

# Lithium Deposits of Nevada

## Brine vs. Clay

**2025 Mine Water  
Management Symposium**

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**Rob Ghiglieri  
Administrator**

January 27, 2025

**Minerals.nv.gov**

Photo: Rhyolite Ridge, by Michael Darin



# Nevada's Mining

>170 Years of Mining History

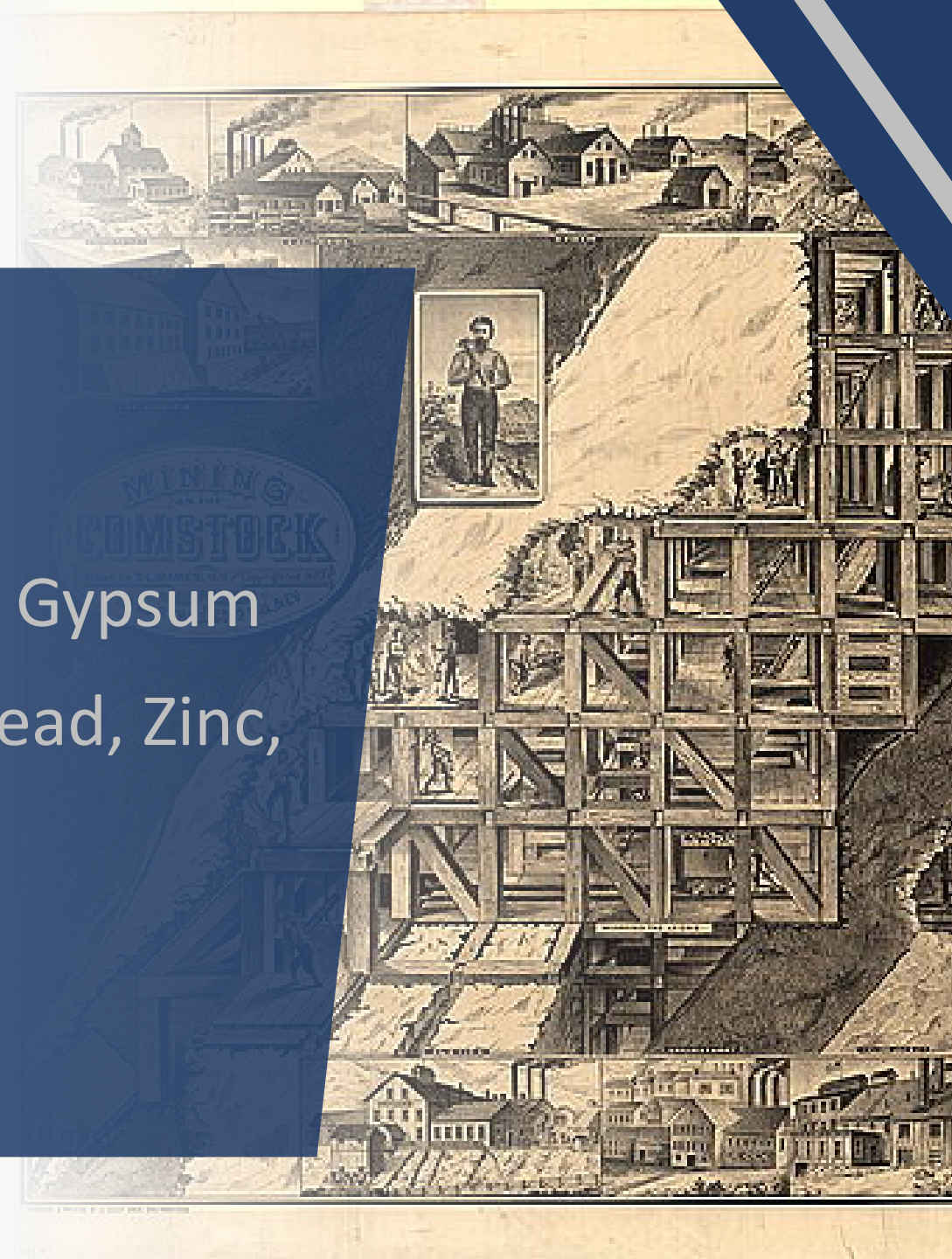
Current or Past Production of:

Gold, Silver, Copper, Lithium, Barite, Gypsum

Clays, Limestone, Magnesite, Iron, Lead, Zinc,  
and many more

Stable Permitting Environment

World Renown Mineral Endowment



FINAL REPORT

SEPTEMBER 2023

# Recommendations to Improve Mining on Public Lands

Developed by the Biden-Harris Administration's  
Interagency Working Group on Mining Laws,  
Regulations, and Permitting

