

# Nevada Division of Minerals

***2017 NEVADA MINERAL AND OGG PRODUCTION  
LITHIUM EXPLORATION ACTIVITY  
AML PUBLIC SAFETY PROGRAM  
NEVADA'S PDAC PRESENCE***

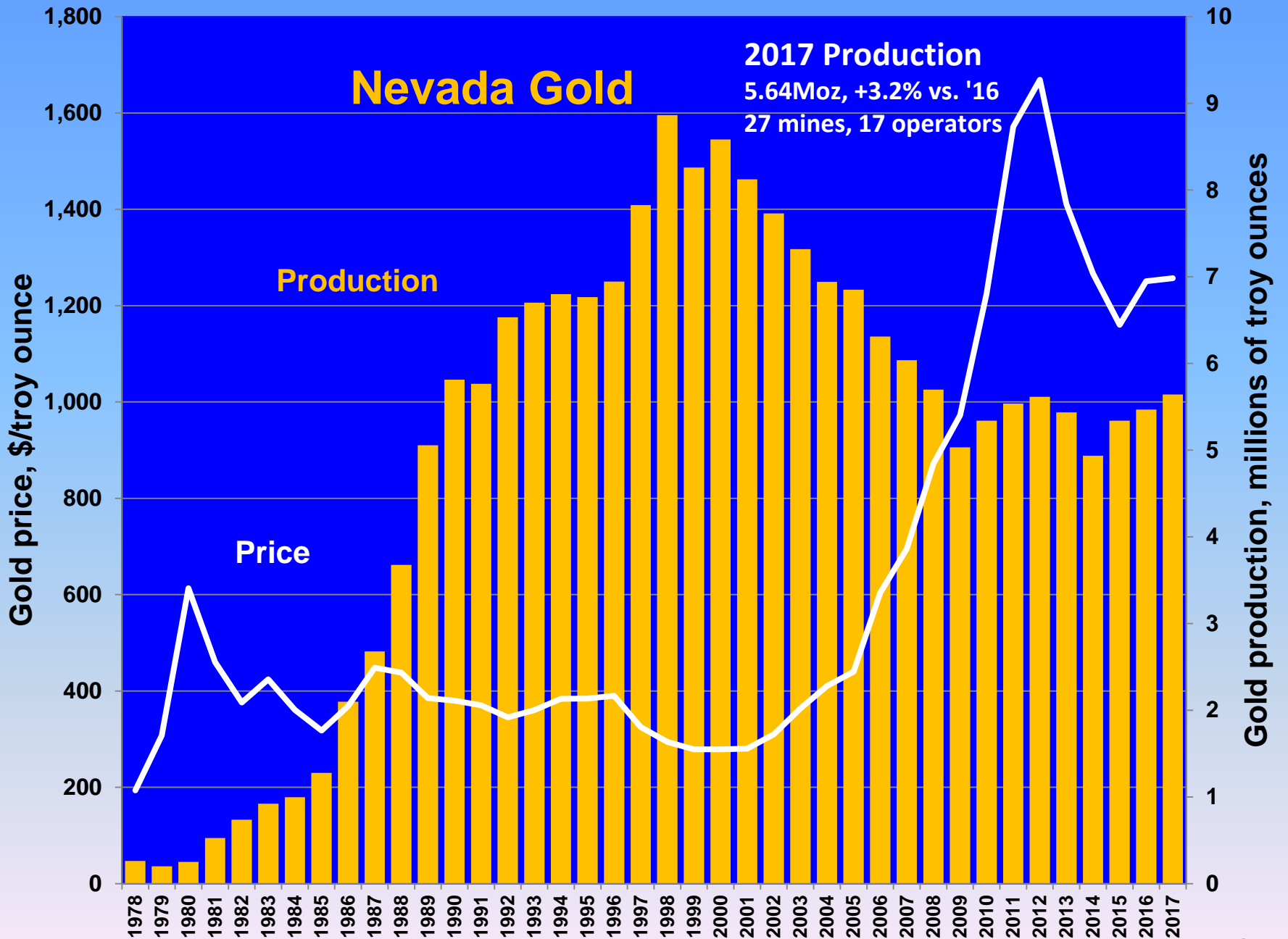
**SME NORTHERN NEVADA SECTION MEETING**

**Reno, NV**

**MAY 14, 2018**

**Rich Perry, Administrator**





# PAN MINE PUT BACK INTO PRODUCTION BY FIORE GOLD



***AFTER A FEASIBILITY STUDY WAS COMPLETED BY SRK WHICH RECOMMENDED CHANGES IN OPERATING AND SAMPLING PROCEDURES, AND A NEW RESOURCE-RESERVES ESTIMATE***



*Pan Mine Mineral Resource Estimate*

Category	Tonnes (000s)	Grade (g/t)	Contained Metal (Au oz)
Measured	8,184	0.62	159,000
Indicated	19,091	0.45	275,000
Measured + Indicated	27,275	0.48	434,000
Inferred	5,144	0.45	72,000

**15,652 OUNCES Au produced in 2017**

From: NI 43-101 Updated Technical Report, SRK 7-7-2017

# NEW OPERATION: TWIN CREEKS UNDERGROUND HUMBOLDT COUNTY

Newmont and SMD team celebrating first round

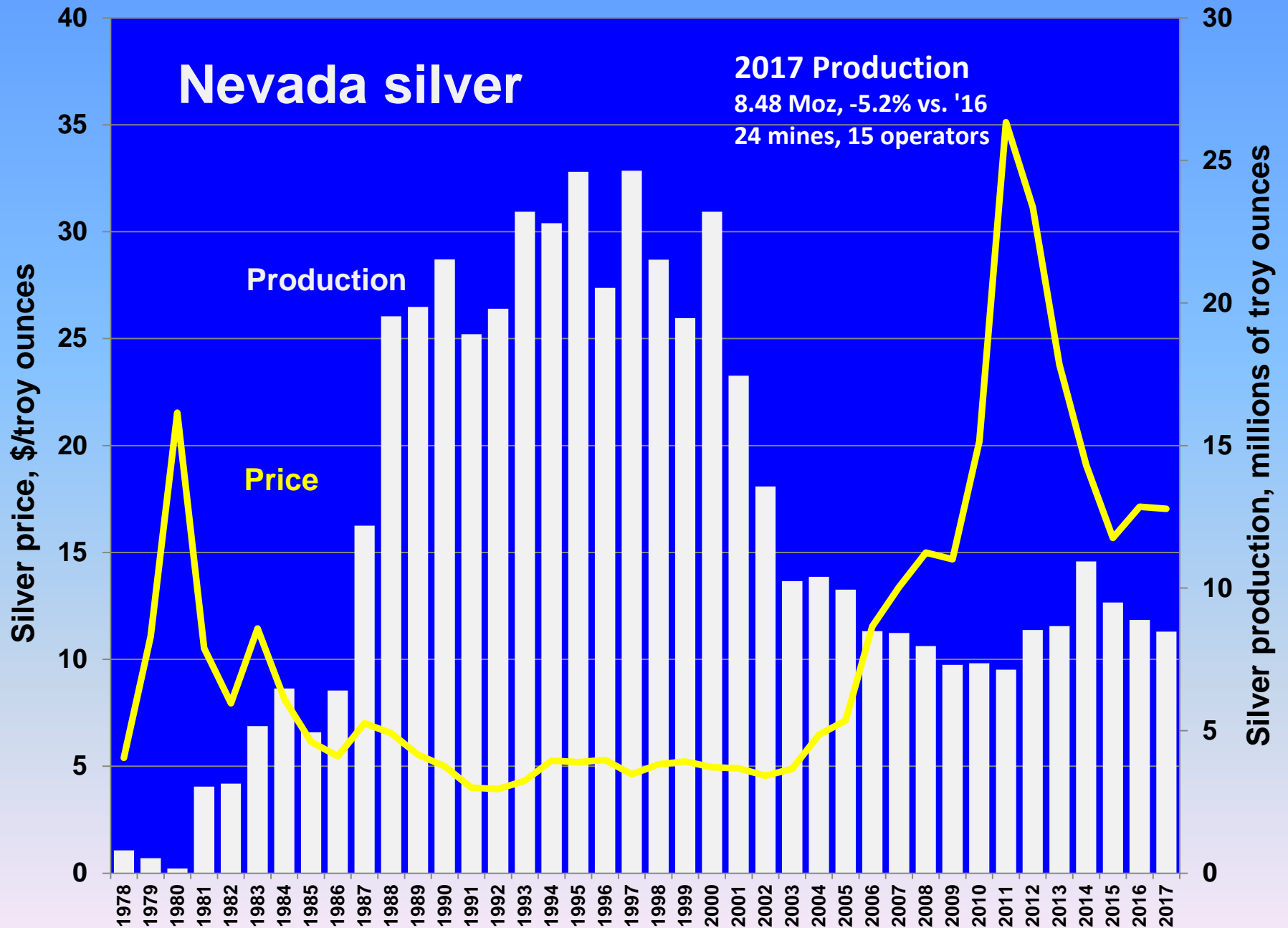


Twin Underground portal and yard,  
March, 2018



**PORTAL BETWEEN TWIN CREEKS VISTA SURFACE MINE  
FIRST PRODUCTION AUGUST, 2017  
EXPECTED AVG ANNUAL GOLD PRODUCTION OF 30,000 TO 40,000 ANNUALLY**

SOURCE: Newmont annual report, 2017  
Photos courtesy of Newmont

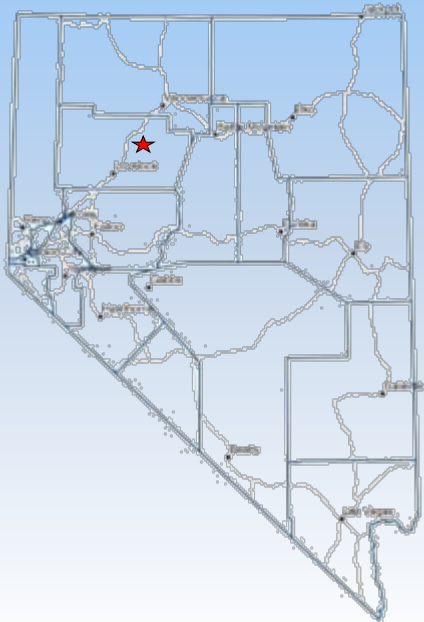


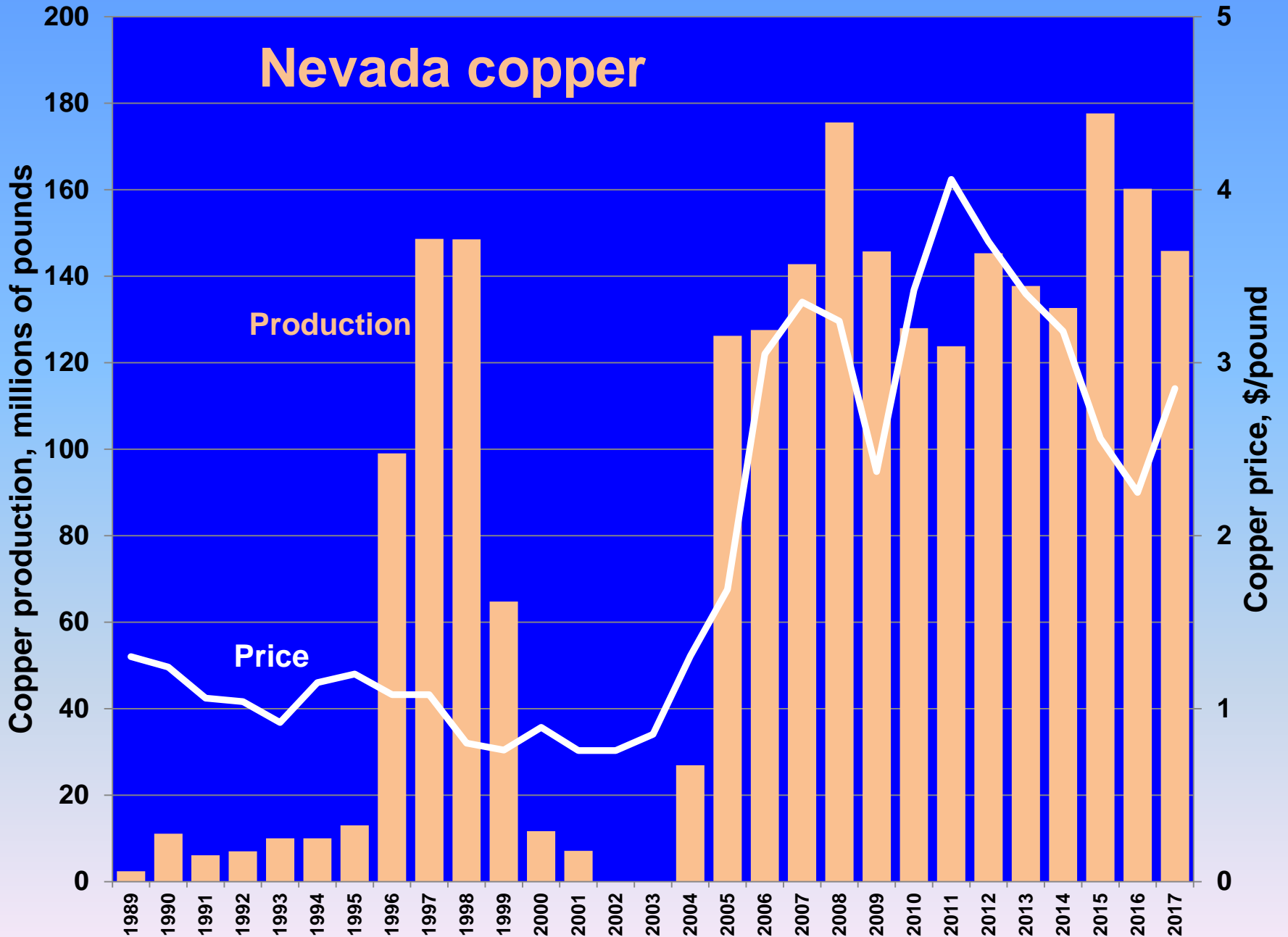
# Nevada's only Primary Silver Mine: Coeur Rochester

Disseminated silver-gold deposit hosted in the Permian-Triassic Weaver and Rochester formations.

