Nevada Division of Minerals

2018 NEVADA MINERAL PRODUCTION, NEW MINES, EXPLORATION, CRITICAL MINERALS AND OTHER FUN FACTS



GEOLOGICAL SOCIETY OF NEVADA Southern Nevada Chapter December 12, 2019 Richard Perry, Administrator



Nevada Division of Minerals (NDOM)

- State Agency and part of the Commission on Mineral Resources (7 members appointed by Governor)
- > Offices in Carson City (8 employees) and Las Vegas (3 employees)
- No general fund monies, all revenue from mining claim fees, fluid mineral permit fees, BLM and USFS grants, etc.
- > What we do by statute:
 - □ NRS 513
 - Abandoned Mine Lands Program
 - Public information and minerals education
 - Annual mineral, geothermal and oil production reporting
 - Advise and recommend mineral policy to Governor and Legislature (act as cooperating State agency on Federal Land withdrawal NEPA actions when requested)



NDOM – what we do, by statute (cont'd)

□ NRS 517: Mining Claims, Mill sites and Tunnel rights

□ NRS 519A.290: State Reclamation Bond Pool

□ NRS 522 Oil and Gas

• Well permitting, drilling and completion compliance, conservation of the resource

□ NRS 534A: Geothermal Resources

• Well permitting, drilling and completion compliance

□ NRS 534B: Dissolved Mineral Resource Exploration

- NEVADA Division OF MINERALS
- Borehole approval, well permitting, drilling and completion compliance, protection of other fluid mineral resources



2018 NEVADA METAL PRODUCTION

2018 NEVADA METAL PRODUCTION, BY PRODUCER - Final Ranked by gold production Gold (ozs) Silver (ozs) Copper (lbs) Moly (lbs) Operator Barrick 105,360 2,425,512 Newmont 1,808,484 1,107,493 32,102,979 Kinross 660,100 820,042 SSR Mining 205,161 4,315 Jerritt Canyon Gold 145,064 NR Hecla (Klondex) 109.614 516,312 Coeur 54,668 5,037,983 Florida Canyon Mining (Alio Gold) 46,878 31,775 KGHM International 38,990 171,679 112,552,787 459,959 37,403 Fiore Gold NR Premier Gold (40% of S. Arturo) 20,980 NR 15.444 208,875 **Rawhide Mining** Mineral Ridge Gold 7.497 3,444 **Ruby Hill Mining** 4,648 3,584 420 **Borealis Mining** 394 Sunrise Minerals 268 150 Geo-Nevada 14 NR New Gold Nevada 14 2 Totals 8,011,408 5,581,160 144,655,766 459,959



2009 - 2018 Annual Gold Production in Nevada

New Operation for 2019, #1: McEwen Mining – Gold Bar



- Groundbreaking November 2017
- First gold pour February 2019
- Full Production achieved May, 2019
- Production target 60,000 Au oz/yr
- Avg. Au grade 1.0 g/t
- Current mine life 7 years



New Operation for 2019, #2: Gold Resource Corp. – Isabella Pearl



Groundbreaking – June 2018
 First gold pour – April 2019
 Production target – 40,000 Au oz/yr
 Avg. Au grade - 3.7 g/t
 Current mine life – 5 years







New Operation for 2019, #3: Nevada Copper – Pumpkin Hollow

- Hybrid IOCG chalcopyrite-magnetite skarn
- 2 deposits with 5 billion contained pounds of Cu:
 - Deep, high-grade eastern deposit mineable underground
 - Shallower western deposit mineable open-pit
- Currently developing a 5,000 tpd underground mine on the eastern deposit with a concentrator
- Main shaft being extended to 2,147 feet
- First copper production planned for @Q4 2019
- The mine should employ ~300 people

Other Industrial Minerals Produced in 2018

- 12,900,000 lbs of lithium carbonate
- 716,000 tons of silica sand
- 348,600 tons of magnesite
- 19,900 tons of salt
- 17,087 tons of perlite

Unpatented Mining Claims By Year

NEVADA DIVISION OF MINERALS

NDOM has been gathering active claim data from LR2000 at the end of October for the last six years. The purpose of this graph is to show claims data and statistics from the same snapshot in time.

195,804 Active Mining Claims (Assessment Year 2020) in Nevada as of 10/28/2019, and increase of 1.1% from October, 2018

Distribution of Mining Claims in Nevada BLM LR2000 Data as of October 28, 2019

Fluid Mineral Resources

- Geothermal well permitting and compliance NRS 534A
- Oil and gas well permitting and compliance NRS 522
- Dissolved Mineral Resource Exploration well and borehole permitting NRS 534B

Ormat Geodrill #1 at Tungsten Mtn, 2018

25% of relative motion between the Pacific and North American Plates, is accommodated along the east side of the Sierra Nevada Mountain Range. The other 75% is taken up by the San Andreas.

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The Basin and Range province includes most of Nevada. East-west extension has resulted in approximately 99 north-south oriented mountain ranges with active range-bounding faults.