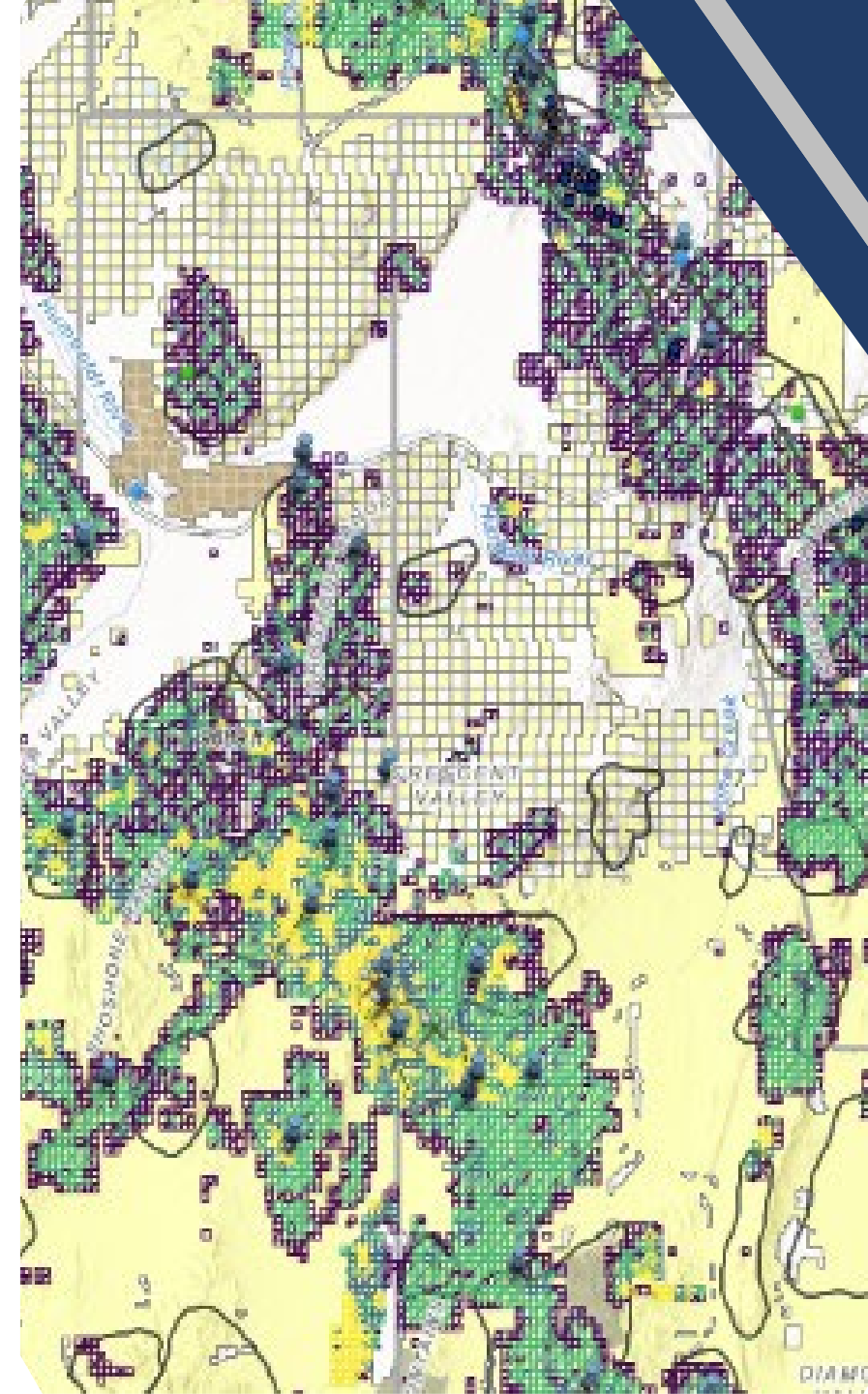


“Update and  
adopt the BLM-  
NV permitting  
process model  
as standard  
operating  
procedure  
nationwide”



# Nevada Commission on Mineral Resources - Division of Minerals

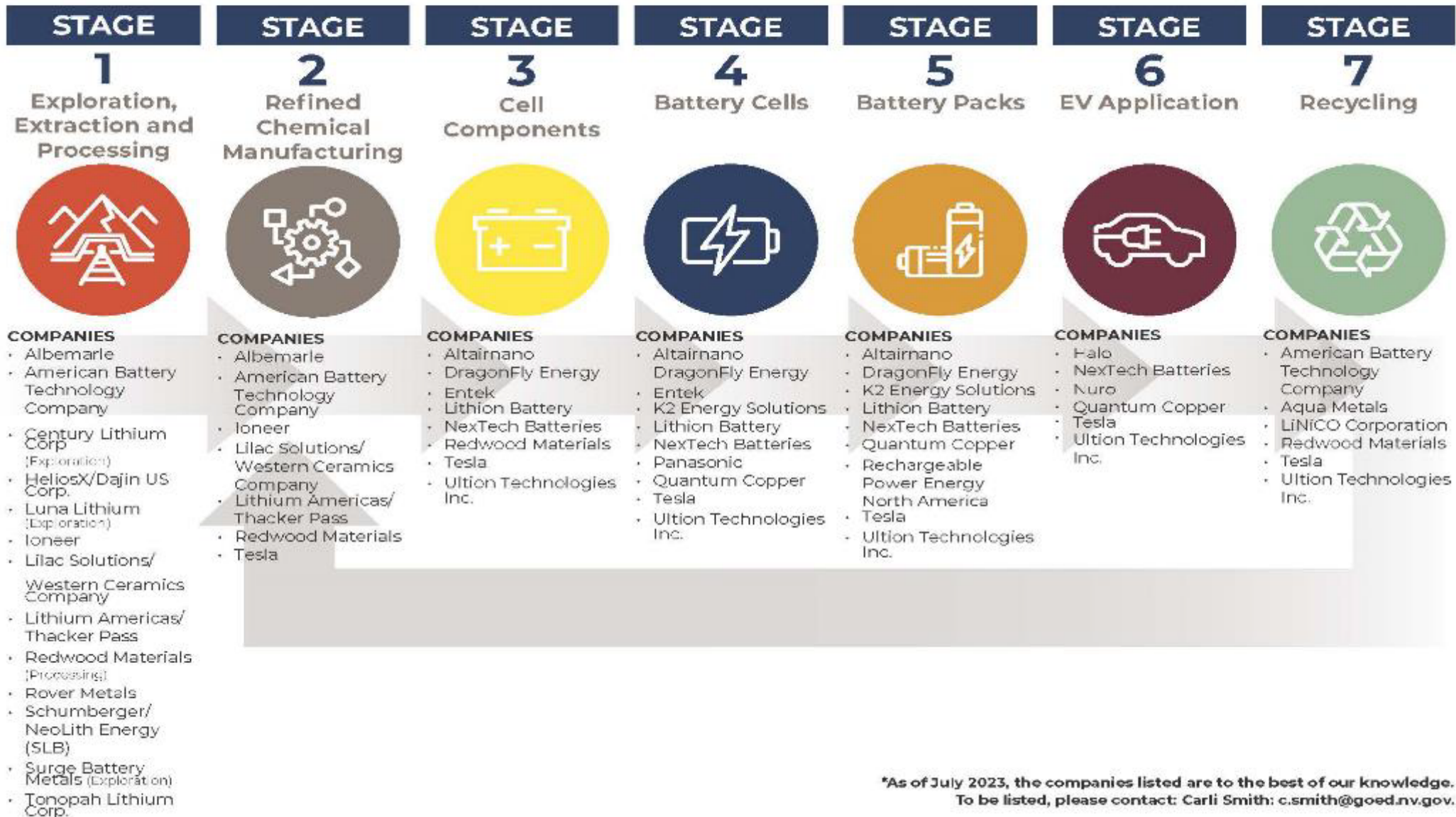
- NRS 513.073 requires the Division to collect and disseminate mineral production and educational materials.
- The Division and Commission are a resource to the Governor and Legislature on mineral related activities
- The Division does not pick or preference any company or project over another, rather only provide publicly available data
- The Division does not give preference or recommend any company over another in this presentation and acknowledges that this presentation has not included all exploration companies in Nevada.





# NEVADA

## Lithium Capital of North America



\*As of July 2023, the companies listed are to the best of our knowledge. To be listed, please contact: Carli Smith: c.smith@goed.nv.gov.



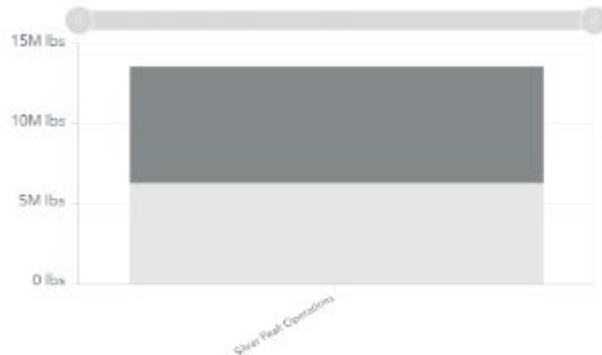
# Nevada's Lithium - 2023

Year over Year Change, gauge shows change in production values from previous year.



