University of Nevada Cooperative Extension

University of Nevada, Reno Center for Economic Development

UCED 2017/18-08

Economic and Fiscal Impacts From New Lithium Mine and Lithium Processing Operations in Humboldt County, Nevada

NOVEMBER 2017

View of the southern-most portion of the McDermitt Caldera. The McDermitt Caldera is among the world's most highly mineralized calderas and contains significant deposits of lithium in smectite and illite clays.

Economic and Fiscal Impacts From New Lithium Mine and Lithium Processing Operations in Humboldt County, Nevada

Prepared by:

Buddy Borden

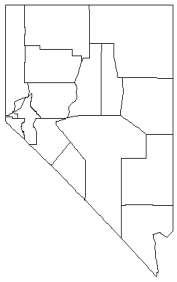
Tom Harris

Buddy Borden is an Area Extension Specialist in Community and Economic Development, University of Nevada Cooperative Extension, University of Nevada, Reno

Tom Harris is Professor & Director, University Center for Economic Development, University of Nevada, Reno.

This publication, ***Economic and Fiscal Impacts from New Lithium Mine and Lithium Processing Operations in Humboldt County, Nevada*** was published by the University Center for Economic Development in the Department of Applied Economics and Statistics at the University of Nevada, Reno. Funds for this publication were provided by the United States Department of Commerce Economic Development Administration under University Centers Program contract ED17SEA3030034. This publication's statements, conclusions, recommendations, and/or data represent solely the findings and views of the authors and do not necessarily represent the views of the U.S. Department of Commerce, the Economic Development Administration, the University of Nevada, Reno, or any reference sources used or quoted by this study. Reference to research projects, programs, books, magazines, or newspaper articles does not imply an endorsement or recommendation by the authors unless otherwise stated.
Correspondence regarding this document should be sent to:

Thomas R. Harris, Director
University Center for Economic Development
University of Nevada, Reno
Department of Applied Economics and Statistics
Mail Stop 204
Reno, Nevada 89557-0105



UCED

University of Nevada, Reno

Nevada Cooperative Extension

Acknowledgments

This report is intended to assist county, state, and land agencies better understand the social, economic and fiscal contributions that a new Lithium Mine and Lithium Processing operation has on Humboldt County and State of Nevada. The research team would like to express a special thanks to Nevada's Mining Association and Nevada's Governor's Office of Economic Development for input and cooperation throughout the study.

Table of Contents

EXECUTIVE SUMMARY

Humboldt County is the oldest county in Nevada that has built its economy around agriculture, mining, and tourism. Agriculture leads the state with over 100,000 acres under cultivation, while sustainable tourism is supported through gaming, abundant outdoor recreation opportunities, and excellent hunting and fishing. Mining has been a cornerstone since the beginning with rich mineral deposits of gold, dolomite, opal, purified wood and silver. Today, Humboldt County's is working towards expanding their overall mineral mining portfolio to include lithium. Large deposits of lithium have been identified in the McDermitt Caldera area that presents a unique opportunity to develop a significant supply to satisfy increasing market demands.

The purpose of this report is to estimate the economic, fiscal and community impacts from the construction and operation of a new lithium mine and lithium processing plant in Humboldt County, Nevada. This study is relevant not only for planning purposes for Humboldt County, but also to contribute to the sage grouse habitat designation being studied by Bureau of Land Management.

Social and Economic Characteristics

Social and economic characteristics of a community are one of the first steps in understanding how a community may respond to change. Understanding current social and economic trends provides a baseline that can be used for future planning and development purposes. Key Humboldt County social and economic characteristics include:

- Between 2017 and 2022, Humboldt County population, households, families and median age are projected to increase nearly four percent.

- In 2017, over 52 percent of Humboldt County's population is between the ages of 25 and 65 years of age. This age cohort is projected to decrease to 50 percent of the total population by 2022.

- In 2017, Humboldt County educational attainment for residents 25 years and older reported approximately 15 percent of the population with less than a 12 grade education, nearly 37 percent of the population 25 years and older have received a high school diploma or their GED, and nearly 48 percent of Humboldt residents 25 and older have received post high school education.

- In 2017, Humboldt County school enrollment was 3,566 student with approximately 58 percent of total school enrollment are in grades Pre K through sixth grade, followed by 14 percent enrolled in junior high (grades 7th & 8th), and 28 percent in high school (grades 9th through 12th).