Nevada has been stretched in some places as much as 100%.

The masses of faulted rock tower over the down-dropped basins. Sediments eroded from these ranges fill the basins. Some basins have over 10,000' of sediments.

Movement along these faults is still taking place.

Alluvium in the basins serve as sources for aggregates used for construction purposes throughout Nevada.

Nevada's Basin and Range & Geothermal Energy

Geothermal Operators

- There are currently 17 geothermal fields in Nevada being operated by 5 operators:
 - Ormat Nevada: Steamboat, McGinness Hills, Brady, Desert Peak, Wild Rose (Don Campbell), Jersey Valley, Tuscarora, and Tungsten Mountain, San Emidio
 - <u>Terra-Gen</u>: Dixie Valley and Beowawe
 - Cyrq Energy: Soda Lake, Patua, Blue Mtn
 - Enel North America: Stillwater and Salt Wells
 - Star Peak Geothermal: Wabuska
- > 458 permitted wells
- 60% on private property
- >334,000 acres in authorized BLM leases

From: NBMG MI-2017

New Geothermal Plant in 2018: Ormat Technologies McGinness Hills Phase III

General

- Phase III plant went on-line in December, 2018
- 48 MW capacity
- 5 Production wells, 1 injection well drilled 2017-2018

- Phase I at 30 MW (2012)
- Phase 2 increase to 72 MW (2015)
- Phase 3 increase to 138 MW (2018)

Nevada Oil-Gas Drilling, Production & Federal Leases 2018-2019

As of 11/5/2019 there were 118 permitted oil wells

There are currently 10 active oil fields in Nevada

To date there are 529 authorized oil leases which total 962,568 acres

There is one oil refinery in Nevada

DMRE WELL DRILLED UNDER NEW REGULATIONS IN RAILROAD VALLEY, NYE COUNTY. 3PL Operating, David Gibson Drilling

Photo taken May 13, 2018

Lithium Clay Projects

- Exploration regulations same as hard rock
 - Notice or plan-level under BLM
 - No permitting of boreholes needed as no water pumped
- > Mine permitting same as any mining project
 - On Federal lands, BLM or USFS lead agency
 - On Private lands, NDEP-BMRR is lead agency
- Two projects which have done PFS reports, metallurgical studies, and proposed flowsheets:
 - Lithium Americas Thacker Pass Project in Humboldt County
 - Ioneer Ltd. Rhyolite Ridge Project in Esmeralda County

Lithium Americas – Thacker Pass Project

Lithium Americas – Thacker Pass Project

PLANT

- Process is comprised of 3 functional areas: Ore Preparation & Leaching, Sulfuric Acid Plant, & Lithium Processing Plant
- No new process technology, only traditional chemical processing equipment used in unique ways, specific to the LNC extraction process:
 - Tanks (stirred reactors)
 - Vacuum Belt Filters
 - Single and Double-Effect Crystallizers
 - o Double Contact / Double Absorption Sulfur-Burning Acid Plant

- Reserves 3.1M tonnes LCE at 2,358 ppm Li
- Strip ratio 1.6:1
- ➢ Mine life − 46 years
- Processing time <24 hours</p>
- Lithium recovery 83%
- Pilot plant operational in Reno
- Final Mine PoO to be submitted to BLM later this year

Ioneer's Rhyolite Ridge Project

A searlesite resource that is different to other sedimentary lithium deposits - it is suitable for a simple acid leach process

- Total Resource¹ of 4.1 million tonnes lithium carbonate & 10.9 million tonnes boric acid
- Including 121 million tonnes of lithium-boron ore containing:
 - 1.1 million tonnes lithium carbonate
 - 8.6 million tonnes boric
 acid
- Lithium only clay mineralisation to be stockpiled

CUMULATIVE MINING PERMITS AND DISTURBANCE ACREAGE IN NEVADA

Critical Minerals Affected by Mineral Entry Withdrawals

- 35 minerals identified as "Critical Minerals" by the U.S. Department of the Interior in May, 2018.
- Minerals selected are deemed "vital to the Nation's security and economic prosperity."
- Nevada contains known occurrences or deposits of 20 of the 35 critical minerals²
- More than 330 historic mining districts contain occurrences of one or more critical minerals¹

¹Tingley, Joseph V. (1998). NBMG Report 47, Mining districts of Nevada (second edition)
 ² Martin, Gary. "Mining of 20 'critical' minerals in Nevada could be streamlined", Las Vegas Review-Journal, 21 May, 2018. Accessed 9 August, 2019.

