t) gold. Gold mineralization is typically associated with variety of breccias bodies and structural controls. Significant mineralization was discovered at the intersection of the steeply west-dipping Anna fault and the moderately west-dipping Sadler reverse fault and associated hanging wall folds. Near this structural intersection, brecciated, altered carbonate rock host high-grade mineralization. This zone remains open both down-dip to the west and along strike. Fourmile and Goldrush combined may be part of a 7 km (4.4-mile) long mineralized system with the mineralization between the two projects being open but under exploration.

Fourmile is not part of Nevada Gold Mines, LLC, (Barrick Gold Corp. 61.5% and Newmont Corp. 38.5%). It is 100% owned by Barrick (Barrick Gold Corp. Management Discussion and Analysis, 5/8/2019, 8/12/2019, 11/6/2019, 2/20/2020; Barrick Gold Corp. Q4 2019 Presentation, 2/12/2020; Barrick Gold Corp. Annual report, 3/25/2020; Barrick Gold Corp. Annual Information Form, 3/25/2020; Barrick Gold Corp. website, <https://www.barrick.com>).

Eureka District

Lookout Mountain/Oswego. Exploration activities continue in a fully funded program encompassing numerous Carlin-type gold occurrences over the 62 km² (24 mi²) land position that was carried out by Timberline Resources. An extensive drill program in 2021 was carried out, both to offset recent and historic high-grade (> 3 g/t gold) drill intercepts, and to test new undrilled targets. Timberline's objectives are to discover additional high-grade gold in and around the current resource and to advance new targets across the district-scale property with geologic mapping, geophysics, and geochemistry. Highlights of the 2021 exploration program included: 1) Completion of approximately 23% (1,409 m) of the planned RC drilling at the Eureka project—five holes completed in the Lookout Mountain area. 2) Completed a controlled source audio magnetotellurics (CSAMT) geophysics survey, spanning 19 line-km along four survey lines. 3) Commenced an induced polarization/resistivity (IP) survey—planned for 29 line-km, primarily in the Windfall area. 4) Carried out geologic mapping in the central Oswego trend and northern Lookout trend. 5) Completed an orientation soil survey across the Windfall trend with approximately 700 soil geochemical samples in the northern portion of the property.

Timberline Resources reported results from two more core holes from the 2021 drilling program at its 100%-controlled Eureka project in Nevada. These are the final

outstanding assays from the drill program. They include one core hole in the Water Well zone (WWZ) and the completed silver and multi-element data from core hole BHSE-206C, totaling 861 m (2,823 ft) of drilling.

The results from hole BHSE-192C confirm a significant zone of strong gold grades in the WWZ between drill holes BHSE-220C and BHSE-212C, which were reported during the first quarter. Highlights of the mineralization in BHSE-192C include: 1) 24.4 m at 3.85 grams per metric ton (g/t) gold from 349.6 m depth, including 6 m at 8.35 g/t gold from 354.2 m depth, and 2) 7.6 m at 5.72 g/t gold from 364.8 m depth.

Several of the drill holes at Oswego encountered significant near-surface gold mineralization, much of which appears to be oxidized, based on preliminary analyses. The most significant new gold intercepts in these holes include: 1) 35.1 m at 2.32 g/t gold (oxide) from 6.1 m depth in BHSE-213, including 19.8 m at 3.93 g/t gold from 7.6 m depth; 2) 13.7 m at 1.31 g/t gold from 3.0 m depth in BHSE-215, 3) 6.1 m at 2.49 g/t gold from 9.1 m depth; 4) 9.1 m at 1.72 g/t gold from surface, and 5) 12.2 m at 1.22 g/t gold from 15.2 m depth in hole BHSE-214.

Patrick Highsmith, Timberline's President and CEO commented, "We are very excited about the results of Timberline's first drilling at Oswego. The program demonstrated the depth extent of the surface gold showing and confirmed the presence of higher-grade gold along the Oswego structure and in the adjoining wall rock. We see a big-picture symmetry of high-grade gold mineralization flanking the IP anomaly on both sides. The Lookout-WWZ-Oswego corridor may be one large mineral system connected at depth. There are many exciting targets to test. We will re-start drilling at the WWZ later in May, and plan to drill more at Oswego this summer." The Oswego target was identified by historical reports of high-grade surface sampling and shallow drilling in the early 1990s, but the area had seen no systematic exploration since then. The objective of the 2021 drilling was to test for down-dip continuation of the high-grade surface sampling reported historically and confirmed by Timberline (see Company news release dated December 6, 2021). Drill hole BHSE-213 intercepted 35.1 m of strong mineralization along the Trench fault beginning only 6.1 m below surface. This result generally confirms and improves upon a historical drill hole in the area. The Trench fault has been mapped by Timberline geologists as a splay of the major Dugout Tunnel fault (DTF) zone. The structure dips steeply to the west and down-drops younger rocks on the west against the older Eldorado dolomite on the east. Timberline geologists believe that favorable units such as the Secret Canyon Shale and Ninemile Formation are cut by this fault and may host gold mineralization at the surface and at depth. The Ordovician-aged Ninemile Formation is a prolific host of gold at the Ruby Hill Mine (i-80 Gold Corp.) at the north end of the Eureka district (Timberline Resources website, <https://timberlinerresources.co/>).

Northern Simpson Park Mountains

Red Hill. NuLegacy Gold Corp. drilled nine core holes in 2021, totaling 2,928 m (9,609 ft) on both flanks of the northeast-southwest trending Rift anticline, a buried anticline of Devonian carbonates including the unit 5 of the Wenban formation, which hosts much of the mineralization at Nevada Gold Mine LLC's Cortez Mine and the Carlin trend.

Four holes encountered numerous high- and low-angle faults and splays with very thick up to 175 m (574 ft) sections of favorable Wenban unit 5 stratigraphy that was strongly decalcified and silicified.

Holes RA20-03C and RA20-04C were drilled at the south end of the anticline. Anomalous intervals of gold in RA20-04 start at a depth of 706 m (2,316 ft) and extend to 863 m (2,831 ft). Intervals included: 3.2 m (10.5 ft) of 0.10 oz/t (3.0 g/t) gold within 13.9 m (45.5 ft) of 1.1 g/t gold, which had a 1.4 m interval of 0.135 oz/t (4.2 g/t) gold. Indications of a Carlin gold system include brecciation, kaolinite veining, variable decalcification, and silicification have all been observed in the drill core (NuLegacy Gold Corp. website, <https://www.nulegacygold.com>; NuLegacy press releases, 1/10/2022, 7/13/2021, 04/13/2021).

HUMBOLDT COUNTY

Awakening District

Slumber/Sand Canyon. NV Gold Corp. announced positive results from its 2021–22 drilling program at its 100%-owned Slumber project. In addition to enlarging the footprint of the epithermal mineralizing system, this recent program intersected higher grades in certain areas and indicates mineralization remains open laterally and to depth. Three drill campaigns were conducted between August 2019 and early 2022; 29 RC holes were completed, totaling 5,201 m (17,063 ft).

The initial two drilling campaigns focused on a bonanza-style model and targeted a tightly-confined, silicified, and mineralized area in the central part of the property. While the early drilling did not encounter the desired high-grade structures, it did intercept significant zones of low-grade-oxide gold along the northern limits of the initial drill area.

In 2021, NV Gold Corp. reinterpreted this zone of mineralized silicification, using CSAMT data and IP-Resistivity to evaluate a wide-open resistivity zone illuminating its correlation with gold mineralization to the north. As a result, most of the 2021–2022 drill holes did encounter significant thicknesses of low-grade-oxide gold distributed over an area of 800-plus meters by 350-plus meters with thicknesses of 100–150 m or more. Most of the 2021–2022 holes bottomed in gold mineralization. While drilling was depth-limited by ongoing equipment

breakdowns, labor challenges and ground water, the results were highly encouraging.

NV Gold Corp. reports that Slumber has now been demonstrated to host a low-grade bulk-tonnage, oxide gold system, which remains open in multiple directions. Drilling remains very widely spaced over this large area, with reasonable expectations of locating structural and lithologically favorable zones of stronger grades (NV Gold website, <https://nvgoldcorp.com/news/>).

Battle Mountain District

Marigold Mine. SSR Mining Inc. drilled 288 drill holes at the Marigold Mine (275 RC and 13 core drillholes) in 2021. The Company's strategy to advance brownfields targets proximal to existing infrastructure has yielded exceptional results in Nevada, as evidenced by the extensive track record of mineral inventory growth throughout Marigold's 32 years of consecutive production. The Marigold Mine currently has a mine life in excess of 10 years, and these results support the extension and enhancement of future life of mine plans.

Resource development drilling at Marigold is focused in the New Millennium area around the Basalt-Antler pit that historically produced approximately 1 million ounces at a grade of 0.75 g/t gold. The New Millennium concept, unlocked by recent land acquisitions, targets low-cost resource and reserve additions proximal to the Marigold plan of operations with the potential to complement the existing life of mine plan. New oxide intercepts in New Millennium include: 1) MRA7324: 10.47 g/t gold over 16.8 m, including 18.72 g/t gold over 9.1 m, 2) MRA7249: 7.88 g/t gold over 10.7 m, 3) MRA7286: 1.51 g/t gold over 22.9 m 2.17 g/t gold over 13.7 m, 4) MRA7285: 0.96 g/t gold over 29.0 m, including 1.45 g/t gold over 9.1 m, and 5) DDH7408: 1.49 g/t gold over 29.0 m, including 2.78 g/t gold over 10.7 m.

In addition to drilling at New Millennium, SSR Mining continues to explore for supplemental oxide ore sources across the broader Marigold land package. At the Trenton Canyon project located ~4 km (2.5 mi) south of New Millennium, drilling has delivered exciting high-grade intercepts of predominantly oxide mineralization. Exploration at Trenton Canyon aims to define oxide material that leverages existing infrastructure at Marigold to provide an avenue for production growth in the future. Oxide intercepts from Trenton Canyon include: 1) MRA7266: 2.97 g/t gold over 71.6 m, 2) MRA7264: 6.53 g/t gold over 12.2 m, including 12.49 g/t gold over 6.1 m, 3) MRA7316: 7.49 g/t gold over 10.7 m.

Total exploration expenditures at Marigold in 2021 were estimated at \$18 million, targeting oxide Mineral Resource additions and conversion at Mackay, Valmy, New Millennium, and Trenton Canyon. Growth exploration expenditures also include studies and test work at Trenton Canyon and Buffalo Valley. In the first quarter of 2021,

Marigold exploration drilled 24,464 m (80,266 ft), primarily in the Mackay North and New Millennium areas. The objective of Mackay North drilling is to increase the confidence of the estimated gold values in areas with widely spaced drilling. This work also included two HQ core holes in the H1 area for metallurgical purposes. Drilling in the New Millennium area focused on East Basalt, but included drill holes in Section Six and Lil' Gun. Drilling in East Basalt further defined the potential pit boundary and showed promising results of an expanded shallow oxide zone. The assay results for the Section Six and Lil' Gun drill targets are still pending.

In addition, during the first quarter of 2021, the Trenton Canyon disturbance request was submitted to the BLM for approval. The Trenton Canyon and Buffalo Valley drilling programs, including major milestones and timeline, were finalized. A positive response from the BLM was anticipated by May 2021; however, drilling will begin in the second quarter of 2021 from existing disturbance as soon as weather conditions allow. A soil and rock geochemistry program has been implemented in the area to follow up on anomalous results. Results of these collaborative efforts have implications for both near mine and greenfield exploration. For 2021, 71,450 m (234,416 ft) of RC and core drilling were planned to target resource and reserve growth at Valmy, East Basalt, Section Six, Trenton Canyon, and Buffalo Valley. This work also includes a small amount of diamond drilling to explore for higher-grade, structurally controlled deposits (SSR Mining website, <https://www.ssrmining.com/>).

Iron Point District

Iron Point (gold). In May, 2021, Nevada King Gold Corp. announced the potential for a Carlin-type gold discovery at Iron Point and was making plans to advance the project including drilling a minimum of 5,000 m in 2021. Shortly after this announcement, the company received the Plan of Operations from the BLM which allowed for comprehensive exploration access to 4 km² within the 61.5 km² project area. The plan included approval for road construction, geological mapping and geophysical surveys, drill site construction, core and RC drilling, trenching for bulk sampling, drilling and test pits for geotechnical assessments, drilling of water monitoring and production wells, and an installation of a meteorological station (Nevada King Gold Corp. website, <https://nevadaking.ca/>, Nevada King Gold Corp. press release, 5/10/2021, 6/3/2021).

Geoff Sterling, Iron Point Gold Project Manager for Nevada King stated, "The 2021 deep drilling program at Iron Point is designed to follow-up on the results of the 2019 program and at the same time test additional targets developed during the past year's systematic data review with step-out holes. Multiple geophysical surveys conducted in 2020 including gravity, CSAMT, and aeromagnetics,

together with soil anomalies and historical drill results, have identified a NNW-trending structural corridor of alteration and gold mineralization centered on the Iron Point intrusive complex. Scout drillhole VM-008C intersected significant intervals of lower grade gold mineralization up to 0.22 g/t Au and bottomed in six meters averaging 0.17 g/t Au, indicating potential for higher grade gold mineralization at depth. Hole VM-008C confirmed the existence of Lower Plate carbonate-hosted gold mineralization at Iron Point, and significant historical gold drill intercepts in Upper Plate rocks elsewhere across the the entire district now need to be tested with deeper drilling.” (Nevada King Gold Corp. website, <https://nevadaking.ca/>, Nevada King Gold Corp. press release, 8/17/2021).

Iron Point (vanadium). Assay results from the second set of holes completed by Victory Metals during the 53-hole Phase II drilling program at its Iron Point Vanadium project, Nevada. The data release includes 11 holes (nine RC and two PQ diamond drill holes) that targeted the northern portion of the Iron Point Vanadium zone and were drilled as both vertical and angle holes. These holes were recommended by Mine Development Associates (Sparks, NV) to better define the outer limits of mineralization and in-fill several gaps in last year’s Phase I drill pattern where lateral correlation of mineralized zones remained unclear. Intercepts included: 1) 25.9 m grading 0.41% V₂O₅ (including 11.7 m grading 0.57% V₂O₅) in VM-84 and 2) 16.6 m grading 0.54% V₂O₅ (including 4.4 m grading 0.94% V₂O₅) in VM-11c.

Mineralization extends from the surface down to a depth of at least 175 m. Intercepts of this broader, low-grade envelope include: 1) 142.9 m grading 0.21% V₂O₅ in VM-10c, 2) 147.4 m grading 0.19% V₂O₅ in hole VM-11c, and 3) 121.6 m grading 0.19% V₂O₅ in hole VM-84.

Phase II in-fill drilling has allowed for more accurate matching of vanadium horizons and confirms the near-horizontal geometry of vanadium mineralization. This is present in both the lower grade vanadium envelope and the two near-horizontal zones (Victory Metals Inc. website, <https://victorymetals.ca/>).

Potosi District

Hot Springs. Bald Eagle Gold Corp. announced receipt of the final assays for the 2021 drill program and the initiation of a summer exploration program on the Hot Springs Joint Venture in Nevada, which is a 50%-50% joint venture between Bald Eagle Gold Corp. and Osgood Mountain Gold, LLC. The final assays from hole HS-2020-04 intercepted 148.2 m of 0.34 g/t gold starting at 181 m downhole, and hole HS-2020-5 intercepted several smaller zones of anomalous gold from 147 m to 312 m downhole. These results together with Bald Eagle’s previously reported results demonstrate the presence of significant gold mineralization at the Hot Springs Joint Venture.

The field campaign outlined a broad zone of anomalous gold with initial drilling along strike. The current drilling identified a broad zone of mixed oxide and sulfide mineralization associated with a chargeability feature from IP geophysics. Drillhole HS-2020-04, which was rotated 15 degrees from HS-2020-01, intercepted the mineralized zone approximately 50 m north of borehole HS-2020-01.

Drilling intercepted mineralization from 150 to 350 m below surface, with true vertical depth of approximately 350 m to the base of mineralized zone (actual downhole depths of 180 m to 390 m and 180 m to 330 m).

The chargeability feature associated with this mineralized zone trends north-south for more than 400 m, has a footprint width of 440 m, and is approximately 150 to 200 m thick. Further drilling is needed to define the lateral extent and to investigate feeder structures. This zone is open along strike to the north and south (Bald Eagle Gold Corp. website, <https://www.baldeaglegold.com/>).

Turquoise Ridge. Construction of the Third Shaft at Turquoise Ridge, which has a hoisting capacity of 5,500 metric tons per day, continues to advance according to schedule and within budget. Commissioning is expected in late 2022. Together with increased hoisting capacity, the Third Shaft is expected to provide additional ventilation for underground mining operations as well as shorter haulage distances. Construction activities continued in the fourth quarter of 2021, focusing on shaft steel installation. At the end of the quarter, shaft steel equipping reached 28% completion as measured by steel weight. Furthermore, commissioning of the concrete/shotcrete slick line was successfully completed, construction on the 2280 level materials handling system restarted and surface construction of the additional main exhaust fan at the No. 1 Shaft began. Permanent conveyance deliveries have started, and a contract is now in place for the construction of the change house facility, which will commence in 2022. The focus of the project will remain on shaft equipping for the first quarter of 2022, followed by final headframe refit. As of December 31, 2021, \$222 million had been spent (including \$7 million in the fourth quarter of 2021) out of an estimated capital cost of approximately \$300–\$330 million (100% basis). Exploration is now focusing on the area between the Turquoise Ridge underground mine and the Twin Creeks open pit, where Placer Dome intercepted mineralization at depth. No exploration results were released in 2021 (43-101 Technical Report on the Turquoise Ridge Complex, 3/25/2020; Barrick Gold Corp. Management Discussion and Analysis, 5/8/2019, 8/12/2019, 11/6/2019, 2/20/2020; Barrick Gold Corp. Annual Information Form, 3/25/2020).

Granite Creek. i-80 Gold announced assay results for the first phase of its drilling at the Company’s Granite Creek Mine (formerly the Pinson Mine), for geotechnical and metallurgical purposes associated with the planned open pit

project, had been received and confirm a high-grade open pit opportunity.

Nine core holes were drilled into the mineralized structures for metallurgical purposes including iGM21-01, 03, 08, and 09. Drilling in the CX-Pit area intersected higher than anticipated grades and additional drilling will likely be completed. The open-pit program was completed for geotechnical and metallurgical purposes in advance of initiating permitting for an open-pit mine with on-site processing. The balance of the ongoing drill program is primarily targeting mineralization to advance underground mining at Granite Creek. Some of the high-grade intercepts included: 1) 9.1 m of 36.74 g/t gold, 2) 51.1 m of 6.80 g/t gold, and 3) 48.6 m of 7.54 g/t gold (i-80 Gold website, <https://www.i80gold.com/>).

Snowstorm Mountains District

Snowstorm/Goldstorm. Seabridge Gold carried out a 4,495 m (14,744 ft) of RC drilling in 2021. The program was designed to test magnetotelluric structures in an unexplored area east of previous exploration drilling. Two of the holes intercepted intensely altered intermediate intrusive rocks. Associated with the sheared and altered zones are anomalous gold, arsenic, and silver concentrations. No assays were released (Seabridge Gold news release, 4/6/2021).

Sulfur District

Hycroft. During the 2021 drill program, Hycroft encountered positive assay results further supporting the strategy to enhance the deposit through exploration drilling. Higher-grade intercepts from the 2021 drill program returned approximately 102 intercepts (1.5-meter intervals) averaging 4.1 g/t gold and 85.3 g/t silver. Recent near-surface, higher grade material was encountered in the Porter area of the deposit with intervals including 3 m grading 9.13 g/t (0.29 oz/t) gold and 32.55 g/t (1.04 oz/t) silver within a larger interval of 19.8 m grading 1.78 g/t (0.06 oz/t) gold and 12.85 g/t (0.41 oz/t) silver (H21C-5568) and 12.2 m grading 0.68 g/t (0.02 oz/t) gold and 12.78 g/t (0.41 oz/t) silver (H21C-5552). As reported in the company's September 8, 2021, press release, exploration drilling in the Vortex Zone identified gold grades that are up to five times higher than the average Mineral Resource grades at Hycroft of 0.34 g/t (0.011 oz/t). Significant intercepts previously reported from that drilling included 1) 51.8 m (170 ft) grading 2.47 g/t (0.08 oz/t) gold and 25.5 g/t (0.82 oz/t) silver (H21R-5592) and an additional intercept of 2) 30.5 m (100 ft) grading 0.71 g/t (0.02 oz/t) gold and 17.5 g/t (0.56 oz/t) silver in drill hole H21R-5591 (Hycroft Gold website, <https://hycroftmining.com/>; September 8, 2022, Hycroft press release).

LANDER COUNTY

Battle Mountain District

Independence. Golden Independence Mining Corp. announced an updated NI43-101-compliant Mineral Resource Estimate (MRE) for the company's flagship Independence project located adjacent to Nevada Gold Mines' Phoenix-Fortitude mining operations in the Battle Mountain-Cortez trend of Nevada.

The resource estimate incorporates over 40,234 m (132,000 ft) of RC and core drilling in 246 holes, outlining both a near surface and an underground resource, and now incorporates a lower cut-off grade for oxide material and higher cut-off grades for transitional and sulfide material based on recent metallurgical and economic analysis for the near surface resource. The resource represents the total modelled mineralization as interpolated by the exploration drilling to date. No constraining economics have yet been applied to the resource. The company is actively advancing the near-surface portion of the MRE towards a Preliminary Economic Assessment anticipated by year-end 2021. Highlights of the MRE include: 1) measured and indicated total resource of 506,052 ounces of gold and 7.8 million ounces of silver, plus an inferred total resource of 108,946 ounces of gold and 1 million ounces of silver in the near surface resource, and 2) inferred resource of 796,200 ounces of gold in the underground resource (Golden Independence website, <https://goldenindependence.co/>).

Lewis Project. Nevada King initiated its maiden drill program at their Lewis project in October 2021 and drilled a total of 1,150 m in 18 RC holes. The program objective focused on: 1) substantiating historical drill results within the Celestine O'Neal and Rocky Canyon targets, and 2) testing for lateral extensions of gold mineralization with step-out drilling from mineralized historical holes. The drilling at the Celestine O'Neal target revealed the presence of a strong epithermal gold system, as evidenced by Nevada King's drill results and historical drill records together with the observed strong micro-veining and well-banded quartz-carbonate-sulfide veins. The geochemistry and style of sulfide mineralization appear similar to the gold mineralization reported at Nevada Gold Mines' Robertson deposit, which is located about 7 km north of the Pipeline Mine and 22 km southeast of the Lewis project, and is currently in the resource development stage. Historical drilling at Lewis outlined two at surface historical gold resources (the Celestine O'Neal historical resource zone and the Rocky Canyon historical resource zone) that are open at depth and along strike. Examples of past intercepts include: 1) Noranda hole 80-R10, a 6.0m intercept grading 7.94 g/t gold starting at 33m depth, 2) Amax/Draco Mines hole RC-10, a 13.7m intercept grading 3.45 g/t from 111m-125m, including 3m of 11.81 g/t, and 3) St. George Metals hole WC-4RC, a 75m intercept grading 0.74 g/t.

Nevada King's drilling will focus on the Rocky Canyon and Celestine O'Neal targets with the objectives of: 1) Confirming historical drilling results, 2) testing the extent of these reported historical resources, and 3) testing the continuity of mineralization between the two historical resources.

The Lewis project represents one of the last underexplored district-scale opportunities in the heart of the Battle Mountain trend, with significant gold intercepts in historical drill holes. Nevada King has an extensive historical database dating back to 1985 on the project, which includes 258 RC and core holes. The mineralized gold footprint has been mapped over a significant area, covering a 5 km by 2 km area.

Notable drill intercepts from 2021 drilling at the Celestine O'Neal target include: 1) 83.9m grading 1.04 g/t Au from 33.5-117.4m in hole LS21-015, including 4.6m grading 3.37 g/t Au from 44.2-48.8m and 9.1m grading 2.1 g/t Au from 85.4-94.5m, 2) 54.9m grading 1.3 g/t Au from 9.1-64.0m and 4.6m grading 0.682 g/t Au from 89.9-94.5m in hole LS21-002, and 3) 9.1m grading 1.79 g/t Au from 76.2-85.4m, with values up to 3.34 g/t Au and 13.7m grading 2.50 g/t Au from 154.0-167.7m in hole LS21-008, including 1.5m grading 15.73 g/t Au from 163.1-164.6m. The fact that this mineralization is buried beneath a geochemically "dead" limestone unit changes the game at Lewis. Historical drilling generally concentrated on areas with strong surficial rock and soil anomalies while areas lacking gold anomalies were avoided. This blanket of landslide or detachment debris effectively hides the underlying gold mineralization and opens up a large area for Nevada King to explore that was ignored by previous operators. The 1.5 m grading 15.73 g/t in LS21-008 is particularly intriguing due to the high-grade gold mineralization encountered, and because this hole stepped out 120 m from the southern-most historical hole at Celestine O'Neal and tested a part of the property that had not previously been drilled. This interval defines an interpreted southwest mineralized trend extending from Celestine O'Neal through hole LS21-008 projecting into an area covered by overburden that also has never been drilled.

Drilling at Rocky Canyon in 2021 encountered intensely fractured rock that created challenging drilling conditions, and consequently the Company was not able to adequately test its intended targets. The Rocky Canyon target is bounded on two sides by areas hosting extensive historical drilling with significant gold mineralization and thus remains a high priority target that the Company will be testing in its 2022 program (Nevada King Gold Corp. press release: 8/30/2022).

Bullion District

Fire Creek Mine. Development by Hecla ceased at Fire Creek in the second quarter of 2019 when the decision was made to limit near-term production to areas of the mine where development was already completed. Mining of non-

refractory ore at Fire Creek in areas where development had already been performed was completed in the fourth quarter of 2020. During 2021 production and revenue were generated from processing of the stockpiled non-refractory ore at the Midas mill and third-party processing of refractory ore in a roaster and autoclave facility, respectively. Fire Creek was placed on care-and-maintenance in the second quarter of 2021 after processing of the remaining non-refractory ore stockpile (Hecla Mining website, <https://www.hecla.com/>).

Robertson Project. Nevada Gold Mines carried out a major core-drilling program at its Robertson project. Robertson is an Eocene intrusion-related gold deposit, located about 7 km (4.3 mi) north of the Pipeline-Crossroads open pit. Besides gold, there is minor silver and molybdenum. Much of the gold occurs as native gold that occurs with pyrite and arsenopyrite in quartz veins and biotite veinlets and disseminations in the intrusion. Most of the gold occurs in contact metasedimentary rocks and skarn along the margin of the intrusion. An indicated resource was declared in 2020 of 1,100,000 ounces of gold at a grade of 0.020 oz/t (0.63 g/t) gold and an inferred resource of 930,000 ounces at a grade of 0.012 oz/t (0.4 g/t) was released. Barrick intends on exploring the area between Robertson and the Pipeline/Crossroads open pit (Barrick Gold Corp. Management Discussion and Analysis, 2/20/2020; Barrick Gold Corp. 2020 Annual report; Barrick Gold Corp. 2020 Annual Information Form, 3/19/2021; Barrick Gold Corp. website, <https://www.barrick.com/>).

Swift Project. Ridgeline Minerals Corp. drilled three, wide-spaced, diamond drill core holes totaling 2,413 m (7,917 ft) in 2020 at its Swift project located west-northwest of the Pipeline open pit near the inactive Elder Creek open pit. Drill holes SW20-001 and SW20-002 successfully confirmed Ridgeline's re-interpreted geologic model and intersected several intervals of Carlin-style mineralization and anomalous alteration with individual assays of up to 0.007 oz/t (0.22 g/t) gold, 27 oz/t (860 g/t) silver and 392 ppm arsenic (Ridgeline Minerals Corp. news release 1/13/2021).

Callaghan Ranch District

South Grass Valley Project. Nevada Gold Exploration (NGE) carried out drill programs at five targets at its South Grass Valley project. At the Waterfall target, NGE completed a NE-SW fence of three RC drill holes (SGVR004, SGVR009, and SGVR010) along the northwestern edge of the target, for a total of 966 m (3,169 ft). The three holes encountered a thick section of the projected favorable carbonate host rocks, including the Clm unit, above large areas of the Grass Valley stock, which confirms their up-dip projection to the west. While the holes did encounter anomalous Carlin-type gold deposit

(CTGD) pathfinder geochemistry, the concentrations at Waterfall are considerably lower and less consistent than those drilled at Freddie and Golden Gorge to the east, and are associated with much weaker alteration features. Furthermore, the results of the more-detailed 3D groundwater sampling provided by the RC drilling also show that the high concentrations of gold in groundwater seen in the Golden Gorge area do not continue this far west to Waterfall.

The Golden Gorge target is located to the east of the Grass Valley stock, where NGE's earlier core drilling confirmed the presence of anomalous gold and CTGD pathfinders within silicified and marbleized breccias along the intrusive margin. The target is supported by the coincident alignment of the highest gold-in-groundwater concentrations seen at the project, which closely map the interface between the lower-plate bedrock units and the intrusion. NGE's objectives for the RC drilling program were to establish the extent of and test for mineralization within the hornfels aureole on the east flank of the intrusive, as well as to test the western, up-dip extension of favorable alteration and geochemistry features seen in the earlier drilling.

NGE completed seven RC drill holes at the Freddie target area for a total of 1,470 m (4,823 ft). With these holes, NGE was specifically aiming to accurately establish the edge of the intrusive, and then to sample the lower-plate bedrock units along its margin. Additionally, with an improved understanding of importance of the Clm unit based on the drilling results at Freddie, NGE was also aiming to complete the RC drill holes at the Golden Gorge target that were deep enough to sample this unit. NGE began drilling at the western edge of the target, moving eastward. Four of the westernmost holes proved to be located on top of the granite. The other three drill holes (SGVR006, SGVR015, and SGVR016) successfully entered and sampled lower-plate bedrock along the intrusion, with SGVR006 and SGVR015 exhibiting significant hornfels.

In terms of testing for mineralization within the hornfels aureole, while the shallower-than-expected drill holes only sampled a portion of this vertical zone, they encountered significant silicification associated with highly anomalous Carlin-type pathfinder geochemistry, which most notably included a 52 m (170 ft) interval in SGVR015 averaging 200 ppm arsenic and 145 ppm antimony.

In total, the gold and Carlin-type pathfinders in the bedrock and groundwater samples from the RC drilling at Waterfall show significantly lower concentrations compared to those seen to the east. With the improved understanding of the geology at Waterfall it appears that the favorable lower-plate host units at Waterfall were likely separated from hydrothermal fluid flow from the east.