- In 2017, Humboldt County reported 7,864 housing units where 58.5% were owner occupied, 27.2% were renter occupied and 14.3% were vacant. Nearly 32% of the vacant housing is classified as seasonal or for recreational uses.

- In 2017 Humboldt County top three industries account for over 80 percent of the total county's employment. Service industry accounts for 41.5 percent of Humboldt County total employment, followed by Agriculture/Mining sector at 28.5% and retail trade at 10.4%.

- Approximately 80 percent of the Humboldt County residents 16 years and older are employed in white and blue collar jobs, 40.5 percent and 38.9 percent, respectively. The remaining 20 percent of the population is employed in service occupations.

- Between 2017 and 2022 Humboldt County Household income is projected to increase approximately 12.8 percent. Nearly 54 percent of households have income between $35,000 and $99,999.

Humboldt County and Nevada Economic Impact Model

The most common methodology used for estimating the economic impacts of positive or negative economic shocks to an economy is Input-Output (I-O) analysis. I-O models offer a snapshot of an economy, detailing the sales and purchases of goods and services between all sectors in a defined economy (i.e. sub-county, county, state, or region). The transactions

between sectors are measured in terms of dollars and segmented into two broad categories: non-basic, which includes transactions between local industries, households and other institutions, and basic, which includes transactions between industries, households, and other institutions outside the economic being modeled (i.e. imports and exports).

Economic impacts for the development of a new lithium mine and lithium processing plant in Humboldt County were estimated using a Humboldt County and state of Nevada hybrid IMPLAN economic impact model (IMPLAN Group. LLC, 2016). IMPLAN stands for "Impact Analysis for Planning" and is a commonly used analytical software tool to estimate socioeconomic impacts originally developed by researchers at the U.S. Forest Service. Out of the box input-output models developed by the IMPLAN software are a good initial model. However, the data needs to be verified and validated as stated by Holland et al. (1997). Also, some economic sectors are not delineated for analysis. For the lithium mining sector and the lithium processing sectors, these sectors were aggregated into an Other Metal Mining Sector and Other Chemical Products Manufacturing Sector. Therefore, the black box IMPLAN input-output model does not have the particular production functions of the lithium mine or the lithium processing sector required for this analysis. For this analysis, primary data was collected by industry operators to develop a separate input-output sector for the Lithium Mining Sector and the Lithium Processing Sector.

Lithium Construction and Annual Operating Estimated Economic and Fiscal Impacts

Economic and fiscal impacts for a new lithium mining and processing facility in Humboldt County were estimated using a county and state hybrid IMPLAN economic impact model. Economic impacts are defined as total expenditures, personal income and employment.

Fiscal impacts are defined as the total local, state, and federal payments for total economic activity.

Two phases of impacts are considered that have different levels of impacts on Humboldt County and Nevada. Phase one is the construction of the new lithium mine and lithium processing plant projected to last up to four years, which is considered a short-term impact that does not have long-term economic sustainability. Phase two consists of annual operations of the two new business enterprises (mine and processing facility), that will provide ongoing economic sustainability and positive impacts on Humboldt County and Nevada for several years.

Under each phase, a baseline of $1,000,000 direct investment and sales was used because actual construction and annual operating projections have not been determined. Given the linear nature of I-O models, larger construction and annual operating sales projections can be estimated by using the multiplier for future projections. Total economic and fiscal impacts were estimated using a Humboldt County and State of Nevada models.

- ***Humboldt County Mining Construction Impacts.*** For each $1,000,000 direct investment in lithium mine construction generates an additional $214,545 in secondary impacts for a total economic activity impact of $1,214,545. This includes $452,978 of personal income and supporting 8.6 jobs. This level of impact also generates $37,610 in state and local taxes and $96,079 in federal taxes.

- ***Humboldt County Processing Plant Construction Impacts.*** For each $1,000,000 direct investment in lithium mine construction generates an additional $222,994 in secondary impacts for a total economic activity impact of $1,222,994. This includes $492,435 of personal income and supporting 9.0 jobs. This level of impact also generates $28,085 in state and local taxes and $102,307 in federal taxes.