**2017 Production:**  
**4,713,574 troy**  
**ounces of silver**  
**and 51,051 troy**  
**ounces of gold.**

Rochester celebrated 150 million  
ounces of silver production in 2017







**Total District Production**  
1906 - 2014  
>5 B lbs. Cu (avg. 1% Cu)  
>3.5 M oz. Au

**Remaining Reserves**  
2014 – 2020  
112 Mt @ 0.43% Cu  
0.006 opt Au  
by-product Mo

**2017 PRODUCTION:**  
118,411,099 lb Cu  
37,897 ozs Au



Ruth Pit 2015



**Robinson Nevada Mining Co.**



# NEWMONT'S FORTITUDE PIT, A GOLD-SILVER-COPPER SKARN-TYPE DEPOSIT

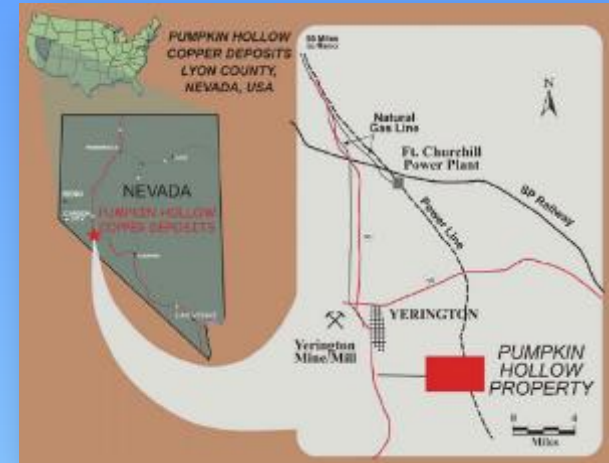


**2017 Production:**  
**41,806,950 lbs Cu**  
**197,026 ozs Au**  
**1,191,630 ozs Ag**

# Nevada Copper: Pumpkin Hollow

Located 8 miles southeast of Yerington, Nevada  
*Hybrid IOCG Chalcopyrite-Magnetite Skarn*

- Located within the Yerington Copper District.
- 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 5000 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 - Q1 2020
- The mine should employ ~300 people



# General Moly: Mt. Hope

*Molybdenum Porphyry Deposit*

Located 22 miles northwest of Eureka, Nevada



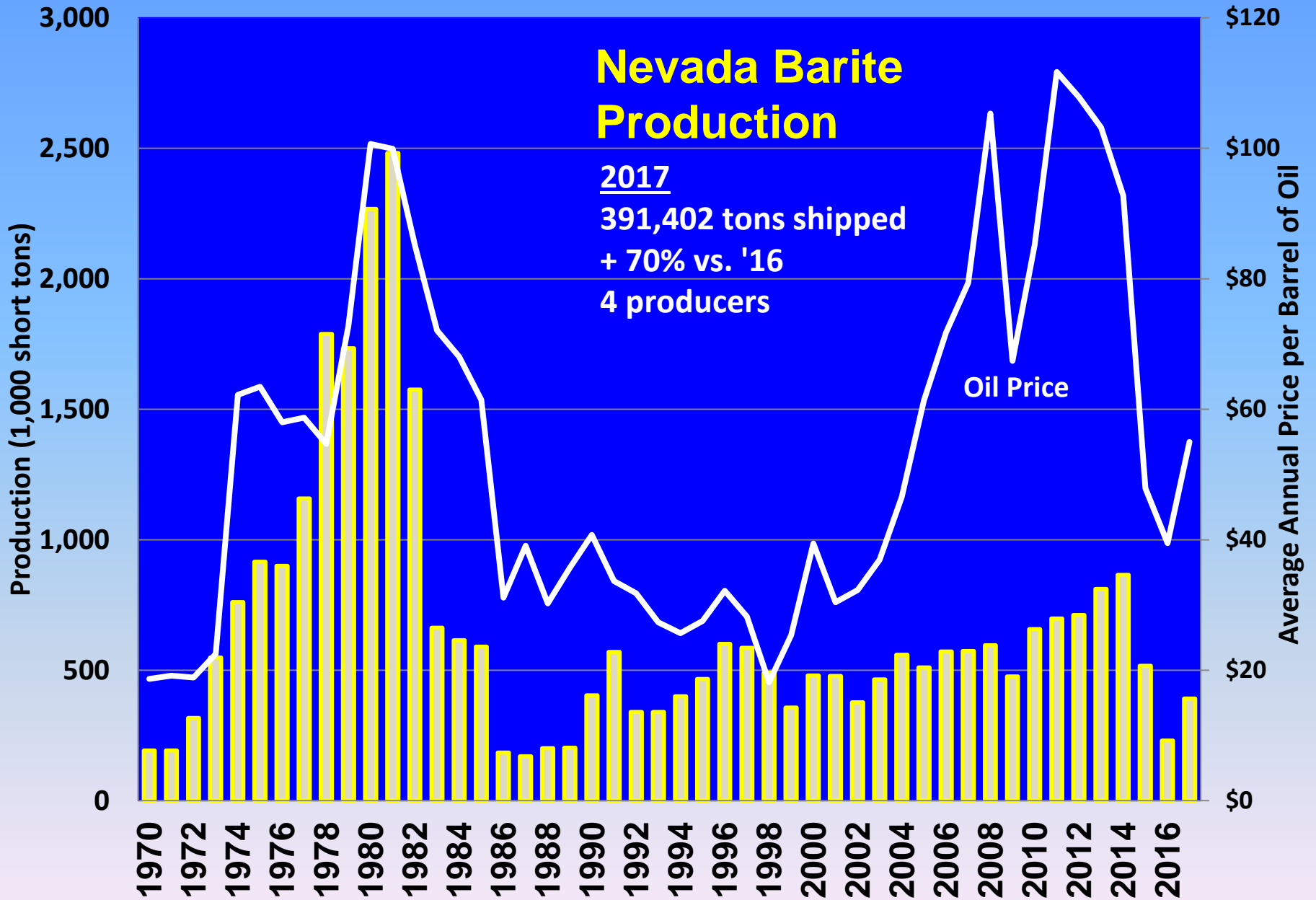
**History and Facts: Supplemental EIS expected to be approved early 2019**

- **World-class Molybdenum Porphyry Deposit first discovered in 1978**
- **Will be mined using open-pit methods**
- **40+ year mine; 400+ new jobs**
- **Project needs a higher moly price**
- **Also conducting exploration for copper, silver and zinc**



Mineral Reserves			
Classification	Cutoff Sulfide Mo	Tons X 1000	Sulfide Mo %
Proven	0.034%	320,473	0.084
Probable	0.034%	664,129	0.063
Proven + Probable	0.034%	984,602	0.070

\*Based on \$12/lb moly price



# Nevada's Barite Producers

**NEVADA'S BARITE PRODUCTION IS FROM STRATIFORM BEDDED DEPOSITS IN THE ORDOVICIAN-DEVONIAN.**

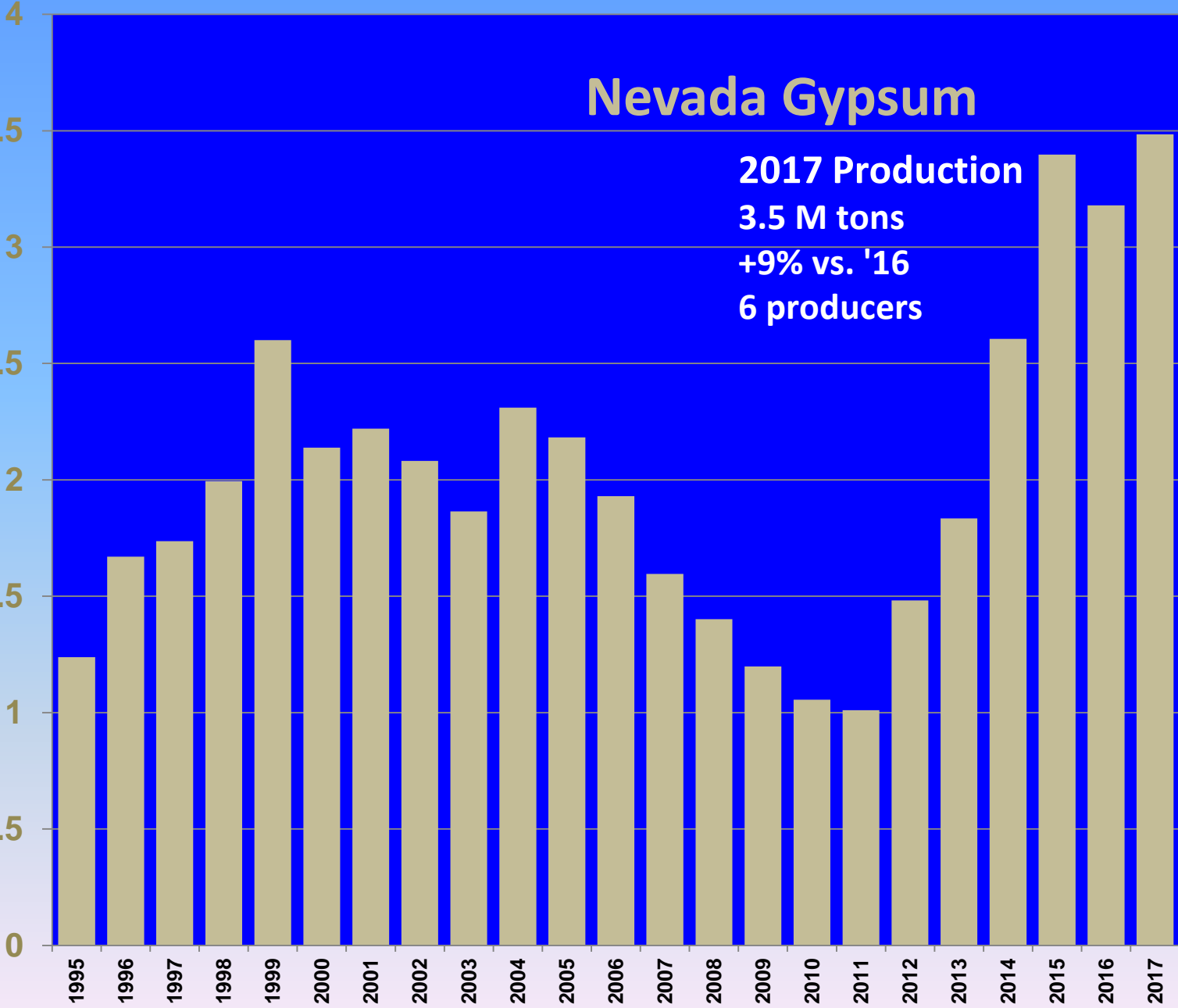
- **3 MINES OPERATED IN 2017**
- **3 PROCESSING PLANTS**



# Nevada Gypsum

Gypsum production, millions of short tons

**2017 Production**  
**3.5 M tons**  
**+9% vs. '16**  
**6 producers**



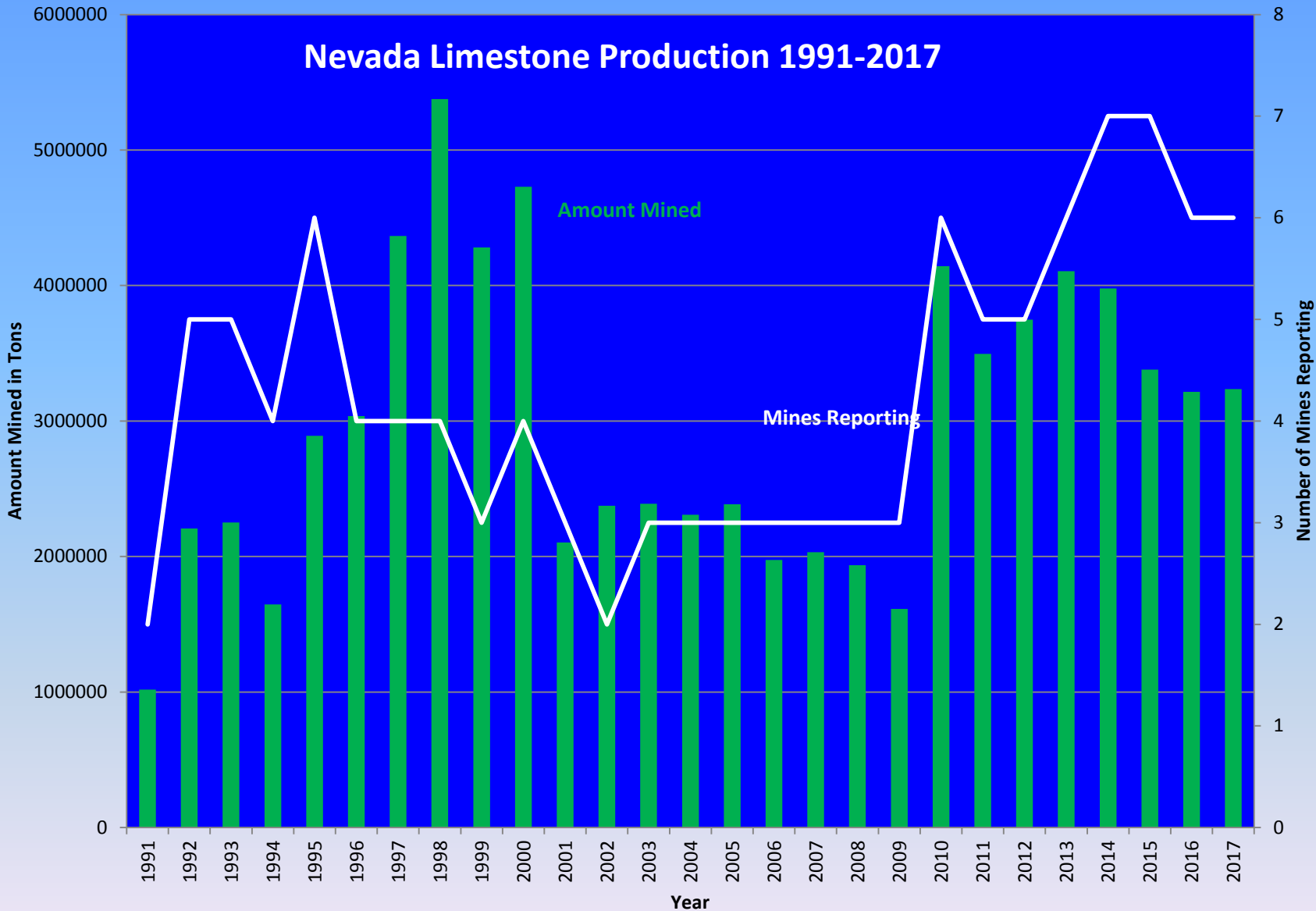
# PABCO GYPSUM LAS VEGAS QUARRY AND WALLBOARD PLANT