In summary, the RC drilling results do not support additional work in this area. Rather, the results at Waterfall, notably the major contrast in terms of gold and pathfinder concentrations between Waterfall and Golden Gorge,

further emphasize the importance of establishing the edge of the intrusion, which marks the boundary between the two target areas, in understanding the controls for mineralization across the project.

At Waterfall, the first-cycle drilling confirmed the presence of a thick section of favorable carbonate host rocks above the Grass Valley stock, and NGE is now completing logging and is waiting for full assays to test for evidence of Carlin-type gold deposits.

At Freddie, initial drilling confirmed that the large Carlin-type hydrothermal system encountered in earlier drilling extends another kilometer to the west-northwest; however, only one drill hole, located at the western edge of the target, was completed deep enough to test the targeted lithologic units. Assays from this western drill hole, while still highly-anomalous, show decreasing gold and pathfinder budgets, and accordingly, for the second stage of drilling, the company will be looking to complete a series of deeper drill holes back towards the east (Nevada Exploration, Inc., news release, 5/27/2020 Nevada Exploration, Inc., website, <https://www.nevadaexploration.com>).

Cortez District

Cortez Hills Mine. At the Cortez Hills underground mine, drill testing of a fertile fault and inferred feeder below the mine referred to as the Hanson Footwall target was successful. To date, multiple intersections (16.9 m at 11.24 g/t gold in the third quarter of 2021 and 22.6 m at 23.07 g/t gold in the fourth quarter of 2021), provide encouragement for expansion along strike and down-dip. Follow-up step-out drill testing is planned to start in early 2022. Follow-up drilling to grow the deposit westward at the Distal target intersected skarn alteration and quartz-sulfide veins that are associated with the previously encountered Distal mineralization. Further to the northwest, field mapping and sampling highlights additional potential associated with parallel structures containing strong alteration, and surface gold mineralization. Mapping and sampling are ongoing with drilling planned for 2022 in this new area of the deposit (Barrick Gold Corp. website, <https://www.barrick.com>).

McCoy District

McCoy-Cove Project. The underground Cove Mine portal has been collared and more than 300 m (1,000 ft) of the decline has been constructed. Phase 1 of the program, which is progressing according to plan, will include the construction of an initial level with multiple drill bays to provide access for upgrading resources. Approximately 40,000 m of underground definition and expansion drilling is anticipated to commence in Q4-2022 followed by a Feasibility Study anticipated to be completed in 2023. The Cove Mine is one of four projects currently being advanced by i-80 Gold and is expected to be a key component in the Company's plans to restart the Lone Tree autoclave (i-80 Gold press release 7/21/2022).

LINCOLN COUNTY

Pioche District

Horsethief Project. Alianza Minerals completed a 2,808 m (9,213 ft), 10-hole reverse circulation drilling program over 3.5 km² (2.2 mi²) at the Horsethief Gold property, located northeast of Pioche in Lincoln County. Drilling followed a successful 2020 drill program that included detailed mapping focused on lithology, structure and alteration of the prospective limestone and dolostone stratigraphy exposed at Horsethief. Significantly, based on lithological and characteristics and fossil identification, this work confidently assigned the stratigraphic ages ranging from upper Cambrian to lower Ordovician. The carbonate locally hosts jasperoid bodies.

Anomalous gold results over broad intervals from jasperoids developed within Ordovician limestone and dolomite, including: 0.004 oz/t (0.13 g/t) gold over 12.2 m and 0.003 oz/t (0.11 g/t) gold over 19.9 m in 20HT-003. Broad intervals of altered/oxidized and weakly anomalous gold mineralized limestone and dolostone at the Cambrian/Ordovician contact with associated pathfinder elements. Broad weakly anomalous gold intervals are associated with a pathfinder element suite of anomalous Mo–Pb–As–Sb+Hg+Mn±Cu±Zn±Te±Bi. Anomalous gold and pathfinder element halos can range from 10 m to 100 m in thickness and are often at limestone–dolostone transitions, and in jasperoid developed bodies at the Cambrian/Ordovician contact (Alianza news releases 7/2/2020, 8/6/2020, 10/22/2020; Alianza website, <https://alianzaminerals.com>).

Atlanta District

Atlanta Project. Nevada King Gold drilled 65 RC holes totaling 5,361 m and 3 core tails totaling 183 m. A fence of five holes was located at the bottom of the historic Atlanta open pit in an area that had never been drilled, uncovered a thick bed of high-grade oxide gold mineralization starting at the surface. The discovery has significant implications, lowering the strip ratio and increasing overall grade within the existing resource. It also potentially ties together with the high-grade mineralization found in discovery hole AT21-003, that was drilled 560 m north of the pit. Drill intercepts in 2021 included: 1) 54.9 m of 2.62 g/t gold, 2) 48.8 m of 2.32 g/t gold, 3) 64m of 3.35 g/t gold, including 12.2 m of 6.88 g/t gold, 4) 41.2 m of 3.94 g/t gold, including 9.1 m of 9.23 g/t gold and, 5) 54.9 m of 5.34 g/t gold, including 10.7 m of 11.19 g/t gold.

Eagle Valley District

Gold Springs Project. Gold Springs Resource Corp. released a significant updated mineral resource estimate for its Gold Springs project, taking into consideration all the 2021 drill results at North and South Jumbo, Tremor,

Charlie Ross, and White Point. The measured gold resource is 26,493,000 metric tons grading 0.51 g/t gold for 439,378 ounces of gold and 9.05 g/t silver for 7,825,943 ounces of silver (Gold Springs Resource Corp. press release, 6/13/2022).

LYON COUNTY

Yerington District

Pumpkin Hollow Mine. Nevada Copper produced 3,296,515 pounds of copper concentrate at an average grade of 22% copper in 2021. Geotechnical stability boundaries and properties of significant portions of the underground East North orebody were verified by underground drilling and development drifting. As expected, the resulting geotechnical modeling has confirmed the stability of the East North ore body.

MacArthur Project. Lion Copper and Gold Corp. completed a core drilling program which commenced May 20, 2022 as part of the Stage One Work Program with Nuton LLC, a Rio Tinto Venture. The program was completed safely and on schedule, with objectives including the evaluation of mineralized potential beneath the legacy Yerington pit, the Montana-Yerington prospect located between the Ann Mason project and the Yerington pit, along with verification works around the MacArthur project resource. The drill program was composed of five drill holes totaling 1,448 m (4,752 ft) (Lion Copper and Gold website, <https://www.lioncog.com/>).

Como District

Hercules Project. Northern Vertex Mining Corp. changed its name to Elevation Gold in September of 2021 and continued to advance its Hercules Epithermal project in the Como district. Northern Vertex identified four new exploration target areas: Ursa, Como Ridge, Hades, and Jurassic Park. A sample from the eastern parts of the Hercules exploration target area returned 72.40 g/t gold and 2,690 g/t silver, making it the highest-grade surface rock sample collected on the property to date. Ongoing surface exploration continues to identify and further delineate structure-hosted epithermal precious metals mineralization in multiple areas, highlighting the exploration potential of the broader Hercules property. Hercules is a district-scale property (approximately 100 square km) that straddles the flanks of a large collapsed volcanic center in the Walker Lane.

The Ursa target area is in the central parts of the property and targets fault-hosted epithermal style veins and altered permeable lithic tuff. Limited rock chip sampling returned gold grades ranging from below detection to 0.71 g/t and silver grades ranging from below detection to 14.6

g/t. The Como Ridge target area is located towards the south end of the property, along trend of the historic Como Mine.

The presence of ledges of vuggy silica, diaspore, alunite, and kaolinite in association with intense argillic alteration indicate the potential for the presence of high-sulfidation epithermal systems in this part of the property. Limited recent rock chip sampling returned gold grades ranging from below detection to 4.74 g/t gold and silver grades ranging from below detection to 70 g/t silver.

The Jurassic Park target area, which is located towards the east side of the Hercules and Siren target area, contains numerous epithermal-style quartz veins, silicified outcrops, and associated argillic alteration that parallels and may be a splay off the property-scale Pony Meadows curvilinear fault. Limited recent rock chip sampling of the target area returned gold grades ranging from below detection to 0.76 g/t and silver grades ranging from below detection to 5.6 g/t (Elevation Gold website, <https://elevationgold.com>).

MINERAL COUNTY

Aurora District

Aurora. In 2021 Klondex Aurora Mines, Inc., a subsidiary of Hecla Mining Co. focused on an exploration potential data review of the district followed by hyperspectral, Lidar, airborne magnetic/radiometric, gravity, and CSAMT geophysical surveys of the property. In 2021, Hecla focused exploration efforts at Aurora on detailed mapping, sampling, and alteration mineral spectroscopy to follow up on targets generated by the review and surveys generated in 2020. The property consists of 448 unpatented lode claims, 92 patented claims, and 944 acres (382 ha) of private property covering about 9,928 contiguous acres (4,018 ha) (Hecla Mining Co. website, <https://www.hecla-mining.com>).

Hecla's exploration efforts in the district are just getting started. Only recently, in the long history of the Aurora district, has the land package been consolidated allowing unencumbered access throughout the district. Previous exploration efforts left many targets untested or open for expansion. Systematically applying modern exploration tools with a 150-year robust historical dataset will certainly result in new discoveries.

There remains a strong upside potential for new discoveries in the under explored 32.6 square kilometer (12.6 mi²) property based on the extent of the veins systems and the unexplored extensions beyond the previous mining. In 2022, exploration drilling is planned to test high-grade vein extensions from historic production areas and the Sawtooth Ridge target area.

Spring Peak Project. Headwater Gold's Spring Peak Project is a one square-mile property in the Aurora district located in the northeastern portion of the Bodie Hills in Mineral County. Aurora hosts potential for the discovery of

epithermal gold-silver deposits. Historically, the property produced about 1.9 million ounces of gold from an anastomosing system of banded quartz-adularia-sericite epithermal veins.

Four of five holes encountered significant gold mineralization beginning approximately 100 m below surface. The drilling resulted in a new blind gold discovery made with drill hole SP21-03 which intersected 38.1 m grading 1.00 g/t gold, including 9.2 m grading 2.49 g/t gold. The results validate Headwater's exploration model, confirming the presence of a laterally continuous gold-bearing epithermal boiling zone below a cap of silica sinter and barren alteration at surface.

Vein textures and multi-element geochemistry suggest mineralization occurred near the top of the targeted boiling horizon, with follow-up targets presented down dip.

Headwater is under an earn-in agreement with Newcrest Mining. They control a commanding land position in an established mining district consisting of 2,232 ha. Headwater had a successful 2021 drilling program that intersected mineralized epithermal quartz veins at a range of elevations in multiple structures.

Infrastructure at nearby Aurora includes a 350 ton per day mill, water wells, & high-voltage power (Headwater website, <https://headwatergold.com/>).

Bell District

Golden Mile Project. Fortitude Gold Corp. announced its maiden Mineral Resource estimate for the Golden Mile Property in November, 2021. Key highlights include: 1) indicated mineral resource of 78,500 gold ounces at 1.13 grams per metric ton, 2) inferred mineral resource of 84,500 gold ounces at 1.10 grams per metric ton, 3) mineralization remains open both on strike and at depth, and 4) maiden resource supported by 17,440 m of drilling in 150 holes. There is also the potential to expand Mineral Resource and or upgrade the Resource through additional infill and step-out drilling. Condemnation drilling was underway in 2021 to confirm locations for heap leach pad, process facilities, and waste storage facilities (Fortitude Gold Corp. website, <https://www.fortitudegold.com/>, Fortitude Gold Corp. press release, 11/9/2021).

Candelaria District

Candelaria Project. Silver One Resources Inc. reported results of the last 22 drill holes from its 52-hole, 15,000 m, reverse circulation and diamond drilling program completed at its Candelaria project. The three main objectives of the program, which included the outlining of deep, higher-grade silver and gold mineralization down-dip from the previously mined open-pits, extending near-surface, potentially open-pit mineralization to the east of west of the previously mined areas, and examining potential for porphyry-related mineralization at depth, were all successfully achieved.

Previous results of this program were released on February 16, and May 26, 2021. Recent assays received continue to confirm the presence of down-dip, higher-grade silver mineralization north of Mount Diablo pit and between Northern Belle and Mount Diablo pits. Similarly, drilling immediately east and west of the Mount Diablo pit reports significant widths of mineralized intervals with silver averages exceeding historic cut-off grades. This confirms the continuity of robust, near surface silver-oxide mineralization along-strike for at least 500 m west and 100 m east of the Diablo pit. The mineralized system remains open along-strike in both directions. Additionally, indications of porphyry style alteration and mineralization have been identified in felsic dykes and altered intrusions with deep, drill intercepted gold mineralization associated with porphyry style alteration returning 5.99 g/t gold over 0.67 m in hole 81 located west of the Northern Belle open pit.

Highlights include a high-grade intercept of 1,070 g/t silver and 1.48 g/t gold over 4.57 m, within a 25.91 m interval that averaged 248.5 g/t silver and 0.40 g/t gold in hole SO-C-21-92, located by the eastern rim of the Northern Belle pit and approximately 42 m east of historic hole N228, which averaged 670 g/t silver over 13.7 m and 300 m northwest of the 2021 hole 047, which returned 1,129 g/t silver and 1.33 g/t gold over 8 m within 28 m of 350 g/t silver and 0.45 g/t gold.

Deep drilling, north of the Candelaria fault on the porphyry/IOCG target, intercepted 81 m of a diorite porphyry with hydrothermal alteration indicative of a potential porphyry system at the bottom of drill hole 81. Massive sulfide veinlets in a potassically altered diorite with secondary biotite and magnetite veinlets reported 5.99 g/t gold over 0.67 m from a depth of 928 m. The system appears to be open to depth.

Additionally, hydrothermal alteration and gold mineralization found in a diorite porphyry at the bottom of hole 81 suggests proximity to a potential porphyry/skarn system. This mineralized system was first identified in historic adit dumps, which returned assays to 2.76% copper, 25 g/t silver and 0.67 g/t gold. Drill targets were subsequently delineated by Silver One's 2019 airborne magnetic survey followed by an IP survey. Silver One's president and CEO, Greg Crowe commented that "the possibility of a porphyry related mineralized system below the extensive area of nearer surface silver-oxide mineralization adds an entirely new and exciting aspect to what is already a robust project at Candelaria." (Silver One Resources press release).

Results from the 15,000 m drill program along with ongoing metallurgical testing will be important in the preparation of an economic study planned for year-end, 2021. An additional phase of drilling is planned for Q4 2021. This will serve to test the near-surface, along-strike extensions still farther away from the pits and to investigate new targets identified from recent surface sampling

programs. The investigation of potential porphyry/skarn mineralization will also be pursued.

Hole 81, collared just north of the Georgine pit, exhibits over 300 m of moderate to strong hydrothermal alteration from the base of Tertiary to Quaternary volcanic rocks at 647.7 m to the bottom of the hole at 989.9 m. Alteration proceeds downhole from near-surface propylitic alteration through quartz-sericite alteration and then into 80 plus meters of a diorite porphyry with potassic alteration. The potassic alteration is characterized by biotite-magnetite micro-veinlets +/- tourmaline and gold mineralization in massive sulfide veinlets near the base of the hole. Here, a 60 cm sample from 928 m depth assayed 5.99 g/t gold within a 13.33 m zone averaging 0.5 g/t.

Mineralization within the historic resource area between Mount Diablo and Northern Belle pits is also spatially related to multiple phases of altered dikes, especially felsic dikes with tourmaline alteration. This could also be an indication of a potential intrusive source to the mineralized systems. Recent reconnaissance by Silver One geologists has identified favorable structures as well as similar alteration in felsic dikes both to the east and west of the pits, all within Silver One's property. These areas have been sampled and are awaiting lab assays. Additional drilling targets will be ranked based on the above-mentioned structure-alteration and mineralization features (Silver One Resources website, <https://silverone.com/>).

Mount Grant District

Lapon Canyon Project. The 2021 drill program continued to target the higher-grade trends and expanded the new gold mineralization previously discovered at the 2,682 m (8,800 ft) elevation, at the Honeypot, and other targets.

The 2020–2021 drill programs at Lapon Canyon consisted of systematic drilling on section for geological modeling purposes, as well as exploration drilling to discover new gold mineralization and extend known gold mineralization.

Walker River Resources announced drill results from the late 2021 reverse circulation drill program at the Lapon Canyon portion, of its 100% owned Lapon Gold project. Drill results confirm the discovery of a new high-grade gold mineralized zone: 1) LC 21-80 returned 7.62 g/t gold over 48.8 m, including 77.16 g/t gold over 4.5 m, 2) LC 21-81 returned 5.68 g/t gold over 60.9 m, including 17.76 g/t gold over 18.3 m, and 99.7 g/t gold over 1.5 m, and 3) LC 21-82 returned 1.84 g/t gold over 122 m including 8.61 g/t gold over 9.2 m, and 4.28 g/t.

Key Highlights include: 1) the presence of significant gold mineralization in granite (LC 21-82), demonstrates new and significant potential to the project. Previously the granite was thought to be barren. The company will now begin to assay granites from the previous drillhole samples not sent to the lab. 2) It is now warranted to drill longer and

deeper holes at Lapon Canyon, with significant gold mineralization recently discovered within the granite at the Hotspot, previously unknown to exist on the project. 3) Hole 21-65 (1.88 g/t over 54.5 m) was the initial discovery hole. The zone is not visible at surface, as it is covered by a blanket of colluvium and granite boulders. 4) Holes LC 20-35 (1.35 g/t over 22.9 m) and LC 21-67 located some 100 m northwest of the new Hotspot zone confirmed its discovery. 5) The unanticipated robust nature of gold mineralization discovered at the Hotspot zone, allows the company to apply the same methodologies at Lapon Canyon's other known mineralized zones, including follow up drilling at the mineralized zones discovered in holes LC 19-42 and 43. 6) The 2022 drill programs at Lapon Canyon will now consist of systematic drilling on section for geological modelling purposes, as well as exploration drilling to discover new gold mineralization (Walker River Resources website, <https://wrrgold.com/>).

Pamlico District

Pamlico Project. As indicated in Newrange Gold Corp. press release of October 6, 2021, ongoing mapping, rock and soil sampling, in conjunction with the expanded IP survey, are building upon the knowledge base that was previously confined to the historic Pamlico Mines area. Within the recently enlarged property (now more than 5,700 ha) covering an area that has seen little to no previous exploration, Newrange geologists have identified a multi-phase intrusive system with locally strong copper +/- zinc mineralization at surface. Gold mineralization in and around the Merritt decline is being reinterpreted with the goal of further defining, and potentially enlarging, the zone of near-surface high-grade gold.

"91" zone was discovered in late 2020 in the historic Central Mine area, 1,300 m northeast of the Merritt decline. The "91" zone presents a significant bulk tonnage gold target. In the northern part of the property, the historic polymetallic La Panta Mine is being re-evaluated for potential continuations of gold-silver-copper-lead-zinc mineralization. Southeast of La Panta is Pamlico East, a north-south copper-bearing shear that shows a strong spatial association with a similarly-trending and three km-long IP anomaly. The Skarn Zone/McGill Canyon is located approximately 4 km southeast of the Merritt Decline. Rock and soil sampling in this area demonstrates widespread gold-silver-copper-lead-zinc mineralization proximal to the contact between a felsic intrusive and limestones that are coincident with a moderate IP anomaly. In particular, grab samples with individual assays of up to 3.0 g/t gold, 2.8% copper and 5% zinc, were taken over an area of 1.2 km east-west by 1.3 km north-south. South of the Skarn zone is Pamlico South which extends along the southern part of the property. At this location, several intrusive bodies have been recognized and are being mapped out in more detail. Grab samples from shears, veins and contact zones within the

intrusive rocks returned up to 3.75% copper with associated endoskarn alteration, while copper mineralization up to 4.2% in grab samples along with widespread anomalous copper, zinc and lead in soils is associated with exoskarn alteration within the adjacent sedimentary rocks. This extensive area is underlain by a strong chargeability IP anomaly roughly 3 km in width (Newrange Resources website, <https://newrangegold.com/>).

Santa Fe District

East Camp Douglas. Fortitude Gold Corp. announced exploration drill results from 11 drill holes in its East Camp Douglas property's lithocap target in June 2021. Results included 17.92 m grading 1.29 grams per metric ton (g/t) gold and 6.10 m grading 1.42 g/t gold. This maiden drill program focused on understanding geologic structures associated with the silicified lithocap located on the southern end of the East Camp Douglas property (Fortitude Gold Corp. website, <https://www.fortitudegold.com/>, Fortitude Gold Corp. press release, 6/9/2021).

Isabella Pearl Mine. In 2021, Fortitude Gold continued to explore for additional mineral reserves at the Isabella Pearl Mine. During the year, 92 RC holes were completed, totaling 8,391 m. This mainly included in-fill and step-out drill holes on the Scarlet, Isabella, and Civit Cat targets. The majority of this drilling was conducted outside the current permitted mine plan (Fortitude Gold website, <https://www.fortitudegold.com/>).

Santa Fe Project. Lahontan Gold Corp. drilled five core holes totaling 1,368 m at the company's 19 km² Santa Fe project in the Walker Lane. These core holes explored down-rake and on-strike extensions of the high-grade BH zone and shallow, potentially open pit minable. High-grade intercepts from the BH zone included 100.3 m grading 2.96 g/t gold and 62.2 g/t silver, including 37.3 m grading 3.78 g/t gold and 96.1 g/t silver, also including 4.9 m grading 10.76 g/t gold and 126.7 g/t silver. Highlights from shallow oxide drilling included 23.9 m grading 0.84 g/t gold and 4.6 g/t silver and 20.7 m grading 0.45 g/t gold and 3.4 g/t silver (<https://lahontangoldcorp.com/>).

Nye County

Barcelona District

Corcoran Canyon Project. Nevada Silver Corporation (NSC) provided a final update on assay results from the 2021 diamond drill on its 100% owned Corcoran Silver-Gold project. The results are from completed assay data in the company's recent 3,040-meter diamond drill program at the outcropping epithermal Corcoran silver-gold deposit located 80 mi north of Tonopah. Drilling results include :1) 1.35 m of 409 g/t AgEq, 2) 26.32 m of

56g/t AgEq, 3) 44.04 m of 46g/t AgEq, 4) 14.23 m of 73 g/t AgEq, and 5) 1.58 m of 521 g/t AgEq.

Mineralized intervals from many of the holes have been reported as data is returned from the laboratory. CC21-01 (10th November 2021); CC21-04 and CC21-05 (14th December 2021); CC21-02, CC21-03, CC21-13, CC21-14 and CC21-17 (12th January 2022); CC21-06 and CC21-07 (18th January). The data from the reported holes in this announcement (CC21-8 to 12, 15, and 16) are new results and comprise the final assay results in the 2021 program.

CC21-08 is a vertical hole located near the southern end of the resource to 116.9 m total depth. Most of the top 90 m of this hole intersected mineralization including near-surface intersections ranging up to 395 g/t silver. A shallow twin hole (CC21-08B) was completed to 20.1 m to provide additional data for the poor sample recovery in the top few meters of CC21-08. Assays for CC21-08B confirmed surface mineralization (18.0 m from surface of 45 g/t AgEq).

CC21-09 is the southernmost drill hole completed in this program. No significantly anomalous silver and gold were returned and the mineralization intersected in CC21-08 appears to be offset to the southeast. Drill testing for a continuation of mineralization to the northwest of CC21-08 is planned for 2022.

CC21-10 is the most northern hole drilled during this program. Mineralization was most prominent in the lower half of the hole (26.32 m from 62.00 m of 56 g/t AgEq and 44.04 m from 94.64 m to the bottom of the hole of 46 g/t AgEq). NSC considers that there is considerable potential for mineralization with similar thickness and grade to continue to the north of CC21-10 and step-out drilling in this area is planned for 2022.

CC21-11 was completed near the center of the drill area and intersected wide zones of appreciable silver and gold grades throughout the hole.

CC21-12 was drilled to test the south east portion of the deposit and the 1.58 m of 516 g/t Ag from 186.42 m may represent a feeder zone in this area. Deeper drill testing in 2022 is planned to test this target.

CC21-15 is located in the north west of the drill area and was drilled to 254.5 m towards grid east (135 O) at a dip of -70 degrees. The thick intersections of silver-gold mineralization intersected throughout CC21-15 total 167 m and include: 1) 45.32 m from 54.86 m at 31 g/t AgEq, 2) 45.43 m from 108.49 m at 43 g/t AgEq, 3) 53.92 m from 162.04 m at 44 g/t AgEq, and 4) 18.69 m from 235.81 m to the end of the hole at 60 g/t AgEq.

The CC21-15 intersections show that the deposit is open to the north and northwest where it appears to dip to the west. Step-out drilling to test this extension is planned for 2022.

CC21-16 was angled at -70 degrees towards 270 degrees AZ to test for silver located along north-south oriented structure near the southern extent of the mineralization. No high-grade intersections were located although weak silver-gold mineralization was intersected between 78.81 and

104.25 m. This interval is likely to represent the southeast limit of the mineralization in this part of the deposit. Northwest from CC21-16, the mineralization has a northwest dip and drill targets of potential extensions will be targeted both to the west and at depth in planned 2022 drilling.

NSC's CEO Gary Lewis commented, "We are very pleased that the last holes of NSC's 2021 Corcoran drilling include further encouraging results. The deposit is clearly not closed by drilling in any direction or at depth. In particular CC21-15 and CC21-10, which are the most northern 2021 drill holes, intersected wide mineralized intervals. CC21-15 showed a combined total length of 167 meters of mineralization and best grades occurred near the bottom of this 254.5 m angled hole. Similarly, CC21-10 intersected more than 70 m of Ag-Au mineralization in the bottom half of the 138.7 m hole." (Nevada Silver Corporation press release 1/26/2022).

Bullfrog District

Bullfrog/Reward Project. Don Taylor, CEO of Augusta Gold commented: "The significant increases in the updated resource estimate further confirms our view of the Bullfrog project and its expansion, potentially adding substantially more ounces at similar grades while reducing the strip ratio for the currently outlined resource. Augusta is now focused on de-risking the project through environmental and engineering studies that will form the foundation for permit applications. The measured and indicated resource at Bullfrog is 1.01 million metric tons grading 0.53 g/t gold (94% oxide) for a total of 1.2 million ounces. Reward is fully permitted and contains 427,000 oz with an average grade of 0.75 g/t gold (~100% oxide).

The updated Mineral Resource Estimate was based on a total of 1,331 drill holes measuring 269,8644 m (885,380 ft) and incorporates drill targets under evaluation since the June 2021 maiden mineral resource report, in addition to updated geologic models and database improvements. The updated MRE has an effective date of December 31, 2021 and is presented in the form of a combined global oxide and sulfide mineral resource as well as individual tables for the each of the Bullfrog, Montgomery-Shoshone, and Bonanza deposits. There remains excellent exploration potential within the district and drilling has indicated that mineralized structures and features continue both laterally and vertically along the known mineralized trends. Specific areas for additional exploration drilling and interpretation include Ladd Mountain and Mystery Hills near the Bullfrog pit; the Polaris vein and related disseminated mineralization near the Montgomery-Shoshone pit; along strike and beneath Bonanza Mountain near the Bonanza pit; and in the prospective Gap area in the northern portion of the property (Augusta Gold website, <https://www.augustagold.com/>).

Manhattan District

Manhattan Mine Property. Scorpio Gold Corporation provided an update of its surface RC drilling program at the Manhattan West and East pits of the recently acquired Kinross Gold Manhattan property.

The first phase of the RC drilling program was completed in 2021, with 31 holes (6,907 m) drilled including 19 holes in the West pit area and 12 holes at East pit area. Assay results received for 12 of the holes were reported in the Company's July 20 and September 7, 2021 news releases, reporting near surface, high-grade mineralization over broad intersections in the West pit area.

Drill hole MWRC21-004 returned a high-grade intersection of 71.3 g/t gold over 4.6 m, including 203.1 g/t over 1.5 m. The lithology and mineralization noted in rock chips from the intersection closely resembles the high-grade intersection in previously reported MWRC21-001, which returned 20.04 g/t gold over 15.3 m. Hole 004 is located 297 m southeast of hole 001 along the strike of the mineralized structural trend.

Drill hole MWRC21-003 collared ~140 m northwest of 004 intersected a barren fault zone at the expected target depth, suggesting the mineralized zone is faulted out in this location. Gold mineralization was encountered a further 30 m downhole within a stockwork calcite zone returning 2.03 g/t gold over 6.1 m.

Goldwedge Project. At its underground Goldwedge project in the Manhattan district, Scorpio Gold Corporation announced high-grade results from a hole drilled to test the on-strike and down-dip continuity of mineralization within and below the current underground mine workings.

Drill hole GWUG21-015 returned 50.2 g/t gold over 5.6 m (1.463 oz/t over 18.5 ft), including a higher-grade intercept of 260 g/t over 0.9 m (7.607 oz/t over 3.0 ft). The mineralization is hosted within sheared, interbedded limestones and argillites with quartz and calcite veining. The intersection is located ~7 m on strike from historical 2011 drill hole GWUG-11-2, which reported 56.4 g/t gold. The mineralization is situated at an average depth of ~58 m from topographic surface and is located ~350 m northwest of the mine portal. Drilling to further test the extent of high-grade mineralization along strike and at depth below the existing mine workings is ongoing. Four additional holes recently completed at the same drill station as GWUG21-015 are being processed for analysis.

To date, the Goldwedge deposit has been traced over a strike length of ~350 m from near surface to a vertical depth of 160 m. The southwestern extent of drilling at the Goldwedge deposit lies 100 m northwest of Scorpio Gold's most northerly exploration drill hole in the West pit area of the Manhattan Mine property. Future drilling will test the company's structural interpretation that mineralization at Goldwedge could connect with mineralization in the West pit area, where drilling has indicated a 300 m continuous

trend of mineralization from as shallow as 19 m from surface. Collectively, the Goldwedge, West pit and East pit areas outline a mineralized trend along the Reliance Structural zone ~2 km in strike length. This trend continues a further 3 km southeast to Scorpio Gold's Keystone-Jumbo project area.

The Goldwedge deposit lies within the Walker Lane gold belt and is located on the southern periphery of the Manhattan caldera, approximately 16 km (9.9 mi) south of the Round Mountain Mine. Scorpio Gold Corp. owns 100% of Goldwedge. The Goldwedge deposit exhibits several styles of gold mineralization from fault breccia and vein-hosted to stratabound replacement style in limestone and in pervasive quartz-sericite-pyrite alteration.