- ***Nevada Mining Construction Impacts.*** For each $1,000,000 direct investment in lithium mine construction generates an additional $569,341 in secondary impacts for a total economic activity impact of $1,569,341. This includes $572,876 of personal income and supporting 10.8 jobs. This level of impact also generates $54,101 in state and local taxes and $138,206 in federal taxes.

- ***Nevada Processing Plant Construction Impacts.*** For each $1,000,000 direct investment in lithium mine construction generates an additional $546,212 in secondary impacts for a total economic activity impact of $1,546,212. This includes $597,589 of personal income and supporting 11.1 jobs. This level of impact also generates $44,580 in state and local taxes and $142,707 in federal taxes.

Estimated Lithium Construction Impacts on Humboldt County for a $1,000,000 Investment in Humboldt County.

	Lithium Mine Construction	Lithium Processing Plant Construction
Total Economic Activity	$1,214,545	$1,222,994
Total Personal Income	$452,978	$492,435
Total Jobs	8.6	9.0
Economic Activity Multiplier	1.21	1.22
Personal Income Multiplier	1.14	1.13
Jobs Multiplier	1.22	1.22
State & Local Taxes	$37,610	$28,085
Federal Taxes	$96,079	$102,307

Estimated Lithium Construction Impacts on State of Nevada for a $1,000,000 Investment in Humboldt County.

	Lithium Mine Construction	Lithium Processing Plant Construction
Total Economic Activity	$1,569,341	$1,546,212
Total Personal Income	$572,876	$597,589
Total Jobs	10.8	11.1
Economic Activity Multiplier	1.57	1.55
Personal Income Multiplier	1.45	1.40
Jobs Multiplier	1.50	1.46
State & Local Taxes	$54,101	$44,580
Federal Taxes	$138,206	$142,707

- ***Humboldt County Mining Annual Operating Impacts.*** For each $1,000,000 direct investment in lithium mine construction generates an additional $299,522 in secondary impacts for a total economic activity impact of $1,299,522. This includes $374,603 of personal income and supporting 5.7 jobs. This level of impact also generates $57,260 in state and local taxes and $83,270 in federal taxes.

- ***Humboldt County Processing Plant Annual Operating Impacts.*** For each $1,000,000 direct investment in lithium mine construction generates an additional $351,515 in secondary impacts for a total economic activity impact of $1,351,515. This includes $204,897 of personal income and supporting 3.1 jobs. This level of impact also generates $44,075 in state and local taxes and $46,857 in federal taxes.

- ***Nevada Mining Annual Operating Impacts.*** For each $1,000,000 direct investment in lithium mine construction generates an additional $766,376 in secondary impacts for a total economic activity impact of $1,766,376. This includes $544,186 of personal income and supporting 8.4 jobs. This level of impact also generates $80,304 in state and local taxes and $135,614 in federal taxes.

- ***Nevada Processing Plant Annual Operating Impacts.*** For each $1,000,000 direct investment in lithium mine construction generates an additional $672,634 in secondary impacts for a total economic activity impact of $1,672,634. This includes $314,102 of personal income and supporting 4.8 jobs. This level of impact also generates $61,290 in state and local taxes and $84,647 in federal taxes.

Estimated Lithium Annual Operating Impacts on Humboldt County for a $1,000,000 Investment in Humboldt County.

	Lithium Mine Construction	Lithium Processing Plant Construction
Total Economic Activity	$1,299,522	$1,351,451
Total Personal Income	$374,603	$204,897
Total Jobs	5.7	3.1
Economic Activity Multiplier	1.29	1.35
Personal Income Multiplier	1.23	1.83
Jobs Multiplier	1.42	2.39
State & Local Taxes	$57,260	$44,075
Federal Taxes	$83,270	$46,857

Estimated Lithium Annual Operating Impacts on State of Nevada for a $1,000,000 Investment in Humboldt County.

	Lithium Mine Construction	Lithium Processing Plant Construction
Total Economic Activity	$1,766,087	$1,672,634
Total Personal Income	$544,186	$314,102
Total Jobs	8.4	4.8
Economic Activity Multiplier	1.76	1.67
Personal Income Multiplier	1.79	2.80
Jobs Multiplier	2.09	3.68
State & Local Taxes	$80,304	$61,290
Federal Taxes	$135,614	$84,647

Population, Housing, and School Enrollment Impacts from New Lithium Development

Four simulated scenarios are considered and based off estimated increased levels of lithium mining and lithium processing plant employment reported in the results section. Given that some new employment opportunities may be filled by existing Humboldt County residents, these scenarios provide varying levels of imported labor.