- Gypsum deposit in a Miocene-age gypsite blanket in the Horse Springs FM.
- 120 feet thick, near-flat, very little stripping required



- Pit run grades 85% gypsum
- 500-year reserve
- Low-cost mining: wheel loader and in-pit conveyor
- 2017 production > 1.4 M. tons

# Nevada Limestone Production 1991-2017





# APEX LIME - LHOIST NORTH AMERICA, CLARK COUNTY

20 Miles NE of Las Vegas



## 2 ORES MINED:

- High-Calcium lime from the Crystal Pass member of the Devonian Sultan Limestone
- Dolomitic lime from the Bullion dolomite member of the Mississippian Monte Cristo Limestone



# LHOIST PRODUCES 3 PRODUCTS AT APEX:

- High purity lime (95-97% CaO) used in environmental & metallurgical applications
- Type-S hydrated dolomitic lime used in construction
- Crushed limestone used in gas scrubbing
- 100+ year ore reserve
- Expanded to four operating calcining kilns
- Rail and truck delivery from plant
- 2017 : 1.25 M. tons



# Nevada Diatomaceous Earth Production

Diatomite production, millions of short tons

600,000

500,000

400,000

300,000

200,000

100,000

0

1991

1992

1993

1994

1995

1996

1997

1998

1999

2000

2001

2002

2003

2004

2005

2006

2007

2008

2009

2010

2011

2012

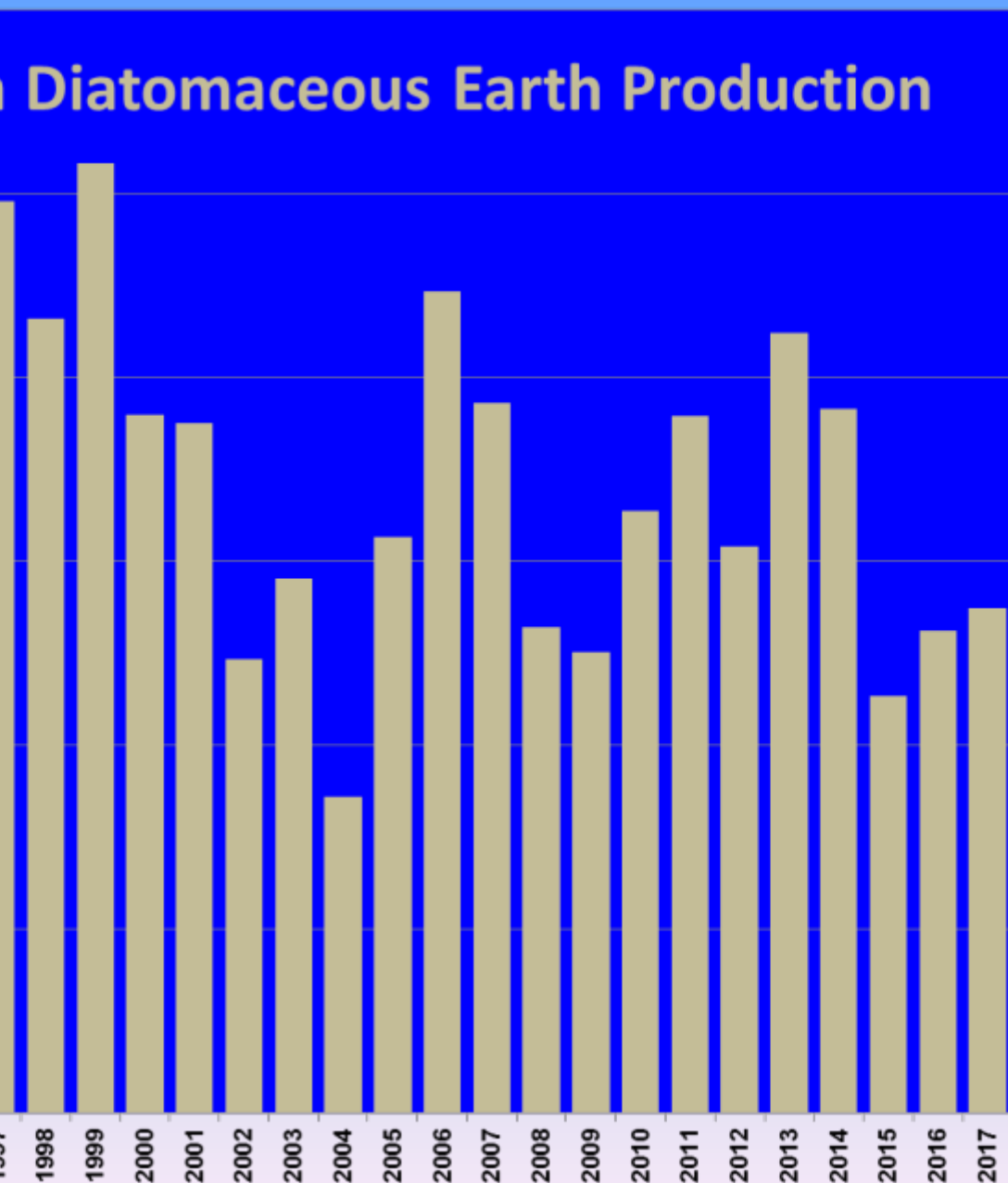
2013

2014

2015

2016

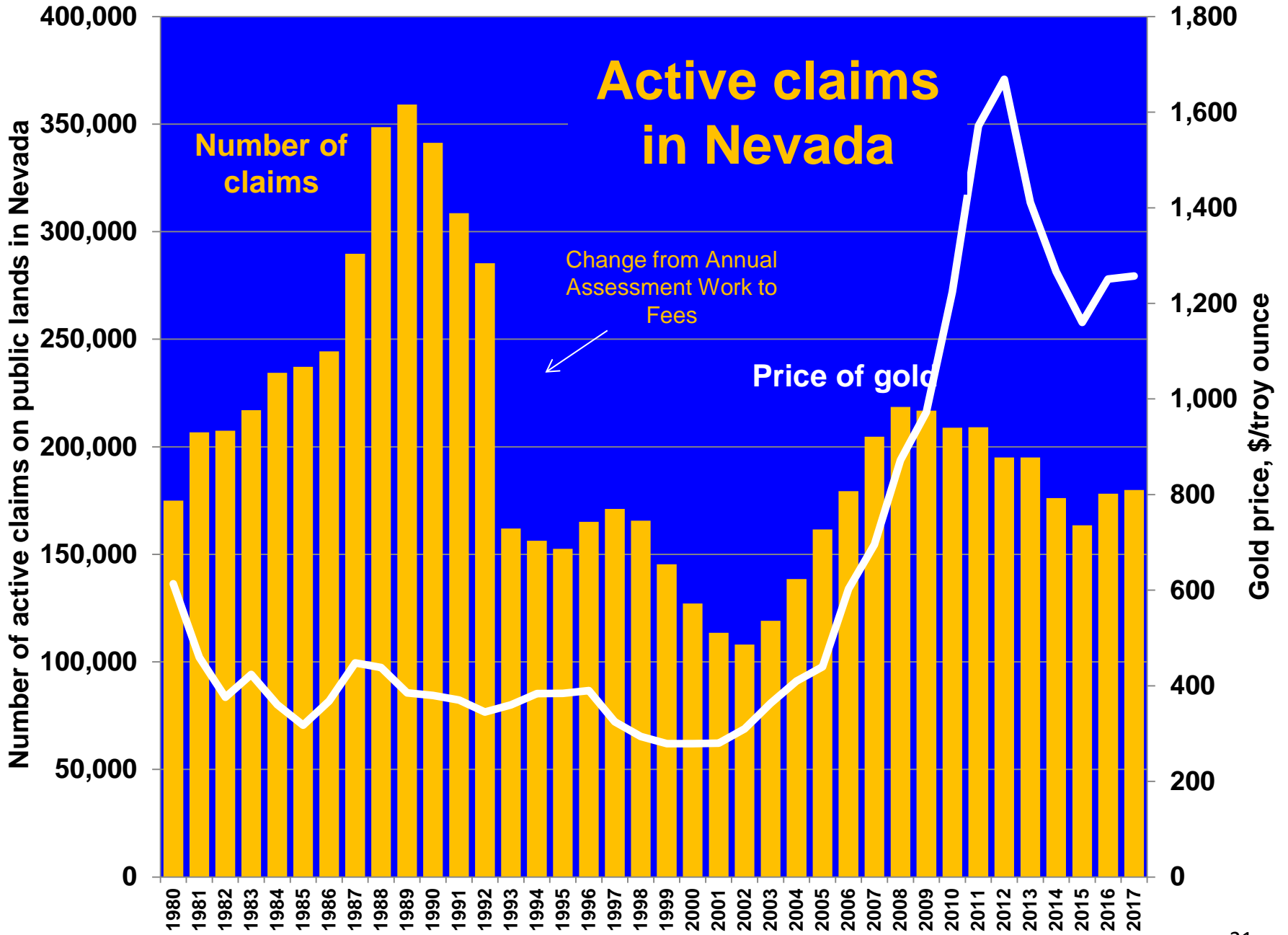
2017



# Other Industrial Minerals Produced, 2017

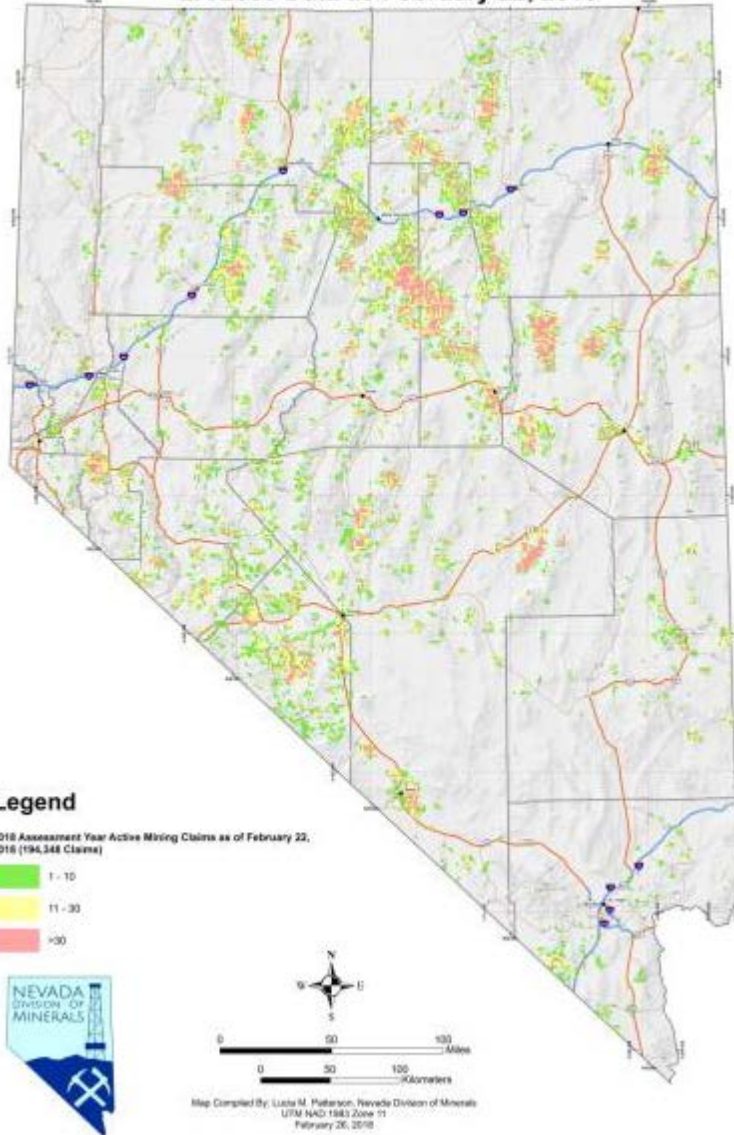
- 10,233,000 lbs of lithium compounds
- 112,634 tons of magnesium oxide
- 727,088 tons of silica sand
- 24,855 tons of salt
- 2,530 tons of perlite





194,348 Active Mining Claims in Nevada  
as of 2/22/2018 an increase of 9.1% from  
January, 2017

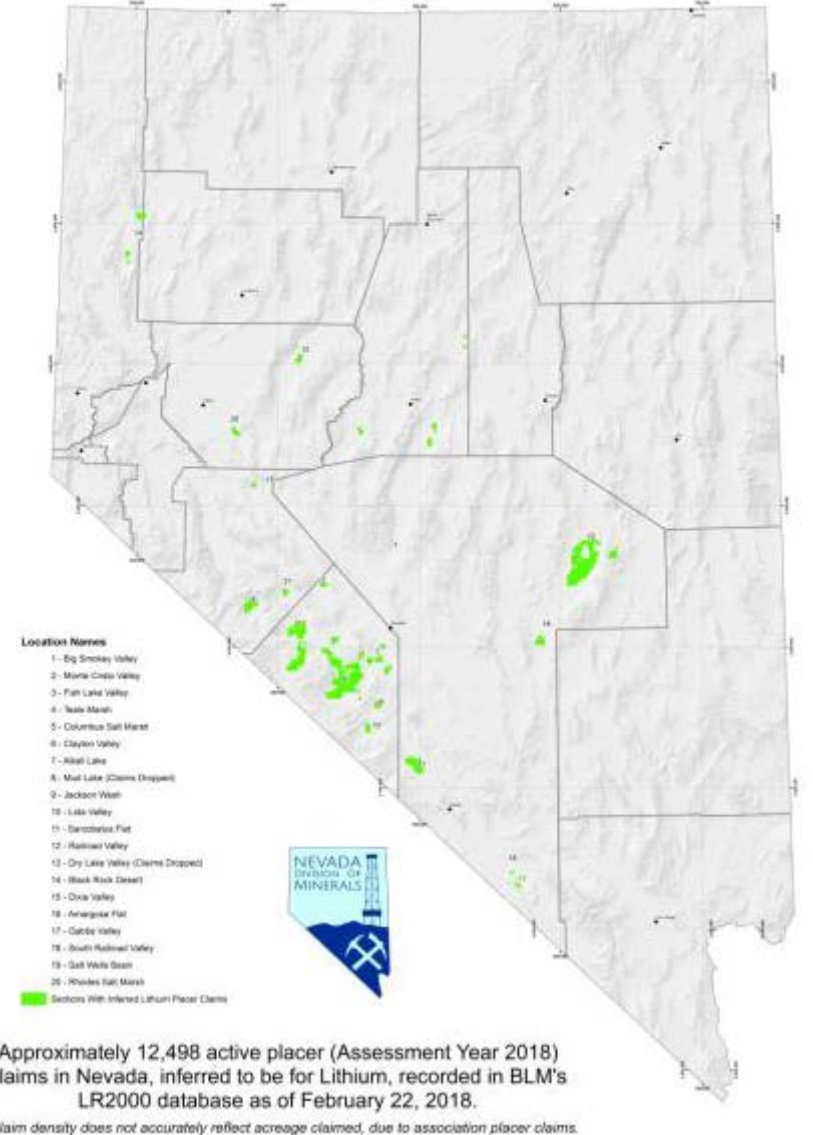
Distribution of Mining Claims in Nevada  
LR 2000 Data as February 22, 2018