Scorpio started a bulk sampling program in October 2020 that was designed to drift through an area of high-grade mineralization intersected in drill hole GWUG20-001, which returned 25 ft (7.6 m) averaging 0.364 oz/t (12.47 g/t) gold and 5.14 oz/t (176.23 g/t) silver, including 5 ft (1.52 m) grading 1.56 oz/t (53.49 g/t) gold and 0.5 ft (0.15m) grading 115.5 oz/t (3,960 g/t) silver. The bulk sampling program incorporated a 2.7 x 2.7 m (9 x 9 ft) drift driven for 34 m (111.5 ft) with chip-channel samples collected along the ribs at 1.5 m (5 m) intervals. Results from the sampling have confirmed that high-grade gold mineralization is associated with subparallel quartz and calcite veins and veinlets within foliation and bedding. The mineralization appears to be stratabound and is hosted within sheared metamorphosed interbedded limestones, argillites and phyllites of late Cambrian age. This mode of occurrence of mineralization appears to show significant potential.

Significant gold mineralization was encountered in two zones from 9.2 to 10.7 m and 70 to 24.4 m (30 to 35 ft and 70 to 80 ft). Bulk samples from these zones are planned to be collected for metallurgical test work (Scorpio Gold Corp. news releases, 3/3/2020, 2/17/2021, 7/27/2021, Scorpio Gold Corp. website, <https://www.scorpiogold.com>).

Round Mountain Mine. At Round Mountain, Kinross Gold implemented initiatives to stabilize a pit wall in 2021, including dewatering and moving waste material from the pit rim. As a result of the mine optimization program, which was initiated in the first quarter of 2021, 938,000 gold ounces at Phase S were converted to proven and probable mineral reserves at year-end 2021. Additional challenges were identified in the west wall of the Phase W area which may affect Round Mountain's annual production plans after 2024. The program is evaluating further initiatives to enhance wall stability, including shallower pit wall slope angles over a more extensive area, and alternative mine plan opportunities, such as incorporating the Phase S pushback. The alternative mine plan opportunities also include modified open pit sequencing for Phase W and Phase S and the potential for underground mining for portions of Phase W and Phase X. The company is planning to construct a drift for

underground exploration at Phase X in 2022 after positive exploration results in 2021. Given the mine optimization program's expanded parameters, results of the analysis are now expected in the second half of 2022.

Exploration focused on Phase X, which is the northwest continuation of Phase W mineralization. Notable gold intercepts included: 1) 15.2 m (50 ft) grading 0.152 oz/t (5.22 g/t); 2) 4.6 m (15 ft) grading 0.458 oz/t (15.73 g/t); 3) 1.5 m (5 ft) grading 0.916 oz/t (31.40 g/t); 4) 56.64 m (185 ft) grading 0.054 oz/t (1.86 g/t), including 1.5 m (5 ft) grading 0.78 oz/t (26.70 g/t) 5) 41.1 m (135 ft) grading 0.016 oz/t (0.55 g/t); and 6) 88.4 m (290 ft) grading 0.092 oz/t (3.17 g/t) (Kinross Gold Corp. 2021 Annual Report, 4/2/2021; Kinross Gold Corp. website, <https://www.kinross.com>).

Rye Patch District

Tonopah (Midway) Project. On November 11, 2021, the Viva Gold Corp. announced drill results for its 2021 drill program at its Tonopah project. The holes drilled in the program confirmed that the mineral system remains open and strong laterally to the east, while extending mineralization at depth. The company has used the latest results from its previous two drill programs to re-interpret its existing geologic model of the Tonopah project. The new model will be used as a basis for an updated resource estimate, which will include the data from the Company's 2020 and 2021 drill holes which were completed. During the second half of 2020, Viva Gold Corp. made significant progress at its Tonopah project (formerly known as Midway). An 11-hole RC drill program was completed in November of 2020, totaling 2,016 m (6,600 ft), which clearly demonstrated that the primary northwest mineral trend on the property has not been closed off, but remains open for further extension and drilling. A 5-hole large diameter diamond drill program was also carried in 2020 and early 2021 (Viva Gold Corp. press release August 22, 2022).

Tonopah District

Hughes Project. Summa Silver Corp. continued drilling on the east side of the historic Tonopah vein system at its Hughes project, drilling nearly 50 holes during 2021, focusing on the Rescue veins of the past-producing underground Belmont Mine. It is drilling in the hanging wall of the Halifax fault where the tailings pile is from the Belmont Mine. Historically the Halifax fault was interpreted as a pre-mineral fault. Work and drilling by Echo Bay and Santa Fe Pacific Gold in the 1980s led them to reinterpret the Halifax fault as a post-mineral fault that offset and down-dropped the approximately east-west-striking Belmont vein in the hanging wall of the Halifax fault. Drilling in the late 1980s by Echo Bay and Santa Fe Pacific Gold in the hanging wall intercepted a vein with relatively high silver grades. Hole SUM21-45 tested for continuity of mineralization between hole SUM-31 and SUM-06. The hole intersected three zones of vein-hosted, high-grade

silver and gold mineralization. Two upper intervals at 400.4 and 409.5 m downhole intersected 552 g/t silver equivalent over 0.5 m, and 126 g/t silver equivalent over 0.8 m.

On the west side of the Tonopah district, Summa drilled several holes on its Murray target. Intercepts included 4,116 g/t silver equivalent (2,009 g/t Ag and 21.1 g/t gold) and 303 g/t silver equivalent (138 g/t Ag and 1.64 g/t gold over 4.1 m) were followed by an interval of 249 g/t silver equivalent over 2.3 m at 414.5 m downhole.

Seven holes were drilled at the Belmont Mine, all of which were widely spaced and targeted different veins. Summa targeted the Rescue veins and intercepted 2,995 g/t silver equivalent over 0.8 m (2.6 ft) at a downhole depth of 378.5 m (1,241 ft) in hole SUM20-19, which is a 50 m (164 ft) step-out from SUM20-06. In another hole, which was a 50 m (164 ft) step-out from SUM20-20, the hole intersected 6,220 g/t silver equivalent (2,910 g/t silver and 33.1 g/t gold) over 0.7 m (2.3 ft).

At the Belmont Mine target hole SUM20-28, drilled 450 m (1,476 ft) northwest of the Rescue veins, intercepted 0.7 m (2.3 ft) of 1,269 g/t silver equivalent (580 g/t silver and 6.89 g/t gold).

One hole is in progress to test the area of hole ET-7, which is located 1.3 km east of the Belmont Mine, where in the 1980s Echo Bay intersected silver and gold mineralization that has not since been pursued (Summa Silver press release, July 20, 2022).

Tonopah West Project. Blackrock Silver's Tonopah West project is a significant landholding within the historic Tonopah silver district with 97 patented and 19 unpatented lode mining claims comprising the property. Blackrock closed the Lease Option to Purchase agreement on April 1, 2020. The historic Tonopah silver district produced 174 million ounces of silver and 1.8 million ounces of gold from 7.45 million metric tons of material.

Blackrock's consolidated land position yielded 2.1 million tons of the total Tonopah gold and silver production making the combined area the second largest producer by tons and gross dollar yield. Five broad target areas have been defined that have significant potential.

Blackrock Silver announced its final 2021 assay results in early 2022. Highlights included: Step-out drillhole TW21-109 encountered an up-dip portion of Merten vein system 350 m southwest of the DPB resource area, returning 1.5 m grading 2 g/t gold and 298 g/t silver. The Merten vein system is the largest mineralized feature identified to date. The vein and its accompanying hanging wall and footwall splays have 1.5 km of mineralized strike and over 1,200 m of drill-tested dip potential.

Step-out drillhole TW21-110 cut two, 1.5 m zones 250 m west of the DPB resource area in the stratigraphic position of the Denver vein. The first intersection returned 2.03 g/t gold and 7.5 g/t silver, and the second yielded 1.46 g/t gold and 157 g/t silver This extends the Denver another

250 m westward making the overall strike of the Denver to be approximately 800 m in length.

RC drillhole TW21-116 at Victor cut three zones, which yielded 1.5 m grading 1.6 g/t gold and 187 g/t silver, 1.5 m with 1.49 g/t gold and 144 g/t silver and 3.0 m returning 1.16 g/t gold and 176 g/t silver. The three intercepts are related to the Murray, Merger, and OK veins. These veins merge toward the west to become the thick Victor vein, tracked over 480 m.

The maiden resource estimate is on track for the first quarter of 2022 (Blackrock Silver Corp. press release, January, 4, 2022, Blackrock Silver website, <https://blackrocksilver.com>).

PERSHING COUNTY

Antelope District

Majuba Hill Project. Bam Bam Resources Corp. was successful in advancing its Majuba Copper-Silver-(Gold) project in 2021. Exciting assays started being released in July of 2021 during drilling of the copper oxide zone on the southwest flank of Majuba Hill. Hole MHB-1 intercepted 22.5 m (74 ft) from 64 to 87 m (210 to 285 ft) that assayed 0.35% copper and 10.2 ppm silver, including 1.5 m (5 ft) of 1.26% copper and 17.4 ppm silver.

Hole MHB-2 was drilled towards the northeast at a 45-degree inclination to test for extensions of the mineralization outwards from the historic workings. The hole intersected from the surface a 44.5 m (146 ft) downhole interval that assayed 1.41% copper and 97.6 ppm silver. High-grade mineralization in MHB-2 occurs with supergene chalcocite, azurite, and malachite. Supergene cuprite exists in historic drill core.

The copper, silver, and local gold mineralization occur in intrusive rocks with porphyry-style alteration. Three of the five intrusive phases at Majuba contain copper. Copper oxide mineralization at the surface is within quartz-sericite-pyrite alteration. Oxidation at Majuba extends as deep as 244 m (800 ft).

Eighteen chip-channel samples were collected along new road cut exposures. Samples assays returned 37 to 16,950 ppm copper and 0.6 to 166 ppm silver. For example, chip sample MHR-403 returned 193 ppm copper and 166 ppm silver over 6 m (20 ft).

In November and December, Bam-Bam drilled a deep hole to downhole depth of 790 m (2,591 ft). Detailed logging of the sulfide zones intersected below the oxide zone. MHB-8 found up to 40% sulfides in intervals comprised of hypogene pyrite, pyrrhotite, chalcopyrite, and arsenopyrite. Drill hole MHB-8 stepped out 518 m (1,700 ft) south from the oxide/enrichment zone to test a deep Induced Polarization chargeability high. The 499 m (1,635 ft) long hole intersected over 366 m (1200 ft) of chalcopyrite in veins, stockworks, and disseminated with tourmaline, below the zone of oxidation and enrichment.

Copper and silver in this chalcopyrite-sulfide zone included: 19.8 m (65 ft) of 0.35% copper and 13.9 ppm silver for a copper equivalent grade of 0.49% copper from 263.7 to 283.5 m (865 to 930 ft) with 1.5 m (5 ft) of 1.22% copper and 53.1 ppm silver. The broader interval of copper and silver returned: 143.2 m (470 ft) of 0.1% copper and 4.04 ppm silver for a copper equivalent grade of 0.14% copper from 253 to 396 m (830 to 1300 ft) (Bam-Bam Resources Corp. news releases 5/19/2020, 7/9/2020, 7/17/2020, 8/21/2020, 9/28/2020, 10/5/2020, 11/23/2020, and 12/23/2020, multiple 2021 news releases).

Rochester District

Rochester Mine (including Lincoln Hill).

Expansion drilling by Coeur Rochester consisted of 7,800 m (25,600 ft) of RC and core drilling, including directional core technology implemented to test the East Rochester mineralization under the Stage I and Stage II leach pads. Key highlights from East Rochester include: 1) 256.9 m (842.8 ft) of 1.3 oz/t (45.4 g/t) silver and 0.009 oz/t (0.3 g/t) gold; 2) 125.5 m (411.6 ft) of 1.0 oz/t (33.6 g/t) silver and 0.009 oz/t (0.3 g/t) gold, and 3) 64.4 m (211.4 ft) of 1.2 oz/t (40.8 g/t) silver and 0.008 oz/t (0.3 g/t) gold.

The capitalized drilling consisted of 7,925 m (26,000 ft) of RC drilling, focused on infill mainly within the Rochester pit.

With the approval of the updated Plan of Operations for West Rochester (composed of Lincoln Hill, Independence Hill and Gold Ridge) received in the prior period, the Company began a resource validation program at Lincoln Hill, which, based on its current resource, contains approximately four times the gold grade compared to Rochester mine reserves. Two RC drill rigs and one core drill rig were active during the period. Infill drilling focused within Lincoln Hill while expansion drilling targeted the Rochester and Nevada Packard pits. Coeur plans to have up to two RC drill rigs active at Rochester during the third quarter of 2022 to finalize the infill program at Lincoln Hill. Additionally, the Company plans to continue the surface mapping and sampling of West Rochester and the Rochester pit, as well as to expand the soil sampling grid covering both areas (10-K Report, 2/19/2020; Coeur Mining Inc. website, <https://www.coeur.com>).

Tobin and Sonoma Ranges

Coronado VMS Project. On December 15, 2020, Nevada Sunrise announced the conclusion of the 2020 Coronado drilling program, which began in the first week of November 2020.

Two diamond drill holes were collared at locations identified by the previous airborne Versatile Time Domain Electromagnetic (VTEMEM) geophysical survey as optimal for penetration of the interpreted conductor. A total of 250.76 m (822.7 ft) were drilled in the two diamond core holes. Each of the drill holes encountered difficulty

penetrating through the overburden and viscous clay layers, and the bedrock targets were not intersected.

DDH-COR20-01 was drilled to 151.4 m (496 ft), at which depth ground conditions made further advance impossible. The drill hole encountered a fault zone composed of clay gouge and breccia at 136.9 m (449.1 ft). Drilling continued through this zone for 14.5 m (47.5 ft) until the hole was abandoned. This fault zone intersection may represent an extension of the thrust fault encountered in the company's previously drilled hole DDH-COR18-01. Formations identified in the core indicate that surface colluvium and the upper part of the Havallah greenstone sequence are situated above the fault as in DDH-COR18-01.

DDH-COR20-02 was drilled through the surface colluvium to a depth of 99.4 m (326.1 ft), at which depth further advance was impeded by a viscous clay layer. This viscous clay is either a layer within the surface colluvium or it may be associated with a fault gouge zone at this depth.

Nevada Sunrise intends to test the Coronado South conductor in a future drilling program with a combination of RC drilling and diamond drilling to penetrate the problematic layers of overburden and continue into bedrock to best intersect the strong VTEMEM airborne conductor detected by the Company in 2018 (Nevada Sunrise website,

<http://www.nevadasunrise.ca/projects/coronado-vms-project/>).

STOREY COUNTY

Comstock District

Comstock Lode Project. Tonogold Resources conducted exploration drilling at Gold Hill and on the southern portion of the Occidental Brunswick Lode in the Art Wilson Claim Group from September 2020 through June 2021. Along the Gold Hill section of the Comstock Lode, Tonogold drilling focused on intermediate to deep targets at several of the historic mines where research indicated that 19th century miners left mineralized material in place that was below their cutoff grades. Tonogold's drilling on the southern Occidental-Brunswick Lode expanded on 2018 drilling done by Art Wilson on his claims and targeted several near-surface mineralized structures within and adjacent to the historic Pride of the West Mine. Tonogold completed a total of 20 holes and 5764.7 m (18,913 ft) of drilling using a combination of core and RC drilling methods to investigate the nature and extent of mineralization at the two target areas (Tonogold Resource website, news release 7/13/2021).

WASHOE COUNTY

Leadville District

Hog Ranch Project. Drilling was undertaken by Rex American Resources at the Bells, Krista and Airport/Cameco project locations with successful extensions to the previously defined gold mineralization identified at every location. A key outcome from the recent drilling effort was the successful test of 3D induced polarization targets in the Airport area. The interpretations from the 3D IP have assisted greatly in the identification of new locations where gold mineralization could exist. Drill holes HR21-010 and HR21-012 were both successful in confirming significant gold mineralization on two new structures. Drill hole HR21-010 intersected 114.3 m at 0.64 g/t gold including a higher-grade section of 36.6 m at 1.4 g/t gold, and HR21-021 returned a significant initial hit on a new structure of 56 m at 2.12 g/t gold, including higher grade intervals of 12.2 m at 3.86 g/t gold and 4.6 m at 8.61 g/t gold. Rex has completed a range of activities at the Hog Ranch property, which continues to outperform expectations in terms of the scale and quality of the opportunity that is rapidly being uncovered.

During the first half of 2021, Rex completed several airborne surveys over the entire Hog Ranch property, undertook RC drilling at the Krista and Bells projects, completed trials for ground-based 2D IP and initiated a cultural survey to pave the way for permitting.

The airborne surveys were completed using state of the art techniques to collect hyperspectral, magnetic and radiometric data. They were flown in the last quarter of 2020, with final processing and interpretations now well advanced. The new surveys are considered to form a critical dataset from which the greater potential at Hog Ranch can be identified.

Initial data reviews and surface ground checks have already encouraged Rex to triple its land holding at Hog Ranch, which currently covers over 70 square kilometers. The RC drilling programs undertaken were designed to test a number of key features associated with the gold mineralization at both the Krista and Bells projects.

At Krista, there were two drilling campaigns. The first was designed to confirm further extensions to the gold mineralization, beyond the current historical drill hole database. The second campaign focused on confirming the locations of higher-grade trends that appear to exist in some sections of the historical drill hole data. Both drilling campaigns at Krista were successful in identifying further extensions and expanding on the previously defined higher-grade trends.

The results from the survey are extremely encouraging because they have identified key features (anomalies) which correlate to known high-grade gold drill intersections at both locations. Based on the orientation survey data, Rex is confident that IP will be an effective exploration tool to fast

track the discovery of additional gold mineralization throughout Hog Ranch (Rex American Resources website, <https://www.rexamerican.com/>).

Wind Mountain Project. Bravada Gold Corp. continued in-fill drilling and exploration on the Wind Mountain project. Hole WM21-111 returned 21.3m of 1.235g/t Au & 20.4g/t Ag within an oxidized interval of 77.7m of 0.518g/t Au & 12.1g/t Ag,

Wind Mountain disseminated mineralization occurs along a zone of multiple, gently south-dipping mineralized horizons that are partially offset by post-mineral faults that is over 4 km long. Drilling confirms that higher grades occur within these horizons along several northeast, north, and northwest-trending fracture zones, and that within these fracture zones are narrow intercepts with much higher grades of gold and silver.

Feeder target drill holes extended the banded quartz vein zone to over 330 m beneath overburden and mine waste, and multi-element geochemistry is consistent with vein mineralogy and textures indicating the holes intersected the top of a well-zoned vein system with potentially high-grade gold below current drilling.

The recently completed program totaled 17 holes (2,186.8 m) and consisted of 13 holes (1,324 m) into under-drilled portions and potential extensions of the existing oxide resource near the Breeze open pit and four holes (862 m) at the feeder target to offset a vein zone encountered in hole WM20-102, which intersected 1.5 m of 0.404 g/t gold and 269.0 g/t silver within a thicker interval of quartz veining with anomalous gold and silver mineralization (Bravada Gold Corp. news release, 3/11/2021).

WHITE PINE COUNTY

Bald Mountain District

Bald Mountain Mine. Kinross did not release any exploration drilling results from Bald Mountain in its 2021 Annual Report.

Butte Valley District

Selena. The Selena property is a shallow-oxide, silver-gold-lead-zinc discovery made by Ridgeline Minerals in 2020. The property hosts a zoned Ag-Au-Pb-Zn Carbonate Replacement Deposit (CRD) with potentially open-pit silver-gold at Chinchilla, Juniper, Revival, and Broken Egg as well as deeper high-grade potential at the CRD zone. The project is located within the historic Limousine Butte district of the south Carlin trend with a claim block comprised of 467 contiguous federal lode claims totaling 39 km². Historic and currently producing mines in the area including the Bald Mountain, Alligator Ridge, Yankee, Illipah, and Golden Butte deposits. Five phases of trenching and drilling have defined a mineralized footprint that crops

out at surface and extends over 3.7 km east-west and over 2.5 km to north-south with mineralization open in multiple directions. The project lies in close proximity to a known copper-gold porphyry system located ~1 km to the west of the property, which Ridgeline interprets as the primary source to mineralizing CRD fluids across the property.

Highlights from the 2021 drill programing at the Chinchilla, Juniper and CRD zones include: 1) SE21-025: 44.2 m grading 123.2 g/t silver, 0.1 g/t gold, 1.5% lead and 0.6% zinc starting at 232 m true vertical depth (TVD) in the Chinchilla zone, 2) SE21-024: 10.7 m grading 194.0 g/t silver, 0.3 g/t gold, 2.0% lead and 1.7% zinc starting at 191 m TVD in the Juniper zone, and 3) SE22-037: 3.0 m grading 40.2 g/t silver, 3.0 g/t gold, 0.2% lead and 6.8% zinc starting at 731 m in the CRD zone.

Robinson District

Robinson Mine. KGHM has an on-going exploration drilling program to provide information for the geologic model, better define the Robinson ore body, and provide metallurgical samples. Drill results from Robinson are rarely released by KGHM.

White Pine District

Gold Rock Project. Calibre Mining Corp. acquired the Gold Rock project from Fiore Gold in 2021 and released drill results from a late-2021 high-grade sulphide exploration program. Darren Hall, President and Chief Executive Officer of Calibre, stated: "It is exciting to see continued high-grade intercepts from Gold Rock, in particular those which occur outside the previously reported Preliminary Economic Assessment (PEA) pit limits. Since the PEA, which was completed in 2020, numerous holes, within and surrounding, the North and South mineral resource pits have intercepted higher grades than the current mineral resource average grade of 0.70 g/t gold. We see significant resource expansion opportunities at Gold Rock and will continue to advance technical studies and drilling along the prospective 16.5 km mineralized trend. Gold Rock presents an exceptional near-term opportunity to grow production in Nevada, leveraging off management and infrastructure at our Pan Mine located approximately 20 km northwest of Gold Rock. We have commenced preparing 2022 budgets for Nevada and see an opportunity to materially expand and accelerate the exploration programs given the opportunity for resource expansion and continued discovery potential. Currently we have five rigs operating between Gold Rock and the adjacent Pan Mine." (January 18, 2022 press release, www.calibremining.com)

Green Springs Project. Contact Gold Corp. spent \$2,413,479 on exploration at Green Springs in 2021, which included \$1,121,974 on drilling, assaying, and geochemistry. The company completed 41 holes totaling 7,511 m (18,980

ft) across the Alpha, Bravo, Charlie, Echo, Golf, and Zulu zones, which lie outside of the old producing pits. The pits last produced between 1988 through 1991.

Gold intercepts from the six holes drilled in the Alpha zone included: 1) 28.96 m grading 1.34 g/t, including 15.24 m grading 1.15 g/t, 2) 35.05 m grading 1.68 g/t, including 39.63 m 1.45 g/t, 21.34 m grading 2.09 g/t and 19.81 m grading 2.55 g/t, and 3) 45.72 m grading 0.86 g/t, including 9.14 m grading 1.82 g/t. The Alpha zone is a zone of shallow, generally less than 90 m in depth, gold mineralization hosted along the lower contact of the Devonian to Mississippian Pilot Shale with the underlying Devonian Guilmette Limestone. The mineralization covers an area of about 500 m by 250 m.

Intercepts from Echo zone, the highest-grade zone of oxide gold mineralization encountered in drilling at Green Springs, included: 1) 35.05m grading 2.24 g/t oxide gold, including 22.86 m grading 3.14 g/t gold and 2) 17.68 m grading 1.49 g/t gold and 15.24 m grading 3.79 g/t gold. The gold mineralization is hosted along the Chainman Shale-Joanna Limestone contact.

Gold intercepts from two holes at the Charlie zone included 3.05 m grading 0.28 g/t and 3.05 m grading 0.15 g/t, which was hosted by the Pilot Shale. Both holes at Charlie were drilled from the bottom of the past producing open pit to target the Pilot Shale at the intersection of major northwest and east-west striking faults, delivering a significant gold intercept at the Pilot Shale-Guilmette Limestone contact. The intercept underscored how underexplored the lower Pilot Shale horizon is.

Drilling at the Golf zone was designed to test the near surface intervals of Chainman Shale-hosted gold mineralization and the Pilot Shale-Chainman Shale-Guilmette Limestone contact, known to host significant gold mineralization at the Alpha, Echo, and Bravo zones. Intercepts included: 1) 4.57 m 0.29 g/t gold and 2) 7.62 m grading 0.83 g/t gold that included 4.57 m grading 17 g/t gold.

Contact Gold's initial drill program at the Zulu zone, located 200 m south of the Echo zone intercepted 25.9 m 1.14 g/t gold. Significant gold intercepts from the hole drilled in the Bravo zone included 23 m grading 1.02 g/t in oxide including 10.67 m grading 1.79 g/t. The Bravo zone lies 750 m north of the past-producing Charlie pit and 900 m southwest of the Alpha zone. It lies at the northern end of the north-south Green Springs trend at a structural intersection with a major northeast striking fault extending to the Alpha zone. The core is an elongated east-northeast-striking zone with currently unquantified higher-grade gold values in a 200 m by 85 m (660 ft by 280 ft) area.

Contact Gold drilled six holes in the Alpha zone to offset the gold mineralization in historical drilling. Drilling extended gold mineralization to north and south of historical drilling. The company believes the discovery of oxide gold mineralization at the base of the Pilot Shale is a significant proof of concept milestone in its exploration thesis (Contact Gold Corp. news releases, 11/16/2020, 11/23/2020, 1/12/2021, 1/20/2021, 1/26/2021, 2/9/2021, 2/23/2021, 3/24/2021), 4/14/2021, Contact Gold Corp. Annual Information Form, 3/31/2020; Contact Gold Corp. website, <http://www.contactgold.com>).

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INDUSTRIAL MINERALS

by Rachel Micander with contributions from Gabriela Villar and Camdyn Newcomb

According to the Nevada Department of Taxation (NDT), the total value of industrial minerals produced in Nevada during 2021 was estimated to be \$246,380,693.58, not including aggregates. Industrial mineral values in the NDT Net Proceeds of Minerals Bulletin are reported in the “other” category while gypsum is included as a separate category. Other values include barite, clay, diatomaceous earth, dolomite, limestone, lithium, magnesite (magnesia), opal, perlite, salt, and silica. The gross yield for gypsum accounted for \$49,643,160, nearly 5% of the total amount reported for industrial minerals. Data used for these estimates, and data reported for individual commodities below were obtained from the Nevada Division of Minerals (NDOM), the Nevada Department of Taxation, the U.S. Bureau of Land Management (BLM), the U.S. Geological Survey (USGS), or directly from companies that produced the commodities where available. Data are given in short tons unless otherwise noted. Individual and compiled state production data are from the annual status and production report issued by NDOM. The gross proceeds are from NDT. USGS data (mostly domestic production, consumption, prices, and trends) are from the minerals commodities summaries on the agency’s website located here: <https://www.usgs.gov/centers/nmic/commodity-statistics-and-information>.

Aggregate (Dimension Stone, Sand and Gravel, Crushed Stone, Landscape Rock, and Decomposed Granite)

According to the USGS mineral industry survey, 29,400,000 tons of aggregate were produced in 2021. This was a 19% increase over 2020 production and amounted to \$235 million. Of the aggregate operations in Nevada that reported annual status and production to NDOM, a total of 11,325,757 tons and 62,398 yards of aggregate were mined in 2021. 617,948 tons of decomposed granite (DG) were mined at the Donovan pit off of Pyramid Way in Sparks, NV. 1,231,575.48 tons of sand were mined from various pits in Fallon, Fernley, Sparks, Henderson, Las Vegas, Jean, and Panaca. 4008 yards of gravel were mined from pits in Pershing County.

Approximately 5,503,649.86 tons and 48,107 yards of aggregate were produced in 2021. A total of 299 tons of dimension stone, listed as quartzite, were produced from Las Vegas Rock’s Rainbow Quarries in Jean. Mt. Moriah Stone Quarries, LLC operating in White Pine County mined 5300 tons of quartzite; however, no amounts were reportedly produced or shipped from this operation. DG was produced from pits in Sparks and Minden totaling

597,115 tons. Sand was produced from various pits in Las Vegas, Panaca, Sparks, and Fallon totaling 846,129 tons.

An approximate total of aggregates shipped in 2021 was 5,495,822 tons and 56,750 yards. Las Vegas Rock shipped 106 tons of dimension stone from their Rainbow Quarries operation. A total of 746,910 tons of DG were shipped from operations in Sparks and Minden. A total of approximately 734,685 tons of sand were shipped from operations in Las Vegas, Panaca, Jean, Sparks, and Fallon.

Nationwide, the estimated domestic production of crushed stone was 1.5 billion metric tons valued at more than \$19 billion. Production occurred from an estimated 1410 companies operating 3440 quarries and 180 sales and/or distribution yards in all 50 States. This was a 2% increase over national production values from 2020. An estimated total of 1 billion metric tons of construction sand and gravel valued at \$9.9 billion was produced during 2021. Production occurred from approximately 3870 companies operating 6800 pits and 340 sales and/or distribution yards in all 50 States. This was an increase of 6.2% from national reported values for 2021 (942,000,000 metric tons). Approximately 2.3 million metric tons of dimension stone, valued at \$430 million, was sold or used by U.S. producers in 2021. This was an ~2% decrease from 2020. Dimension stone was produced by approximately 200 companies operating 236 quarries in 34 States (USGS, 2022).

The amount of landscape rock and dimensional stone produced from Nevada quarries is likely greater than the estimates reported in the Annual Status and Production Report. Vista Landscape Center, Inc., of Henderson sold decorative stone mined from quarries near Searchlight and Crescent Peak, 20 miles (30 km) west of Searchlight (Fowler, Vista Landscape Center, Undated). Desert Deco Rock sold landscape rock from the Lucky Dutchman and Copper Rose pits at the south end of the McCullough Range and the Eldorado pit about 2 miles (3 km) west of Nelson in the Eldorado Mountains (Desert Deco Rock) R.T. Donovan Co., Reno Rock Transport of Reno, Cheyenne Rock of North Las Vegas, and others also sold decorative rock produced in Nevada (R.T. Donovan; Reno Rock Transport; Cheyenne Rock, 2015).