Scenario One	100% of total estimated employment impact on Humboldt County will come from outside the county
Scenario Two	75% of the total estimated employment impact on Humboldt County will come from outside the county and 25% will come from within Humboldt County
Scenario Three	50% of the total estimated employment impact on Humboldt County will come from outside the county and 50% will come from within Humboldt County
Scenario Four	25% of the total estimated employment impact on Humboldt County will come from outside the county and 75% will come from within Humboldt County

Estimated Impacts on Humboldt County Population, Housing and School Enrollment From $1,000,000 Lithium Construction Investment and $1,000,000 Lithium Operating Sales.

	Total New Jobs	New Population	Housing Units	School Enrollment
CONSTRUCTION				
100% Outside Jobs	17.6	45.8	20.4	12.8
75% Outside Jobs	13.3	34.6	15.4	9.7
50% Outside Jobs	8.8	22.9	10.2	6.4
25% Outside Jobs	4.5	11.7	5.2	3.3
ANNUAL OPERATING				
100% Outside Jobs	8.8	22.8	10.1	6.4
75% Outside Jobs	6.6	17.1	7.6	4.8
50% Outside Jobs	4.5	11.7	5.2	3.3
25% Outside Jobs	2.2	5.7	2.5	1.6

Conclusions and Discussion

Study results show that both operations have positive economic and fiscal contributions to Humboldt County and the State of Nevada through increased economic activity, employment, household incomes and tax receipts. In this study, economic impacts were estimated for every $1,000,000 of lithium construction investment in Humboldt County and $1,000,000 of lithium mining and processing sales originating in Humboldt County. Given the linear nature of input-output models, higher levels of investments and sales can be expanded by using model generated multiplies. For example, if $200 million is invested in constructing a new lithium mine, short-term impacts lasting up to 4 years under the construction phase, this activity will generate an additional $42 million for total economic activity of over $242 million, including over $10.3 million in total personal income and supporting nearly 1,728 total jobs for Humboldt County. Under this scenario total state and local taxes collected annually are estimated to be approximately $7.5 million. Impacts are even greater when expanding the economic region to

include the entire State of Nevada. When considering the long-term sustainable impacts through ongoing annual operations, after the construction phase, estimated impacts are positive for Humboldt County and State of Nevada. Under the hypothetical scenario of $200 million of processed lithium sales in Humboldt County will generate an additional $70.3 million for total economic activity of over $270.3 million, including over $40.9 million in total personal income and supporting 148 total annual jobs. Under this scenario total state and local taxes collected annually are estimated to be approximately $8.8 million. Again annual economic impacts will be greater when expanding the economic region to include the entire State of Nevada.

Both the Humboldt County and State of Nevada economic and fiscal impact models will continue to be improved and developed as this lithium industry develops in Humboldt County. This will be accomplished in cooperation with lithium operators and supporting industries, trade associations, agencies and communities to best reflect economic linkages.

INTRODUCTION

Humboldt County is the oldest county in Nevada that has built its economy around agriculture, mining, and tourism. Agriculture leads the state with over 100,000 acres under cultivation, while sustainable tourism is supported through gaming, abundant outdoor recreation opportunities, and excellent hunting and fishing. Mining has been a cornerstone since the beginning with rich mineral deposits of gold, dolomite, opal, purified wood and silver. Today, Humboldt County's is working towards expanding their overall mineral mining portfolio to include lithium. Large deposits of lithium have been identified in the McDermitt Caldera area that presents a unique opportunity to develop a significant supply to satisfy increasing market demands.

The purpose of this report is to estimate the economic, fiscal and community impacts from the construction and operation of a new lithium mining and lithium processing plant in Humboldt County, Nevada. This study is relevant not only for planning purposes for Humboldt County, but also to contribute to the sage grouse habitat designation being studied by Bureau of Land Management.