12,498 Inferred Lithium Placer Claims in  
Nevada as of 2/22/2018 a decrease of  
5.7% from January, 2017

Inferred Active Lithium Placer Claims in Nevada

Map Produced by: Lucia M. Patterson, Nevada Division of Minerals

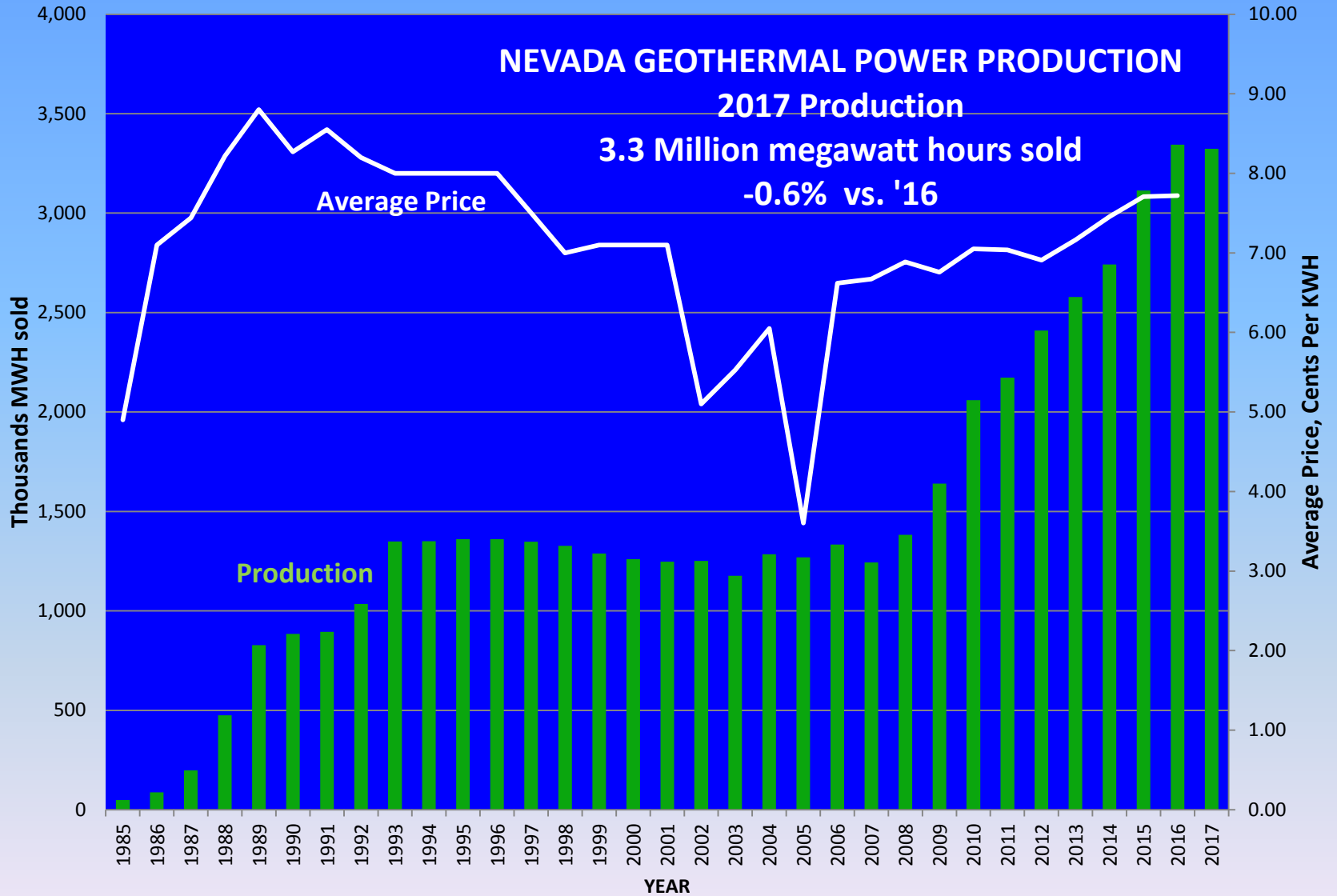


# NEVADA GEOTHERMAL POWER PRODUCTION

2017 Production

3.3 Million megawatt hours sold

-0.6% vs. '16



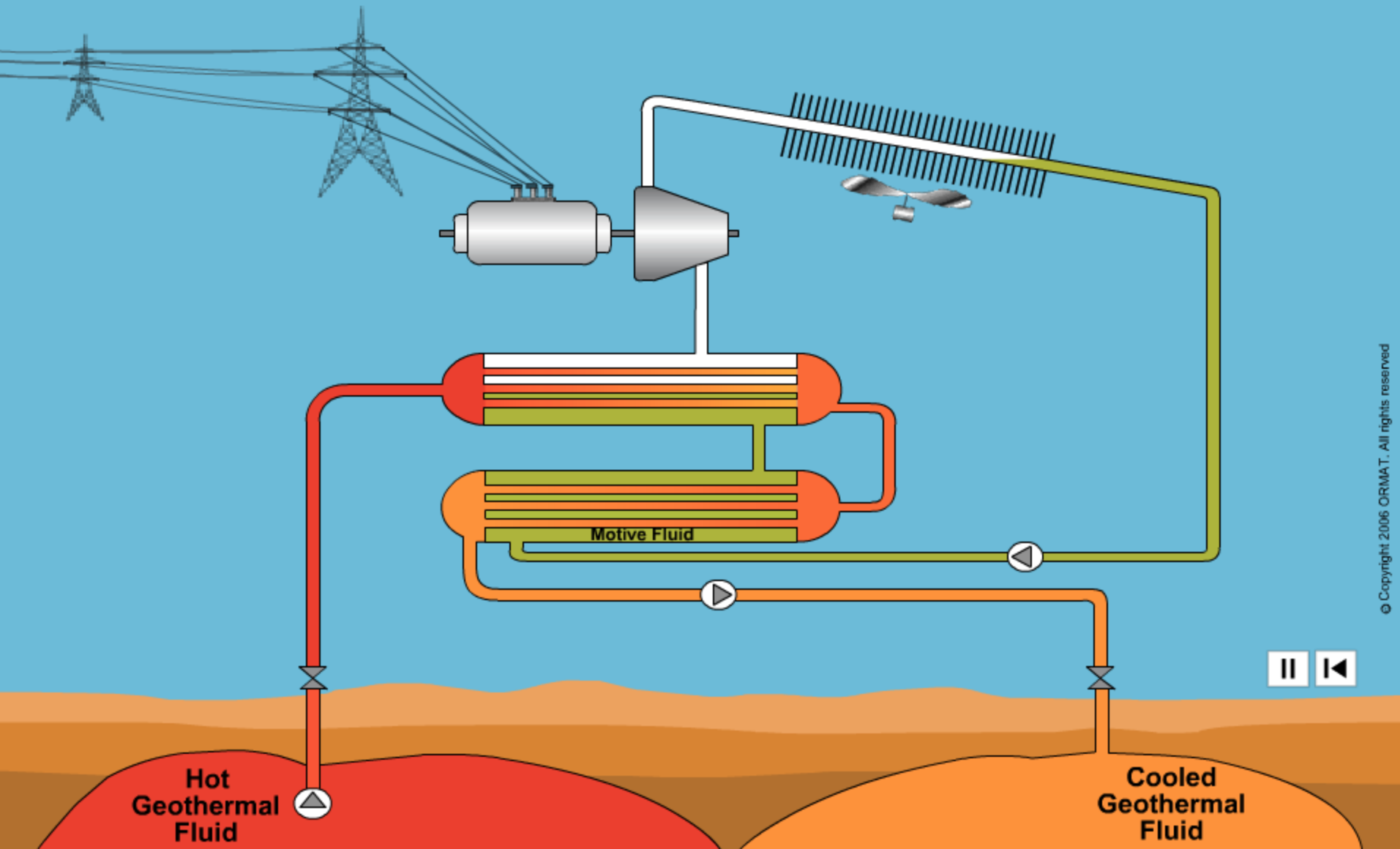
# Uses of Geothermal Energy in Nevada

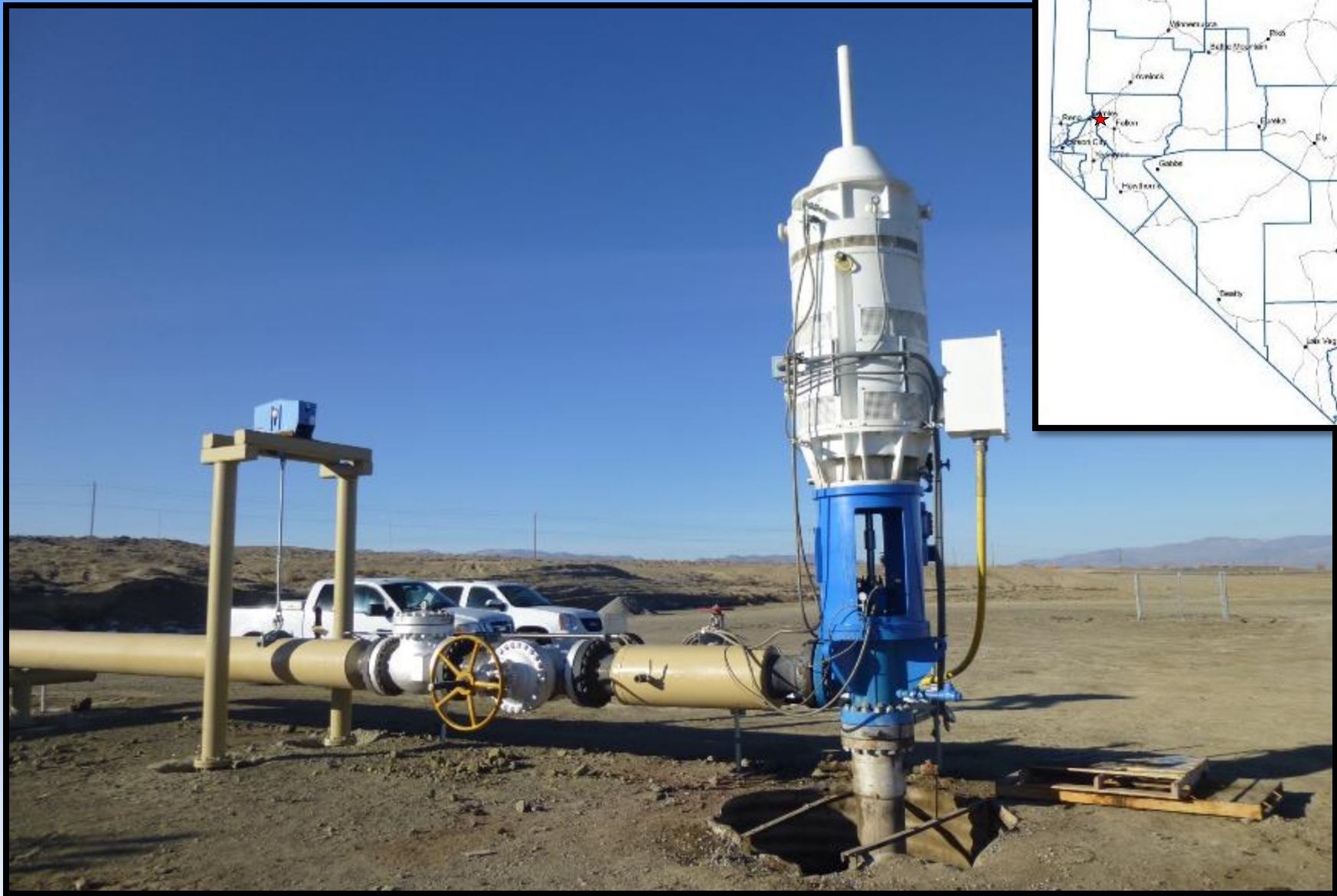
- Heat and cool buildings
- Industrial drying processes
- Electrical generation





# Air-Cooled Binary Geothermal Power Plant





**Geothermal Production Well at Patua, Churchill County**

# NEW GEOTHERMAL FIELD AND PLANT: ORMAT TUNGSTEN MOUNTAIN Churchill County

- 22 MW OUTPUT
- 4 PROD WELLS
- On-Line October, 2017



# Ormat Technologies Inc: McGinness Hills

Located in Lander County northeast of Austin  
*Largest Geothermal Field in Nevada*

## General

- First explored for gold in the 1980's due to exposure of high-sulfidation and low-sulfidation hydrothermal alteration products
- In 2004 Newcrest Resources encountered hot water during exploration drilling
- Each 300 meter exploration hole punctured the sinter cap and intercepted near-boiling waters

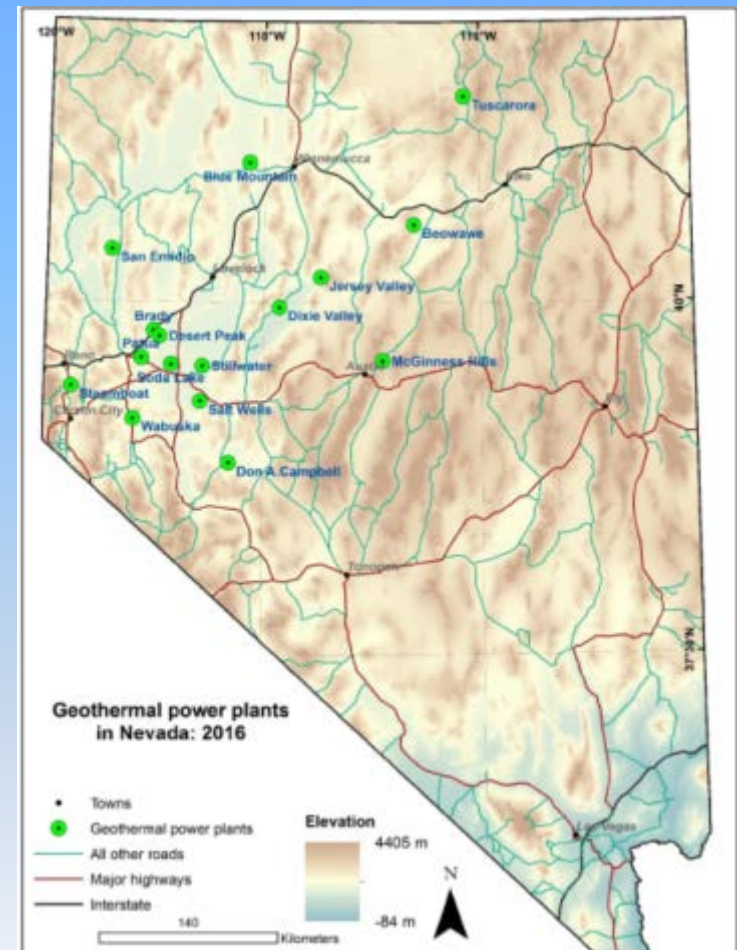


- Geysering action was observed in one hole
- Ormat leased the McGinness Hills Property in 2009
- Phase I at 30 MW (2012)
- Phase 2 increase to 72 MW (2015)
- Phase 3 increase to 120 MW (late 2018)