Barite

Domestic barite production for 2021 drastically decreased from previous years and all domestic production came from two mines in Nevada. However, mine production amounts were withheld by the USGS in order to avoid disclosing proprietary company information. According to NDT, the gross yield for barite was \$27,288,229.70 in 2021. More than 90% of the barite sold in the United States is used as a weighting agent in fluids used in the drilling of oil and natural gas wells. Barite also has its uses in the automotive industry, and in paint, plastics, and rubber. Due to barite’s ability to block x-ray and gamma-ray emissions, it is used in high-density concrete for radiation

shielding in multiple industries where such radioactive emissions pose a threat to exposure (USGS, 2022). The estimated average price of barite was \$180 per metric ton, a 10.43% increase from 2020.

Barite is mined from two locations in Nevada: the Rossi Mine and Dunphy Mill located in Elko County and the Mountain Springs Mine located in Lander County. Of these two mines, the Mountain Springs Mine was the only producer of barite. The Rossi Mine and Dunphy Mill are operated by Halliburton Energy Serviced and mined 414 tons of barite. The Mountain Springs Mine is operated by M-I LLC and mined a total of 46,500 tons and produced 44,200 tons of barite.

In addition to the Mountain Springs Mine, barite was produced from the Battle Mountain Grinding Plant in Lander County, the Big Ledge Mine and Osino Mill in Elko County, and from the Greystone Mine in Lander County. Both the Battle Mountain Grinding Plant and Greystone Mine are operated by M-I LLC, and produced 249,500 and 104,300 tons of barite, respectively. The Big Ledge Mine and Osino Mill are operated by Drilling Minerals Industries, LLC and produced 18,573 tons of barite.

According to the annual status and production reports, barite was shipped from three locations statewide including 249,500 tons shipped from the Battle Mountain Grinding Plant, 19,262 tons shipped from the Big Ledge Mine and Osino Mill, and 15,017 tons shipped from the Maggie Creek Operation in Elko County. The Maggie Creek operation is owned by Progressive Consulting Inc., and neither mined nor produced barite in 2021.

There are 181 Barite deposits documented in Nevada (Papke, 1984). A collection of Nevada barite samples acquired by Keith Papke, the author of *Barite in Nevada*, is available at the NBMG Great Basin Science Sample and Records Library located in Reno, Nevada.

Cement

Nationwide, domestic cement production increased slightly from 2020 to an estimated 90 million tons. Masonry cement production stayed the same as 2020 at 2.4 million metric tons. Cement is produced from 96 plants in 34 states and 2 plants in Puerto Rico.

Nevada Cement Co. is the only producer of cement in Nevada and distributes bulk and sack cement. Nevada Cement mined both limestone and pozzolan from operations in Lyon, Pershing, and Churchill counties. The plant's production capacity is 500,000 tons of clinker and 560,000 tons of cement annually (Nevada Cement Co., undated). See sections on Lime, Limestone, and Dolomite and Pozzolan for more detailed information and production amounts.

Clay

Domestic clay production was estimated to be 25 million metric tons valued at \$1.5 billion in 2021. This was a decrease of 0.4% from 2020 values. The USGS divides clay into ball clay, bentonite, common clay, fire clay, fuller's earth, and kaolin. The total gross yield reported in the Net Proceeds of Minerals Bulletin was \$11,839,493.00 for six Nevada Clay operations.

In the past, operations in Nevada have produced alum sulfur, bentonite, hectorite, kaolinite, montmorillonite, saponite, sepiolite, smectite, and mixed clays. According to the annual status and production report, 8000 tons of kaolinite were mined by Nevada Cement Co. at their Flanigan clay mine in Washoe County. Vanderbilt Minerals, LLC produced and shipped 264 tons of smectite from the New Discovery Mill and Mine, 1628 tons from their Blanco Mine, and 1254 tons from the Buff/Satin Mine. The New Discovery Mine is located just south of Beatty. The mine temporarily shut down on March 31, 2017, but smectite was processed and shipped from stockpiles starting in 2018 through 2021. The Blanco Mine is located about 40 miles (64 km) west-southwest of Tonopah in the Coaldale mining district of Esmeralda County. The mine was temporarily shut down on May 1, 2017, but smectite has been shipped from stockpiles since then. The Buff-Satin property is about 10 miles (16 km) northeast of Lovelock in the Willard mining district of Pershing County. Shipping amounts decreased nearly 49% from 2020 numbers reported for this property. The clay at the New Discovery Mine is derived from altered perlite and perilitic pitchstone interbedded in Tertiary tuff-breccia. The clay at the Blanco Mine is derived from altered tuff and tuffaceous sedimentary rocks of the late Miocene to early Pliocene Esmeralda Formation (Papke, 1970). The clay at the Buff/Satin Mine is derived from late Miocene to early Pliocene altered welded and non-welded tuffs (Vanderbilt Minerals, Undated).

American Colloid Company shipped 676 tons of bentonite from their Nassau operation in Pershing County. Clay deposits here are hosted in an altered rhyolitic tuff breccia (Papke, 1970). Calcium bentonite is intermittently produced from this property in Coal Canyon (Willard mining district); however, the company has not mined the deposit since 2016. The amount of bentonite shipped in 2021 was nearly a 90% increase from 2020.

A total of 31 clay deposits have been inventoried for Nevada (Papke, 1970). A collection of the Nevada clay samples acquired by Keith Papke is also available at the NBMG Great Basin Science Sample and Records Library.

Diatomite

At 36% of the total, the United States is the world's largest producer of diatomite. Domestic production increased 19% in 2021 to an estimated 830,000 metric tons valued at \$274 million. Estimated apparent consumption

remained the same in 2021 at 770,000 metric tons. Exports increased 6% to 70,000 metric tons. Production came 12 mining areas and nine processing facilities operated by 6 companies in California, Nevada, Oregon, and Washington. About 55% of the diatomite mined in the U.S. is used in filtration products. The rest is used absorbents, fillers, light weight aggregates, specialized pharmaceuticals, biomedical purposes, nontoxic insecticides, and other applications. The estimated average free on-board plant price remained the same as 2020 at \$330 per metric ton. Nevada produced 262,727 tons of diatomite, a 38% decrease from 2020. Total gross yield reported in the Net Proceeds of Minerals Bulletin was \$51,282,304.

U.S. Silica, LLC produced about 98% of Nevada's diatomite in 2021, producing a total of 257,076 tons of diatomite. Grefco Minerals, Inc. produced the difference from their Basalt Diatomite Mine in Mineral and Esmeralda counties. Grefco Minerals mined 4774 tons of diatomite and shipped 5884 tons throughout 2021. The deposit at the Basalt Diatomite Mine is hosted in Miocene to Pliocene lacustrine sedimentary rocks consisting of diatomite, argillaceous and calcareous diatomite, clay, sand, and volcanic ash. The main diatoms are *Melosira granulata*, *Stephanodiscus asraea*, and *Eunotia robusta* (Albers and Stewart, 1972). Imerys Filtration Minerals Inc., shipped a total of 24,984 tons of diatomite from their Nightingale pit in Churchill County.

The U.S. Silica, LLC, Colado facilities in Pershing County is the world's largest diatomite operation (U.S. Silica). It consists of a plant near Lovelock that processes diatomite mined from a series of pits about 15 miles (24 km) to the northwest in the Velvet mining district. The plant produced 151,805 tons, and shipped 122,836 tons of diatomite. The Colado Mine reported 198,202 tons of diatomite mined during 2021. The diatomite occurs as thick beds interbedded with freshwater tuffaceous sedimentary rocks of probable Miocene age (Olson, 1964). The diatomite mined at the Colado Mine contains 50% water. Since diatomite must be dry before processing, mining occurs in the summer months and the diatomite is laid out to dry in the sun. The operation consists of 3773 acres (1527 ha) of company-owned claims on Federal land and 7025 acres (2843 ha) of an evergreen land lease.

U.S. Silica's Clark operation consists of the Clark Mill in the Clark mining district, Storey County, about 32 km (20 miles) east of Reno and the nearby Clark Mine about 6 km (4 miles) east of the plant. The plant produced 62,765 tons and shipped 61,729 tons. 52,836 tons of diatomite were mined from the Clark Mine throughout 2021. The Clark operation consists of 2690 acres (1089 ha) of combined company-owned private property and unpatented placer claims and 2813 acres (1138 ha) of leased land. The diatomite at Clark contains about 90% of the diatom *Melosira granulata*, and is interbedded with Neogene diatomaceous shale and thin beds of lacustrine volcanic tuff

capped by basalt (Albers and Stewart, 1972; U.S. Silica, 2019).

U.S. Silica's Fernley Diatomite Operation is located about 20 miles (32 km) northeast of Fernley in the Desert mining district. 55,888 tons were mined, 42,506 tons were produced, and 43,115 tons were shipped from this location throughout the year. The end use of diatomite from the Fernley Diatomite Operation is mainly automotive and industrial absorbent products. The deposits consist of freshwater diatomite interbedded with minor volcanic ash and tephra units and is composed primarily of amorphous silicate (U.S. Silica, 2019).

Gemstones

The combined value of domestic production of natural and synthetic gemstones was \$95 million, a 25% increase from the previous year. Domestic production of natural gemstones include agate, beryl, coral, diamond, garnet, jade, jasper, opal, pearl, quartz, sapphire, topaz, tourmaline, and turquoise, among others. Nevada produces both opal and turquoise from a few gemstone mines throughout the state. Gross yield from the NDT for gemstones was only reported for the Royal Peacock Mine (opal) at \$2188.

Precious opal is produced from several small mines in the Virgin Valley area of northern Humboldt County, a well-known source of gemstones in North America. The best-known mines are the Bonanza, Rainbow Ridge, and Royal Peacock Mines, which are pay-to-dig operations. According to the annual status and production report, Bonanza Opal Mine mined, produced, and shipped 82 pounds (~37 kg) of common opal, 1 pound (0.45 kg) of gem opal, and 15 pounds (6.8 kg) of opal potch. Rainbow Ridge Opal Mine mined a total of 100 pounds (45.4 kg) of gem opal. No amounts were reported produced or shipped for this location.

Turquoise is produced from several small operations in Nevada. Lone Mountain Mining, LLC, mined about 500 pounds (227 kg) of turquoise from the Lone Mountain Mine in T1N, R41E, sections 7 and 18 in the Lone Mountain district of Esmeralda County. They produced 1500 lbs (680 kg) of turquoise and shipped 700 lbs (~318 kg). Production was not reported for the Blue Ridge Mine, which is operated by the Wintle family and located in T28N, R47E, sections 19, 20, 29, 30 in the Bullion district of Lander County. Though production was not divulged, Otteson Brothers Turquoise operated the Royston claims in the Royston district in Nye County as a pay-to-dig operation and by running tours of the property. Also, though production was not divulged, High Desert Gems and Minerals, Inc., operated the Bonanza Turquoise claims in the Pilot Mountains as a pay-to-dig operation by appointment only.

Three new notices for gemstones were filed by two different customers in 2021 for claims located in T6N, R387E, Section 9. The case disposition was authorized as of 7/30/2021 and total land amounted to 0.6 acres. Eight new

notices were filed for phosphate minerals by Silver State Turquoise, LLC in 2021 for claims located in T30N, R34E, sections 3, 4, 7, 8, 9, 10, 17, and 18. Turquoise is a copper aluminum phosphate mineral ($\text{CuAl}_6(\text{PO}_4)_4(\text{OH})_8 \cdot 4-5 \text{H}_2\text{O}$). The case disposition was listed as authorized as of 8/30/2021.

A total of 68 turquoise mines and districts are documented in *Turquoise Deposits of Nevada*, 1968, by Frank R. Morrissey. A list of 34 turquoise and two opal deposits are compiled in NBMG Bulletin 65, *Minerals and Water Resources of Nevada*, 1964, prepared by U.S. Geological Survey and Nevada Bureau of Mines and Geology.

Gypsum

Domestic crude gypsum production was estimated to be 23 million metric tons valued at \$210 million. Leading crude gypsum producing states were California, Iowa, Kansas, Nevada, Oklahoma, Texas, and Utah. A total of 47 companies produced or processed gypsum at 52 mines in 16 states. Domestic production is primarily used for agriculture, cement production, and manufacturers of wallboard and plaster products. Total wallboard sales were estimated to be 28.0 billion square feet during 2021.

Nevada ranked as the fourth largest crude gypsum-producing state. Based on data reported in the annual status and production report, total gypsum production was 2,095,222 tons, which was a 13% decrease 2020. The gross proceeds were \$49,643,160, a 20% increase from 2020.

PABCO Building Products, LLC, mined 1,392,558 tons of gypsum from the PABCO Gypsum Plant and Mine in Clark County northeast of Las Vegas, a ~7% decrease from the previous year. The company also produced 987,061 tons and shipped 987,061 tons. PABCO Gypsum processes its gypsum to make wallboard at a plant adjacent to their mining operation (PABCO Gypsum, undated). The gypsum ore occurs in a nearly flat-lying late Miocene gypsite blanket atop a 5-square-mile (13-square-km) mesa (Papke, 1987).

Empire Mining Co., LLC, operates the Empire Quarry Mine and Mill located in Pershing County. They mined 702,026 tons of gypsum, produced 654,000 tons, and shipped 678,900 tons throughout 2021. The gypsum and anhydrite occur in the Triassic or Jurassic Nightingale sequence and form ten orebodies within an area two miles (3.2 km) in diameter. The 4400-foot by 2200-foot (1340 m by 670 m) selenite orebody is the largest. The gypsum is white, fine-grained, and nonfriable. It occurs in beds grading 85% to 95% gypsum in limestone, marble, and metasiltstone (Papke, 1987).

The Art Wilson Co. of Carson City mined 294,574 tons of gypsum from the Adams Claim Gypsum Mine in Lyon County. 304,721 tons were produced and 295,019 tons of gypsum were shipped from this location. Ore occurs in very thinly to thinly bedded gypsum-anhydrite layers of probable Jurassic age. The top of the deposit is a karst surface with up

to 40 feet (12 m) of relief. In the pit, the northern two-thirds is overlain by pale orange limestone, and the southern third is overlain by dioritic breccia. Anhydrite is more abundant deeper in the pit. (Papke, 1987).

The Art Wilson Co. last mined gypsum at the Ludwig Mine in 2019. No mining occurred in 2020 or 2021. However, 9,098 tons of gypsum were shipped from the Ludwig Mine in 2021 (Papke, 1987). This was a nearly 776% increase from 2020 when the company only shipped 1039 tons of gypsum. The deposit is Jurassic in age and is in an apparent fault contact with limestone on the east side and quartz monzonite on the west side. The deposit becomes anhydrite at depth (Papke, 1987).

H. Lima Nevada, LLC mined and produced 149,440 tons of gypsum and shipped 147,240 tons from its Lima Nevada Gypsum Mine. The Lima Nevada Gypsum Mine is part of the same late Miocene gypsite deposit as the PABCO operation. The gypsum is used as a soil enhancer and cement retarder (Papke, 1987; Plan of Operations, H. Lima Nevada, LLC, Lima Nevada Gypsum Quarry, 11/2017).

Georgia-Pacific Gypsum LLC has produced drywall and related products from its plant at Apex; however, no numbers were reported in the 2021 annual status and production report, and the plant was idle in 2018 and 2019. The quarry is in gypsum interbedded with limestone of the Permian Toroweap and Kaibab Formations. (Georgia-Pacific Gypsum, 2022). Georgia Pacific Corporation filed mining plans for gypsum with the BLM for a total of 40 acres in T18S, R63E, Sections 34 and 35 northeast of Las Vegas along I-15 in Clark County. The case disposition was listed as pending as of 8/31/2021.

Nevada gypsum deposits are inventoried in Nevada Bureau of Mines and Geology Bulletin 103, *Gypsum Deposits in Nevada*, 1987, by Keith Papke. A collection of Nevada gypsum samples acquired by Keith Papke is also available at the Nevada Bureau of Mines and Geology Great Basin Science Sample and Records Library.

Lime, Limestone, and Dolomite

According to the USGS, an estimated 17 million metric tons of quicklime and hydrated lime was produced nationwide valued at about \$2.3 billion. The USGS rolls its production figures of limestone and dolomite not used in lime production into the figure for crushed stone. Nevada reported limestone production was 971,531 tons and dolomite production was 342,529 tons. 498,802 tons of lime were produced in 2021. The gross proceeds were \$32,570,285 for limestone (including cement), a 6% decrease from 2020, and \$3,917,743 for dolomite, a 9% decrease from 2020.

Nevada's largest lime producer, the Pilot Peak high-calcium lime operation run by Graymont Western US, Inc. is in the Toano Range about 10 miles (16 km) northwest of Wendover in Elko County. The operation mined 1,192,834

tons of limestone, produced 498,802 tons of lime, and shipped 498,802 tons of lime.

Nevada's other lime producer, Lhoist North America, has historically produced lime in the Apex mining district about 20 miles (32 km) northeast of Las Vegas. In some years, the operation is the State's largest lime producer; however, no lime was produced in 2021. The company mined 300,000 tons of dolomite and 1,058,000 tons of limestone. The same amount of dolomite and 970,000 tons of limestone were produced from the operation. Even though no lime was produced, the Lhoist did ship 461,000 tons of lime in 2021. The operation makes high-calcium quicklime used in metallurgical processing, paper manufacturing, and environmental markets. The company also produces dolomitic quicklime and hydrated high calcium lime at Apex, mainly for construction uses. Production comes from the Devonian Sultan Limestone (Lhoist, undated).

Nevada Cement Co. mines limestone from three quarries in Churchill, Pershing, and Lyon counties. The company's main production came from its Churchill Limestone Quarry in the Trinity Range about 40 miles (64 km) east of the plant. 531,099 tons of limestone were mined from Mesozoic marble at this location. The company mined 110,000 tons from its Relief Canyon pit which is located in massive limestone beds of the Upper Triassic Natchez Pass Formation in the southern Humboldt Range. The company also mined 48,000 tons from its Fernley Limestone operation which is situated in Tertiary lacustrine limestone deposits a few miles south of Fernley (Nevada Cement Co., undated).

Min-AD, Inc. mined 39,175.00 tons of dolomite, produced 41,219 tons, and shipped 38,422 tons of dolomite from their facilities in Winnemucca. Dolomite is mined from the Dun Glen Formation at the MIN-AD Mine is located about 6 miles (10 km) south of Winnemucca at the base of the Sonoma Range in Humboldt County. MIN-AD, Inc. quarries, processes, and distributes a specialty mineral supplement for dairies and feedlots in North America (Min-AD).

Nutritional Additives Corp. produces agricultural and nutritional dolomite products from its Sexton Mine along the northwest edge of the Sonoma Range about eight miles (14 km) south of Winnemucca. The company processed 1310 tons of dolomite; however, no amounts were reported mined or shipped for 2021.

Along with gypsum, the Art Wilson Co. mined 1644 tons, produced 1531 tons, and shipped 1505 tons of limestone from the Adams Claim Gypsum Mine. The limestone is used for soil pH control and reportedly contains no detectable magnesium.

Bridgesource LLC and Clyde Cement filed exploration plans for limestone in several 5-acre parcels in T14S, R67E, Section 32 and T15S, R67E, Sections 4, 5, 7, and 8. The case disposition was pending as of 10/25/2021. Infrastructure Materials Corp filed notices for 4.6 acres each in T8S, R68E

Section 19 and Section 27. The case disposition was pending as of 11/29/2021.

Lithium

Nationwide lithium production in 2021 came from one brine operation in Nevada. The Silver Peak operations, run by Albemarle U.S. Inc., in Clayton Valley is the only active lithium mine. Domestic production data were withheld by the USGS in order to avoid disclosing proprietary company data. According to the NDT, the gross yield for lithium was \$41,691,698. The company pumped a total of 3,869,712,685 gallons of brine, produced 13,663,624 pounds of lithium carbonate, and shipped 12,693,382 pounds of lithium carbonate, nearly double the amount shipped in 2020.

Lithium exploration in Nevada has significantly increased in the past few years as companies search for the critical mineral. Some activities that occurred in 2021 are broken out by geographic area below.

Bonnie Claire

Surface management exploration plans for twenty-two claims south of Scottys Junction on Sarcobatus Flat were filed by Bonaventure NV Inc, a wholly owned subsidiary of Iconic Minerals Ltd. The case disposition was listed as pending as of 4/20/2021. The Bonnie Claire project consists of 915 placer claims amounting to a total of 18,300 acres. It is jointly owned by Iconic Minerals Ltd. and Nevada Lithium (50% each) and is estimated to be one of the largest lithium deposits in North America (Samari et al., 2021). The companies issued a 43-101 technical report in September of 2021. Lithium mineralization here is present as lithium compounds deposited within fine-grained clay, silt, and sand pore space (Samari et al., 2021).

Big Smoky Valley

Smoky Lithium, Nevada

Victory Resources Inc. submitted surface management notices for 4 claims in their Smoky Lithium project area amounting to 13.28 acres in T1N, R38.5E, Sections 7, 8, 13, and 18. The case disposition was listed as authorized as of 12/10/2021. Hitech Minerals Inc. submitted surface management notices for two claims amounting to 6 acres in T1N, R38.5E, Sections 7 and 8. As of 7/19/2021 the case disposition was listed as authorized.

The Smoky Lithium project area consists of 350 claims covering over 7000 acres in the south end of Big Smoky Valley. The geologic setting is similar to Clayton Valley and Victory Resources reported that sampling indicated high lithium values (up to 1500 ppm) in claystone. In December, the company announced it had received a drill permit to drill 15 holes on the property to locate key targets and further define the lithium resource (Victory Resources, 2021).

Solar Lithium Project

The Solar Lithium project owned by Cruz Battery Metals directly borders American Lithium Corporation's TLC project (see below). In October of 2021, Cruz Battery Metals reported sample results returned lithium values higher than 1509 ppm and up to 1610 ppm (Cruz Battery Metals, 2021b).

Cruz Battery Metals filed surface management notices for 14 claims in T4N, R42E, Sections 4, 5, 6, 8, and 9, and T5N, R42E, Sections 17, 18, 19, 20, 29, 30, 31, 32, and 33. The case disposition was listed as authorized as of 10/28/2021. The Cruz Battery Metals Solar Lithium project is located north of Tonopah along the western flank of the San Antonio Mountains. The company acquired the drill-ready, 3100-acre project from Las Vegas Lithium Locators Corp in July of 2021 (Cruz Battery Metals, 2021a).

In September of 2021, the company expanded the project area to ~5500 acres prospective for lithium (Cruz Battery Metals, 2021a). The property was again expanded in early November 2021 to a total of 6215 acres (Cruz Battery Metals, 2021d). A drill program consisting of 4 to 6 holes began in mid-November 2021 (Cruz Battery Metals, 2021c), and in mid-December the company reported that they encountered potential lithium-bearing claystone in every hole drilled at the property (Cruz Battery Metals, 2021e).

TLC Lithium Project

American Lithium Corp. owns the TLC lithium project which is located just south of the Solar Lithium project (Cruz Battery Metals) near Tonopah. The company submitted surface management notices for 7 claims in T3N, R42E, Section 3, T4N, R41E, Section 24, and T4N, R42E, Sections 9, 16, 17, 19, and 34 under the name Tonopah Lithium Corp. The case disposition was listed as authorized as of 9/27/2021. The TLC lithium project is a near-surface lithium deposit with surface samples reported to be between 220 ppm and 1810 ppm lithium. The deposit is hosted in claystone, and clay, silt, ash, diatomite are all interbedded with sandstones and conglomerate in the project area (American Lithium Corp., 2021a).

The company filed an application for a plan of operations to the BLM in January 2021 that was accepted for review in June 2021. In September 2021, the company reported that it had acquired the Crescent Dunes project from Big Smoky Holdings Corp. This acquisition increased the TLC project area to 12,975 contiguous acres. In addition, the company received approval from BLM to drill up to 15 new holes to test for high-grade target areas (up to 2361 ppm lithium) on recently acquired land (American Lithium Corp., 2021c).

In December, the company reported that initial exploration drilling had commenced on the property acquired from Big Smoky Holdings Corp. This drilling had successfully drilled intersections of lithium-bearing claystone up to 318 ft (96.9 m) thick (American Lithium Corp., 2021b).

Tonopah Flats Lithium Exploration Project

This project is operated by the American Battery Technologies Company and is located northwest of Tonopah in Big Smoky Valley. The company submitted surface management notices for 10 claims in T03N, R41E, sections 2, 11, 12, 13, 14, 15, 22, 23, 25, and 26 amounting to 13.9 acres. As of 11/16/2021, the disposition was listed as authorized. The company began acquiring unpatented claims in the fall of 2020 and had a total of 427 lode claims equaling 8440 acres by December 2021. They are currently exploring the development of claystone, a potentially lithium-bearing resource in the area (American Battery Technology, 2022). The company commenced an exploratory drilling program in December of 2021 in order to further develop the resource. Additionally, the company shared initial surface sample results for 305 lode claims acquired in September 2021. Resulting data showed grades of anomalous reported lithium present from 260 ppm to 1530 ppm in the project area (American Battery Technology, 2022).

West Tonopah (Smoky Valley) Lithium Project

Enertopia Corporation staked 88 lode claims covering approximately 1760 acres approximately 4 miles west of Tonopah near Hwy 95. The claims were staked in December of 2021. The company reports surface samples containing between 570 ppm and 620 ppm lithium. The outcrop that returned 570 ppm was followed up with a man-portable drill hole which returned results of 750 ppm lithium and up to 860 ppm lithium. A second man-portable drill hole was drilled south of the initial outcrop and returned between 583 and 730 ppm lithium (Enertopia Corp., 2021).

Clayton Valley

Clayton Valley Lithium Project

The Clayton Valley Lithium project covers 5590 acres immediately east of Albemarle's Silver Peak operation in Clayton Valley and is owned 100% by Cypress Development Corp. Per a prefeasibility study amended in March 2021, the company expects a production rate of 15,000 metric tons per day to produce a total of 27,400 tons of lithium carbonate equivalent annually over a 40-year mine life. The lithium primarily occurs in claystone, tuffaceous mudstone, and siltstone (Fayram and Lane, 2021). A reserves and production plan was derived from an Indicated Mineral Resource of 1304 million metric tons averaging 905 ppm lithium based on cut-off grade of 400 ppm lithium (Fayram and Lane, 2021).

In November of 2021 the company reported extraction testing of lithium-bearing claystone from the Clayton Valley Lithium project had commenced. Test work is ongoing at their pilot plant located in Amargosa Valley (Cypress Development Corp., 2021).

Clayton Valley Project

NeoLith Energy, a wholly owned subsidiary of Schlumberger, submitted surface management mining plans for 57 claims in Clayton Valley. The case disposition was listed as pending as of 10/21/2021. Additionally, Schlumberger Technology Corporation submitted surface management mining plans for 9 claims in Clayton Valley. The case disposition was listed as pending as of 10/21/2021.

Pure Energy Metals announced in August 2021 that Schlumberger had received approval from the BLM for a plan of operations covering construction and operation of a pilot plant for the Clayton Valley project. Schlumberger, Pure Energy's partner and operator of the Clayton Valley project, had also received permit approval for the associated reclamation plan from the Nevada Division of Environmental Protection, Bureau of Mining Regulation and Reclamation. In March 2021, Schlumberger announced its plans to develop a lithium extraction pilot plant at the Clayton Valley project through NeoLith Energy (Pure Energy Metals, 2021).

McGee Lithium Clay Project

Mathers Lithium Corp. submitted surface management notices for 6 claims amounting to 5.4 acres in T2S, R40E, Sections 32, 33, and 34, and T 3S, R40E, Sections 3, 4, and 5. The case disposition was listed as pending as of 10/20/2021. Mathers Lithium Corp. is a Nevada-based company 100% owned by Spearmint Resources Inc.

In November 2021, Spearmint Resources Inc. announced that they had received a drill permit from the BLM for the McGee Lithium Clay project that directly borders the Cypress Development Corp. project area (see Clayton Valley Lithium project) and the Pure Energy Metals Project area (see Clayton Valley project). In June of 2021, Spearmint Resources received a technical report for their McGee Lithium Clay project area. Maiden resource estimates were listed as 815,000 indicated metric tons and 191,000 inferred metric tons for a total of 1,006,000 metric tons of lithium carbonate equivalent (Loveday and Turner, 2021). Per the company's website, the goal of the upcoming drill program will be to increase the maiden resource estimate by following the drilling recommendations in the technical report (Spearmint Resources Inc., 2021).

Spearmint owns two additional lithium projects in Clayton Valley. These properties include the Green Clay Lithium Project consisting of 97 contiguous claims over ~2000 acres, and the Elon Lithium Brine project. The latter has access to some of the deepest parts of the lithium brine basin in Clayton Valley (Spearmint Resources Inc., 2021).

Nevada Energy Metals Inc.

Nevada Energy Metals submitted surface management notices for 4 claims in T2S, R40E, Sections 4, 10, 11, and 14 amounting to 6.16 acres. The case disposition was listed as authorized as of 3/15/2021.

Rhyolite Ridge Lithium-Boron Project

The Rhyolite Ridge project is owned by Ioneer and is located approximately 25km west of the Silver Peak operations run by Albemarle U.S. Inc. Ioneer submitted a Definitive Feasibility Study (DFS) in April of 2020. The company reports it is on track to be construction ready by Q4 2022. In October 2021, the company announced an agreement with Sibanye-Stillwater to develop a joint venture whereby Sibanye will contribute \$490 million for a 50% interest in the Rhyolite Ridge property (Ioneer, 2022).

Zeus Lithium Project

The Zeus Lithium project consists of 164 placer claims and 136 lode claims covering 2800 acres in Clayton Valley. The project is operated by Noram Lithium Corp. and sits within 1 mile (1.6 km) of the Albemarle Silver Peak lithium mine. Measured and indicated values along with inferred were reported by the company in August 2021. Measured and indicated values were reported as 363 million metric tons with a lithium grade of 923 ppm and cutoff of 400 ppm. The lithium carbonate equivalent was given as 1.78 million metric tons. Inferred values reported in August 2021 were given as 827 million metric tons with a lithium grade of 884 ppm using a cutoff grade of 400 ppm. The inferred lithium carbonate equivalent was given as 3.89 million metric tons (Noram Lithium Corp., undated).

The company's Phase V drill program concluded in April of 2021 resulting in final and updated assay results for core hole CVZ-68. The hole contained 938 feet (121.0 m) of an average grade of 1018 ppm lithium. This interval included 250 ft (76.2 m) with an average of 1151 ppm lithium (Noram Lithium Corp., 2021). An updated technical report was released in August of 2021 (Peek, 2021).

Kibby Flat

In February of 2021, Belmont Resources announced the expansion of its Kibby Basin Lithium project located approximately 37.3 miles (60 km) north of Clayton Valley on Kibby Flat in Monte Cristo Valley bordering Esmeralda and Mineral counties. The company staked an additional 10,868 acres covering nearly all of Kibby Flat bringing the total claim area to 16,012 acres. The project area shares similarities with Clayton Valley and sits within a closed structural basin (Belmont Resources, 2021). In November 2021, Belmont announced an Option/JV agreement with Marquee Resources for a 6.2 square-mile (10 square-km) portion of the Kibby Basin project area (Belmont Resources, undated).