YOY change for Lithium Carbonate Shipped Amounts

Production by Operator



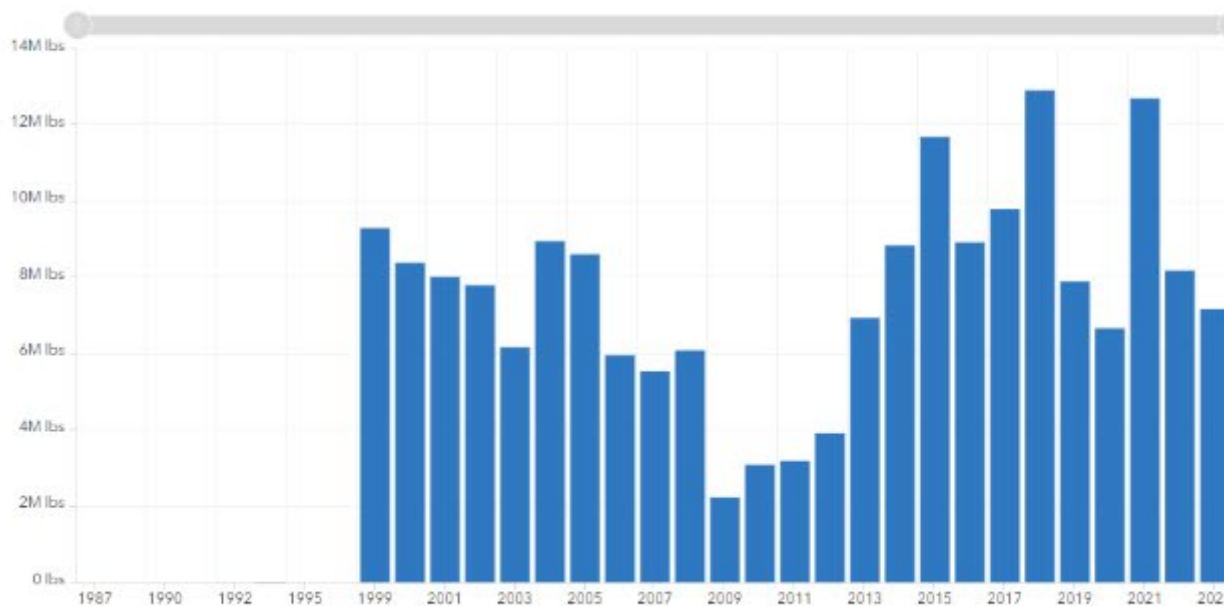
Production by Operator (serial chart)

## Lithium Carbonate Produced (lbs)

# 6,397,171

Produced | Shipped

Lithium Carbonate Shipped / Year



Map | Li2CO3/Year

Silver Peak Operations

Op. List | Op. Details

Count of Distinct Company Names

# 1

Count of Mining Operations

# 1



# Nevada's Lithium

**Only** Lithium producer in United States

**Largest** lithium Mine in North America under development

**One** late-stage exploration project with completed permitting

Estimated >**117 Million** Metric Tons of lithium in resources already discovered



*Photo provided by Lithium Americas*

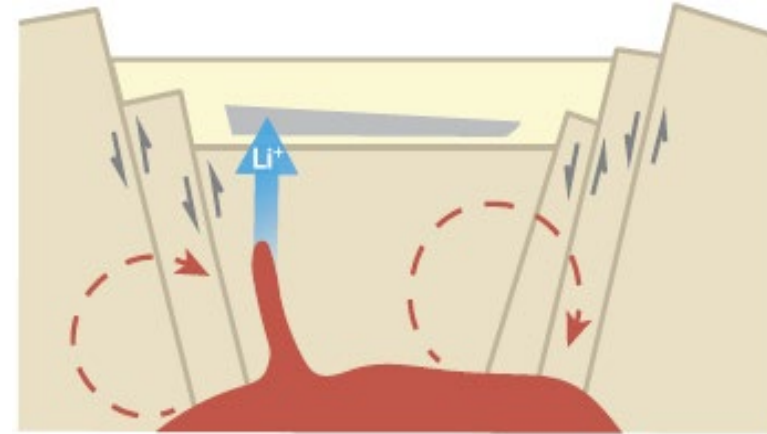


# Lithium Deposits

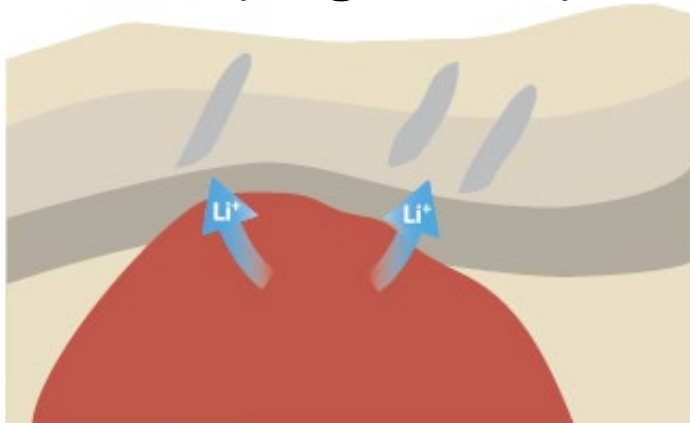
- Salar (Brine)