The report is separated into seven sections. The first section reports relevant social and economic characteristics in Humboldt County and compares to Nevada and United States. The second section discusses the overall lithium industry and lithium opportunities in Nevada. The third section provides a brief discussion of input output models and some errors if models are used as a black box procedure. The fourth section discusses the Humboldt County and Nevada export base economic model. The fifth section reports economic and fiscal impact results for lithium mining and lithium-processing operations on Humboldt County and the State of Nevada,

using newly developed hybrid input-output models. The sixth section discusses and estimates some of the additional impacts that Humboldt County needs to consider with the creation of a new lithium mining and lithium processing operation. Specifically, estimates are considered for the potential impacts on Humboldt County's total population, housing and education. The final section provides a summary conclusion and discussion.

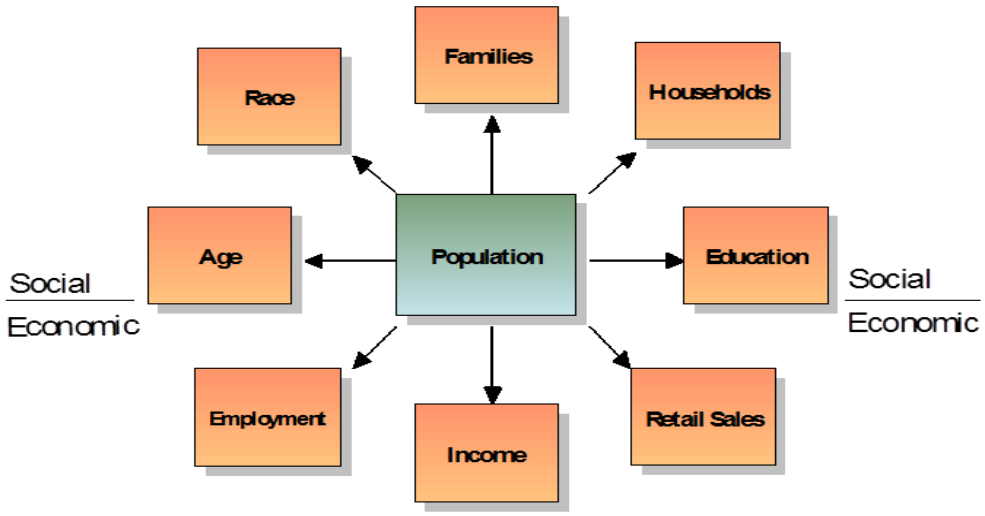
SOCIAL AND ECONOMIC CHARACTERISITCS

Social and economic characteristics of a community are one of the first steps in understanding how a community may respond to change. Understanding current social and economic trends provides a baseline that can be used for future planning and development purposes. This is the case in Humboldt County, where a relatively mineral rich county has recently discovered lithium mineral reserves (USGS). Lithium is used in several products that we use every day including batteries, glass & ceramics, lubricants, and pharmaceuticals. The proposed development of new lithium mine and lithium processing plant in Humboldt County could have significant implications on the county's overall social and economic conditions.

The purpose of this section is to provide Humboldt County with a baseline understanding of the most current social and economic characteristics and trends. Figure 1 shows the specific characteristics that define an area's population. Social characteristic include age, households, families and education. Economic characteristics include employment and income. Sub-indicators for each category are also presented. For example, education also includes educational enrollment by grade and highest level of education. Each indicator is analyzed using the most recent data and is compared to Nevada and United States.

Social and economic data was collected using secondary data sources published by ESRI, Bureau of Census, and Bureau of Economic Analysis. Basic frequency analysis was performed on all variables for the most recent year and, when available, projections to 2022. Comparisons are made between Humboldt County, Nevada and United States to provide benchmarks and better understanding how Humboldt County is performing compared to state and national trend. Tables, graphs and summary findings are presented for each variable in the following pages.