Muddy Mountains

Rubicon Explorer Corporation submitted surface management notices for 6 claims amounting to 6.6 acres in T18S, R 66E, Sections 25, 26, 35, 36, and T19S, R66E,

Sections 1 and 3. The case disposition was listed as authorized as of 4/13/2021.

Railroad Valley

3PL Operating Inc., filed surface management mining plans for 76 claims in the northern portion of Railroad Valley. As of 7/9/2021, the case disposition was listed as pending. These claims are located in townships 6N, 7N, and 8N, ranges 55E, 56E, and 57E, and sections 1 through 36. The company holds hundreds of claims in Railroad Valley and has been actively exploring for lithium. However, in April 2021, the Bureau of Land Management filed notice in the Federal Registry that the National Aeronautics and Space Administration (NASA) had segregated approximately 22,995 acres (9306 ha) of public lands from all forms of appropriation or other disposition under the public land laws, including the mining, mineral leasing, and geothermal leasing laws, for up to two years, subject to valid existing rights in a portion of Railroad Valley. The area affected includes sections 2 through 17 and 20 through 27, T7N, R56E and sections 19 through 21 and 27 through 35, T8N, R56E (Raby, 2021). Much of the area proposed by NASA overlaps with existing lithium claims. This land segregation has halted exploration activity in a large portion of the valley (3PL Operating).

In the southern part of Railroad Valley, two surface management notices were filed in T10N, R53E, sections 5 and 6 by Zenolith USA, Inc for a total of 1.7 acres. The case disposition was listed as authorized as of 9/15/2021.

Smith Creek

The Smith Creek Lithium Property, located in southwestern Lander County is also owned by Iconic Minerals Ltd. Surface management notices for six lithium-brine claims were filed by Bonaventure NV Inc. in T17N, R40E, sections 21, 22, 23, 28, 32, and 33. The case disposition was listed as authorized as of 7/21/2021. Iconic Minerals currently controls 808 placer claims in the Smith Creek Valley where felsic ash-flow tuffs, an excellent source for lithium, are weathering into the valley (Iconic Minerals Ltd., undated).

Thacker Pass

The Thacker Pass property is situated along the southern edge of the McDermitt caldera in northern Humboldt County and is owned by Lithium Americas. The company received a record of decision from the BLM in January 2021. All key state environmental permits were issued in Q1 of 2022 and early-works construction is on track to begin in 2022. The project site has a total of proven and probable resources amounting to 179,422 tons. Average lithium of proven and probable lithium is 3283 ppm. Mine life is estimated to be 46 years utilizing open pit, continuous

mining (<https://www.lithiumamericas.com/usa/thacker-pass/>).

Magnesia

Domestic production noted as shipments of magnesium compounds (magnesium oxide content) was an estimated 590,000 metric tons, a nearly 8% increase from 2020. About 64% of domestic magnesia production came from seawater and natural brines, and the rest was produced from mining magnesite in Nevada. About 78% of magnesium compounds produced are used in the form of caustic-calcined magnesia, magnesium chloride, magnesium hydroxide, and magnesium sulfates in the environmental, agricultural, chemical, and de-icing industries. The remaining 22% are generally used for refractory material as dead-burned magnesia, fused magnesia, and olivine. Premier Magnesia, LLC owns and operates the Gabbs magnesia operation in Nye County, which is the only place in the country where magnesite is mined.

Premier Magnesia mined 488,289 tons of magnesite, produced 130,416 tons of magnesium oxide, and shipped 129,252 tons of magnesium oxide. No brucite was mined or produced from the Premier Magnesia Mine in 2021. The gross proceeds decreased 6% to \$8,057,512.00 in 2021. The magnesite and brucite occur as complex replacement bodies in Triassic dolomite in an area of about 1300 acres (530 ha) in the Paradise Range just east of the town of Gabbs (Cornwall, 1964).

Brief descriptions of six magnesite deposits are compiled in NBMG Bulletin 65, *Minerals and Water Resources of Nevada*, 1964, prepared by U.S. Geological Survey and Nevada Bureau of Mines and Geology.

Perlite

Domestic produced crude perlite sold and used in 2021 amounted to 500,000 metric tons valued at \$31 million. 860,000 metric tons of crude ore were mined from eight operations across six western states. According to the 2022 Mineral Commodity Summary published by the USGS, about 44% of perlite production is used in building construction products, 21% is used as horticultural aggregate, 14% as fillers and 12% as a filler aid. The remaining 9% is used for special insulation and other miscellaneous uses.

Statewide, two operations reported perlite production in the annual status and production report. Gross yield in 2021 increased nearly 15% to \$767,906. Wilkin Mining and Trucking, Inc. mined 3728 tons from their Tenacity Perlite Mine in Lincoln County. No perlite was reportedly produced or shipped from this operation. The Tenacity Perlite Mine is located in the South Pahroc Range mining district about 25 miles (40 km) west of Caliente, Nevada.

US Silica produced 9469 tons and shipped 7469 tons of perlite from the Colado plant in Pershing County during 2021. The crude perlite comes from the Popcorn Mine (also known as the Desert Mountains Perlite deposit and Perlite Mine) about 15 miles (24 km) south of Fallon in Churchill County (U.S Silica). Perlite was mined in 2018, but not in 2019, 2020, or 2021. The perlite occurs as glassy flows associated with rhyolitic flows (Willden and Speed, 1974).

Pozzolan

According to the annual status and production report, Nevada Cement Co. mined 8000 tons of pozzolan from its Mustache quarry near Fernley, a significant decrease from the 27,791 tons reported for 2020. The gross proceeds were \$110,381.00, down from \$227,735 reported for 2020.

Rare Earth Elements

MP Materials, Mountain Pass Mine in California, which restarted production in 2018 after being on care and maintenance since 2015, is the only domestic producer of rare earths elements (REE). During December 2020, American Rare Earths, Ltd. collected ten samples from a site in the Crescent mining district about 19 miles (30 km) east of the Mountain Pass Mine. Sampling resulted in favorable assay results and the company staked 80 claims covering 1620 acres (656 ha) in early 2021 near the Nevada-California state line. The project is known as the Searchlight Rare Earth Elements project and a technical report was published in June, 2021 (American Rare Earths).

Salt

Domestic production of salt decreased slightly to 40 million metric tons valued at \$2.5 billion. Nevada's only salt producer, the Huck Salt Co., mined 16,000 tons of salt from their mine in Churchill County, an 11% decrease from 2020. The gross proceeds for 2021 were \$560,830 which was the same as 2020. Huck Salt Co. produced 2443.91 tons and shipped 16,494.8 tons of salt throughout 2021. The salt is mined from a playa on Fourmile Flat about 25 miles (40 km) southeast of Fallon, Churchill County. Salt at this location has been harvested almost continuously since the 1860s, when it was hauled to the mills that processed Comstock silver and gold ore.

The descriptions of brine and evaporite deposits in Nevada are compiled in Nevada Bureau of Mines and Geology Bulletin 87, *Evaporites and Brines in Nevada Playas*, 1976, by Keith Papke. In addition, brief descriptions of 16 evaporite and brine deposits are compiled in NBMG Bulletin 65, *Minerals and Water Resources of Nevada*, 1964, prepared by U.S. Geological Survey and Nevada Bureau of Mines and Geology.

Silica

Silica sand produced in the United States is primarily used for hydraulic fracturing sand and well-packing and cementing sand (64%), other whole-grain silica (11%), and glassmaking sand (10%). Other uses include recreational sand, whole-grain fillers for building products, and silica gravel (12% combined). Minor uses include use as chemical abrasives, filtration sands, ceramics, among others (combined 3%).

The total gross yield for silica produced in Nevada was \$18,173,927 for 2021. According to the annual status and production report, J.R. Simplot mined a total of 1,000,000 tons from their Simplot Silica Products operation in Clark County, Nevada. 1,000,000 tons of silica sand were produced and 657,796 tons were shipped throughout 2021.

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GEOTHERMAL ENERGY

By Bridget Ayling

OVERVIEW

The total installed geothermal energy capacity in Nevada was ~808 MWe (megawatts electric) in 2021, representing a small increase from 2020 due to the completion of the McGinness Hills Phase III expansion project (fig. 1; tables 1 and 2). The total gross geothermal power generation in Nevada for 2021 increased to approximately 590 MWe, and net generation (power to market) reached 450 MWe. The difference between the gross and net generation reflects the parasitic losses associated with running the geothermal plant (e.g., downhole pumps), and this averaged 24% in 2021.

The total geothermal power generation in Nevada in 2021 was 5,165,318 megawatt-hours (MWh) gross and 3,942,594 MWh net, representing an insignificant increase (~1%) from generation in 2020. Data obtained from the Nevada Department of Taxation indicate that the total gross 2021 proceeds from geothermal operators in Nevada were \$318,747,661 (approximately \$5.4 million greater than in 2020). In 2021, the estimated average price for geothermal electricity is 8.08 cents(c)/kilowatt-hour (kWh) (calculated by dividing the total gross proceeds by the annual net electricity production)—almost identical to 2020 (8.05 c/kWh) (fig. 2). The share of geothermal electricity generation in the state was ~9.4% in 2021, representing a relative decline compared to 2020 and likely associated with the continued rapid annual growth in establishing more solar generation in Nevada (fig. 3). This proportion reflects the generation of geothermal electricity in Nevada, not consumption. Some geothermal power from Nevada is sold to utilities in California and Utah (e.g., Sacramento Municipal Utility District; Southern California Public Power Authority; the University of Utah) under various power purchase agreements (PPAs).

In August 2021, the U.S. Bureau of Land Management (BLM) held a geothermal lease sale, with 32 parcels offered equating to 85,543 acres. 26 of the parcels were sold for a total acreage of 73,631 (fig. 4; table 3a). The high bid per acre was \$100 (more than double the high bid from 2020), and high bid per parcel was \$379,600. Total monies received by the BLM were an order of magnitude higher than in 2020, with \$1,602,207 received (including the bonus bid, administrative fees, and first year lease rental at \$2/acre). In addition to the competitive lease sale, a non-competitive lease sale was held the day after the competitive sale (and is hence known as the ‘day after’ sale), with six parcels nominated for offers and one parcel receiving an offer for a total of 629 acres (table 3b). Thus, between the competitive and non-competitive lease sales, 74,260 acres were taken up for geothermal exploration in the state in 2021—three times as many as sold in 2020 (fig. 5).

Areas of interest for parcels leased in 2021 include:

- The Lahontan Valley north of the town of Fallon (Riverside Minerals LLC; Imperial Corporation LLC);
- Leases north and east of Ormat’s McGinness Hills geothermal area (Rodatherm Energy Corporation);
- Dixie Valley south of Sou Hills (Aspect Holdings LLC);
- North-west of the town of Wells in the Tabor Flat area (Velikan Renewables LLC); and
- Northwestern Gabbs Valley (Rodatherm Energy Corporation).

While the acreage taken up in 2021 was a substantial increase from 2020, drilling activity was very low with only one geothermal well drilled during the year. This represents the fewest number of geothermal wells drilled per year for at least the last 15 years. The single drilled well was a commercial size production well drilled by Ormat Nevada in Crescent Valley (table 4). 14 new geothermal drilling permits were approved by the Nevada Division of Minerals (NDOM) in 2021, so it is anticipated that more wells will be drilled in 2022.

Trends

In 2021, average wellhead fluid production temperatures ranged from 97–186 °C (207–368 °F) for electricity generation, and two reported direct-use applications utilized geothermal fluids ranging between 77–95 °C (171–203 °F) (fig. 6). Production flow rates for an individual well averaged 137 liters/second (l/s; ~2,171 gallons/minute (gpm)) for electricity generation, with the highest production flowrates measured at the Don A. Campbell geothermal field (319 l/s; 5,056 gpm). The three most recently developed geothermal fields in Nevada (McGinness Hills, Tungsten Mountain, and Don A. Campbell) have the highest production well flowrates and collectively produce an average of 6,096 l/s (96,624 gpm). This represents almost 40% of total fluid production from geothermal plants in Nevada for 2021 and coincidentally, these three fields account for ~40% of gross power generation for the year (these numbers could be expected to vary due to different production temperatures for each field).

The total installed nameplate capacity, gross and net geothermal power generation for Nevada remained steady in 2021, due to no new geothermal plants coming online (fig. 7). The new Steamboat Hills plant achieved its first full year of production this year and demonstrated more than double its generation prior to the repower (fig. 8b). Some fields continue to experience production declines in recent years, including Brady Hot Springs, Don A. Campbell, Steamboat Hot Springs, Stillwater, and Salt Wells (fig. 8). The repowering of the Soda Lake plant in late 2019 has arrested the decline previously observed for Soda Lake. Don A. Campbell and Steamboat Hot Springs have each experienced a pronounced decline of more than 10 MWe net total production over the last five years (fig. 8). Some

fields have seen increases in generation in 2021 relative to 2020 including San Emidio and Tungsten Mountain. Other fields have continued to maintain stable production,

including Beowawe, Blue Mountain, Desert Peak, Dixie Valley, and Tuscarora.

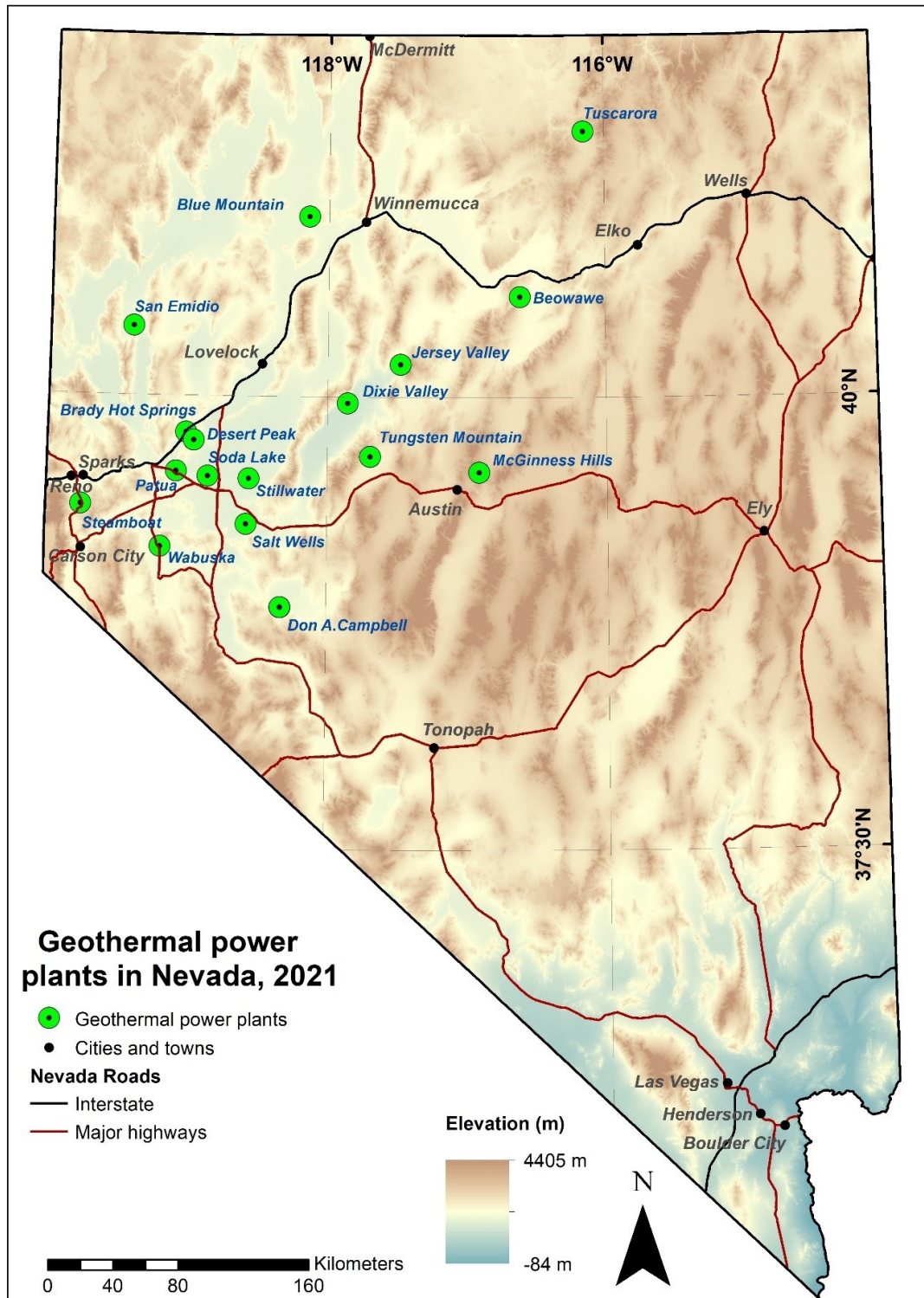


Figure 1. Location of geothermal power plants in Nevada in 2021.

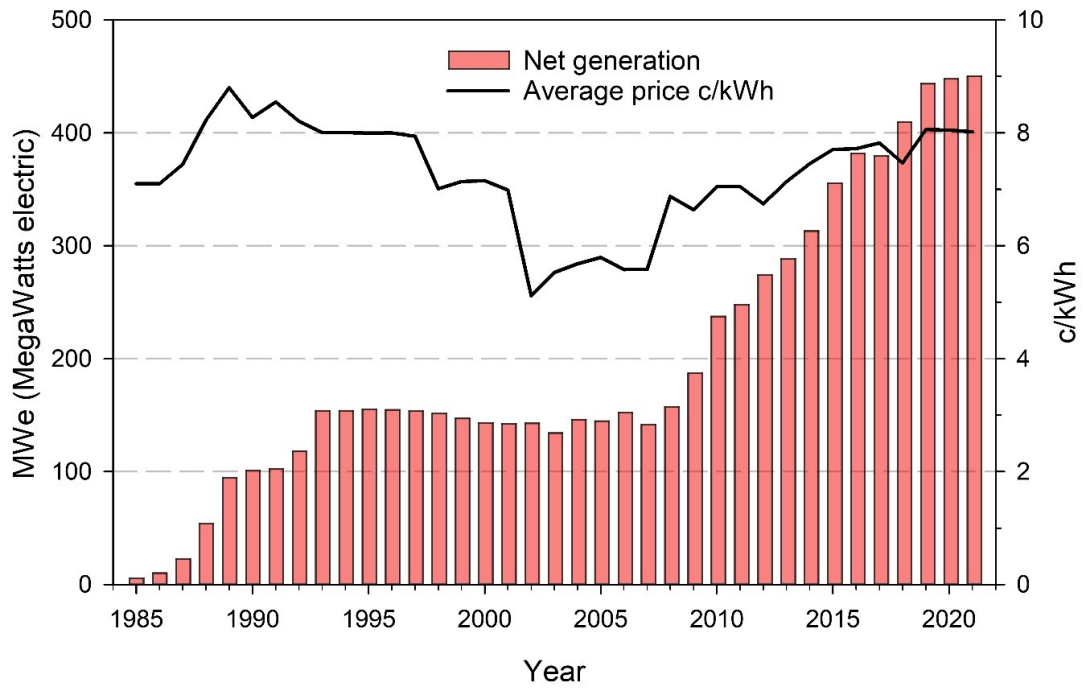


Figure 2. Trends in annual, net geothermal electricity generation and the estimated average price of geothermal electricity (calculated from gross proceeds and reported net production through 2021) in cents per kilowatt hour (c/kWh). The actual price for any individual power plant may be different and is held confidential by the state energy office.

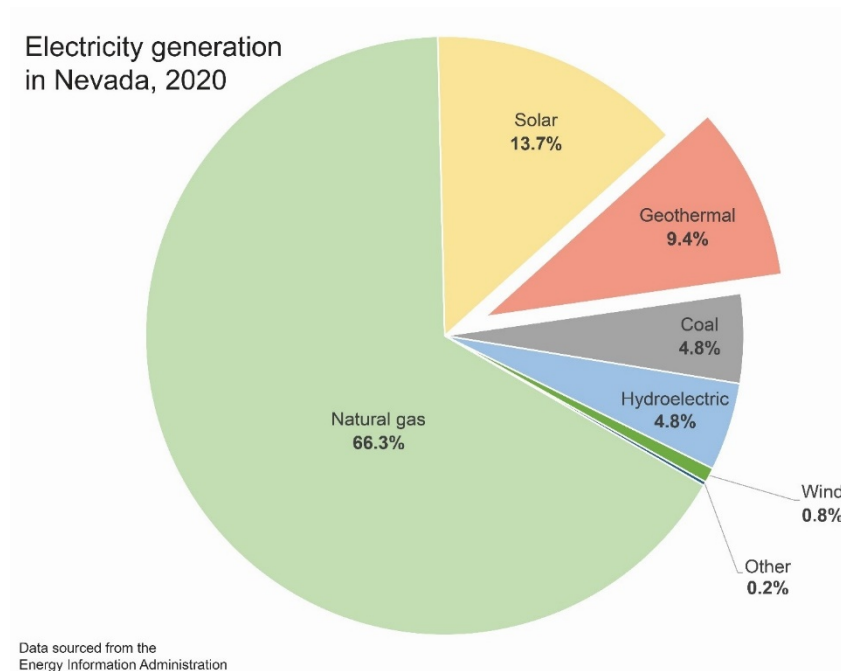


Figure 3. Sources of Nevada's electricity generation in 2020. Data sourced from the U.S. Energy Information Administration (EIA)¹.

¹ <https://www.eia.gov/electricity/state/nevada/>

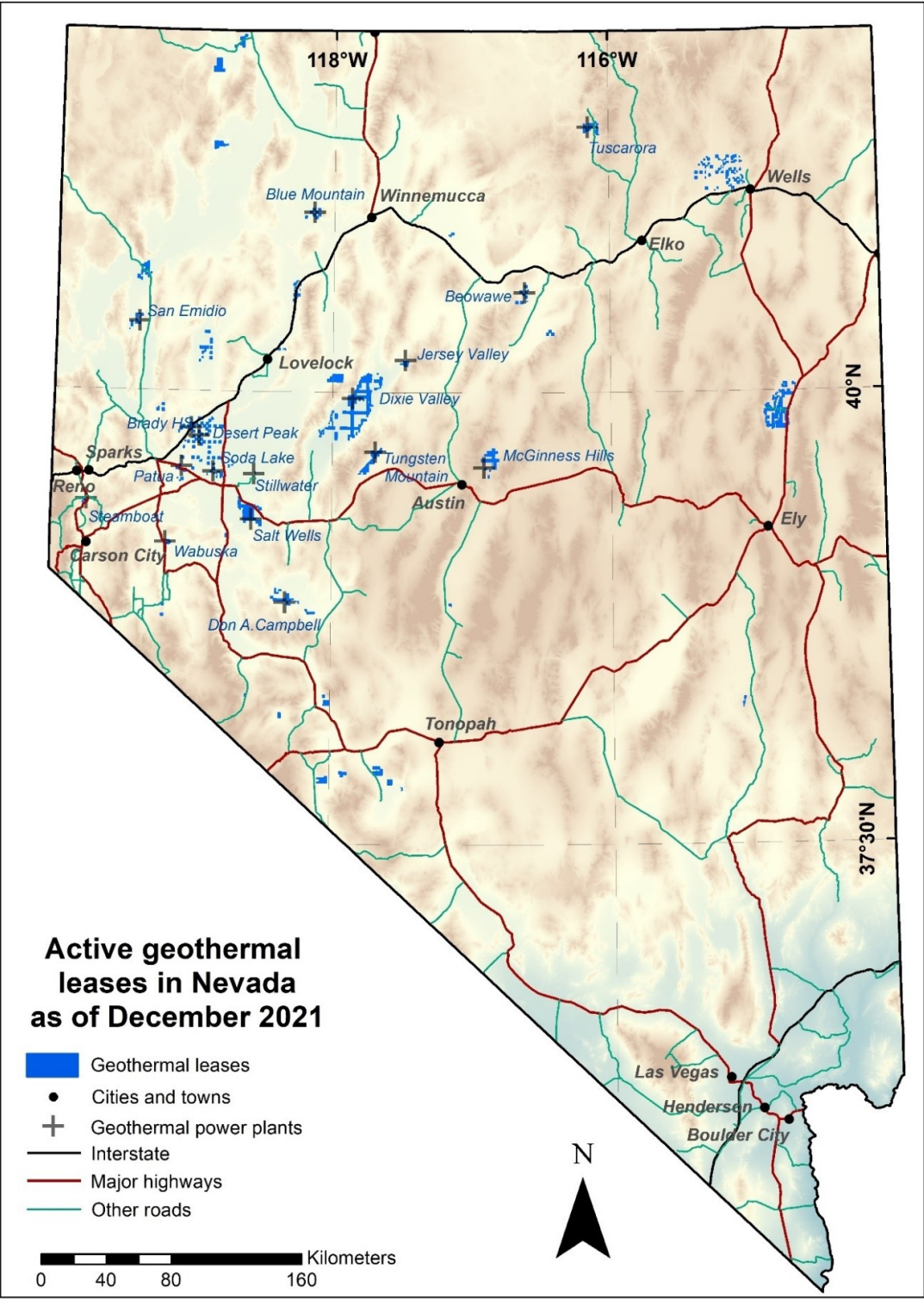


Figure 4. Active geothermal leases in Nevada at year-end 2021.

Table 1. Nevada geothermal power plants and generation figures, 2021.

Plant Name	Nameplate Capacity (MWe) ¹	Flash or Binary	Commission Year ²	2021 Production (MWhr)		2021 Production (MWe) ³		Operator
				Gross	Net	Gross	Net	
Beowawe	18.5	F/B	1985	120,117	98,535	13.7	11.2	Ormat Technologies, Inc.
Blue Mountain	49.5	B	2009	324,579	223,408	37.1	25.5	Cyrq Energy
Brady Hot Springs	26.1	B	1992 (2018)	137,272	88,438	15.7	10.1	Ormat Technologies, Inc.
Desert Peak II	23.0	B	2006	122,824	92,541	14.0	10.6	Ormat Technologies, Inc.
Dixie Valley	64.7	F	1988	554,308	490,138	63.3	56.0	Ormat Technologies, Inc.
Dixie Valley Binary Unit	6.2	B	2012			0.0	0.0	Ormat Technologies, Inc.
Don A. Campbell	22.5	B	2013	169,830	130,554	19.4	14.9	Ormat Technologies, Inc.
Don A. Campbell II	25.0	B	2015	154,857	114,930	17.7	13.1	Ormat Technologies, Inc.
Jersey Valley	23.5	B	2011	104,672	65,132	11.9	7.4	Ormat Technologies, Inc.
McGinness Hills	48.0	B	2012	411,890	333,598	47.0	38.1	Ormat Technologies, Inc.
McGinness Hills II	48.0	B	2015	410,465	345,571	46.9	39.4	Ormat Technologies, Inc.
McGinness Hills III	70.0	B	2018, 2021	621,434	508,231	70.9	58.0	Ormat Technologies, Inc.
Patua	48.0	B	2012	195,567	109,193	22.3	12.5	Cyrq Energy
Salt Wells	23.6	B	2009	94,296	62,175	10.8	7.1	Enel Green Power
San Emidio	11.75	B	2012	119,999	88,897	13.7	10.1	Ormat Technologies, Inc.
Soda Lake No. 3	26.5	B	2019	162,583	124,524	18.6	14.2	Cyrq Energy
Steamboat II	23.9	B	1992	82,560	50,450	9.4	5.8	Ormat Technologies, Inc.
Steamboat III	23.9	B	1992	87,279	54,176	10.0	6.2	Ormat Technologies, Inc.
Galena 1	30.0	B	2005	145,214	116,554	16.6	13.3	Ormat Technologies, Inc.
Galena 2	13.5	B	2007	79,575	35,881	9.1	4.1	Ormat Technologies, Inc.
Burdette (Galena 3)	30.0	B	2008	138,613	100,405	15.8	11.5	Ormat Technologies, Inc.
Steamboat Hills II	30.0	B	2020	237,622	214,633	27.1	24.5	Ormat Technologies, Inc.
Total MW at Steamboat	151.3							
Stillwater 2	47.2	B	2009	173,791	97,889	19.8	11.2	Enel Green Power
Tungsten Mountain	37.0	B	2017	292,838	242,602	33.4	27.7	Ormat Technologies, Inc.
Tuscarora	32.0	B	2012	194,714	135,002	22.2	15.4	Ormat Technologies, Inc.
Wabuska	5.6	B	1984 (2018)	28,418	19,138	3.2	2.2	Open Mountain Energy
Total:	808.0			5,165,318	3,942,594	589.6	450.1	

¹ Nameplate capacity is the manufacturer's rating of equipment output capacity, as reported to the Nevada Division of Minerals by the plant operators and does not necessarily reflect the capability of the currently developed resource. These nameplate capacities are estimates, and several different values can be found in the literature. Generator nameplate capacity refers to the size of the actual generator, but not to the turbine size or the actual capacity of the power plant. There are no public documents breaking down nameplate capacity of the turbines so these numbers may not adequately reflect actual generation.

² Years in brackets are those in which a plant re-powering occurred but was not associated with a change in plant name.

³ Production values were calculated by dividing annual megawatt hours (MWh) produced by the number of hours in a year.

Table 2. Geothermal power plant operator contact information.

Company Address	Local Contact	Project	Nameplate Capacity (MWe)
Cyrq Energy 15 West South Temple, Suite 1900 Salt Lake City UT 84101 (801) 875 4200 https://cyrqenergy.com/	NGP Blue Mountain 1 15250 Blue Mountain Road Winnemucca, NV 89445 (775) 786-4322	Blue Mountain	49.5
	17388 Patua Road Hazen, NV 89408 (775) 217-2650	Patua	48
	Soda Lake Power Plant 5500 Soda Lake Road Fallon, NV, 89406 (775) 867-5093	Soda Lake No. 1 Soda Lake No. 2	5.1 21
Enel Green Power 1755 East Plumb Lane, Suite 155 Reno, NV 89502 (775) 329 0700 https://www.enelgreenpower.com/countries/north-america/united-states	(775) 423-5374	Salt Wells	23.6
	(775) 423-0322	Stillwater	47.2
Open Mountain Energy 3451 N. Triumph Blvd, Suite 201 Lehi, UT 84043 (385) 352-8858 http://openmountainenergy.com/	21 Julian Lane Yerington, NV 89447 (385) 352-8858	Wabuska	5.6
Ormat Technologies, Inc. 6140 Plumas St Reno, NV 89511 (775) 356-9029 https://www.ormat.com/en/home/a/main/	(775) 635-2130	Beowawe	18.5
	(775) 322-7782	Brady Hot Springs	26.1
	(775) 423-5800	Desert Peak	23
	(775) 423-6535	Dixie Valley	70.9
	(775) 852-1444	Jersey Valley	23.5
	(775) 384-7807	McGinness Hills (I, II, III)	166
	(775) 557-2015	San Emidio (Empire)	11.75
	(775) 852-1444	Steamboat	151.3
	(775) 852-1444	Tungsten Mountain	37
(775) 852-1444	Tuscarora	32	
(775) 384-7807	Don A. Campbell (Wild Rose)	47.5	
Total Installed MWe (nameplate capacity)			808

Table 3a. Geothermal competitive leasing activity in Nevada, 2007–2021.