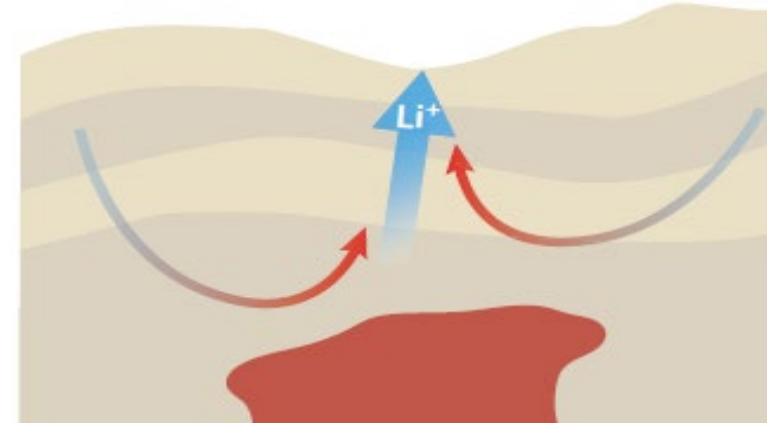
- Clay or Sediment



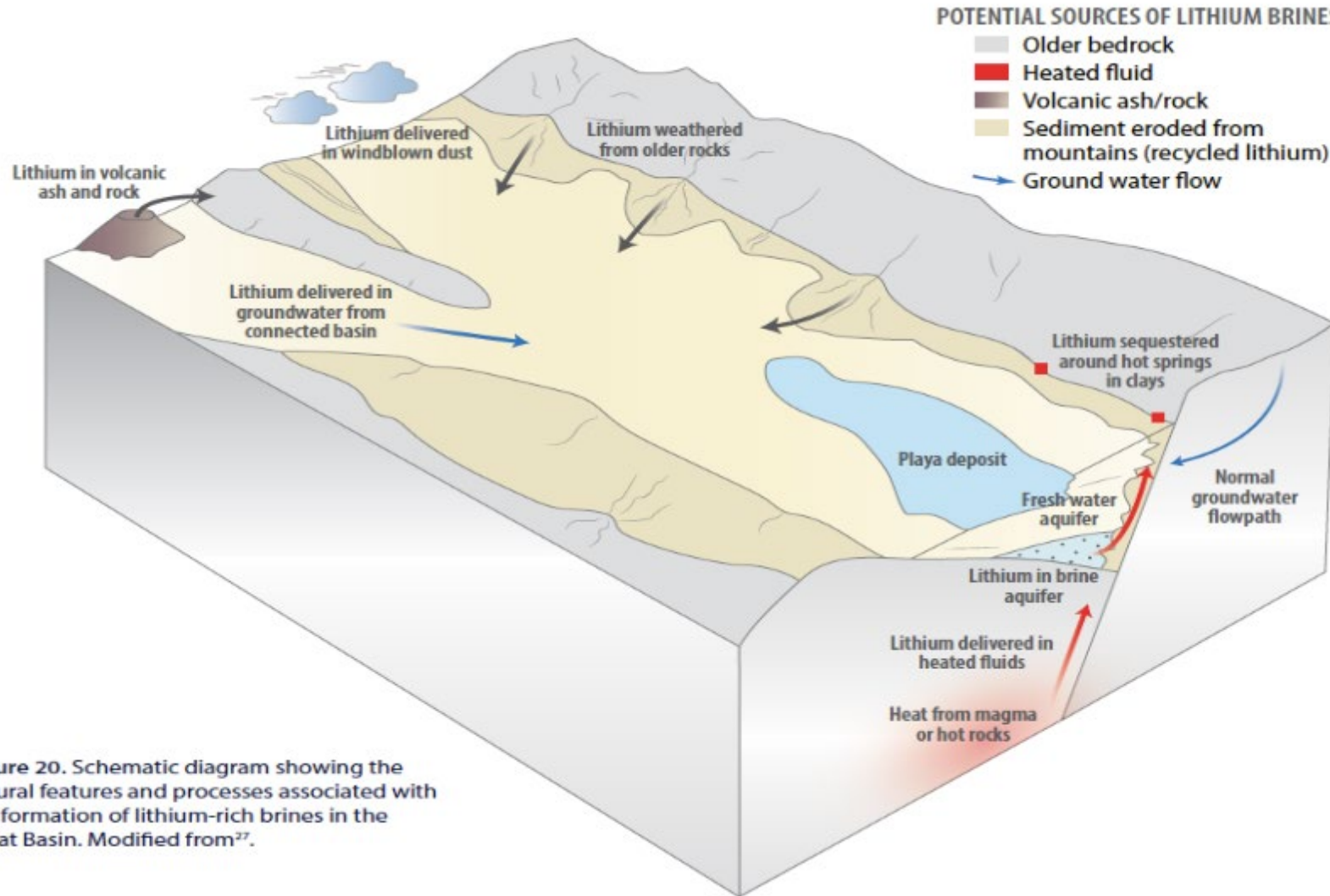
- Hardrock (Pegmatite)



- Geothermal/Oilfield Brines



# Brine Deposits



# The Challenge to Lithium Brine Exploration in Nevada

- Lithium is locatable mineral under the Mining Law
- Water belongs to the State of Nevada and the State Engineer regulates quantity and beneficial use.
- To pump and test for lithium in brine you need a water right, which is not a quick process and is subject to appeal.
- Some lithium brine projects are located on top of active oil and geothermal leases.
- NRS 534B was passed in 2018 establishing an updated path for safe exploration of lithium brine with limited water.





# NRS 534B Dissolved Mineral Resources Exploration

- Defines a dissolve mineral exploration borehole, well, and project
- Allows for sampling of water in exploration boreholes
- DMRE approved well permits expire after 2 years, can be extended for 2 more years
- Requires a Nevada licensed water well driller to drill DMRE boreholes and wells
- Well design approval required: casing, seals, etc.
  - Very similar to those for NDWR
- Well permits not retroactive to existing MM waivers or existing permitted rights issued by NDWR
- Plugging logs signed by licensed water well driller to be submitted for all boreholes and wells



# NRS 534B

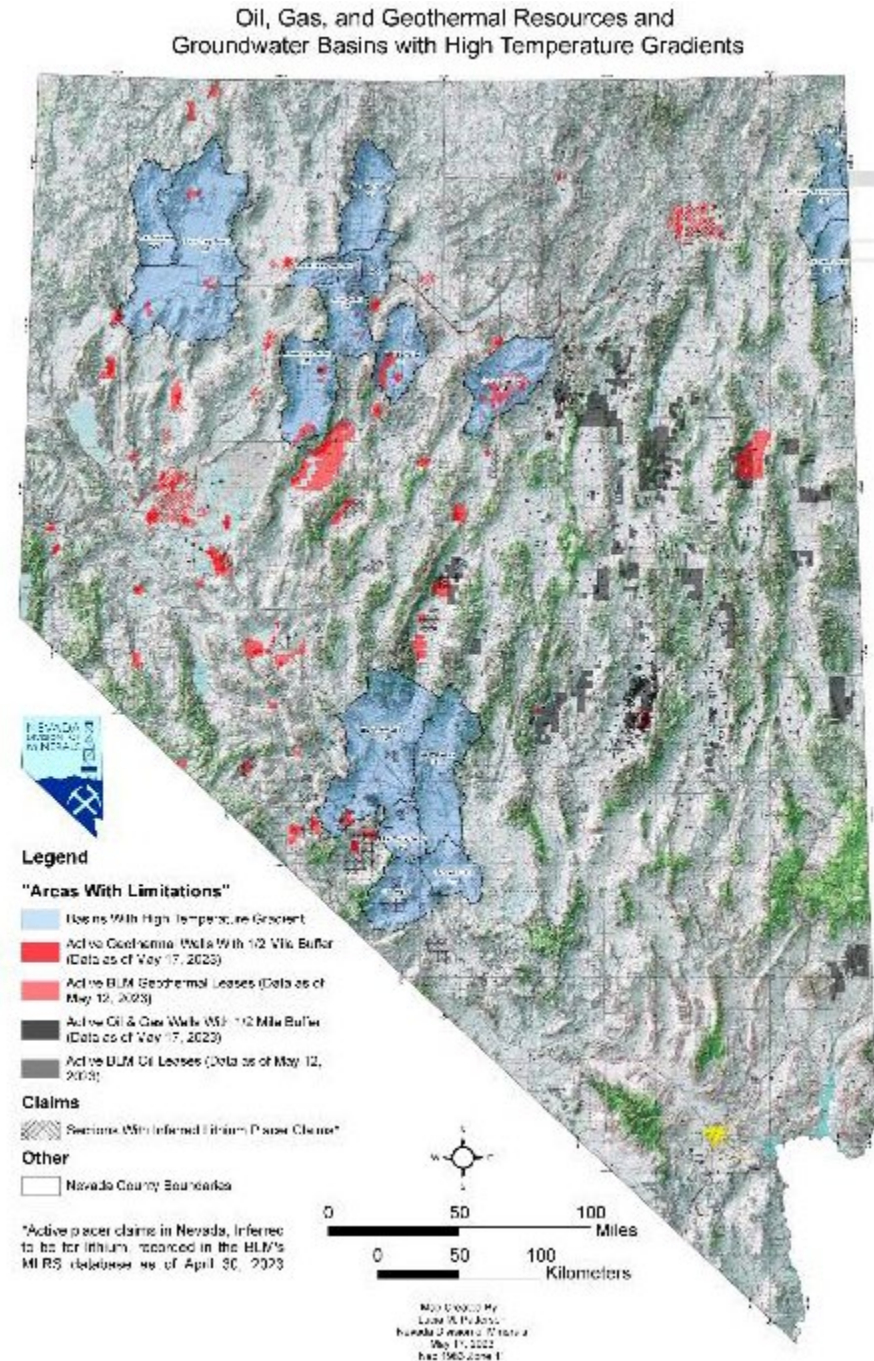
- Allows for up to 5 acre-feet of water to be pumped for testing per project (not annually)
- All permits are provided to NDWR for input before approval
- > 5 acre-feet requires a water right from NDWR
- Must comply with NRS 445A for discharges during pump tests
- Does not change the appropriation procedures in NRS/NAC 533, 534
- Reclamation bonding required
- A penalty can be assessed for a violation and for each day violation continues