# Geothermal Operators

There are currently seventeen geothermal fields in Nevada being operated by seven operators:

- **Ormat Nevada**: Steamboat, McGinness Hills, Brady, Desert Peak, Wild Rose (Don Campbell), Jersey Valley, Tuscarora, and Tungsten Mountain.
- **Terra-Gen**: Dixie Valley and Beowawe.
- **Cyrq Energy**: Soda Lake and Patua
- **Enel North America**: Stillwater and Salt Wells.
- **US Geothermal**: San Emidio.
- **Nevada Geothermal**: Blue Mountain
- **Homestretch Geothermal / Star Peak Geothermal**: Wabuska



From: NBMG MI-2016

# Oil, Gas & Geothermal Drilling Activity 2017

Totals Wells Drilled: 29 Geothermal, 1 Oil



## Wells Drilled in 2018

Field	Operator	Well Type
<b>GEOTHERMAL</b>		
Carson Lake	CRNI 16 LLC	Industrial - Injection
Dixie Comstock	Ormat Nevada	Temperature Gradient
Dixie Comstock	Ormat Nevada	Temperature Gradient
Dixie Meadows	CRNI 32 LLC	Industrial - Injection
Domestic	Domestic	Domestic
Domestic	Domestic	Domestic
Elko	City of Wells	Temperature Gradient
Elko	City of Wells	Temperature Gradient
Elko	City of Wells	Temperature Gradient
Elko	City of Wells	Temperature Gradient
Elko	City of Wells	Temperature Gradient
Elko	City of Wells	Temperature Gradient
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Elko	City of Wells	Temperature Gradient
Elko	City of Wells	Temperature Gradient
Elko	City of Wells	Temperature Gradient
McGinness Hills 3	CRNI 41 LLC	Industrial - Production
McGinness Hills 3	CRNI 41 LLC	Industrial - Production
McGinness Hills 3	CRNI 41 LLC	Industrial - Production
McGinness Hills 3	CRNI 41 LLC	Industrial - Injection
San Emidio	USG Nevada	Observation
San Emidio	USG Nevada	Observation
San Emidio	USG Nevada	Observation
Tungsten Mountain	CRNI 43 LLC	Industrial - Injection
Wabuska	Hamstretch Geothermal	Industrial - Production
<b>OIL AND GAS</b>		
Railroad Valley	True Energy	Production

# Nevada has produced oil since 1954

from Paleozoic and Mesozoic host rocks  
64 wells pumped in 2016



**Oil  
production  
well,  
Railroad  
Valley, Nye  
County**



**Foreland oil  
refinery,  
Railroad  
Valley, Nye  
County**



## OIL FROM SHALE

DIRECTLY SOUTH OF THIS POINT AND ACROSS THE VALLEY FLOOR ARE THE REMAINS OF A SHORT-LIVED EXTRACTION PLANT, WHICH REACHED THE PEAK OF ITS PRODUCTIVE CAPACITY IN THE EARLY TWENTIES. DRIVING OF THE MAIN SHAFT BEGAN IN 1916. OF SEVERAL TRIES AT EXTRACTING OIL FROM SHALE, THIS WAS THE ONLY SUCCESSFUL OPERATION IN NEVADA.

ROBERT M. CATLIN, SR. SPENT MANY YEARS EXPERIMENTING ON THE EXTRACTION OF CRUDE OIL FROM THESE BEDS BEFORE BEGINNING THE COMMERCIAL PRODUCTION OF OIL. AFTER A PRODUCTION PERIOD OF LESS THAN TWO YEARS, THE PLANT WAS CLOSED IN THE FALL OF 1924. HI-POWER CATLIN OIL WAS TOO EXPENSIVE TO COMPETE WITH THE FOSSIL OILS OF THAT DAY.

EASILY 50 YEARS AHEAD OF HIS TIME, CATLIN DID, FOR A FEW YEARS GIVE ELKOANS AND NEVADANS, A DREAM AND THE COMMUNITY AN OIL BOOM IN THE ROARING TWENTIES.



# Last Oil Play in Nevada was 2013-15 Noble Energy

Unconventional Oil Prospect in Tertiary Elko Formation

## Exploration Stage Unconventional Oil Prospects

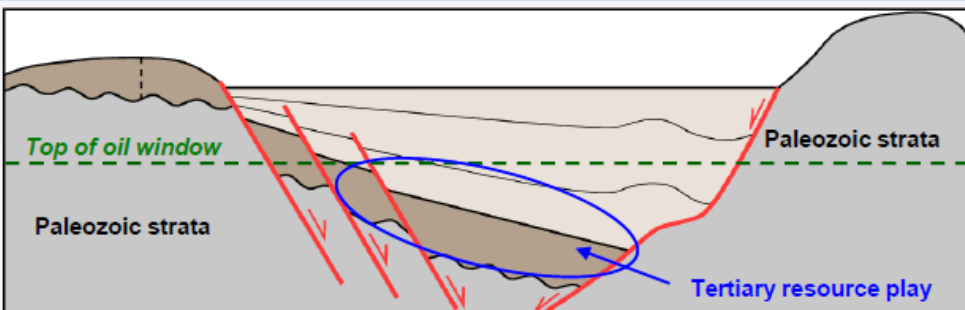
- Targeting Tertiary age lacustrine shale (Elko Formation) with play at depths between 6,000 – 12,000 ft
- Unconventional tight oil prospect
- 4 Wells drilled to date, 3 hydraulically fractured

## Results:

- Hydrocarbon saturation up to 70%
- Thermal maturity in peak oil generation window
- Total organic content 1-24%
- 2 wells recorded oil production

## Looking Forward:

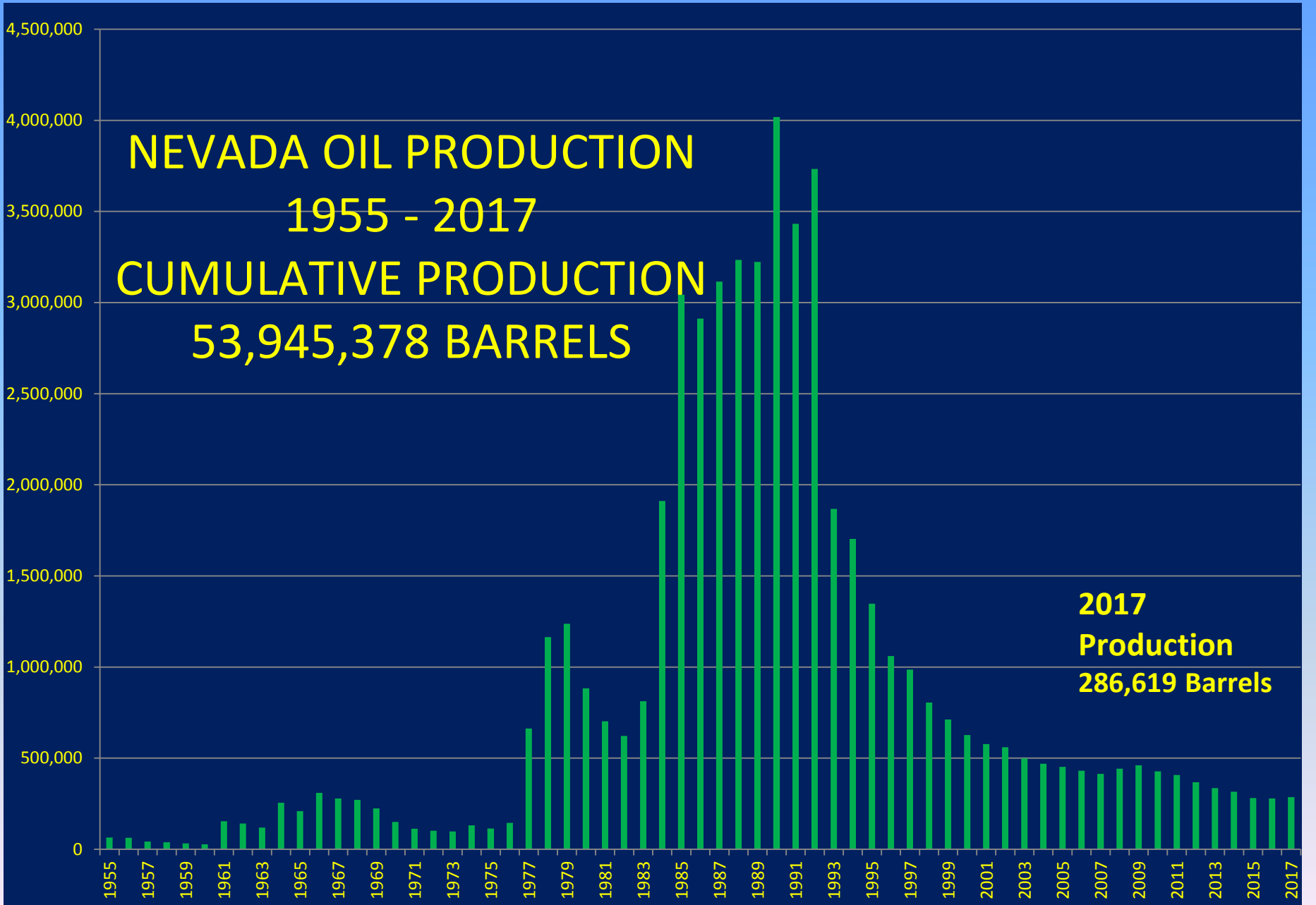
- Complete Analysis of data from wells
- Design Completion and conduct production tests
- Evaluate horizontal vs. vertical approach