Year	Parcels Offered	Acres Offered	Parcels Sold	Acres Sold	Total receipts ¹	Highest bid per acre	Avg. bid per acre	% Acres Sold	% Parcels Sold
2007	43	122,849	43	122,849	\$11,669,821	\$95	\$92.90	100%	100%
2008	35	105,212	35	105,212	\$28,207,806	\$268	\$266	100%	100%
2009	108	323,222	82	243,727	\$8,909,445	\$3,800	\$34.50	75%	76%
2010	114	328,020	75	212,370	\$2,762,292	\$1,000	\$10.90	65%	66%
2011	51	151,119	17	42,627	\$456,353	\$60	\$8.70	28%	33%
2012	33	94,829	8	27,834	\$112,540	\$2	\$2	29%	24%
2013	13	16,284	9	10,373	\$42,870	\$2	\$2	64%	69%
2014	2	3,438	1	40	\$315	\$2	\$2	1%	50%
2015	0	0	-	-	-	-	-	-	-
2016	22	46,976	14	32,075	\$30,552	\$2	\$2	68%	64%
2017	20	38,208	10	19,209	\$78,444	\$2	\$2	50%	50%
2018	10	27,331	2	2,321	\$26,422	\$12	\$9.20	8%	20%
2019	142	387,032	37	102,403	\$637,892	\$20	\$4.20	26%	26%
2020	18	35,232	11	23,351	\$148,009	\$42	\$4.30	65%	61%
2021	32	83,544	26	73,631	\$1,602,207	\$100	\$22	88%	81%
Totals:	643	1,763,101	370	1,018,021	\$54,784,968		\$54	58%	58%

¹ Includes bids, first year lease rental at a price of \$2 per acre and application fee (~\$175 per parcel; this changes year-to-year).

Table 3b. Non-competitive geothermal leasing activity in Nevada, 2018–2021 ('day-after' sale).

Year	Parcels Offered	Acres Offered	Parcels Sold	Acres Sold	Total Receipts ²	% Acres Sold	% Parcels Sold
2018	8	24,749	0	0	0	0	0
2019	105	281,967	19	64,420	\$72,875	23%	18%
2020	7	11,881	2	3,335	\$4,225	28%	29%

² First year lease rental at a price of \$1 per acre and application fee (\$450 per parcel in 2021).

Table 4. Geothermal wells reported as drilled, re-drilled, or completed in 2020.

County	Area	Permit #	Operator Name	Well Number	Well Type ¹	UTM Easting ²	UTM Northing ²	Land Type	Permitted depth (m) ³
Eureka	Crescent Valley	1490	Ormat Technologies, Inc.	37(48)-3	Ind-Prod	547760	4463361	Private	1827.6

¹ Abbreviations as follows: Ind-Inj = Industry injection well, Ind-Prod = Industry production well, TG = Thermal gradient hole.

² North American 1983 Datum UTM 11N (in meters).

³ Permitted depth for each well obtained from the Nevada Division of Minerals (<https://minerals.nv.gov/Programs/Geo/GeoPermits/>).

Table 5. Geothermal drilling activity in Nevada, 2007–2020

Year	Number of permits issued	Number of wells drilled	Number of production wells drilled
2007	71	41	5
2008	130	53	16
2009	195	71	16
2010	119	74	19
2011	85	37	19
2012	49	24	12
2013	21	23	8
2014	27	14	6
2015	26	17	7
2016	14	16	9
2017	35	31	5
2018	23	25	3
2019	7	6	1
2020	21	9	2

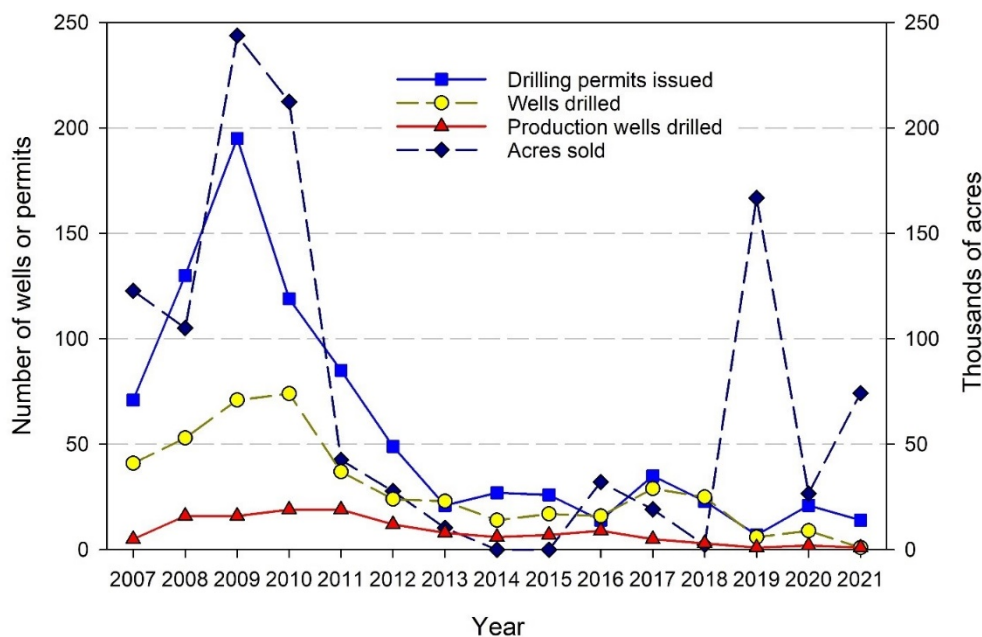


Figure 5. Trends in geothermal leasing and drilling activities in Nevada from 2007 to 2021. Note: acreage for 2019–2021 includes parcels sold through both competitive and non-competitive ('day-after') lease sales.

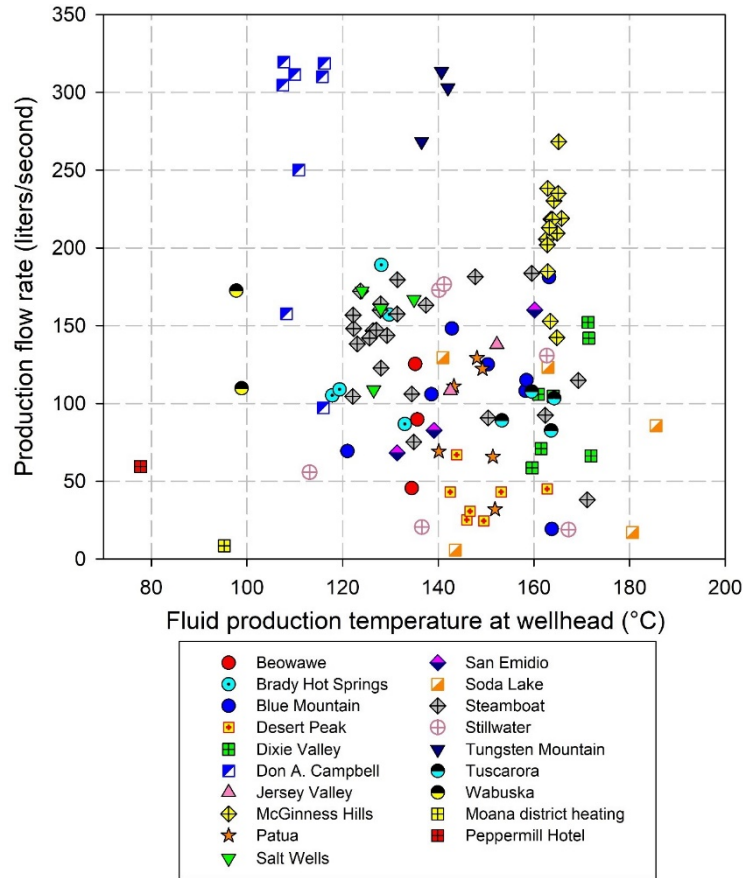


Figure 6. Average production flow rates of geothermal wells in Nevada in 2021 and their associated temperatures as measured at the wellhead. Data based on information provided to the Nevada Division of Minerals, 2021. Note that temperatures reported for wells in Dixie Valley and Beowawe represent post-flash temperatures.

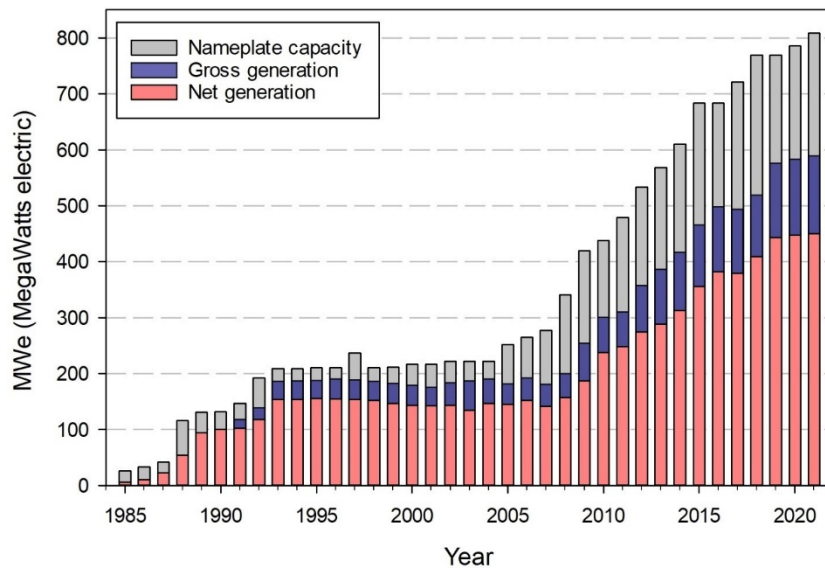


Figure 7. Growth in installed nameplate capacity, and net and gross geothermal power production in Nevada between 1985 and 2021, as reported to the Nevada Division of Minerals. Gross and net generation are calculated by dividing annual net generation in megawatt-hours by the number of hours in a year.

Significant Federally Funded Geothermal Research Projects in Nevada in 2020

In 2021, there were five active geothermal research projects in Nevada that were supported by federal funds from the U.S. Department of Energy's (DOE) Geothermal Technologies Office (GTO) and the USGS's National Geological and Geophysical Data Preservation Program (NGGDPP). These projects are briefly reviewed as follows:

1. INGENIOUS

- **Project PI:** Bridget Ayling, Great Basin Center for Geothermal Energy, Nevada Bureau of Mines and Geology (NBMG), UNR. Co-PI: James Faulds, NBMG, UNR
- **Project partners:** USGS, Utah Geological Survey, Idaho Geological Survey, Raser Power Systems LLC, Geothermal Resource Group, National Renewable Energy Laboratory, Lawrence Berkeley National Laboratory, Innovate Geothermal Ltd., W Team Geosolutions, Hi-Q Geophysical, Petrolern LLC, Aprovechar Lab L3C
- **Project duration:** 4.5 years: February 2021–July 2025.
- **Total project funding:** \$10,332,968 (DOE-GTO)
- **Project goal:** Accelerate discoveries of new, commercially viable hidden geothermal systems in the Great Basin region (GBR) in the Basin and Range Province of the western USA, while significantly reducing the exploration and development risks for all geothermal resources to identify prospective geothermal resources and reduce exploration risk. This ambitious 4.5-year-long project proposes to fully integrate play fairway analysis (PFA), 3D and conceptual modeling, resource capacity estimation, machine learning (ML), the application of advanced geostatistics, and value-of-information (VOI) analysis to develop a comprehensive exploration workflow toolkit for the Great Basin region. This toolkit will include predictive geothermal play fairway (PF) maps at both the regional-and prospect-scale, updated regional geoscience data compilations for much of the GBR, detailed 3D maps and conceptual models, software tools to facilitate practical use of the refined exploration workflows, and a developers playbook. Building on geothermal PF efforts in central Nevada, NE California/NW Nevada, and western Utah, the INGENIOUS project is expanding these study areas to the broader GBR for early-stage prospect identification. Concurrently, several blind prospects will be moved forward with detailed geological and geophysical analyses followed by drilling thermal-gradient holes (TGH).

2. Understanding a Stratigraphic Hydrothermal Resource – Geophysical Imaging at Steptoe Valley, Nevada

- **Project PI:** Sandia National Laboratories with subawards and co-PI's at several institutions, including the Nevada Bureau of Mines and Geology at UNR.
- **Project duration:** 2.5 years: 1 October 2020 to 30 March 2023.
- **Total project funding:** \$1,500,000 (DOE-GTO)
- **Project goal:** Advance the understanding of the nature and extent of the hidden, stratigraphic hydrothermal geothermal resource in Steptoe Valley, Nevada and recommend an optimized strategy for subsequent exploration and development for this resource and analogous resources. This will be achieved by supplementing legacy geophysical and well information with new gravity, magnetics, and CSEM-MT surveys, conducting joint inversion modeling to inform a revised 3D geological model of the basin, and using these data to develop thermal-hydrologic models of the inferred stratigraphic resource in Steptoe Valley.

3. Nevada Geothermal Machine Learning Project

- **Project PI:** James Faulds, Nevada Bureau of Mines and Geology, UNR
- **Project duration:** 36 months: 1 August 2019–28 August 2022.
- **Total project funding:** \$526,000 (DOE-GTO)
- **Project goal:** Apply machine learning (ML) techniques to develop an algorithmic approach to identify new geothermal systems in the Great Basin region and build on the successes of the Nevada geothermal play fairway project. An algorithmic approach that empirically learns to estimate weights of influence for diverse parameters may scale and perform better than the play fairway analysis. Project activities include augmenting the number of training sites (positive and negative) that are needed to train the ML algorithms, transforming the data into formats suitable for ML, and development and testing of the ML techniques and outputs (Faulds et al., 2020; Brown et al., 2020).

4. National Geophysical Geological Data Preservation Program Award 1:

Increasing the Utility and Accessibility of Nevada's Digital Geologic Libraries: Digitization of Geothermal Well Logs, GeMS Geologic Map Conversions, and Great Basin Science Sample and Records Library Data Preservation

- **Project PI:** Emily O'Dean, Nevada Bureau of Mines and Geology, UNR
- **Project duration:** 14 months: June 2020 – August 2021.
- **Total project funding:** \$92,961 (USGS-NGGDPP)
- **Project goal:** Enhance the utility of geothermal datasets through digitizing geothermal well logs and converting

geologic maps to GeMS for key geothermal areas in Nevada. The proposed sites for geothermal well log digitization included San Emidio Desert, the Hot Springs Mountains, and Hot Sulphur Springs. At these sites, >300 temperature and pressure logs are available in scanned pdf format and able to be digitized to create tabular data. Capturing tabular log data will bolster important functionality of the subsurface geothermal

database managed by the Nevada Bureau of Mines and Geology at UNR, as such data are fully discoverable, machine readable, and formatted consistently. The benefits of such data include improved geothermal resource evaluation and inclusion in machine learning algorithms to reduce geothermal exploration risk.

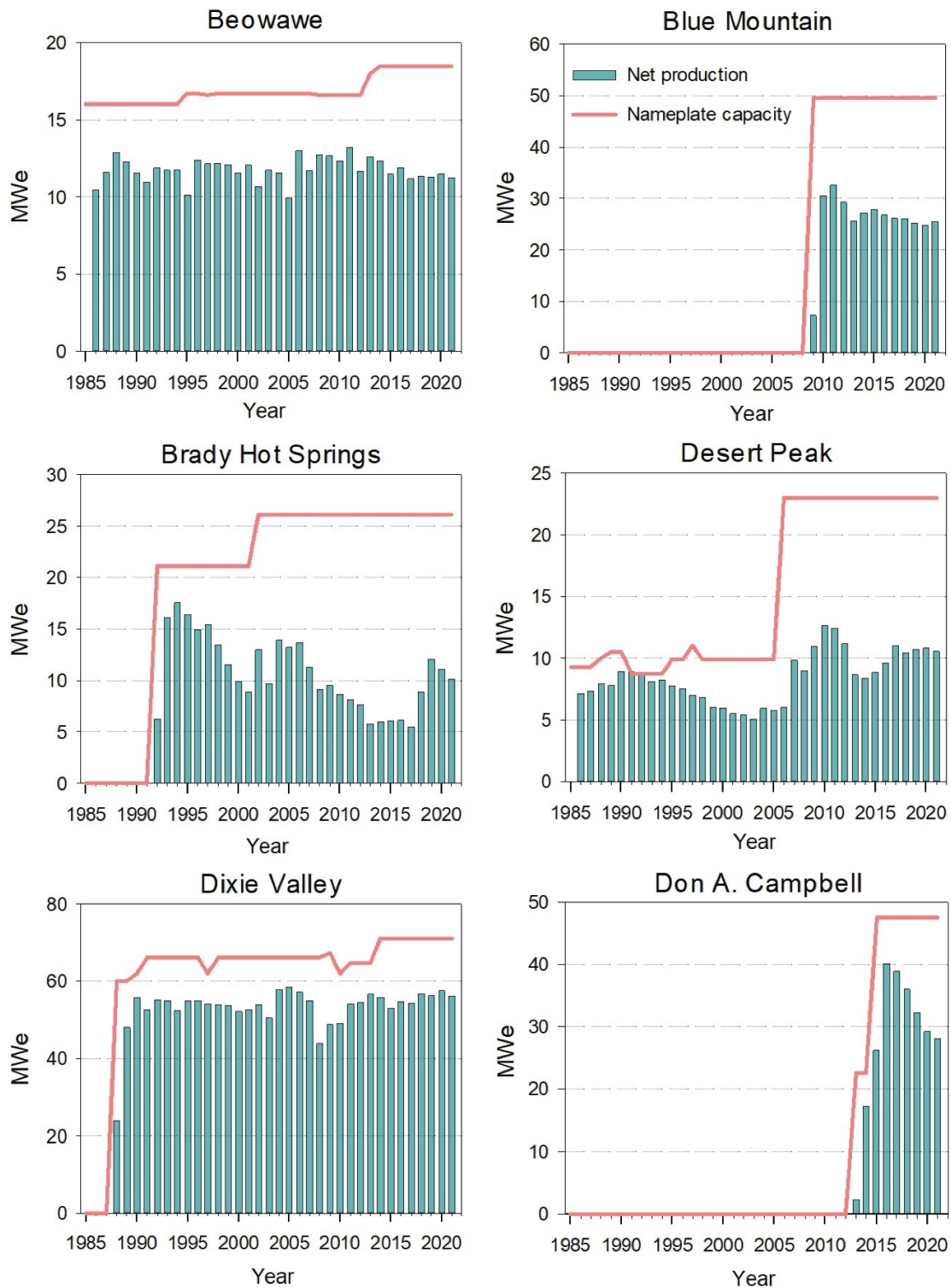


Figure 8a. Evolution of nameplate capacity (MWe) and net power generation (MWe) for geothermal power plants in Nevada (legend is the same for all plots).

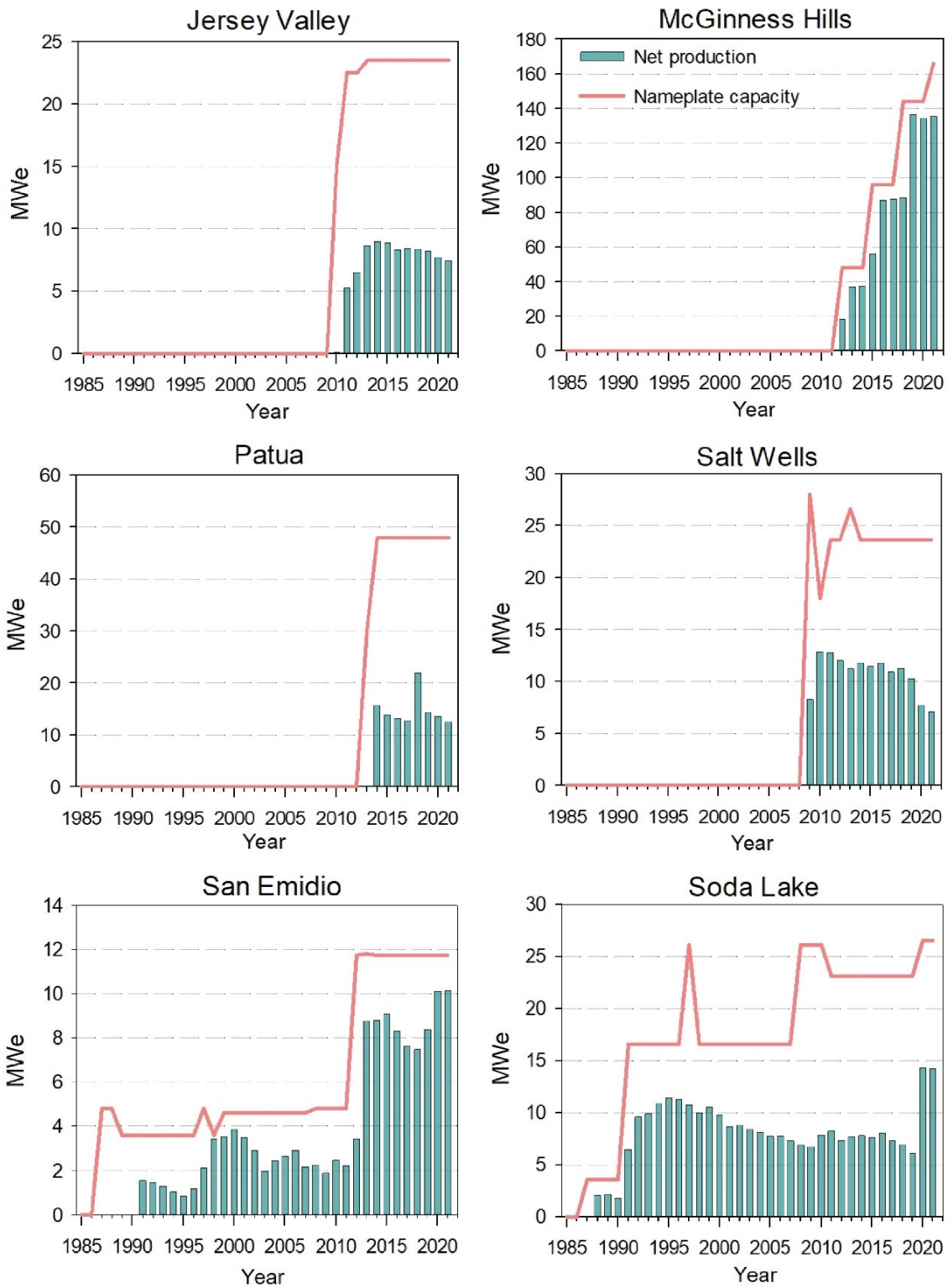


Figure 8b. Evolution of nameplate capacity (MWe) and net power generation (MWe) for geothermal power plants in Nevada (legend is the same for all plots).

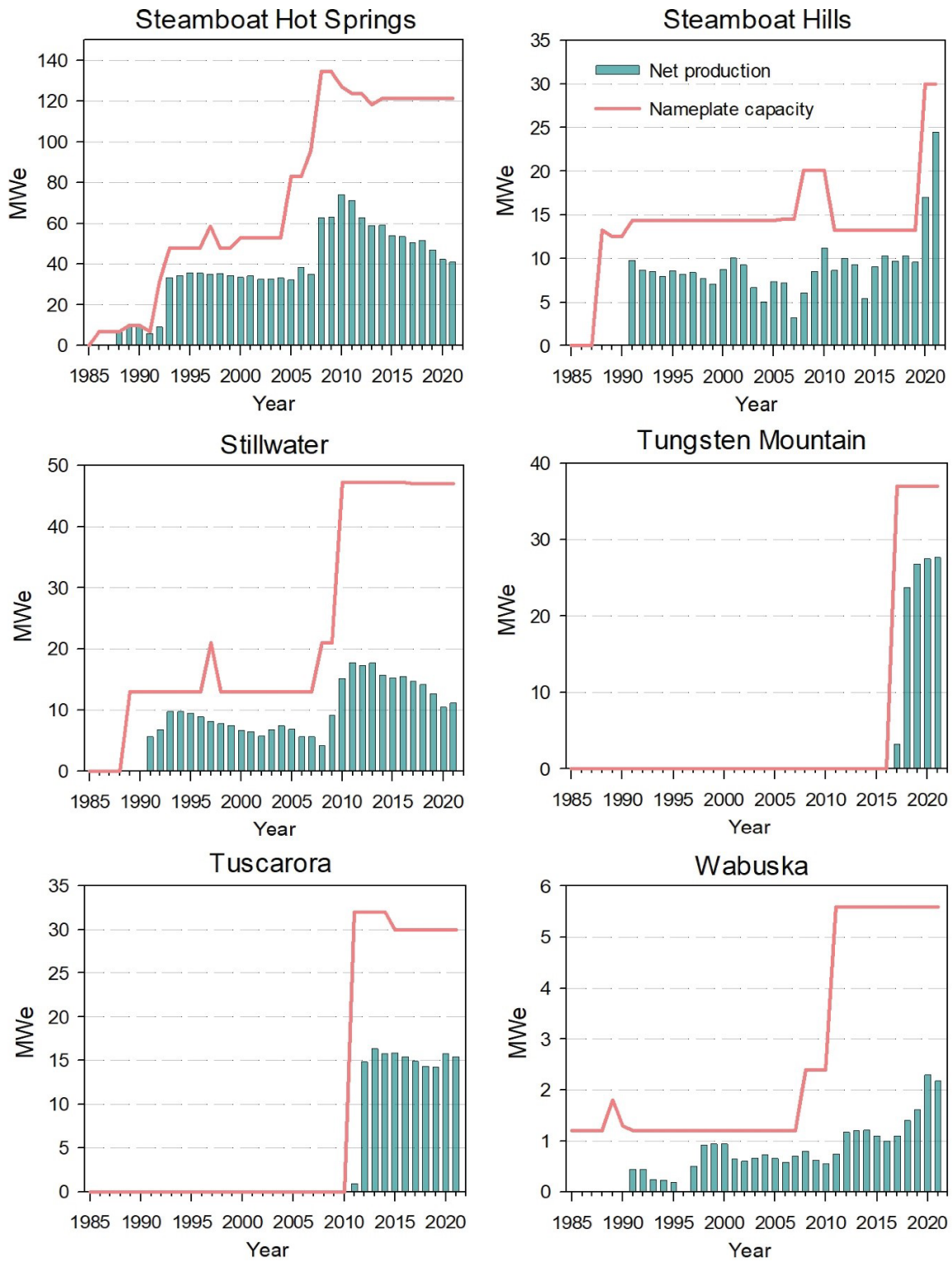


Figure 8c. Evolution of nameplate capacity (MWe) and net power generation (MWe) for geothermal power plants in Nevada (legend is the same for all plots).

ACTIVITY DURING 2021

The following section outlines new activity at geothermal power plants and major exploration sites in 2021. For historical information about geothermal sites in Nevada, refer to previous Mineral Industry reports published annually by NBMG (e.g., Muntean et al., 2021).

Crescent Valley (Ormat Technologies, Inc.)

In 2021, Ormat drilled the first of their full-size production wells at the Crescent Valley geothermal prospect, well 37(48)-3 with a permitted depth of 1828 m. This is the first of three production wells that Ormat submitted permits for in 2020 and is the second full-size well drilled at the site. The first full-size well was drilled by U.S. Geothermal in 2015 to a depth of 837 m. Both wells were drilled on private land, although Ormat holds exploration leases on BLM land for parcels immediately adjacent to these well locations. In October 2021, the BLM opened up public consultation in response to Ormat's proposed Crescent Valley geothermal exploration project, which stated that Ormat proposes to construct and maintain 8 well pads and new access roads.

Beowawe and Dixie Valley (formerly Terra-Gen, LLC, now Ormat Technologies, Inc.)

In May 2021, Ormat announced that it had entered into a purchase agreement with a subsidiary of Terra-Gen, LLC to acquire the operating Dixie Valley and Beowawe geothermal plants. The acquisition was completed in July with Ormat paying \$171 million for the equity interests and assumed debt and lease obligations, which collectively have a book value of \$206 million. The electricity from the Dixie Valley plant is currently sold to Southern California Edison (SCE) under a PPA that expires in 2038. Power from the Beowawe plant is sold to NV Power, Inc. under a PPA that expires in December 2025. Additionally, Ormat obtained the rights to Coyote Canyon, which is an undeveloped prospect that has inferred high resource potential, and the transmission line that connects Dixie Valley to the Nevada grid (and California).

Blue Mountain (Cyrq Energy)

Cyrq Energy via their subsidiary NGP Blue Mountain 1, LLC, submitted four drilling permits for their Blue Mountain site in 2021: two observation wells and two injection wells. These wells were permitted with proposed drilling depths between 2,377–2,460 m (7800–8060 ft) true vertical depth. No other activity was reported for the site for 2021.

Dixie Meadows (Ormat Technologies, Inc.)

In November 2021, the BLM approved Ormat's Dixie Meadows geothermal development project. The project includes the development and operation of up to two 30-megawatt net rated geothermal power plants, and up to 26 wells in total (18 geothermal production and injection wells) and eight core holes. Ormat has drilled nine wells at the site to date (comprising three observation wells, two thermal gradient holes, two production wells, and two injection wells).

Don A. Campbell (Ormat Technologies, Inc.)

In 2021, Ormat submitted drilling permits for five new injection wells (permitted depths up to 213 m (700 ft)). This complements the five permits submitted in 2020 for four new observation wells and a new production well. No drilling activity occurred at the site in 2021.

Fish Lake (Open Mountain Energy)

In early 2021, China's Kaishan Compressor Co. Ltd is reported to have purchased the Fish Lake prospect from Berkshire Hathaway (CalEnergy), obtaining the lease and five existing wells at the site. Kaishan's partner Open Mountain Energy, via their subsidiary Fish Lake Geothermal LLC, submitted two permits with NDOM for drilling at their Fish Lake Valley prospect. The permitted maximum drilled depth for these two wells was 2,484 m (8,149 ft). The wells were reportedly aiming to intersect a steeply dipping fault system that intersects Proterozoic and Paleozoic sedimentary and metasedimentary basement rocks. No other activity was reported for this site in 2021.