# NRS 534B

## Areas of Limitations

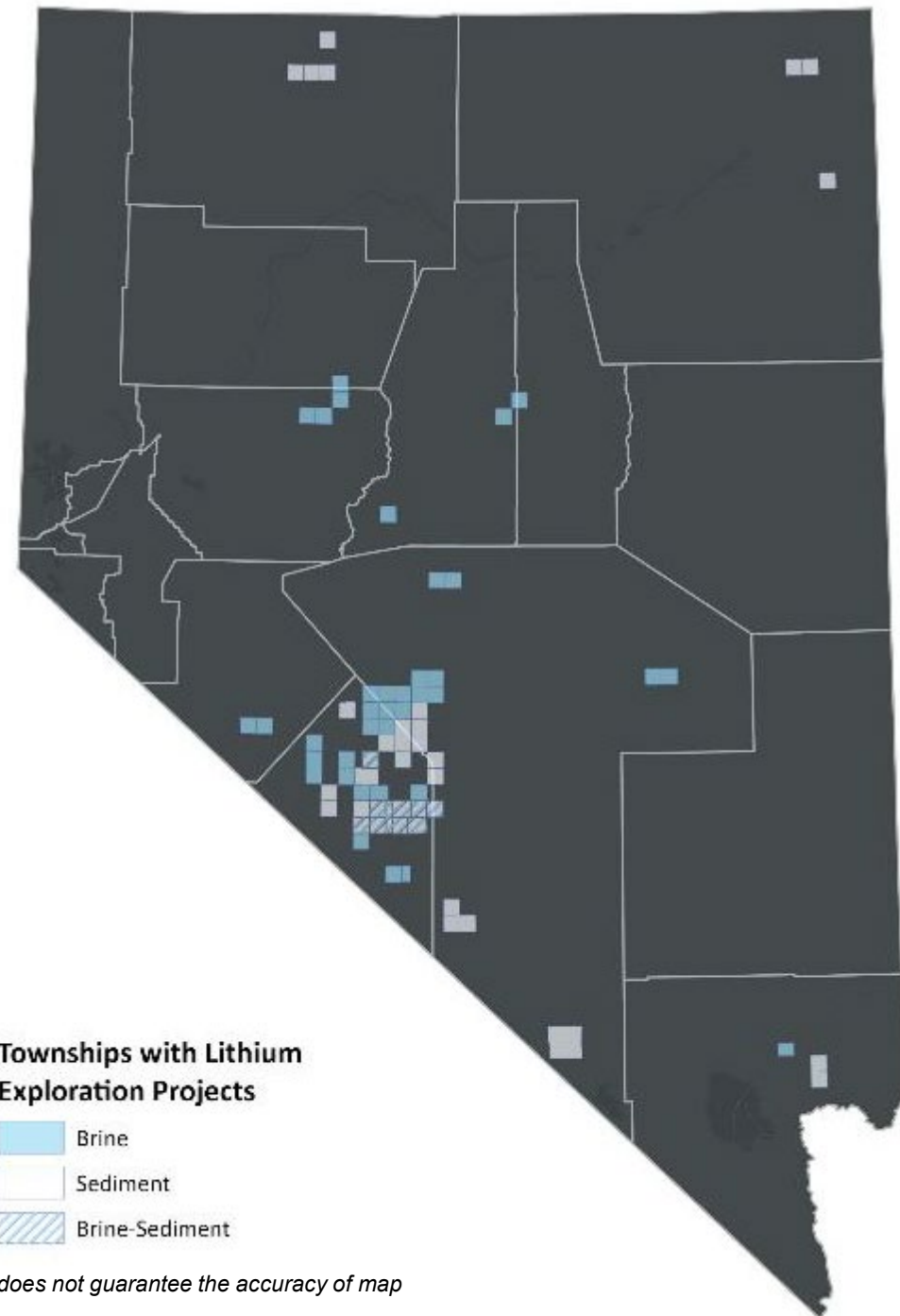
- Regulatory mechanism for additional review to ensure proposed DMRE activity is safe and doesn't impact permitted oil, gas, and geothermal (OGG) wells and resources
- Uses map published on NDOM website depicting:
  - NDOM-permitted OGG wells
  - Federally-authorized oil, gas, and geothermal leases
  - Groundwater basins having increased thermal gradient
- Depth limitations and BOP requirements
- Monitoring of drilling mud temperatures



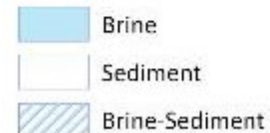


# Nevada Exploration

1074654 Nevada Corp	Intor Resources Corporation	Playa Minerals Co
3 Pl Operating Inc	Ioneer Usa Corporation	Powr Lithium Corp.
Albemarle Us Inc	Ionic Minerals (Bonaventure	Pure Energy Minerals Ltd
Altitude Lithium Usa Corp	Last Basin LLC	Rangefront Consulting LLC
American Battery Technology Company	Lithic Lithium LLC	Rangefront Mining Services
American Lithium Corp	Lithium Holdings Nevada LLC	Red Mountain Mining Company
Authium LLC	Lithium Nevada Corp	Rover Metals (Usa) Inc
Battery Mineral Resources Nevada Inc	Lithiumore Corp	Rubicon Explorer Corporation
Belmont Nevada Inc	Logan Resources Usa Inc	Schlumberger Technology Corporation
Bonaventure Nevada Inc	Lone Mountain Resources, LLC	Scotch Creek Ventures Nevada, Inc
Bronco Creek Exploration Inc	Mathers Lithium Corp	Sienna Resources (Us) Corp
Centerstone Resources LLC	Ml Nevada Corp	Sierra Lithium LLC
Cosmo E&P Usa Inc.	Morella Minerals Corporation	Stone Brothers Inc.
Cruz Battery Metals	Needles Holdings Inc	Surge Battery Metals Usa Inc
Cypress Holdings (Nevada) Ltd	Neolith Energy	Ultra Lithium Usa Inc
Dome Rock Resources, LLC	Nevada Lithium Exploration Inc	Us Energy Metals Corp
Fort Cady California Corp	Nevada Alaska Mining	Usha Resources Ltd.
Geoxplor Corp.	Nevada Li Corp	Waterleaf Minerals, LLC (WML)
Great Basin Resources Inc	Nevlith LLC	WC1 Nevada Lithium
Green Energy Resources Inc	Origin Minerals Exploration, LLC	Zanskar Geothermal & Minerals, Inc
Grid Battery Metals Usa Inc	Ormat Mineral LLC	
Halo Lithium LLC	Paradigm Minerals Usa Corp	
	Pilot Peak, LLC (Ppl)	