# NOBLE ENERGY HUNTINGTON K1L-1V PRODUCTION WELL NEAR JIGGS, NV. T.D. = 9,692'



# NEVADA OIL PRODUCTION 1955 - 2017 CUMULATIVE PRODUCTION 53,945,378 BARRELS

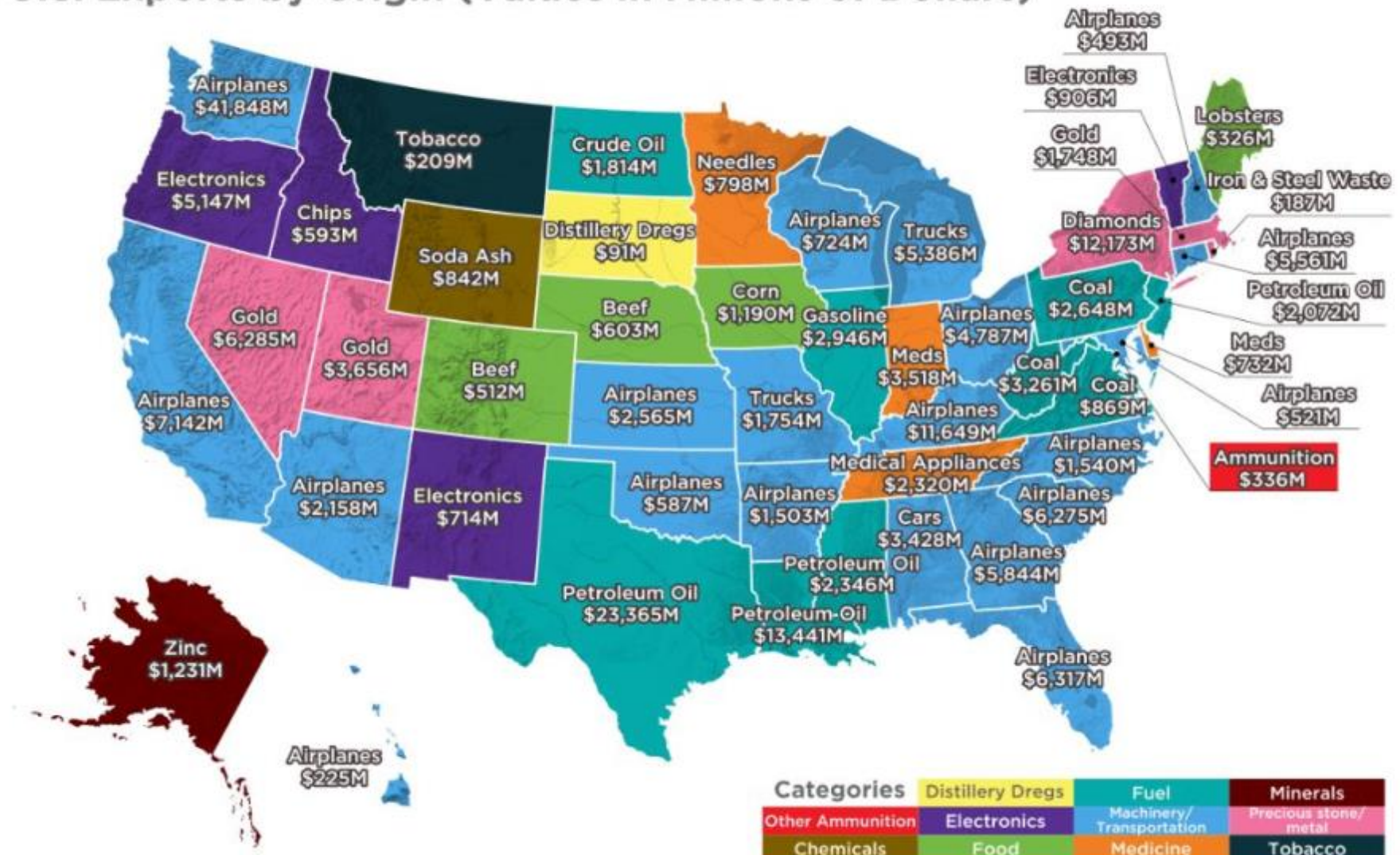


**2017  
Production  
286,619 Barrels**



# The Biggest Export From Every State in 2017

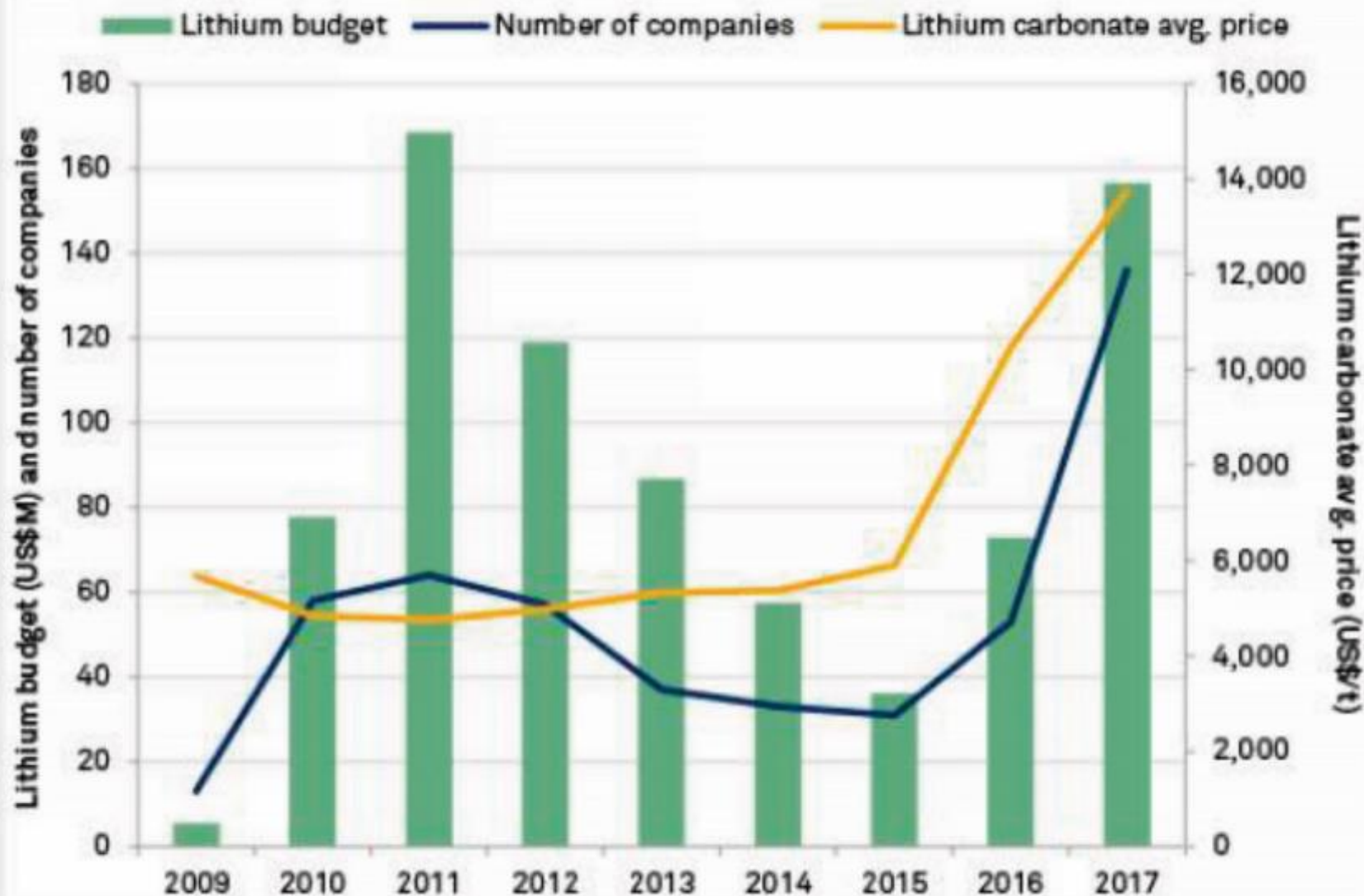
U.S. Exports by Origin (Values in Millions of Dollars)



Article & Sources:  
<https://howmuch.net/articles/biggest-export-from-each-state>  
<https://www.census.gov/foreign-trade/statistics/state/data/index.html>

# Not Just Gold: Worldwide Lithium Exploration Boom

## Lithium exploration budgets, 2009-2017



Data as of Oct. 30, 2017.

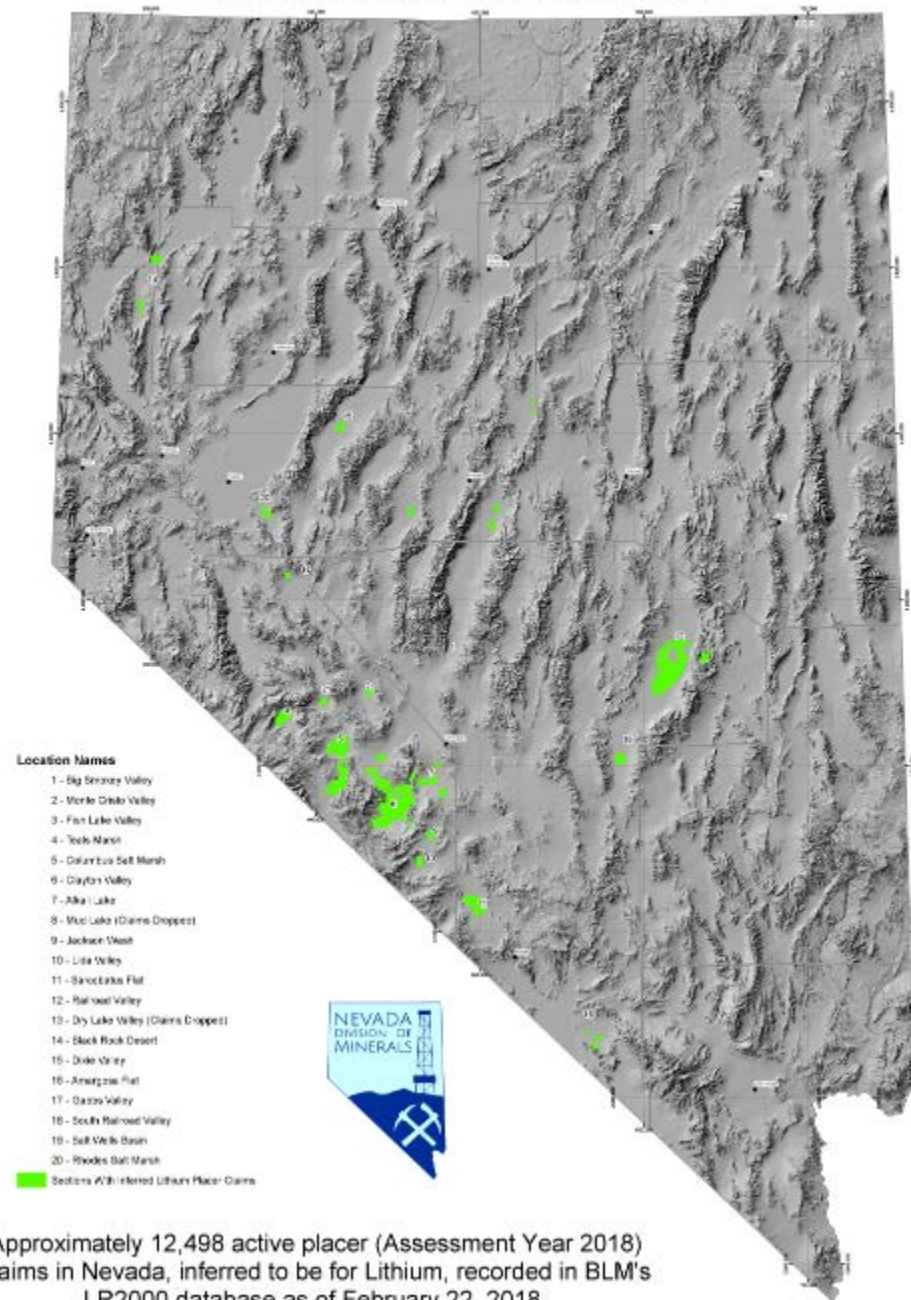
Source: S&P Global Market Intelligence

# LITHIUM EXPLORATION ACTIVITY IN NEVADA

- Lithium targets:
  - **Brines**: in playas, locatable on Federal land with placer claims
  - **Clays**: sediment-hosted, locatable on Federal lands with lode claims.

## Inferred Active Lithium Placer Claims in Nevada

Map Produced by: Lucia M. Patterson, Nevada Division of Minerals



Approximately 12,498 active placer (Assessment Year 2018) claims in Nevada, inferred to be for Lithium, recorded in BLM's LR2000 database as of February 22, 2018.

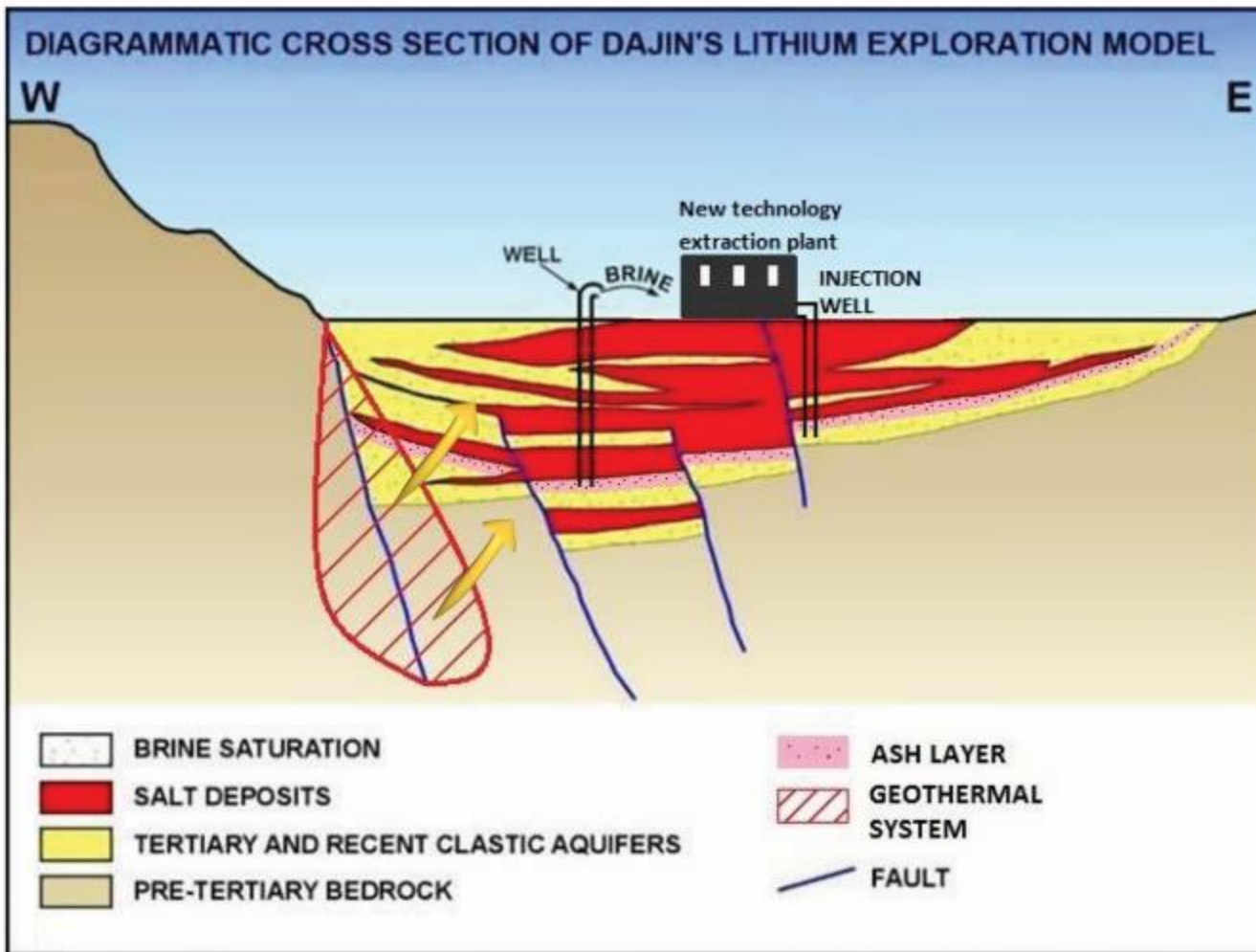
Claim density does not accurately reflect acreage claimed, due to association placer claims.

# Lithium Brine Production and Exploration in NV

- **Nevada has the only operating lithium mine in the U.S. – located in Clayton Valley, Esmeralda County**
  - Operated since 1967, employs 85 people
  - Produces lithium carbonate
  - Uses surface evaporation ponds to concentrate lithium pumped from brine aquifers in valley
- **Geologic Model for a lithium brine deposit:**
  - Salar deposits – a salt flat that may represent the basin of a salt lake
  - Accumulations of saline groundwater that are enriched in dissolved lithium.
  - Exploration by drilling and sampling of brine aquifers



# Dajin Resources: Brine Exploration Model



- Brines form in arid closed basins.
- Volcanism and geothermal waters important.
- Large diameters wells drilled.
- Brines with Lithium concentration pumped from the subsurface.
- Direct extraction technologies removes Lithium in under 24 hours.
- Spent brine is re-injected.