McGinness Hills (Ormat Technologies, Inc.)

Currently the largest developed geothermal system in Nevada, Ormat completed its Phase 3 expansion of the McGinness Hills Complex in 2021. This resulted in an increase in gross generation for the complex to ~165 MWe (table 1), with an estimated total nameplate capacity of 166 MWe. Ormat continues to sell the power from the McGinness Hills III plant to the Southern California Public Power Authority (SCPPA) under a 25-year long portfolio PPA that expires in 2043.

San Emidio (Ormat Technologies, Inc.)

In 2021, the BLM approved Ormat's San Emidio II – North Valley geothermal development project. This project will upgrade the current plant and build a new power plant to produce up to 40 megawatts of electricity. Ormat indicates that construction will include a substation, up to 26 total geothermal production and injection wells, approximately 12 km (7.5 miles) of above-ground pipelines and an approximately 93-km long (58 miles) 120-kilovolt

overhead power line originating at the power plant that will terminate at the NV Energy Eagle Substation near Fernley, Nevada. Ormat drilled two injection wells at the northern end of the San Emidio geothermal field in 2019 and 2020. No drilling occurred at the site in 2021. However, Ormat submitted two additional drilling permits with NDOM for injection wells (55-4 and 76-4) that will also support the North Valley geothermal development project, with maximum permitted depths of 305 m (1000 ft).

Steamboat Hills (Ormat Technologies, Inc.)

The new Steamboat Hills plant achieved its first full calendar year of generation in 2021. The 30 MWe plant was commissioned in June 2020 and achieved an average gross generation of 27 MWe in 2021. The prior 10 MWe flash plant at Steamboat Hills typically only generated ~11–12 MWe gross.

Tungsten Mountain (Ormat Technologies, Inc.)

Ormat reported that construction for their Tungsten Mountain enhancement project was nearing completion at the end of 2021. This expansion involves commissioning an additional ~11 MWe geothermal air-cooled binary plant to complement the existing 7 MWe solar PV plant (commissioned in 2019) and 37 MWe (nameplate capacity) geothermal plant (Ormat, 2021 annual report). Ormat also reported that construction has commenced on a second solar PV plant at Tungsten Mountain, which will provide an additional 9 MWe for internal plant use (offsetting the plant parasitic load). This second solar PV array is expected to be complete in 2022.

ACKNOWLEDGMENTS

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Smith, C.M., Faulds, J.E., Coolbaugh, M., Brown, S., Lindsey, C.R., Treitel, S., Ayling, B., Fehler, M., Gu, C., and Mlawsky, E., 2021, Characterizing signatures of geothermal exploration data using machine learning

techniques—an application to the Nevada play fairway analysis: Proceedings of the 46th Workshop on Geothermal Reservoir Engineering, SGP-TR-218, 13p.

WEB LINKS TO OTHER GEOTHERMAL INFORMATION

For further information on geothermal resources in Nevada check the following websites:

- The Nevada Bureau of Mines and Geology ARC-GIS Open Data website: <https://data-nbmgs.opendata.arcgis.com/>
- The Great Basin Center for Geothermal Energy <https://gbcge.org/>
- Map of geothermal resources in Nevada, NBMG Map 161, available online in PDF format: <http://www.nbmgs.unr.edu/Geothermal/Published/Maps.html> (includes zipped file of GIS layers)
- Nevada Bureau of Mines and Geology Geothermal Resources of Nevada website at <http://www.nbmgs.unr.edu/Geothermal/> This site contains geothermal exploration data, interactive maps, lease and information, and numerous geothermal digital data sets. These data are increasingly made available through the National Geothermal Data System (<https://www.geothermaldata.org>) and the Department of Energy's Geothermal Data Repository (<https://gdr.openei.org/>).
- Nevada Commission on Minerals, Nevada Division of Minerals at <http://minerals.state.nv.us/> and <http://minerals.nv.gov/Programs/Geo/Geo/>
- Southern Methodist University Geothermal Lab, specializing in geothermal gradient data and maps of the entire country, posts information at <https://www.smu.edu/Dedman/Academics/Departments/Earth-Sciences/Research/GeothermalLab>.
- Summary of supporting data for USGS regional heat-flow studies of the Great Basin, 1970–1990, by John H. Sass, Susan S. Priest, Arthur H. Lachenbruch, S. Peter Galanis, Jr., Thomas H. Moses, Jr., John P. Kennelly, Jr., Robert J. Munroe, Eugene P. Smith, Frederick V. Grubb, Robert H. Husk, Jr., and Charles W. Mase; USGS Open-File Report 2005-1207 online version 1.0 on the Web at <http://pubs.usgs.gov/of/2005/1207/>.
- Geothermal industry temperature profiles from the Great Basin, by John H. Sass, Susan S. Priest, Arnold J. Blanton, Penelope C. Sackett, Stephanie L. Welch, and Mark A. Walters; USGS Open-File Report 99-425 online version 1.0 on the Web at <http://pubs.usgs.gov/of/1999/of99-425/webmaps/home.htm>.

- The Bureau of Land Management Land and Mineral Records-LR2000 system website, <https://www.blm.gov/services/land-records>. Provides reports on BLM land and mineral use authorizations for oil, gas, and geothermal leasing, rights-of-ways, coal and other mineral development, land and mineral title, mining claims, withdrawals, classifications, and more on federal lands or on federal mineral estate.
- The U.S. Department of Energy (DOE) Geothermal Technologies Office (GTO)'s (<https://energy.gov/eere/geothermal/geothermal-energy-us-department-energy>) Office of Scientific and Technical Information (OSTI) have scanned approximately 3,300 agency and national lab technical reports. These files are in a PDF, full-text-searchable format and accessible online at <http://www.osti.gov/scitech/> and <https://www.osti.gov/home/collections>. The DOE-GTO also supports the Geothermal Data Repository (GDR), where datasets and products associated with DOE-funded projects are uploaded and available for public use. <https://gdr.openei.org/>

OIL AND GAS

by Rachel Micander with contributions from Dave Reynolds and Gabriela Villar

PRODUCTION

According to the Nevada Division of Minerals, Nevada's net oil production was 223,229 barrels, which accounted for less than 0.01% of total domestic production. Production increased 1.3% from 220,292 barrels in 2020 marking the first increase in several years. Production came from 58 actively producing wells in eight fields in Railroad Valley, Nye County, which accounted for 88% of the state's production, and eight wells in two fields in Pine Valley, Eureka County, which accounted for about 12% of the state's production. Five other minor fields were shut-in throughout the year and four other minor fields plus an outlier well that briefly produced were plugged and abandoned. Nevada ranked 26 out of the 32 oil-producing states (U.S Energy Information Administration). A total of 288,342 barrels of oil were sold during 2021. The sales volume (or gross proceeds) increased 74% to \$12,759,077 from \$7,329,877 in 2020 (Nevada Department of Taxation, 2022). Unless otherwise noted, production comes from the Oil Patch Reports provided by the Nevada Division of Minerals.

Production from Nevada's 66 actively producing wells ranged up to 48 barrels of oil per day and up to 3,066 barrels of water per day. The daily averages were 8.9 barrels of oil, a 2% decrease from 9.1 barrels per day in 2020, and 174 barrels of water per day for the 66 water producers, a 2% decrease from 178 barrels per day in 2020 for 62 water producers. Fifteen wells were shut-in for up to three months, and 14 were shut-in for between 4 and 11 months. Thirty-two wells produced less than 300 days, and 17 produced less than 100 days during the year.

At 76 barrels of oil and 824 barrels of water per day over a full year of production, Grant Canyon 10 was Nevada's most productive well. Trap Spring 9 was Nevada's second most productive well at 48 barrels of oil and 1,118 barrels of water per day over 362 days of production. Trap Spring 19 was Nevada's third most productive well at 29 barrels of oil and ~11 barrels of water per day over 351 days of production.

Bacon Flat Field

The Bacon Flat Field produces from dolomite in the Devonian Guilmette Formation (Garside et al., 1988) between about 4,960–5,350 feet (1,512 and 1,634 m). The field's one producer, which has been active since 1994, averaged 23 barrels of oil and 92 barrels of water per day and accounted for 3.7% of Nevada's total oil production. Oil production increased 77% and water production decreased 46% from 2020.

Blackburn Field

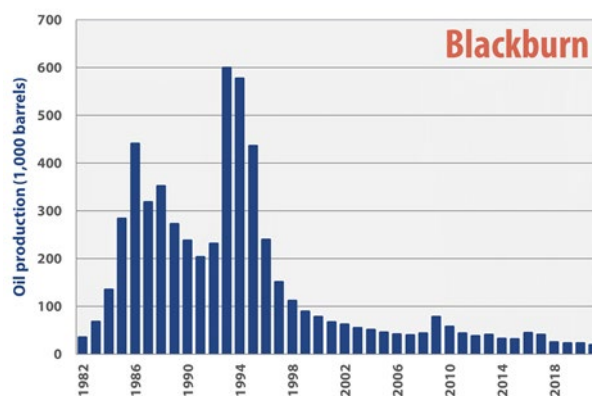


Figure 1. Chart showing oil production from the Blackburn Field in Pine Valley, Eureka County, from 1983 to 2021.

The Blackburn Field produces from the Oligocene Indian Well Formation (tuff and tuffaceous sandstone), Mississippian Chainman Shale (sandstone), and Devonian Nevada group (dolomite) (Garside et al., 1988) between about 6,700 and 6,750 feet (2,043 and 2,058 m). The field had six active wells. Production ranged between 20 and 357 days and averaged 260 days of production each. Spread over the year, production for the field averaged 55 barrels of oil and 4,139 barrels of water per day, and accounted for 9.4% of Nevada's total oil production. Oil production decreased 11%, and water production increased almost 15% from 2020.

Eagle Springs Field

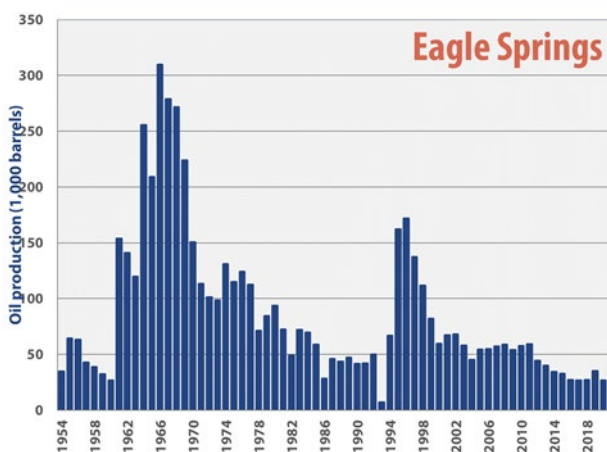


Figure 2. Chart showing oil production from the Eagle Springs Field in Railroad Valley, Nye County, from 1954 to 2021.

The Eagle Springs Field produces from Oligocene ignimbrites, the Eocene Sheep Pass Formation (lacustrine carbonates) and the Pennsylvanian Ely Limestone (Garside et al., 1988) between about 5,780 and 7,360 feet (1,762 and 2,244 m). The field had 13 active producers, the same as in

2020. Several wells were only active during very short periods during the year. One well only produced five barrels of oil during a five-day period in December, one well produced 6 barrels during one day in June and 4 barrels during one day in July. One well produced 11 barrels of oil over 10 days of operation during the entire year and another well produced 53 barrels during 15 days of operation. Not counting these outliers, production ranged between 58 and 348 days and averaged 218 days. Spread over the year, production for the field averaged 87 barrels of oil and almost 900 barrels of water per day and accounted for about 15% of Nevada’s total oil production. Oil and water production increased 19% and 36%, respectively from 2020.

Ghost Ranch Field

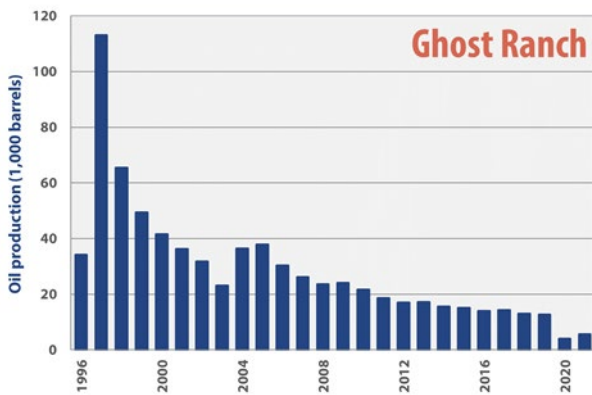


Figure 3. Chart showing oil production from the Ghost Ranch Field in Railroad Valley, Nye County, from 1996 to 2021.

The Ghost Ranch Field produces from late tertiary landslide breccia blocks of Devonian Guilmette Limestone and dolomite (LaPointe et al., 2007) between about 4,350 and 4,620 feet (1,326 and 1,409 m). The field had four active producers, three of which produced between 248 and 258 days throughout the year, except for March and April. The fourth producer was active in July, August, and September. Spread out over the average of 189 days, production for the field averaged 33 barrels of oil and 1,221 barrels of water per day and accounted for almost 3% of Nevada’s total oil production. Oil production neither increased nor decreased from 2020 values, and water production decreased slightly from 1,274 barrels in 2020.

Grant Canyon Field

The Grant Canyon Field also produces from dolomites of the Devonian Guilmette Formation (Garside et al., 1988) between about 2,160 and 4,300 feet (659 and 1,333 m). The field had three active producers, two of which produced 365 days and one for 354 days. Spread over the year, production for the field averaged 97 barrels of oil and 1,582 barrels of water per day and accounted for almost 16% of Nevada’s total oil production. Oil production increased 3% and water production decreased 11% from 2020.

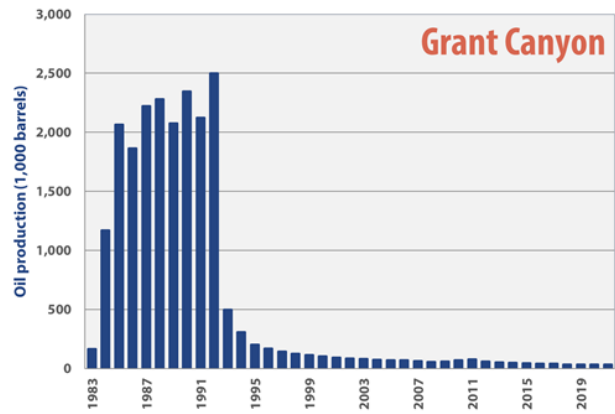


Figure 4. Chart showing oil production from the Grant Canyon Field in Railroad Valley, Nye County, from 1983 to 2021.

Kate Spring Field

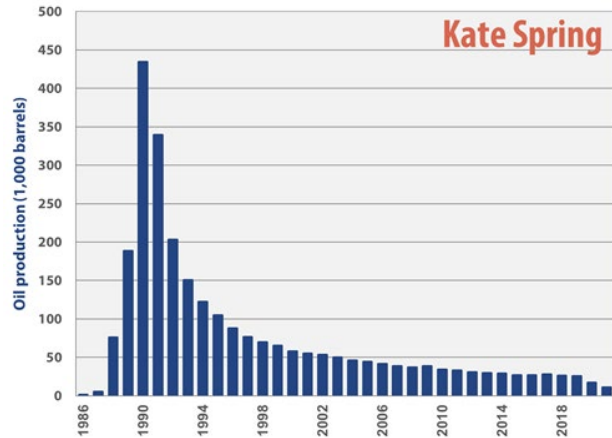


Figure 5. Chart showing oil production from the Kate Spring Field in Railroad Valley, Nye County, from 1986 to 2021.

The Kate Spring Field produces from the Tertiary Horse Camp Formation (breccia) and the Devonian Guilmette Formation (Garside et al., 1988) between about 4,450 and 4,820 feet (1,357 and 1,470 m). The field had five active producers, however, one well only produced water during one month of operation in October. The well was shut in for the remainder of the year. Production ranged between 92 and 338 days and averaged 242 days of production each. Spread over the year, production for the field averaged 39 barrels of oil and 358 barrels of water per day, and accounted for almost 7% of Nevada’s total oil production. Oil and water production decreased 17% and 48%, respectively, from 2020. Kate Spring 12-2 was shut in for the entire year, Kate Spring 1-A was shut in for the month of September, Kate Spring 1-B was shut in for all but the month of October where it produced only water. The well was shut in again after that. Taylor Federal No. 1 was shut in from September through the end of the year. A total of 402,100 cubic feet of gas were produced, a 53% decrease from 2020.

Sans Spring Field

The Sans Spring Field produces from the Oligocene Garrett Ranch Group (volcaniclastic rocks and ignimbrites) (LaPointe et al., 2007) between about 5,640 and 5,770 feet (1,720 and 1,759 m). Only one well was active during 2021 between May and October. This well produced a total of 646 barrels of oil over a 20-day period, averaging 32 barrels of oil per day of production. No water was produced from this well. Production decreased 6% from 2020 and accounted for about 0.3% of Nevada's total oil production. The field also contains two inactive producers.

Three Bar Field

The Three Bar Field produces from sandstone and volcanic rock of the Miocene Humboldt Formation, the Oligocene Indian Well Formation, and sandstone and carbonate rocks from the Cretaceous Newark Formation (LaPointe et al., 2007). Three Bar Federal 25-2 came online in September, 2019 and produced most of 2020 and continued to produce for 348 days in 2021. It averaged almost 20 barrels of oil and 25 barrels of water per day. Three Bar 6R came online in October 2021 and produced for 11 days in October and November. It averaged 24 barrels of oil and 157 barrels of water per day. Water was only produced in November. The Three Bar Field averaged a total of 39 barrels of oil and 58 barrels of water per day. Oil and water production increased 100% and 66%, respectively, from 2020.

Trap Spring Field

The Trap Spring Field produces from the Oligocene tuff of Pritchards Station (Garside et al., 1988) between about 3,210 and 4,950 feet (979 and 1,509 m). The field had 30 active producers, one less than in 2020. Production ranged between 10 days and 365 days. Sixteen wells produced for more than 360 days. Average days of production for the entire field was 289. Spread over the year, production for the field averaged 344 barrels of oil and 6,804 barrels of water per day and accounted for 46% of Nevada's total oil production. Oil production by well ranged from 93 to 17,425 barrels and between 14 and 929,107 barrels of water over the entire year. Oil and water production increased almost 32% and 85%, respectively, from 2020. The field had 14 inactive producers.

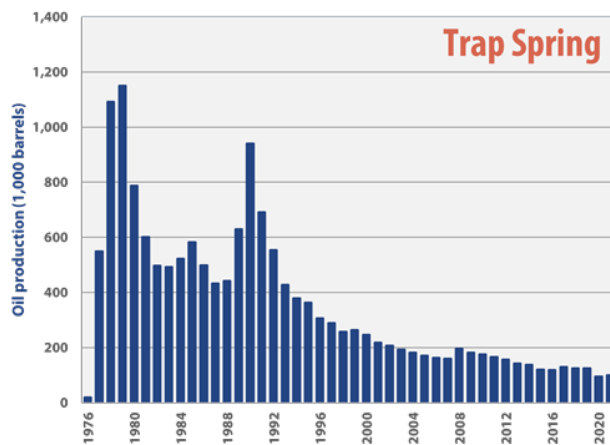


Figure 6. Chart showing oil production from the Trap Spring Field in Railroad Valley, Nye County, from 1976 to 2021.

Minor Fields

Six minor fields were shut-in throughout 2021. The latest production in the Tomera Ranch Field was from an unnamed conglomerate unit. The field has not produced since February 2020. Tomera Ranch 33-1B was shut-in after September 2019. Past production from three now plugged and abandoned wells were from the Oligocene Indian Well Formation (tuffaceous sandstone) between about 1,150 and 1,950 feet (351 and 595 m) (LaPointe et al., 2007). The North Willow Creek Field, which produced from the Mississippian Chainman Shale (LaPointe et al., 2007) between about 6,290–6,470 feet, contains two wells and has been shut in since 2008. The remaining four fields contain one well each. The Sand Dune Field produced from Permian and Pennsylvanian limestones (LaPointe et al., 2007) between about 5,970 and 6,200 feet (1,820 and 1,890 m) and were shut in in 2018. It began producing again for 7 days during July, 2021. It produced a total of 197 barrels of oil and 138 barrels of water. It was shut in for the remainder of the year. The Currant Field produced from the Eocene Sheep Pass Formation (LaPointe et al., 2007) between about 6,850 and 7,080 feet (2,088 and 2,159 m). The Duckwater Creek Field produced from the tuffs of the Oligocene Garrett Ranch Group (LaPointe et al., 2007) between about 5,680 and 5,830 feet (1,732 and 1,777 m). The East Inselberg Field, produced from the Devonian Guilmette Formation between about 1,046–1,171 feet (319 and 357 m). The Currant, Duckwater Creek, and East Inselberg fields have been shut-in since 2015.

Production from Nevada's oil fields (barrels of oil)

Compiled from producers' reports filed with the Nevada Division of Minerals

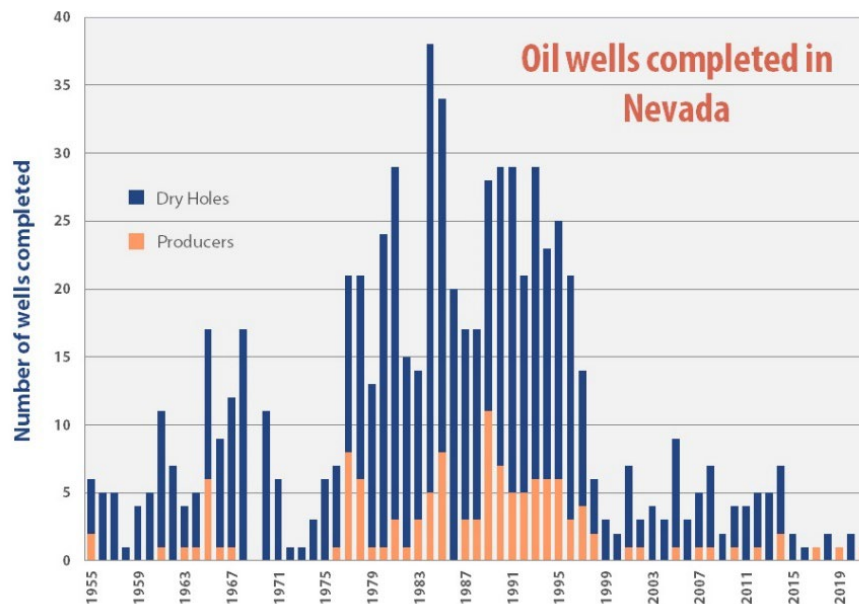
Field (year discovered)	1954-2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
Eagle Springs (1954) (Railroad Valley)	5,445,179	58,900	44,422	39,818	34,217	32,675	26,872	26,716	27,045	35,205	26,606	31,971	5,829,626
Trap Spring (1976) (Railroad Valley)	14,465,502	166,383	156,962	143,876	136,627	120,748	118,847	129,104	125,262	125,540	95,586	99,396	15,883,832
Currant (1979) (Railroad Valley)	1,932	119	159	194	143	25	0	0	0	0	0	0	2,572
Bacon Flat (1981) (Railroad Valley)	1,028,969	6,358	5,690	6,447	6,223	5,000	5,261	5,325	5,000	4,623	4,692	8,103	1,091,691
Blackburn (1982) (Pine Valley)	5,402,033	43,198	38,004	40,392	32,217	31,605	44,180	40,767	24,625	22,559	22,838	20,235	5,762,653
Grant Canyon (1983) (Railroad Valley)	21,186,236	77,683	58,897	50,517	46,263	42,810	41,631	38,861	32,126	33,495	34,345	35,089	21,677,953
Kate Spring (1986) (Railroad Valley)	2,404,019	32,719	30,833	29,402	28,934	26,672	26,486	27,861	26,102	25,428	17,241	14,304	2,690,000
Spencer Lease (1986) (Railroad Valley)	86	0	0	0	0	0	0	0	0	0	0	0	86
Tomera Ranch (1987) (Pine Valley)	36,472	0	11,705	3,757	2,016	1,224	961	854	385	372	208	0	57,746
North Willow Creek (1988) (Pine Valley)	51,841	0	0	0	0	0	0	0	0	0	0	0	51,841
Three Bar (1990) (Pine Valley)	23,837	0	0	0	0	0	0	0	0	5,910	13,737	7,054	50,538
Duckwater Creek (1990) (Railroad Valley)	18,818	115	117	119	124	45	0	0	0	0	0	0	19,338
Sans Spring (1993) (Railroad Valley)	273,747	1,404	1,498	1,318	1,604	1,268	246	1,567	1,437	1,148	1,170	646	287,053
Ghost Ranch (1996) (Railroad Valley)	597,348	18,605	17,022	17,232	15,564	15,106	13,914	14,345	12,959	12,592	4,077	6,264	745,028
Deadman Creek (1996) (Elko County)	367	0	0	0	0	0	0	0	0	0	0	0	367
Sand Dune (1998) (Railroad Valley)	151,225	2,483	2,656	2,567	7,467	2,606	201	121	37	0	0	167	169,530
East Inselberg (2005) (Railroad Valley)	434	32	29	33	24	14	0	0	0	0	0	0	567
Toano Draw (2007) (Elko County)	1,964	0	0	0	0	0	0	0	0	0	0	0	1,964
Humboldt (2014) (Elko County)					2,756	0	0	0	0	0	0	0	2,756
Huntington (2014) (Elko County)					2,248	1,584	0	9	0	0	0	0	3,840
Total	51,090,009	407,999	367,994	335,672	316,426	281,382	278,599	285,530	254,978	266,872	220,292	223,229	54,328,982
Change from previous year		-4%	-10%	-9%	-6%	-11%	-1%	2%	-11%	5%	-17%	-2.5%	

Production of water from Nevada's oil fields (barrels of water)

Compiled from producers' reports filed with the Nevada Division of Minerals

Field (year discovered)	1994-2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
Eagle Springs (1954) (Railroad Valley)	8,097,846	644,703	361,101	375,711	429,749	557,326	377,316	474,199	611,335	465,346	242,519	302,062	12,939,213
Trap Spring (1976) (Railroad Valley)	39,125,155	2,450,044	2,460,099	2,429,108	2,382,353	2,325,601	2,394,821	2,386,266	2,299,045	2,320,594	1,346,868	1,965,462	63,885,416
Currant (1979) (Railroad Valley)	2	0	0	0	0	0	0	0	0	0	0	0	2
Bacon Flat (1981) (Railroad Valley)	427,823	1,810	1,765	1,685	1,825	1,625	4,152	56,319	83,590	54,717	48,070	31,983	715,364
Blackbum (1982) (Pine Valley)	30,543,822	1,334,105	1,418,780	1,284,774	1,117,893	1,373,509	1,601,484	2,022,722	1,602,479	1,416,358	1,322,443	1,010,938	46,049,307
Grant Canyon (1983) (Railroad Valley)	7,166,873	644,303	640,311	637,840	621,172	547,166	572,710	534,650	803,463	687,952	648,672	571,057	14,076,169
Kate Spring (1986) (Railroad Valley)	8,042,980	450,155	426,896	337,981	368,722	398,138	343,883	449,919	496,998	400,474	250,438	85,712	12,052,296
Spencer Lease (1986) (Railroad Valley)	0	0	0	0	0	0	0	0	0	0	0	0	0
Tomera Ranch (1987) (Pine Valley)	505,881	0	0	0	0	0	0	7	0	0	0	0	505,888
North Willow Creek (1988) (Pine Valley)	3,983	0	773	360	0	0	0	0	0	0	0	0	5,116
Three Bar (1990) (Pine Valley)	5,958	0	0	0	0	0	0	0	0	1,530	12,429	10,360	
Duckwater Creek (1990) (Railroad Valley)	72,081	1,080	1,080	1,080	990	0	0	0	0	0	0	0	76,311
Sans Spring (1993) (Railroad Valley)	4,205,523	0	0	0	0	0	0	0	0	0	0	0	4,205,523
Ghost Ranch (1996) (Railroad Valley)	1,025,976	514,379	479,013	600,429	537,388	561,107	452,521	518,688	442,673	505,623	159,221	204,390	6,001,408
Deadman Creek (1996) (Elko County)	0	0	0	0	0	0	0	0	0	0	0	0	0
Sand Dune (1998) (Railroad Valley)	420,827	50,857	55,225	49,525	14,308	5,211	365	135	102	0	0	138	596,693
East Inselberg (2005) (Railroad Valley)	4,200	698	0	0	0	0	0	0	0	0	0	0	4,898
Toano Draw (2007) (Elko County)	29,121	0	0	0	0	0	0	0	0	0	0	0	29,121
Humboldt (2014) (Elko County)					0	0	0	0	0	0	0	0	0
Huntington (2014) (Elko County)					0	4,589	0	0	4,589	0	0	0	9,178
Total	99,678,051	6,092,134	5,845,043	5,718,493	5,474,400	5,774,272	5,747,252	6,442,905	6,344,274	5,852,594	4,030,660	4,182,102	161,182,180
Change from previous year		-4%	-4%	-2%	-4%	5%	-1%	12%	-2%	-8%	-31%	3.8%	

Figure 7. Chart showing number of wells completed and how many were producers in Nevada from 1955 to 2021.



The following four minor fields produced in the past, but are all now plugged and abandoned. Deadman Creek had only one well that produced briefly from the Humboldt Formation between 8,165 and 8,850 feet (2,489 and 2,698 m). Toano Draw had only one well that produced from the Humboldt Formation between 8,250 and 8,950 feet (2,515 and 2,729 m). The Humboldt Field, produced from the Elko Formation between 7,906 feet and 8,210 feet (2,410 and 2,503 m). The Huntington Field also produced from the Eocene Sheep Pass Formation between 8,924 and 9,290 feet (2,721 and 2,832 m) (LaPointe et al., 2007). The Humboldt and Huntington Fields were plugged and abandoned in 2017.

Most of Nevada's oil is used to make such products as No. 1 and No. 2 diesel fuel, kerosene, stove oil, and asphalt. Nevada crude oil was transported in batches by trucks to the 8,000-barrel-per-day capacity refinery near Currant in Railroad Valley, which is owned by Foreland Refining Corporation.

NEW PRODUCERS

Grant Canyon Oil and Gas LLC filed a permit for and drilled the new Three Bar 6R well in Eureka County. The well was completed on October 11th, 2021 and has produced 261 barrels of oil and 1,723 barrels of water.