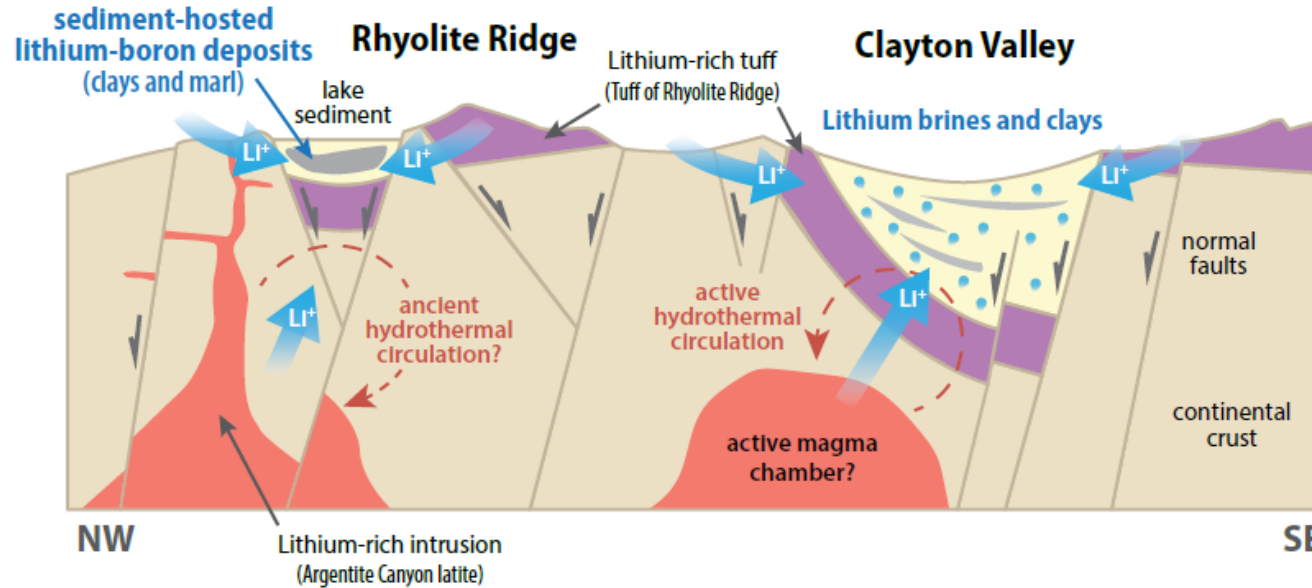
## Townships with Lithium Exploration Projects



Source: List of companies and map locations were derived by use of the BLM's MLRS database. The Division of Minerals does not guarantee the accuracy of map locations or if all companies looking for lithium were captured or if all companies listed are currently active

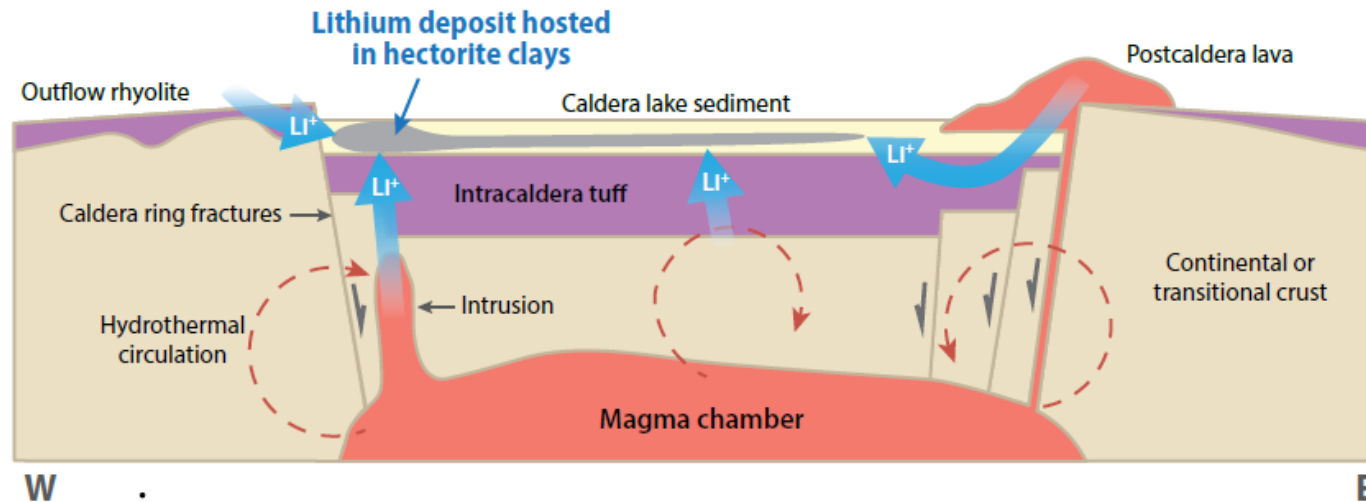
# Nevada Clay Deposits

## Tectonic (non-caldera) lithium basins



## Caldera-hosted lithium basins

### McDermitt caldera



Source: Jowitt, S.M., Henry, C.D., Crespo Mena, J., Lindsey, C.R., Darin, M.H., Saftner, D.M., Heintz, K.M., and Hershey, R.L., 2024, *Lithium in Nevada—origins, extent, role in the energy transition, and implications for economic development and national security: Nevada Bureau of Mines and Geology Special Publication 40*, 48 p



# Clay Processing Technology



Photo from Lithium Americas Website

## Lithium Americas

- Sulfuric acid plant with thickening, filtration, and centrifuge to crystallization
- Onsite energy production
- Battery Grade Lithium Carbonate

## Ioneer

- Sulfuric acid plant with vat leaching process then evaporation and crystallization phased process and filtering
- Onsite energy production – no grid connection

## ABTC

- Selective leach extraction (SLE) and novel purification technologies

## Nevada Lithium

- Borehole mining at depth



# SLB's Direct Lithium Extraction (DLE)

September 10, 2024, SLB Press Release:

- Produced lithium from DLE at scale
- “The proprietary integrated solution.... ..produces lithium 500 times faster than conventional methods while using only 10 percent of the land. Operating at approximately one tenth the size of a commercial-scale facility, the plant reached a verified recovery rate<sup>1</sup> of 96% lithium from brine.”
- “The entire SLB solution, from extracting lithium from brine to converting it to lithium carbonate, takes just hours. Traditional evaporation methods can take up to 18 months and have a much lower recovery rate of 50 percent or less.”
- Uses resin that selectively absorbs lithium ions while rejecting most undesired ions
- Uses less water and returns the spent brine, or the brine with a reduced lithium concentration, back to its source after the lithium is processed and separated.