**FIRST DMRE WELL BEING DRILLED UNDER NEW REGULATIONS  
SIERRA LITHIUM, COLUMBUS SALT MARSH, ESMERALDA COUNTY**

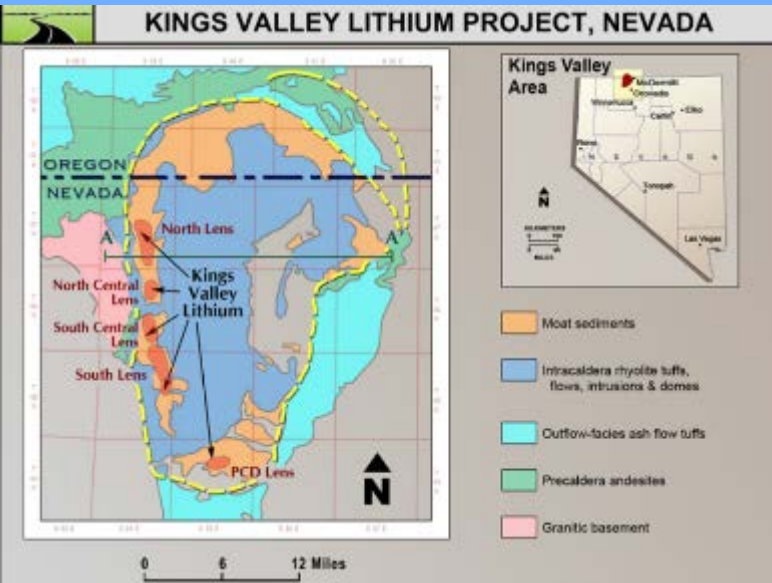


Photo taken March, 2018

# Lithium Americas: Kings Valley

100 km north-northwest of Winnemucca, NV and 40 km west-northwest of Orovada, NV

*Lithium/Organoclay Drilling Additive Supplier*



- **Hectorite clay deposit in the moat deposits of the McDermitt Caldera**
- **It is a near surface clay exposure that is right next to a major highway**
- **Hectorite is an effective additive to drilling muds and has emerged as the enabling mineral with thermal stability superior to bentonite clays to perform in challenging environments i.e. High Pressure & High Temperature**
- **Developing process to remove the Li from clay.**

**High Purity Hectorite Clay**



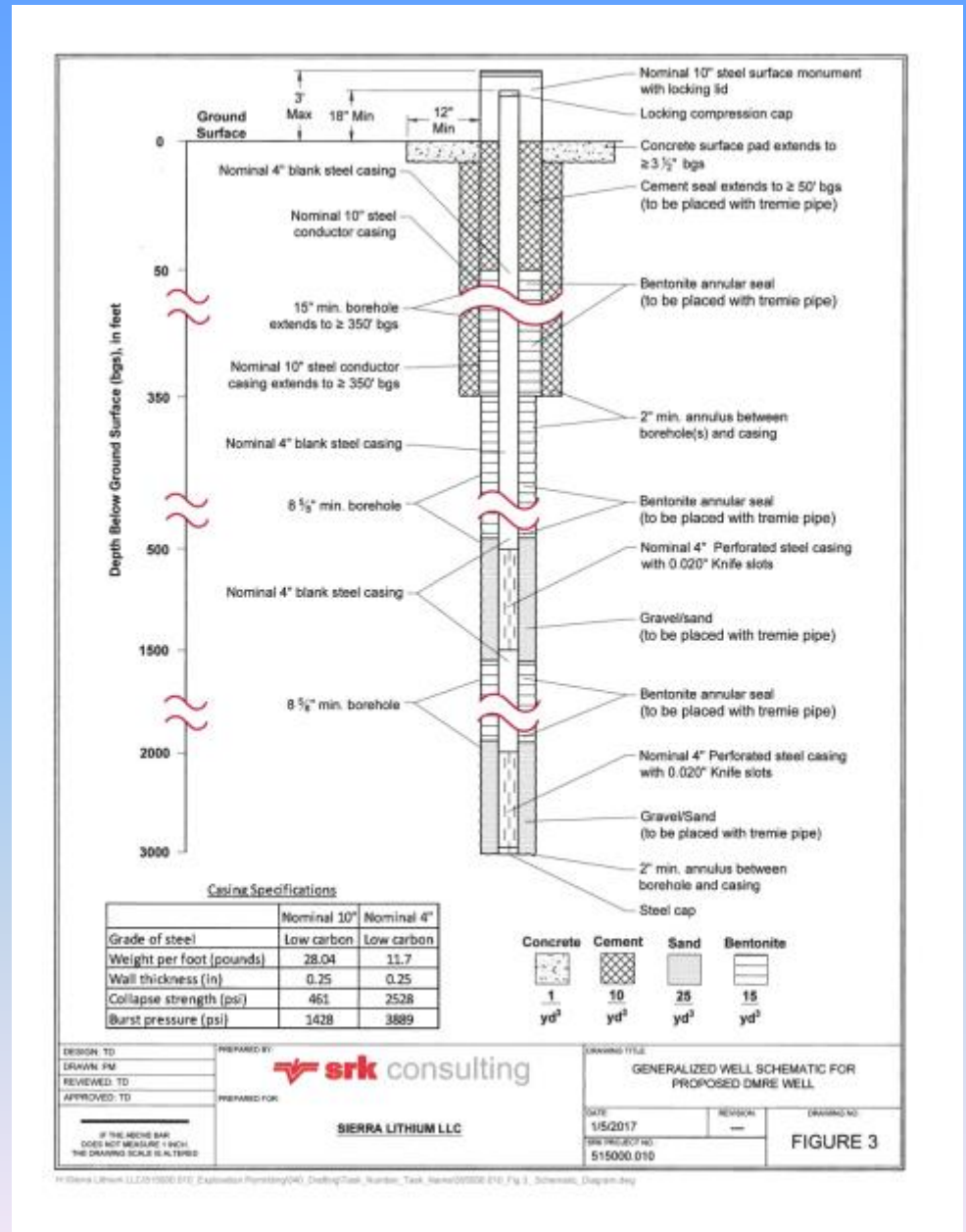
# Lithium in the 1872 Mining Law



- Is a locatable mineral on Federal land under the general Mining law
- Placer claims are used to locate potential lithium brine deposits
- Lode claims are used to locate potential lithium clay deposits

# DISSOLVED MINERAL RESOURCE EXPLORATION REGULATIONS

- A.B. 52 from 2017 session
- Will be Chapter 534B
- Addresses sampling of brines in exploration boreholes and wells
- Replaces NDWR MM well waivers
- NDEP, NDWR and NDOM jointly developed regs.
- Statute became effective 1/1/2018
- Regulations approved by Commission on Mineral Resources 4/27/18
- 5 DMRE wells have been issued permits



Nevada Division of Minerals Open Data Site

# Nevada Division of Minerals

Open Data Site





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

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## Pages


Visit one of our pages to view interactive maps and download data, view our site or any of the photos below and click on links for the options.

- 
[Informed Decision-Making: Done in Nevada](#)
- 
[Active Mining Claims in Nevada](#)
- 
[Nevada Public Lands Issues](#)
- 
[Visit Our Main Website](#)

## Dissolved Mineral Resource Exploration

To access the Oil, Gas, and Geothermal Resources and Groundwater Basins with High Temperature Gradients Map

[Click here](#)




## Upcoming Events/Meetings/Public Hearings:

Meetings, events, and public hearings are your opportunity to stay informed and to be heard. We strive to be an open and transparent organization for the mineral producer and exploration communities.

Upcoming:

- Sediment Society of Nevada Monthly Meetings
- Nevada Petroleum and Geothermal Society Monthly Meetings



The Commission on Mineral Resources Quarterly Hearing

## Contact Information (Questions/Comments/Suggestions)

[Impatterson@minerals.nv.gov](mailto:Impatterson@minerals.nv.gov)

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## About

- Get Involved in Open Data
- Documentation
- Share Your Own Comments

# NDOM Open Data Site

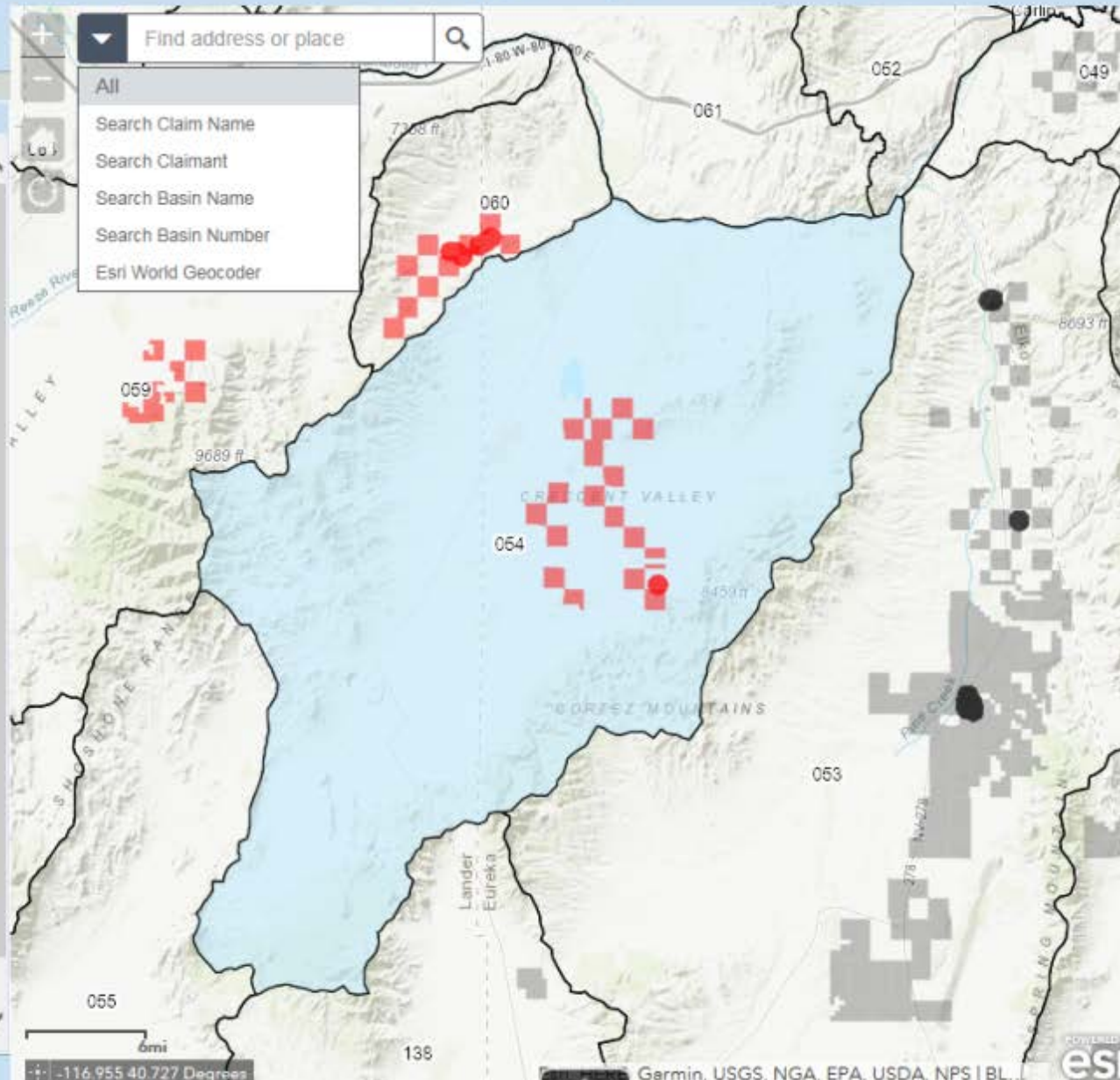
- Public interface data repository available for download or interactive viewing
- A practical response to high volumes of data requests and limited staff

# Oil, Gas, and Geothermal Resources and Groundwater Basins with High Temperature Gradients



## Layer List

- Operational layers
- "Area With Limitations" Active Geothermal Wells with 1/2 Mile Buffer (Data as of December 18, 2017)
- "Area With Limitations" Active Oil & Gas Wells with 1/2 Mile Buffer (Data as of December 18, 2017)
- "Area With Limitations" Active BLM Geothermal Leases (Data as of 11/15/2017)
- "Area With Limitations" Active BLM Oil & Gas Leases (Data as of 11/15/2017)
- Lithium Placer Claim Points (LR2000 date as of 10/31/2017)
- Lithium Claims Per Section (LR2000 Data as of 10/31/2017)
- Count\_
- "Area With Limitations" Basins With High Temperature Gradient



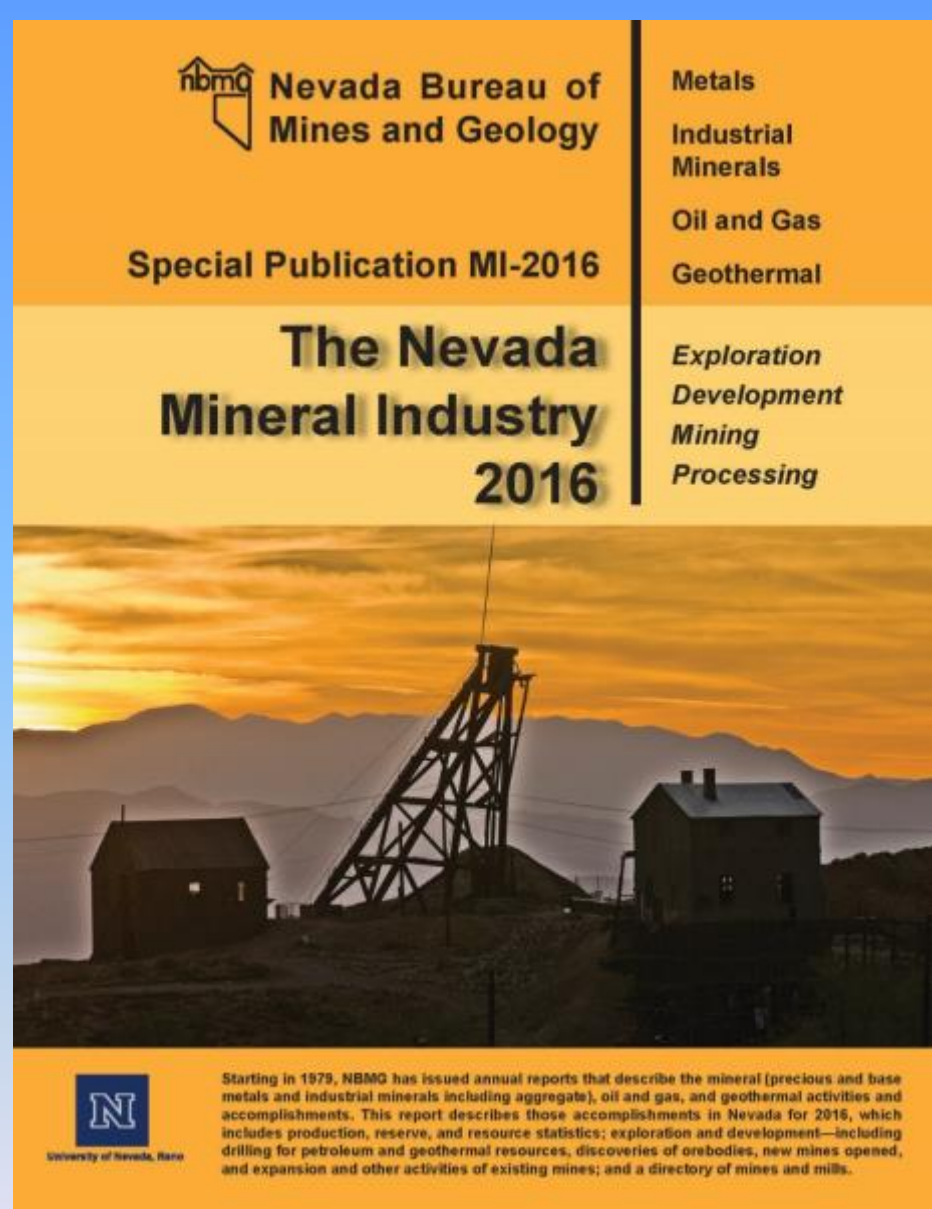
# NBMG Nevada Mineral Industry 2016 Report