Figure 1.
Key Community Characteristics



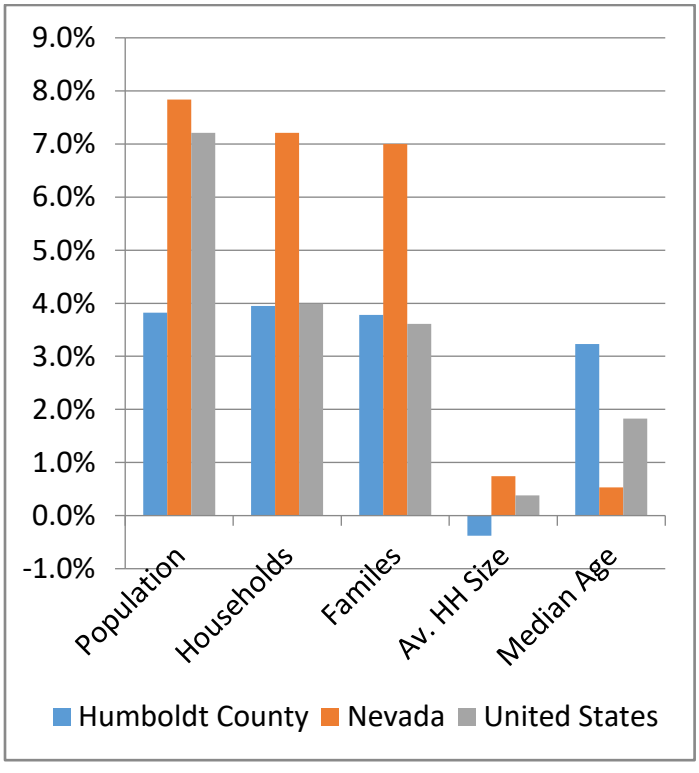
GENERAL DEMOGRAPHICS

Table 1. General Demographics

	Humboldt County			Nevada	US
	2017	Forecast 2022	% Change 2017-22	% Change 2017-22	% Change 2017-22
Population	17,675	18,351	+3.82%	+7.84%	+4.21%
Households	6,740	7,006	+3.95%	+7.21%	+3.99%
Families	4,603	4,777	+3.78%	+7.00%	+3.61%
Average HH Size	2.60	2.59	-0.38%	+0.74	+0.38%
Median Age	37.2	38.4	+3.23%	+0.53%	+1.83%

Source: U.S. Census Bureau, ESRI

Figure 2. Percent Change 2017 - 2022



Summary:

- Between 2017 and 2022, Humboldt County population, households, families and median age are projected to increase nearly four percent.
- Nevada's general demographic indicators are projected to grow at nearly twice the rate of Humboldt County indicators.