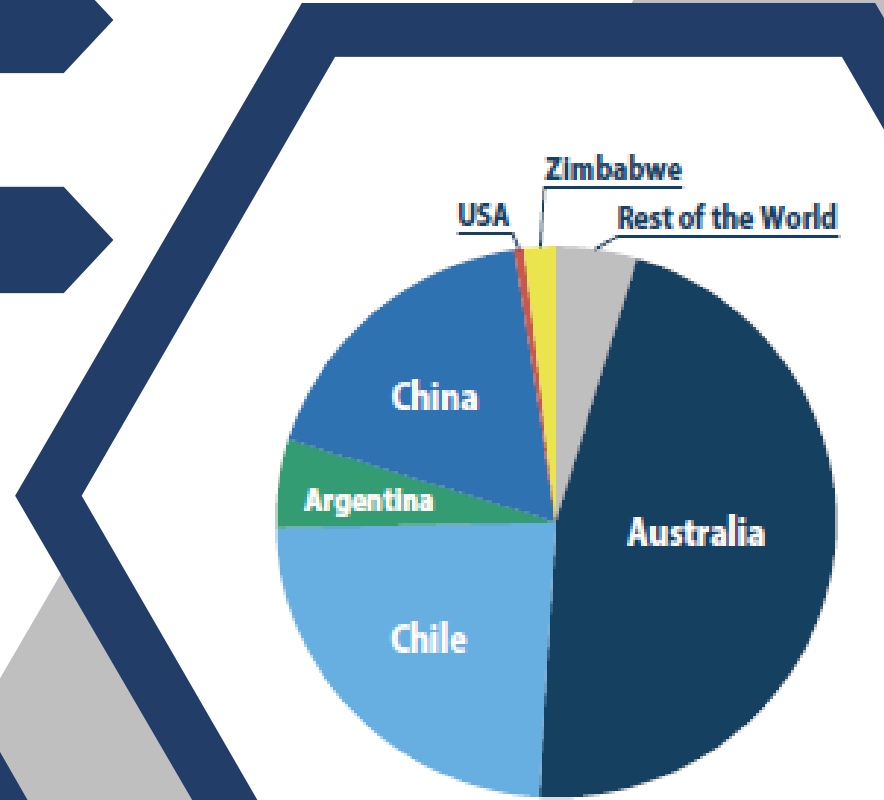
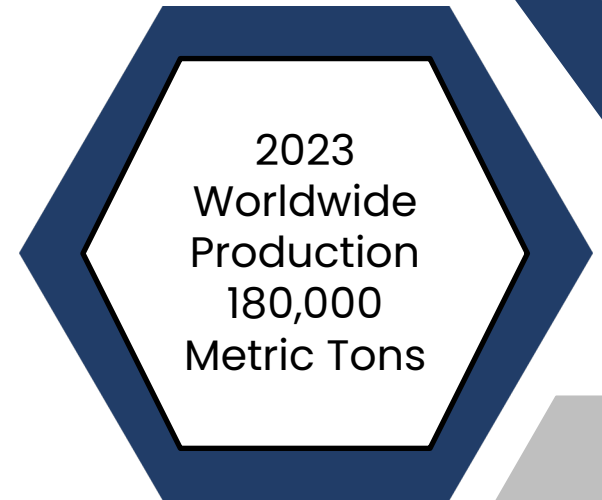
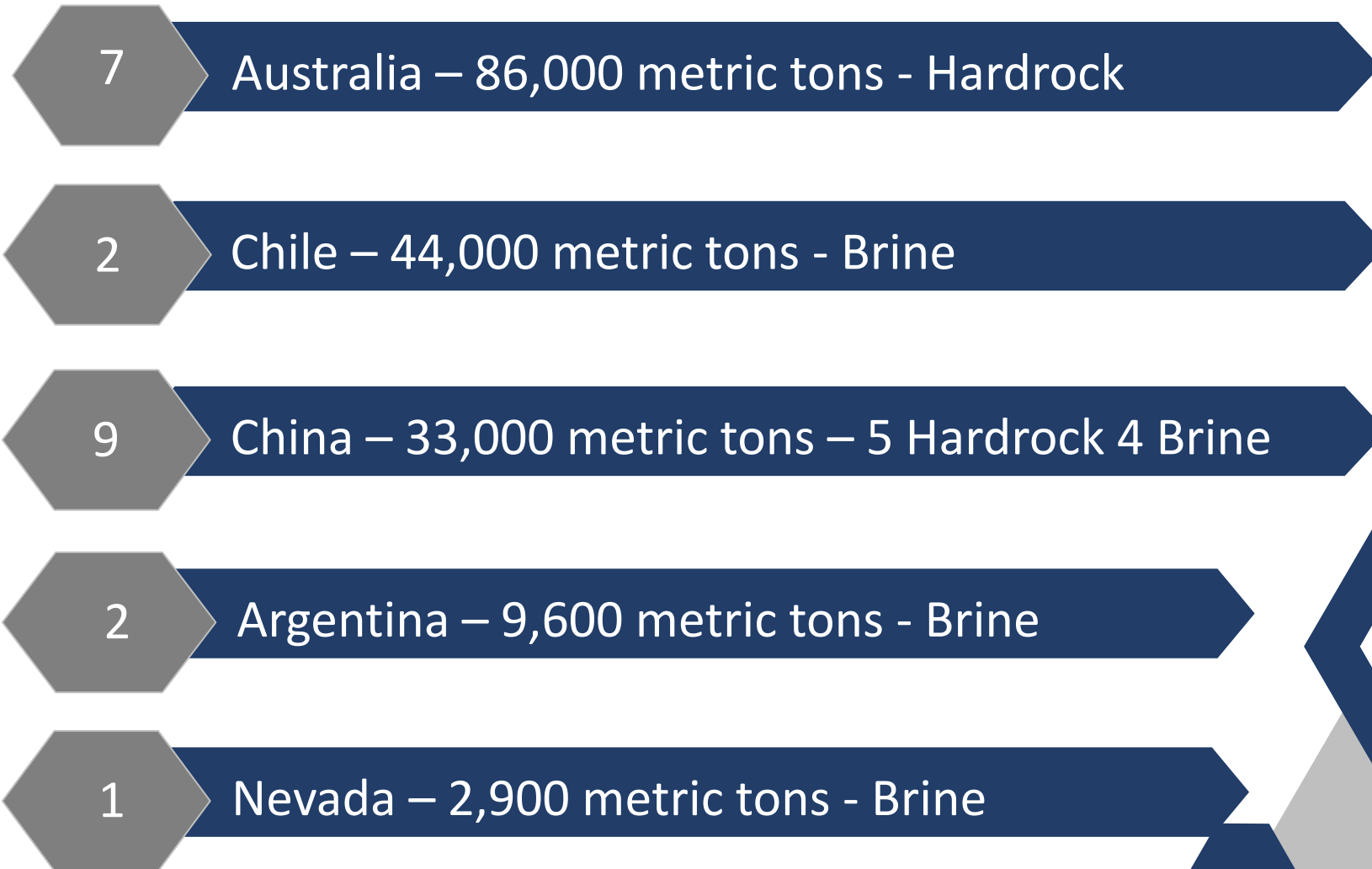


Photo from SLB Press Release: <https://investorcenter.slb.com/news-releases/news-release-details/slb-achieves-breakthrough-results-sustainable-lithium-production>

Source: <https://investorcenter.slb.com/news-releases/news-release-details/slb-achieves-breakthrough-results-sustainable-lithium-production>



# World's 2023 Lithium Mining



Source: U.S. Geological Survey, Mineral Commodity Summaries, January 2024, Division of Minerals: NDOMdata.com

# World Lithium Reserves

- Bolivia, 23 million tons – Primarily Brine
- Argentina, 22 million tons – Primarily Brine
- United States, 14 million tons – Various\*
- Chile, 11 million tons – Primarily Brine
- Australia, 8.7 million tons – Primarily Hardrock
- China, 6.8 million tons – Various
- Germany, 3.8 million tons – Primarily Hardrock
- Canada, 3 million tons – Primarily Hardrock

\*United States Estimates from continental brines, claystone, geothermal brines, hectorite, oilfield brines, and pegmatites





# Nevada Lithium Reserves

## NBMG Lithium Report, September 2024 – Table 1

- 17 individual projects
  - 14 clay/sediment
  - 3 brine
- Total Reserves
  - Clay 4.28 million tons
  - Brine 0.36 million tons
- Total Resources
  - Clay 117 million tons
  - Brine 1.52 million tons

## Thacker Pass – December 2024

- 14.3 million ton reserve
  - Up to 160,000 tons a year

## Rhyolite Ridge – April 2023

- 3.4 million tons
  - 22,000 tons a year

## Clayton Valley (Century Lithium) – April 2024

- 1.76 million tons

## Silver Peak – December 2023

- 0.36 million tons

Lithium Price was ~\$10,250 per ton at the end of 2024

Sources: <https://lithiumamericas.com/thacker-pass/overview/default.aspx> <https://rhyolite-ridge.ioneer.com/new-ioneer-mineral-resource-update/#:~:text=The%20updated%20report%2C%20conducted%20by,tonnes%20of%20boric%20acid%20equivalent.>