John Muntean

Economic Geologist / Director  
of CREG

Nevada Bureau of  
Mines and Geology  
University of Nevada Reno

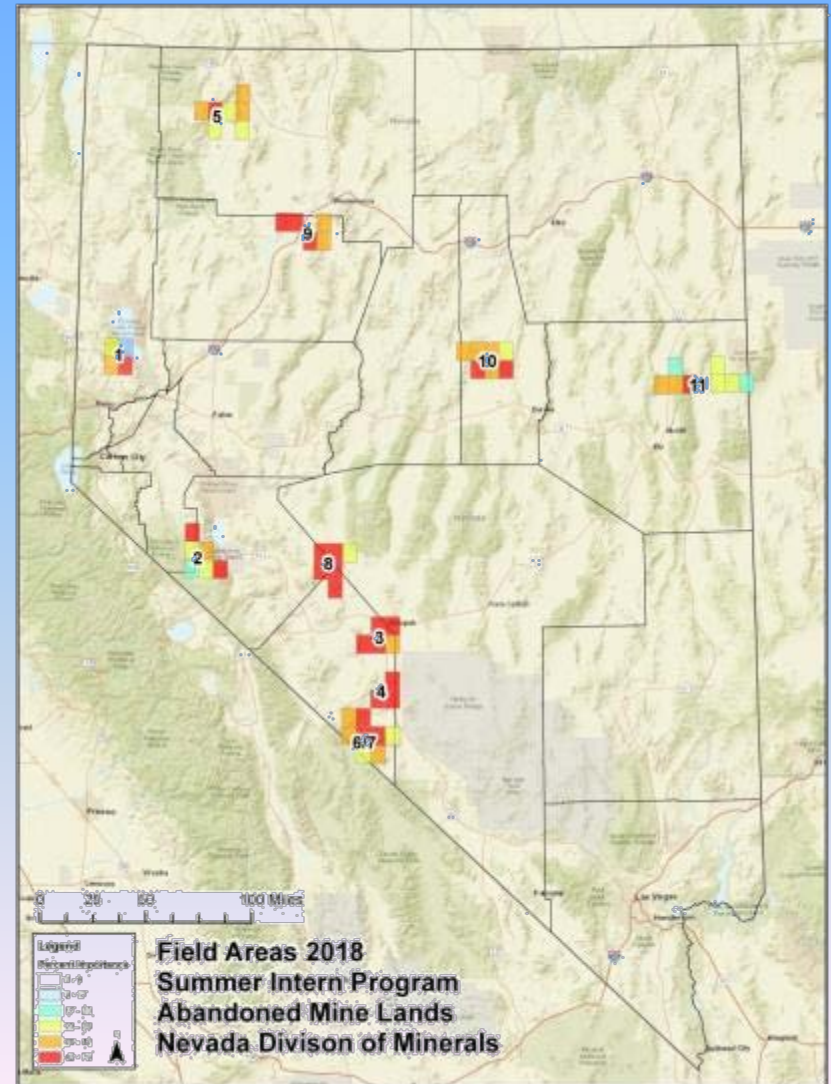
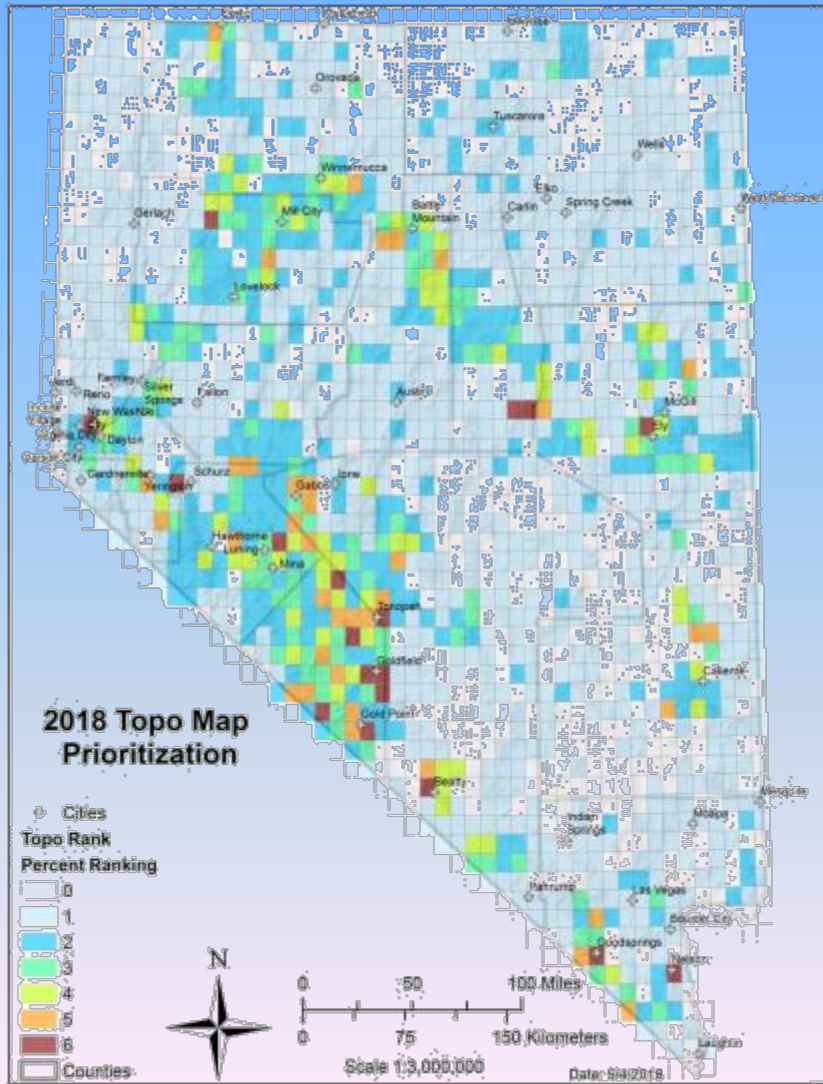
Presentation at the:  
**Nevada Commission on  
Mineral Resources Meeting**  
February 20<sup>th</sup>, 2018



University of Nevada, Reno



# AML Program - 2018 Ranking



# Hard Closure Projects - 210 closures in 2017

- **Backfills**



- **Bat Compatible Closures**



- **Polyurethane Foam Plugs**



# 2017 Emergency Closures

## Carnation

- A Jeep was parked on the road when the back right tire collapsed into a “ballroom” style working below and almost took the Jeep with it
- Hazard was fenced and road closed the following day after being reported
- 14 hazards in the immediate area were closed, including five wildlife compatible closures, for \$46,038.68



## Monte Cristo

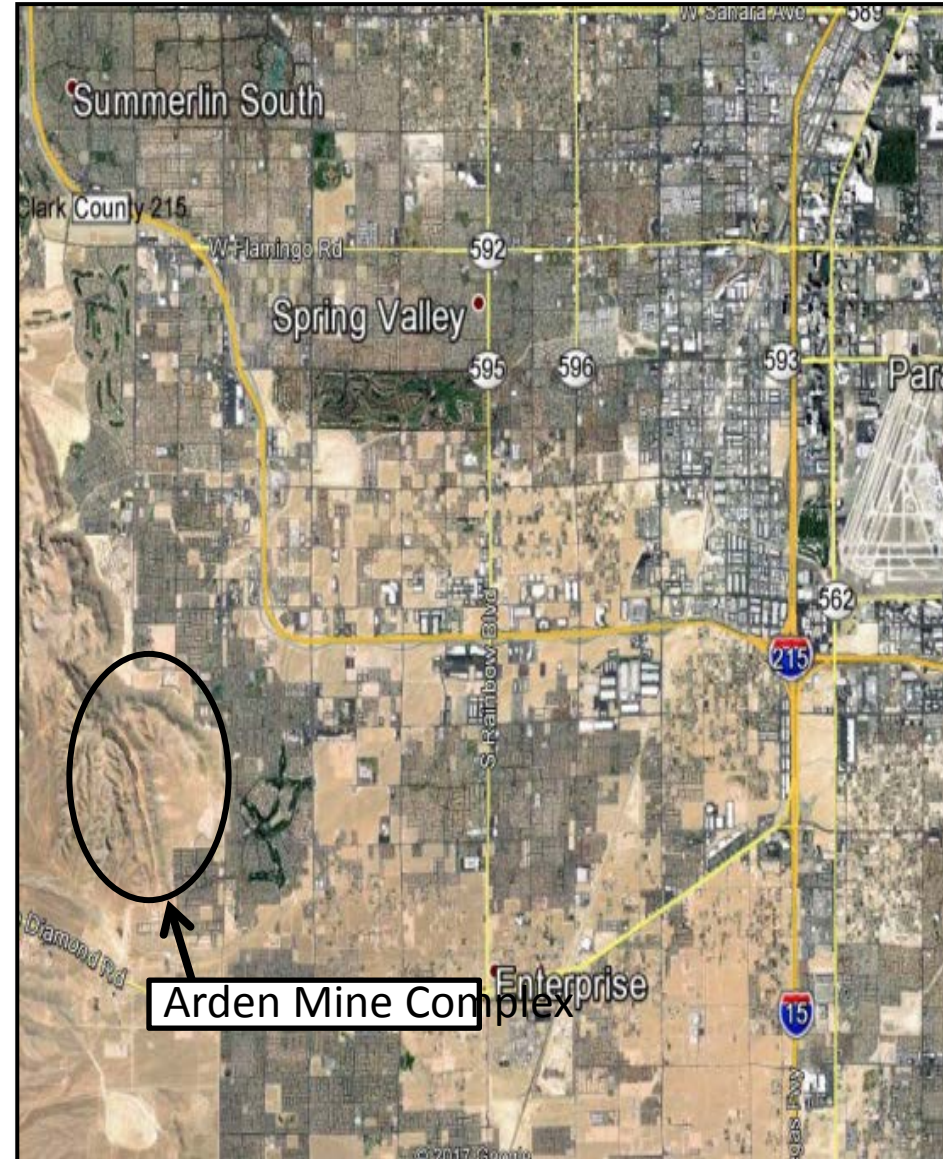
- A collapse of a “ballroom” style working along a the Virginia City Grand Prix race route.
- NDOM staff and County Firefighter constructed a fence the same day it was reported.
- Site was backfilled for \$3,000



# Arden Mine Closure Project – Clark County

Las Vegas 1984

Las Vegas 2017



# Arden Mine Closure, East Knob area, April 2018



# Arden Mine Closure, Ridge Area, April, 2018



# Arden Mine Closure, East knob final slope, April 2018

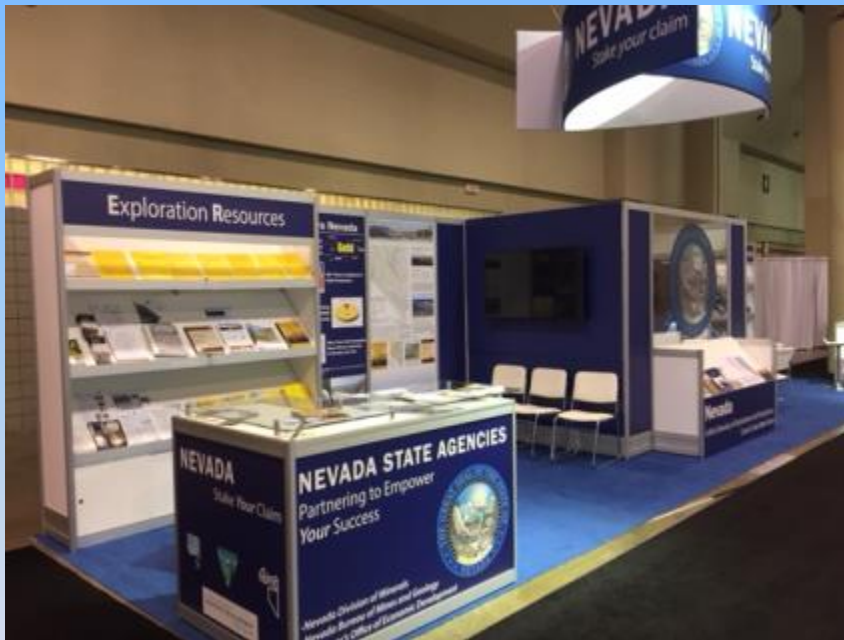


Cooperative effort between Clark County and the NDOM

# NEVADA PDAC REPRESENTATION

March 4-7, 2018

First time Nevada had a State-funded presence.



A Collaborative effort between GOED, NDOM, NBMG, BLM, NMA, NMEC, GSN





State of Nevada  
Commission on Mineral Resources  
**Division of Minerals**



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Mining: Dissolved mineral exploration drilling in Esmeralda County.



### Current Information

- [Dissolved Mineral Resources permitting page](#)
- [2017 Nevada Excellence in Mine Reclamation Award](#)
- [2015/2016 NV Mineral and Energy Resource Exploration Survey \(NBMG\)](#)
- [Recent Presentations](#)
- [Information Related to Proposed Land Use Plans and Withdrawals](#)

### Public Workshop(s) and Hearings(s)

- [Commission on Mineral Resources, May 17, 2018, 1:00pm](#)
- [Dissolved Mineral Resources Exploration \(DMRE\) - Response to Summary Comments on Proposed Regulations, April 25, 2018](#)

### Employment Announcement(s)

- [Mining Industry Specialist, Governor's Office of Economic Development](#)
- [How To Apply for a State Job](#)

### Education Workshop(s)

- [34th Annual Northern Nevada Earth Science Education Workshop 2018](#)
  - [July 17 and 18, 2018](#)
  - [Tentative Location: Wooster High School, Reno, Nevada.](#)
  - [Register at:](#)
    - [Direct Link: \(Website Registration URL Pending\)](#)