EXPLORATION

One well was permitted for oil and gas in 2021, a decrease from four permitted wells in 2020. The application for permit to drill an oil or gas well was filed by Grant Canyon Oil and Gas, LLC for the Three Bar 6R well.

No wells were hydraulically fractured in Nevada in 2021, but a table of wells hydraulically fractured in the past is provided. At year's end, Nevada had 413 authorized oil and gas leases covering 741,895 acres (300,234 ha), an area a little smaller than the state of Rhode Island. This was a ~15% decrease in both number of leases and acreage from 2020.

The BLM opted to postpone the lease sale scheduled for March 9, 2021. In addition, The BLM exercised its discretion to not hold lease sales in the second quarter of calendar year 2021 citing new executive orders issued by the current administration (U.S. Department of the Interior, 2021b). Lease sales were scheduled for September 7th and December 7th, 2021 but no results were reported. (U.S. Department of the Interior, 2021c).

TRANSFERS

No transfers occurred during this year.

Partial list of Nevada oil wells that were stimulated in the past

Modified and compiled from well records and data from consultant Jerry Walker

Permit	Company	Well Name	Year Completed	Perfs (gross)	Fluid	Proppant	Date Fracked	Present Status	Formation
3	Gulf Refining Co.	Wilkins Ranch No. 1	1954	6510'-6740'	4,000 gal. oil; 500 gal. mud acid	sand	5/25-30/1954	P&A	Oligocene volcanic tuff
203	Northwest Exploration Co.	Trap Spring No. 13	1977	4976'-5078'	10,122 gal. lease oil	55,000 lbs. 8/12 sand	6/21/1977	WD	Garrett Ranch Volcanics
189	Northwest Exploration Co.	Trap Spring No. 4	1977	4018'-4389'	53,000 gal. oil	37,000 lbs. 8/12 sand	8/19/1977	P&A	Garrett Ranch Volcanics
196	Northwest Exploration Co.	Trap Spring No. 8	1977	4408'-4575'	72,300 gal. lease oil	100,000 lbs. 10/20 sand	9/11/1977	Producer	Tertiary volcanic rock
233	Northwest Exploration Co.	Trap Spring No. 20	1978	3932'-3987'	62,000 gal. lease oil	75,000 lbs. 10/20 sand	8/4/1978	WD	Pritchards Station Volcanics
196	Northwest Exploration Co.	Trap Spring No. 8	1979	4408'-4575'	1,795 gal. lease oil	100,000 lbs. 10/20, 8/12, 4/8 sand	6/23/1979	Producer	Tertiary volcanic rock
263	Wexpro Co.	Jiggs 10-1	1980	10,060'-10,080'	Hy-gel	1.5 ppg 100 mesh sand	3/6/1980	P&A	Paleozoic rock
324	Amoco Production Co.	Blackburn No. 3	1982	6274'-6345'	Jellied lease crude	30,000 lbs. 20/40 sand	1982	Shut in	Indian Well Formation
342	Sun Exploration and Production Co.	Southern Pacific No. 3-13	1983	8386'-8432'	53,090 gal. diesel; 1500 SCF CO ₂	53,620 lbs. 20/40 sand	1/28/1983	P&A	Humboldt Formation
350	Amoco Production Co.	Blackburn No. 10	1983	5660'-5870'	87,500 gallons foamed oil	120,000 lbs. 20/40 sand	9/22/1983	Producer	Indian Well Formation
210	MAPCO Oil and Gas Co.	Trap Spring No. 17	1985	3570'-3610'	10,000 gal. foam	12/20 sand	1985	P&A	Horse Camp Volcanics
856	DY Exploration	Toano Draw 15-19	2005	8800'-8950'	75,000 gal. gel; 6,400 gal. slickwater	115,000 lbs. 20/40 PR6000 sand	8/30/2005	P&A	Humboldt Formation
856	DY Exploration	Toano Draw 15-19	2006	8800'-8950'	61,967 gal. water, solvents, gels, and other additives	30,900 lbs. 20/40 PR6000 sand	6/1/2006	P&A	Humboldt Formation
942	Noble Energy, Inc.	M2C-M2-21B	2014	7906'-8210'	250,057 gal. water; 2% by mass solvents, gels, and other additives	9% by mass PRC Sand; 0.7% by mass Premium white sand	3/17-24/2014	Shut in	Elko Formation
946	Noble Energy, Inc.	M10C-M10-11B	2014	8620'-8889'	343,919 gal. water; 2.5% by mass solvents, gels, and other additives	10% by mass PRC Sand; 0.6% by mass Premium white sand	6/3-4/2014	Shut in	Elko Formation
458	Grant Canyon Oil and Gas	Blackburn No. 16	1985	6959'-7012'	209,600 gal. water; 2.4% by mass solvents, gels, and other additives	12% by mass Premium white sand; 2.4% by mass PRC Sand	6/5/2014	Producer	Nevada Formation
928	Makoil, Inc.	Portuguese Mtn. 14A-2	2014	N/A	29,949 gal. water; 14% by mass solvents, gels, and other additives	32% by mass Premium white sand	11/23/2014	P&A	N/A
960	Noble Energy, Inc.	K1L-1V	2014	N/A	300,537 gal. water; 0.3% by mass solvents, gels, and other additives	7% by mass Premium white sand; 1.5% by mass SSA-2	12/5/2014	Producer	N/A

Abbreviations: Perf (gross) - larger interval containing one or more smaller perforated intervals; P&A - plugged and abandoned; gal. - gallons; WD - water disposal

OTHER DEVELOPMENTS

The NSO-BLM had received an expression of interest for oil leasing involving U.S. Forest Service lands in the Ruby Mountains, Elko County. Oil exploration in Ruby Mountains would likely be speculative, because the range is mainly underlain by a metamorphic core complex which has low-to-no hydrocarbon potential. Even so, the BLM sent a request asking the Forest Service for leasing concurrence, along with any stipulations to protect surface resources. In 2018 and 2019, the Forest Service released draft and final environmental assessments covering potential oil lease sales on 52,533 acres (21,260 ha) in the Ruby Mountains. The area is between Lamaille and Sherman Creeks and includes parts of T26-27N, R56E; T28-29N, R57E; and T32N, R57E. Hunting, conservation, and environmental groups, the general public, and the local Indian tribes sent a large number of negative responses. In 2019, the U.S. Forest Service issued a notice decision adopting the No Leasing Alternative of the final environmental assessment and the affected U.S. Forest Service lands were withdrawn from oil and gas leasing. The decision only involved U.S. Forest Service lands, and the BLM included some parcels adjacent to withdrawn lands during the July 2019 lease sale. In 2019, U.S. Senator Catherine Cortez Masto of Nevada introduced the Ruby Mountains Protection Act (Senate Bill 258) and recently reintroduced the Act. The Act would withdraw 309,272

acres (125,161 ha) from oil leasing though it would continue to protect existing multiple uses including recreation, grazing, and mining (U.S. Department of Agriculture, 2019; U.S. Congress, 2019; Senator Catherine Cortez Masto, 2021; Elko Daily Free Press, 2021).

In 2019, Southwest Gas Corp. filed a notice with the Public Utilities Commission of Nevada for an application to a Federal agency for approval to construct a 69.5-mile (111-km) 24-inch (61-cm) steel natural gas transmission pipeline. The pipeline will address increased demand and replace two existing pre-code pipelines, which will be abandoned in place, with one using modern materials placed with current construction standards and practices. The pipeline will start at the company's existing pressure limiting station south of Laughlin and extend westward and northwestward roughly along US 95 west of Searchlight and end at the company's existing pressure limiting station south of Henderson. The pipeline will cross Federal land and be within Clark County, Boulder City, and Nevada Department of Transportation rights-of-way. The project will be done in three phases over 12 years. The BLM commenced compiling a draft environmental assessment for release in early 2021 (U.S. Department of the Interior, 2021a).

In 2016, the BLM published its final Methane and Waste Reduction Rule, which was summarized in MI-2017 and MI-2018 and involves the perceived waste of natural gas from BLM-administered mineral leases. In Nevada, most

production is from public lands, but gas production is small and only from the Kate Spring Field, where it is used to run equipment. The rule and delays in implementation spawned a series of lawsuits, and Congress was reviewing the rule. The BLM suspended 2018 compliance dates until 2019 and proposed to return to the rules in place prior to 2016. A lawsuit was initiated against the BLM by the State of California, the Sierra Club, the Wilderness Society, and others. In July 2020, Judge Yvonne Rogers of the United States District Court, District of Northern California ruled against the BLM and ordered the rule must go into effect within 90 days. (United States District Court, District of Northern California, Case No. 4:18-cv-05712-YGR, Bureau of Land Management, 2021).

U.S. OIL PRODUCTION AND CONSUMPTION

According to the Energy Information Agency of the U.S. Department of Energy (U.S. Energy Information Administration) the total petroleum products supplied to

the U.S. averaged 19,782,000 barrels per day, an 8% increase from 18,186,000 barrels per day in 2020, and down 5% from the all-time high of 20,788,000 barrels per day in 2005. Domestic crude oil production averaged 11,254,000 barrels per day, a 1% decrease from 11,318,000 barrels per day in 2020. Except for 2016, 2020, and 2021, production has increased annually since 2009. Production had reached an all-time high in 2019 and was 27% higher than the previous record of 9,636,849 barrels per day set in 1970. Imported crude oil averaged 6,110,000 barrels per day, a 4% increase from 5,877,000 barrels per day in 2020, and down 40% from the all-time high of 10,126,000 barrels per day in 2005. Imported crude oil accounted for 31% of the total, down from 32% in 2020. The average price of domestic oil increased 43% to \$68.13 per barrel from an average of \$39.16 per barrel in 2020. On a monthly basis, however, the average price per barrel started the year at \$52.00, steadily increased to \$81.48 in October before dipping slightly to \$79.15 in November and \$71.71 in December. (U.S. Energy Information Administration)

NEVADA OIL PRODUCERS AND REFINERY

(Nevada Oil Patch; unpublished well files)

Company	Field/Refinery	Contact	Addresses, Phone and FAX Numbers, and Websites
Grant Canyon Oil and Gas, LLC	Bacon Flat	Michael O'Neal	717 17th Street, No. 1400
	Blackburn	Rod Prosceno	Denver, CO 80202
	Grant Canyon	Steve Barnes	Phone: 303-297-2777
	Sans Spring		FAX: 303-298-0049
	Three Bar		E-mail: michael@onealrc.com E-mail: rod@4rocket.com E-mail: steve@breckenergy.com
Kirkwood Oil and Gas, LLC/ Wesco Operating, Inc.	Eagle Springs	Robert Kirkwood	120 South Durbin Street
	Ghost Ranch		P. O. Box 1706
	North Willow Creek		Casper, WY 82602
	Sand Dune		Phone: 307-265-5178 FAX: 307-265-1791 E-mail: bradl@kirkwoodcompanies.com Website: http://www.kirkwoodcompanies.com
Makoil, Inc.	Currant	Gregg Kozlowski	25391 Commercentre Drive, No. 120
	Duckwater Creek		Lake Forest, CA 92630
	Ghost Ranch		Phone: 949-462-9010
	Kate Spring		FAX: 949-462-9012
	Trap Spring		E-mail: makoil@msm.com Website: http://www.makoil.com
Tomera Oil Fields, LLC	Tomera Ranch	Patsy Tomera	HC 65 Box 11
		Thomas Tomera	Carlin, NV 89822 Phone: 775-754-2333
Western General, Inc.	Kate Spring	Richard Taylor	HC 34 Box 34830 Ely, NV 89301 Phone: 702-233-1490 E-mail: richardtaylor@cox.net
Foreland Refining Corporation	Currant Refinery		1582 West 2600 South Woods Cross, UT 84087 Location: 65 miles south of Ely Phone: 775-863-0229

Status of Nevada oil and gas production wells in 2020

This table gives the amount of oil and water produced and the number of production days in 2021. The sources of information include well records and statistics from the Nevada Division of Minerals. Status abbreviations with dates of the action were applicable: BBL-barrels; ex-except; MCF-thousand cubic feet; PA-plugged and abandoned; Prod-production; SI-shut-in; WD-w ater disposal

FIELD/OPERATOR/WELL	NEVADA PERMIT	DATE COMPLETED	STATUS	LOCATION	PRODUCTION OIL (BBL)	PRODUCTION WATER (BBL)	PRODUCTION GAS (MCF)	PRODUCTION DAYS
EAGLE SPRINGS (Nye Co., 1954)								
Kirkwood Oil and Gas, LLC								
Eagle Springs Federal No. 44-35	813	05/98	SI 08/04-06/11; SI 02/12	SE, NW, S35, T9N, R57E	0	0		0
Eagle Springs Federal No. 54-35	726	10/94	Prod; SI 3/21-4/21	SW, NE, S35, T9N, R57E	2,895	65,519		252
Eagle Springs Unit No. 1-34	107	07/67	SI 07/86	SE, NE, S34, T9N, R57E	0	0		0
Eagle Springs Unit No. 1-35	4	05/54	WD 1978	NE, NW, S35, T9N, R57E	0	0		0
Eagle Springs Unit No. 1-36	76	02/65	SI 05/08	SW, NE, S36, T9N, R57E	0	0		0
Eagle Springs Unit No. 2-36	80	07/65	Prod	NW, SE, S36, T9N, R57E	7,226	50,692		322
Eagle Springs Unit No. 4-36	86	10/65	SI 06/97	NW, SE, S36, T9N, R57E	0	0		0
Eagle Springs Unit No. 5-36	94	04/66	Prod	NW, NE, S36, T9N, R57E	8,378	2,843		261
Eagle Springs Unit No. 15-35	21	07/55	Prod; SI 1/21; 3/21-4/21; 12/21	NW, SW, S35, T9N, R57E	53	860		15
Eagle Springs Unit No. 35-35	17	03/55	Prod; SI 3/21-4/21; 10/21	NE, SW, S35, T9N, R57E	420	8,779		97
Eagle Springs Unit No. 43-36	83	08/65	Prod; SI 1/21-11/21	NE, SE, S36, T9N, R57E	5	14		5
Eagle Springs Unit No. 62-35	46	01/60	SI 01/12	NW, NE, S35, T9N, R57E	0	0		0
Eagle Springs Unit No. 73-35	69	10/63	Prod	SE, NE, S35, T9N, R57E	3,380	71,119		348
Eagle Springs Unit No. 74-35	71	04/64	Prod; SI 2/21; 4/21-5/21	SE, NE, S35, T9N, R57E	1,054	26,688		167
Eagle Springs Unit No. 84-35	77	01/65	SI 10/97	SE, NE, S35, T9N, R57E	0	0		0
Eagle Springs/Plains Petroleum No. 13-36	744	02/96	SI 01/21-12/21	SW, NW, S36, T9N, R57E	0	0		0
Eagle Springs/Plains Petroleum No. 23-36	733	10/95	Prod; SI 9/21 & 11/21	SW, NW, S36, T9N, R57E	7,422	8,492		289
Eagle Springs/Plains Petroleum No. 24-36	737	11/94	Prod; SI 1/21-3/21; 7/21-10/21	SW, NW, S36, T9N, R57E	11	29		10
Eagle Springs/Plains Petroleum No. 55-35	761	11/95	Prod; SI 1/21-8/21; 10/21; 12/21	SW, NE, S35, T9N, R57E	73	60		58
Eagle Springs/Plains Petroleum No. 64-35	755	09/95	SI 01/12	SW, NE, S35, T9N, R57E	0	0		0
Eagle Springs/Plains Petroleum No. 82-35	734	10/94	Prod; SI 11/21	NE, NE, S35, T9N, R57E	1,044	91,913		166
Eagle Springs/Plains Petroleum No. 83-35	754	07/95	Prod; SI 1/21-5/21; 8/21-12/31	SE, NE, S35, T9N, R57E	10	340		2
TRAP SPRING (Nye Co., 1976)								
J. N. Oil and Gas Federal No. 1	449	09/85	PA 01/99	NE, NW, S34, T9N, R56E				
Munson Ranch No. 12-42	572	06/90	PA 08/08	SE, NE, S12, T9N, R56E				
Munson Ranch No. 12-44X	445	07/85	PA 08/08	SE, SE, S12, T9N, R56E				
Trap Spring No. 4	189	03/77	PA 07/95	SE, NE, S27, T9N, R56E				
Makoi, Inc.								
Britton No. 13-21	224	04/78	SI 12/91	NE, NW, S13, T9N, R56E	0	0		0
Munson Ranch No. 11-23X	346	10/82	SI 11/82	NE, SW, S11, T9N, R56E	0	0		0
Munson Ranch No. 12-14	688	05/95	Prod	SW, SW, S12, T9N, R56E	524	421		42
Munson Ranch No. 12-23	596	11/90	SI 04/98	NE, SW, S12, T9N, R56E	0	0		0
Munson Ranch No. 12-24	432	04/85	Prod	SE, SW, S12, T9N, R56E	2,214	14,242		364
Munson Ranch No. 12-32	559	12/89	Prod	SW, NE, S12, T9N, R56E	2,121	18,013		339
Munson Ranch No. 12-33	423	03/85	SI 04/96	NW, SE, S12, T9N, R56E				
Munson Ranch No. 12-34	406	10/84	Prod	SW, SE, S12, T9N, R56E	2,115	3,818		339
Munson Ranch No. 12-43	880	03/08	Prod	NE, SE, S12, T9N, R56E	6,452	13,469		365
Munson Ranch No. 13-1	435	08/85	Prod	SE, NW, S13, T9N, R56E	3,268	120		361
Munson Ranch No. 13-11	622	11/91	SI 01/18	NW, NW, S13, T9N, R56E	0	0		0
Munson Ranch No. 13-11R	840	11/01	Prod	NW, NW, S13, T9N, R56E	1,420	24,050		362
Munson Ranch No. 13-12	537	07/89	SI 07/89	SW, NW, S13, T9N, R56E	0	0		0
Munson Ranch No. 13-14	623	09/91	SI ex 12/21	SW, SW, S13, T9N, R56E	309	2,998		20
Munson Ranch No. 13-21X	640	05/92	Prod	NE, NW, S13, T9N, R56E	4,024	15,002		364
Munson Ranch No. 13-24	218	08/79	SI 12/18	SE, SW, S13, T9N, R56E	0	0		0
Munson Ranch No. 13-31	382	07/84	Prod	NW, NE, S13, T9N, R56E	2,281	20,604		365
Munson Ranch No. 13-32	373	08/84	Prod	SW, NE, S13, T9N, R56E	4,280	41,402		365
Munson Ranch No. 13-33	211	11/78	Prod	NW, SE, S13, T9N, R56E	1,687	5,415		365
Munson Ranch No. 13-41X	448	09/85	Prod	NE, NE, S13, T9N, R56E	7,619	86,214		363
Munson Ranch No. 13-42	222	11/78	Prod; SI 4/21-12/21	SE, NE, S13, T9N, R56E	93	19,690		72
Munson Ranch No. 13-45	547	08/89	Prod	NW, SW, S13, T9N, R56E	1,156	171		365
Munson Ranch No. 13-46	548	07/89	Prod	NE, SW, S13, T9N, R56E	1,504	176		365
Munson Ranch No. 14-23	313	08/81	Prod	NE, SW, S14, T9N, R56E	2,955	20,506		365
Munson Ranch No. 14-24	354	10/83	SI 06/96	SE, SW, S14, T9N, R56E	0	0		0
Munson Ranch No. 14-32	455	09/87	Prod	SW, NE, S14, T9N, R56E	2,925	75,720		365
Munson Ranch No. 14-33	513	07/89	Prod; 1/21-2/21; 4/21-5/21	NW, SE, S14, T9N, R56E	872	2,803		166
Munson Ranch No. 14-34	287	11/80	SI 07/15	SW, SE, S14, T9N, R56E	0	0		0
Munson Ranch No. 14-34X	522	08/88	Prod	SW, SE, S14, T9N, R56E	1,425	9,828		365
Munson Ranch No. 14-41	538	07/89	SI 12/20	NE, NE, S14, T9N, R56E	0	0		0
Munson Ranch No. 14-44	528	08/89	Prod; SI 5/21-6/21	SE, SE, S14, T9N, R56E	2,260	117,379		252
Munson Ranch No. 14-49	550	08/89	Prod	NE, SE, S14, T9N, R56E	1,197	3,875		325
Munson Ranch No. 14-49X	562	02/90	Prod; SI 1/21, 4/21, 12/21	NE, SE, S14, T9N, R56E	138	14		10
Trap Spring No. 2	185	02/77	Prod; SI 3/21-5/21	SE, SW, S27, T9N, R56E	3,906	528		273
Trap Spring No. 3	188	04/77	Prod; SI 1/21-2/21	NW, NE, S34, T9N, R56E	9,332	929,107		303
Trap Spring No. 8	196	09/77	SI 12/19	SE, SW, S23, T9N, R56E	0	0		0
Trap Spring No. 9	197	09/78	Prod	NW, NW, S26, T9N, R56E	17,425	101,788		362
Trap Spring No. 14-42	523	10/88	Prod ex 10/21	SE, NE, S14, T9N, R56E	1,091	15,836		315
Trap Spring No. 16	232	09/78	Prod	NW, SE, S23, T9N, R56E	4,018	114,798		365
Trap Spring No. 19	219	12/77	Prod	SE, NW, S23, T9N, R56E	10,244	3,768		351
Trap Spring No. 23-41	574	06/90	Prod	NE, NE, S23, T9N, R56E	541	689		33
Trap Spring No. 27-41	899	01/09	SI 01/09	NE, NE, S27, T9N, R56E	0	0		0
Zuspann No. 24-1	198	06/77	SI 07/86	NW, SW, S24, T9N, R56E	0	0		0
Zuspann No. 24-3	208	09/77	SI 12/19	NE, NW, S24, T9N, R56E	0	0		0
EAST INSELBERG (Nye Co., 2005)								
Makoi, Inc.								
East Inselberg No. 36-33	860	04/05	SI 12/06-06/10; SI 08/15	NW, SE, S36, T10N, R56E	0	0		0
CURRENT (Nye Co., 1979)								
Makoi, Inc.								
Current No. 1	241	10/78	SI 07/05-05/07; SI 08/15	SE, SW, S26, T10N, R57E	0	0		0

Status of Nevada oil and gas production wells in 2020 (continued)

FIELD/OPERATOR/WELL	NEVADA PERMIT	DATE COMPLETED	STATUS	LOCATION	PRODUCTION OIL (BBL)	PRODUCTION WATER (BBL)	PRODUCTION GAS (MCF)	PRODUCTION DAYS
BACON FLAT (Nye Co., 1981)								
Grant Canyon Oil and Gas, LLC								
Bacon Flat No. 1	316	07/81	SI 10/88	C, SW, S17, T7N, R57E	0	0		0
Bacon Flat Federal No. 23-17	657	09/92	SI 12/93 ex 10/19	NE, SW, S17, T7N, R57E	0	0		0
Bacon Flat Federal No. 23-17A	710	01/94	Prod	NE, SW, S17, T7N, R57E	8,103	31,983		349
BLACKBURN (Eureka Co., 1982)								
Grant Canyon Oil and Gas, LLC								
Blackburn No. 3	324	03/82	SI 12/98 ex 11/05	SW, SW, S8, T27N, R52E	0	0		0
Blackburn No. 10	350	09/83	Prod	SW, NW, S8, T27N, R52E	8,362	42,139		357
Blackburn No. 14	442	07/85	Prod; SI 01/01-10/08	NE, SE, S7, T27N, R52E	5,780	7,429		330
Blackburn No. 16	458	12/85	Prod; SI 4/21-6/21	SE, NE, S7, T27N, R52E	1,292	46,759		181
Blackburn No. 18	660	11/92	Prod	NE, SE, S7, T27N, R52E	3,984	922,530		339
Blackburn No. 19	724	06/94	SI ex 1/21 & 4/21	NW, SW, S8, T27N, R52E	19	4,082		20
Blackburn No. 21	802	09/97	Prod	NE, SE, S7, T27N, R52E	798	499,691		332
Grant Canyon Oil and Gas, LLC								
Blackburn No. 22	971	05/16	SI 08/19	NW, SW, S8, T27N, R52E	0	0		0
GRANT CANYON (Nye Co., 1983)								
Grant Canyon No. 4	376	07/84	PA 04/92	NE, NW, S21, T7N, R57E				
Grant Canyon No. 5	400	08/84	PA 07/95	E/2, NE, S20, T7N, R57E				
Grant Canyon Oil and Gas, LLC								
Grant Canyon No. 3	375	08/84	SI 06/92	SW, SW, S16, T7N, R57E	0	0		0
Grant Canyon No. 7	625	08/91	Prod	NW, NW, S21, T7N, R57E	793	136,225		365
Grant Canyon No. 9	642	04/92	SI 03/18	NW, NW, S21, T7N, R57E	0	0		0
Grant Canyon No. 10	706	07/11	Prod; PA 11/93-01/10	NW, NW, S21, T7N, R57E	27,884	300,820		365
Grant Canyon No. 22-21	705	01/94	Prod	SE, NW, S21, T7N, R57E	6,412	134,012		354
KATE SPRING (Nye Co., 1986)								
Makoil, Inc.								
Kate Spring No. 12-2	544	08/89	SI 1/21-12/21	NW, NW, S2, T8N, R57E	0	0	0	0
Western General, Inc.								
Kate Spring No. 1	436	01/86	Prod ex 9/21	W/2, SW, S2, T8N, R57E	1,250	12,550	115	269
Kate Spring No. 1A	560	12/89	Prod ex 9/21	NW, SW, S2, T8N, R57E	10,177	38,285	777	338
Kate Spring No. 1B	567	08/90	Inj 10/90	NE, SW, S2, T8N, R57E	0	1,323		92
Kate Spring No. 1C	592	09/91	Prod ex 9/21	SW, SW, S2, T8N, R57E	1,250	12,550	115	297
Taylor Federal No. 1	497	10/87	Prod; SI 4/21 & 9/21-12/21	NE, SE, S3, T8N, R57E	1,627	36,029	127	216
Taylor Federal No. 2	536	06/89	SI 09/93 ex 06/17	SE, NE, S3, T8N, R57E	0	0	0	0
SPENCER LEASE (Nye Co., 1986)								
Spencer Federal No. 32-29	446	12/85	PA 06/86	SW, NE, S29, T9N, R57E				
TOMERA RANCH (Eureka Co., 1987)								
Tomera Ranch No. 33-1	591	10/90	PA 09/07	SW, SW, S33, T31N, R52E				
Southern Pacific Land Co. No. 1-5R	647	05/92	PA 06/97	NE, NE, S5, T30N, R52E				
Tomera Ranch No. 33-2RR	841	01/02	PA 09/07	SW, SW, S33, T31N, R52E				
Tomera Oil Fields, LLC								
Tomera Ranch No. 3	923	02/12	SI 1/21	SE, SW, S33, T31N, R52E	0	0		0
Tomera Ranch No. 33-1B	962	11/14	SI 09/19	SW, SW, S33, T31N, R52E	0	0		0
Foreland Corp.								
Southern Pacific Land Co. No. 1-5	492	08/87	WD 1992	NE, NE, S5, T30N, R52E				
NORTH WILLOW CREEK (Eureka Co., 1988)								
North Willow Creek No. 5-27	646	06/93	PA 10/98	SE, NW, S27, T29N, R52E				
Kirkwood Oil and Gas, LLC								
North Willow Creek No. 6-27	648	09/93	SI 04/02	NE, SW, S27, T29N, R52E	0	0		0
Southern Pacific Land Co. No. 1-27	633	01/92	SI 02/97-04/02; SI 06/08	NW, SE, S27, T29N, R52E	0	0		0
THREE BAR (Eureka Co., 1990)								
Three Bar Federal No. 24-13A	566	09/90	PA 01/01	SW, SW, S24, T28N, R51E				
Three Bar Federal No. 5	679	07/93	PA 12/00	SE, NE, S25, T28N, R51E				
Three Bar Federal No. 25-A	556	10/90	PA 01/01	C, NE, S25, T28N, R51E				
Grant Canyon Oil and Gas, LLC								
Three Bar 6R	983	10/21	Prod ex 12/21	SE, NE, S25, T28N, R51E	261	1,723		11
Three Bar Federal No. 25-2	977	06/19	Prod	C, NE, S25, T28N, R51E	6,793	8,637		348
DUCKWATER CREEK (Nye Co., 1990)								
Makoil, Inc.								
Duckwater Creek No. 19-11	542	03/90	SI 06/15	NW, NW, S19, T9N, R57E	0	0		0
SANS SPRING (Nye Co., 1993)								
Grant Canyon Oil and Gas, LLC								
Federal No. 5-14	635	02/93	SI 03/98	SW, NW, S14, T7N, R56E				
Sans Springs No. 5-14A	792	05/97	Prod; SI 1/21-4/21 & 11/21-12/21	SW, NW, S14, T7N, R56E	646	0		20
Federal No. 12-14	673	06/93	SI 10/93	SW, SW, S14, T7N, R56E				
GHOST RANCH (Nye Co., 1996)								
Makoil, Inc.								
Ghost Ranch Springs No. 2-21X	800	08/97	SI ex 7/21-9/21	NE, NW, S2, T8N, R57E	263	24		28
Kirkwood Oil and Gas, LLC								
Ghost Ranch Springs No. 38-35	793	01/97	Prod	SE, SW, S35, T9N, R57E	1,807	83,491		248
Ghost Ranch Springs No. 47-35	799	03/97	Prod ex 3/21-4/21	SE, SW, S35, T9N, R57E	2,316	66,666		249
Ghost Ranch Springs No. 48-35	779	07/96	Prod ex 3/21-4/21	SE, SW, S35, T9N, R57E	1,678	80,507		250
DEADMAN CREEK (Elko Co., 1996)								
Deadman Creek No. 44-13	342	01/96	PA 09/98	SE, SE, S13, T39N, R65E				
SAND DUNE (Nye Co., 1998)								
Kirkwood Oil and Gas, LLC								
Sand Dune Federal No. 88-35	816	07/98	SI ex 7/21	SE, SE, S35, T9N, R57E	167	138		7
TOANO DRAW (Elko Co., 2007)								
Toano Draw No. 15-19	856	12/06	PA 10/08	NW, SW, S19, T39N, R66E				
HUMBOLDT (Elko Co., 2013)								
M2C-M2-21B	942	10/13	PA 08/17	NE, NW, S2, T34N, R58E	0	0		0
HUNTINGTON (Elko Co., 2014)								
K1L-1V	960	11/14	PA 09/17	SW, SW, S1, T29N, R55E	0	0		0

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