Century Lithium - NI 43-101 TECHNICAL REPORT ON THE FEASIBILITY STUDY OF THE CLAYTON VALLEY LITHIUM PROJECT Esmeralda County, Nevada, USA

[https://s201.q4cdn.com/960975307/files/doc\\_financials/2023/q4/9aefa2f5-78dc-4015-bf20-b71aba0bb593.pdf](https://s201.q4cdn.com/960975307/files/doc_financials/2023/q4/9aefa2f5-78dc-4015-bf20-b71aba0bb593.pdf) Jowitt, S.M., Henry, C.D., Crespo Mena, J., Lindsey, C.R., Darin, M.H., Saftner, D.M., Heintz, K.M., and Hershey, R.L., 2024, Lithium in Nevada—origins, extent, role in the energy transition, and implications for economic development and national security: Nevada Bureau of Mines and Geology Special Publication 40, 48 p.



# Nevada Companies Federal Funding and Offtake Agreements

## Lithium Americas

- Offtake agreement with General Motors for 100% of production volumes from Phase 1 for 20 years, plus 38% of Phase 2 production volumes for 20 years, and a right of first offer on the remaining Phase 2 production volumes
- DOE Loan, \$2.26 Billion

## Ioneer

- Offtake agreements with Ford, Prime Planet Energy & Solutions (a joint venture battery company between Toyota Motor Corporation and Panasonic Corporation), and EcoPro Innovation
- DOE Loan \$996 Million

## ABTC

- \$144 million DOE Grant for Recycling Facility

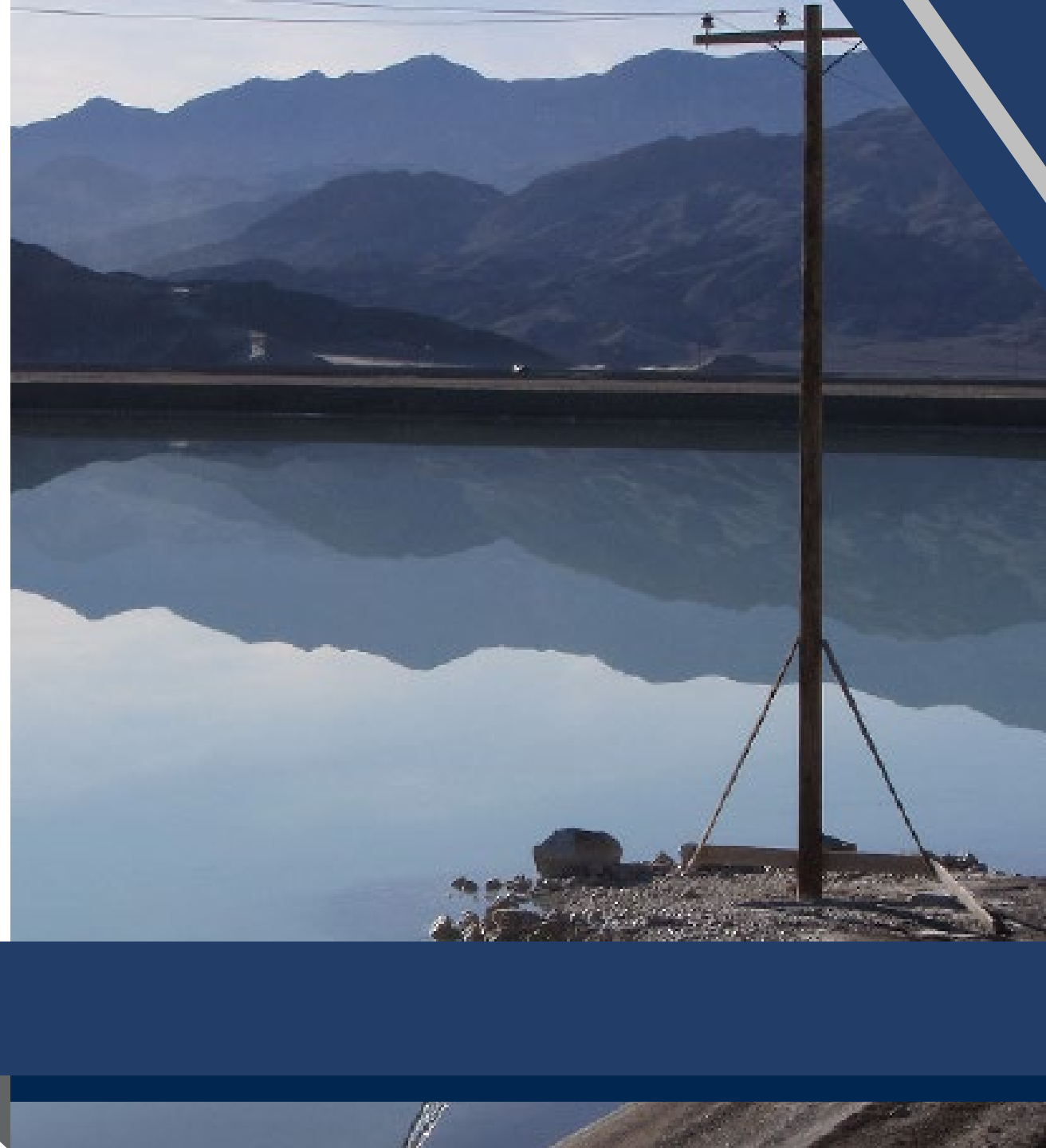
Sources: <https://lithiumamericas.com/thacker-pass/overview/default.aspx> <https://www.reuters.com/markets/commodities/us-energy-dept-finalizes-226-billion-loan-lithium-americas-nevada-mine-2024-10-28/> <https://www.energy.gov/lpo/articles/doe-announces-996-million-loan-guarantee-ioneer-rhyolite-ridge-advance-domestic>



# Brine vs. Clay

Depends on locality

- In NV, Clay has taken a significant lead
- South America, Brine looks to dominate
- Technology advances can play a big role
  - DLE for traditional brine and spent oil and gas
    - Needed for low Li concentration, ~100ppm
    - Water availability
- Co-location with Geothermal
  - Possible, but would need to be able to handle the flow of water geothermal deals with
  - Need's DLE technology





# Featured Content!

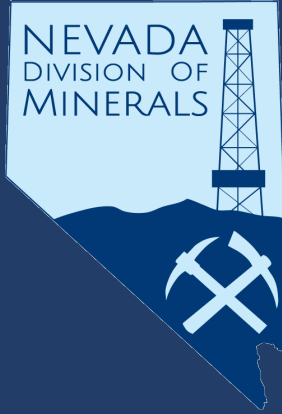
# Nevada's Open Data Site

## All Publicly Available Data in ONE Location

[ndomdata.com](http://ndomdata.com)

- Claims
- Notices
- Plans
- Production
- Critical Minerals
- Oil & Gas
- Geothermal
- Historic Data
- Public Land Issues
- Education and Outreach
- Links to other important sites
- FREE  
DOWNLOADABLE  
DATA

# Questions



[MINERALS.NV.GOV](http://MINERALS.NV.GOV)

[NDOMDATA.COM](http://NDOMDATA.COM)