Critical Minerals Affected by Mineral Entry Withdrawals

Aluminum Antimony* Arsenic* Barite* Beryllium* Bismuth Cesium & Rubidium Chromium Cobalt Fluorspar* Gallium Germanium Graphite Helium Indium Lithium* Magnesium*

- Manganese*
- Niobium
- PGM
- Potash
- ► REE
- Rhenium
- Scandium
- Strontium
- Tantalum
- Tellurium
- Tin
- Titanium
- Tungsten*
- Uranium*
- > Vanadium
- Zirconium & Hafnium

¹ USGS Mineral Resources Data System, (2016). https://mrdata.usgs.gov/mrds/

Gold Butte AML Public Safety Project Development

- Gold Butte National Monument Created in 2016
- 2016, NDOW identified key bat habitat in the Virgin Mountains
- 2017, DCP Received funding for protecting Bat habitat in Clark County
- 2018, DCP and NDOM Interlocal Agreement
- 2018, Categorical Exclusion from BLM

MINERA

Key Factors

- Project spans 220 square miles
- Accessibility
- 18 AML hazards with significant bat habitat
- 42 total know AML hazards within the Monument
- Desert Tortoise habitat found in three AML hazards
- BLM approval for closures

Helicopter Needs

Azure Ridge

Tramp Complex

Gold Butte

Black Jack Mine

Photo Credit: Utah State Historical Society

The Study

Opportunities for Precious Metals Toll Milling and Copper Concentrate Processing in Nevada

Nevada Bureau of Mines and Geology - Report 57

Funded by The Nevada Commission on Mineral Resources

Authored by

ECO

Thomas J. DeMull

David A. Davis

Lucia M. Patterson

ernor's Offic

Joel C. Lenz

Figure 1. Nevada Ore Processing Facilities and Infrastructure

Thomas J. DeMull, David Lucia M. Patterson, and J 2018

Concentrator

- Carlin Mill 5 1 2 Lone Tree
- 3 Phoenix
- Robinson 4
- 5 Taylor

Heap Leach $^{\circ}$

- Bald Mountain Plant 2 6 Bald Mountain Mooney North 7
- Bald Mountain Mooney South 8
- Borealis 9
- 10 Carlin
- 11 Coeur Rochester
- 12 Comstock
- 13 Cortez
- 14 Denton-Rawhide Emigrant 15
- 16 Florida Canyon
- 17 Gold Bar
- 18 Hycroft
- 19 Lone Tree
- 20 Long Canyon
- 21 Marigold
- Mineral Ridge 22 23
- Pan 24
- Phoenix Gold 25 Relief Canyon
- 26 Round Mountain
- 27 Ruby Hill
- 28 Sterling
- 29 Twin Creeks
- 30 Vantage

31 Phoenix

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	Oxide Mill
32	Aurora
33	Carlin Mill 5
34	Cortez Pipeline
35	Crown Point
36	Gold Bar
37	Goldwedge
38	Midas
39 40	Mineral Ridge
40 41	Phoenix Round Mountain
42	Ruby Hill
43	Taylor
44	Twin Creeks Juniper
45	Twin Creeks Pinion
4	Autoclave
46	Goldstrike
47	Lone Tree
48	Twin Creeks Sage Mills
	Roaster
49	Carlin Mill 6
50	Goldstrike
51	Jerritt Canyon

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Other

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------ County Boundary

Major Roads

Transmission Lines

Natural Gas Lines

Facility

HHH Railroads

Nevada Division of Minerals Open Data Site

Lucia M. Patterson, GIS/Field Specialist – Geologist

Nevada Division of Minerals

Mission: To encourage and assist in the responsible exploration for, and the production of, minerals, oil, gas, and geothermal energy which are economically beneficial to the state. This is the Nevada Division of Minerals' public platform for exploring and downloading our open data.

Disclaimer

The Nevada Division of Minerals (NDOM hereafter) assumes no responsibility for errors or omissions. No warranty is made by NDOM as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data; nor shall the act of distribution to contractors, partners, or beyond, constitute any such warranty for individual or aggregate data use with other data. In no event shall NDOM have any liability whatsoever for payment of any consequential, incidental, indirect, special, or tort damages of any kind, including, but not limited to, any loss of profits arising out of the use or reliance on this data.

Download The Data

Anyone can use this data at no cost. Download data in the format you use.

Download Data (mining claims, land

withdrawals/issues, mining districts and much more)

Interact with data (all maps are interactive and are linked to outside data sources as necessary)

Perform land research (Various resources commonly utilized for land research have been linked to interactive maps to streamline workflows)

Publications

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Thomas J. DoMull, David A. Davis, Locia M. Patterson, and Jos Laws

NDOM AML Internship

AVAILABLE TO ALL MINING / EARTH SCIENCE AND RELATED MAJORS! Inventory Nevada AML features - Secure features of critical hazard by fencing

- Field experience
- Map reading
- Data collection methods
- Four wheel drive training
- Leadership & teamwork skills

- Letter of recommendation for future work
- Paid with overtime & per diem
- Includes one mine tour
- Hard work A summer in the field!

Last Years Interns

- Completed 312 Securings
- Logged 641 Hazards
- Logged 10,117 Non-Hazards
- Completed 286 Revisits

Thank You!

Questions