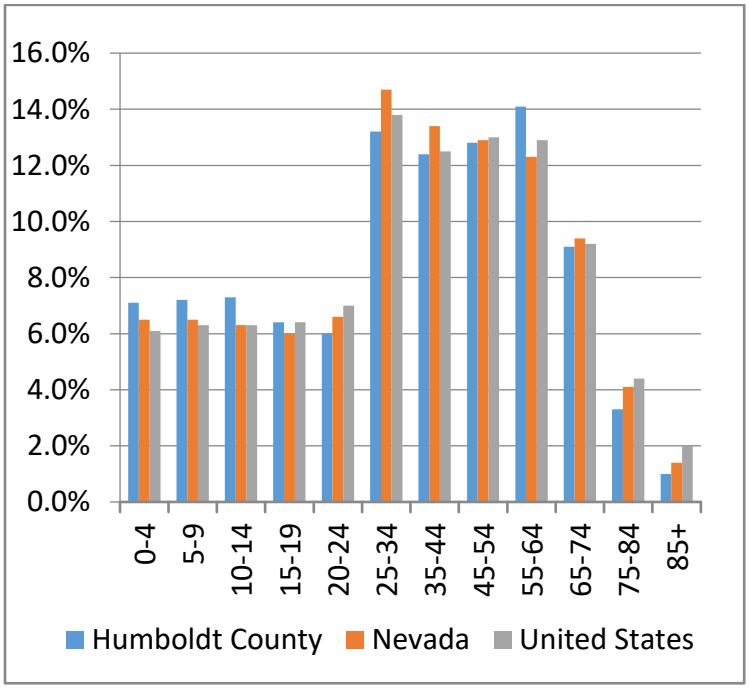
AGE

Table 2. Population by Age

	Humboldt County				Nevada	US
	2017	Percent 2017	Forecast 2022	Percent 2022	Percent 2017	Percent 2017
0-4	1,247	7.1%	1,270	6.9%	6.5%	6.1%
5-9	1,271	7.2%	1,288	7.0%	6.5%	6.3%
10-14	1,287	7.3%	1,337	7.3%	6.3%	6.3%
15-19	1,139	6.4%	1,227	6.7%	6.0%	6.4%
20-24	1,059	6.0%	999	5.4%	6.6%	7.0%
25-34	2,332	13.2%	2,218	12.1%	14.7%	13.8%
35-44	2,194	12.4%	2,407	13.1%	13.4%	12.5%
45-54	2,268	12.8%	2,140	11.7%	12.9%	13.0%
55-64	2,500	14.1%	2,457	13.4%	12.3%	12.9%
65-74	1,610	9.1%	1,982	10.8%	9.4%	9.2%
75-84	583	3.3%	821	4.5%	4.1%	4.4%
85+	185	1.0%	205	1.1%	1.4%	2.0%
Total	17,675	100%	18,441	100%	100%	100%

Source: U.S. Census Bureau, ESRI

Figure 3. Percent Age Distribution, 2017



Summary:

- In 2017, over 52 percent of Humboldt County's population is between the ages of 25 and 65 years of age. This age cohort is projected to decrease to 50 percent of the total population by 2022.

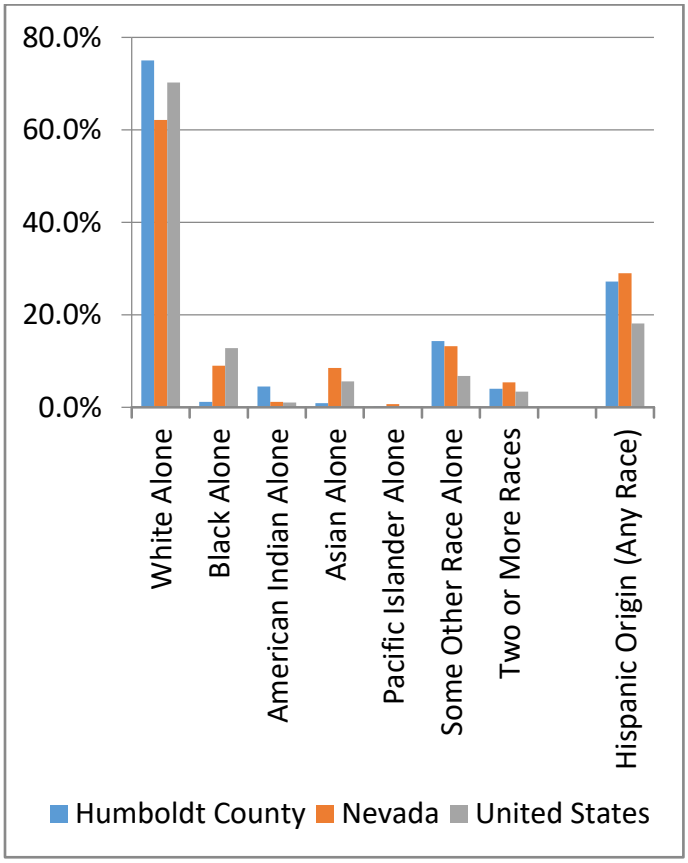
RACE & ETHNICITY

Table 3. Race & Ethnicity.

	Humboldt County				Nevada	US
	Forecast 2017	Percent 2017	Forecast 2022	Percent 2022	Percent 2017	Percent 2017
White Alone	13,248	75.0%	13,223	72.1%	62.1%	70.2%
Black Alone	206	1.2%	286	1.6%	9.0%	12.8%
American Indian Alone	796	4.5%	859	4.7%	1.2%	1.0%
Asian Alone	157	0.9%	184	1.0%	8.5%	5.6%
Pacific Islander Alone	37	0.2%	49	0.3%	0.7%	0.2%
Some Other Race Alone	2,525	14.3%	2,886	15.7%	13.2%	6.8%
Two or More Races	706	4.0%	864	4.7%	5.4%	3.4%
Hispanic Origin (Any Race)	48,810	27.2%	5,398	29.4%	29.0%	18.1%

Source: U.S. Census Bureau, ESRI

Figure 4. Percent Race Distribution, 2017



Summary:

- In 2017, Humboldt County reported 75 percent of the population white alone ethnicity. This is nearly 13 percent higher than Nevada's white alone ethnicity.
- Humboldt County Hispanic origin ethnicity represents approximately 27 percent of the total population in 2017 and projected to increase to nearly 30 percent by 2022.

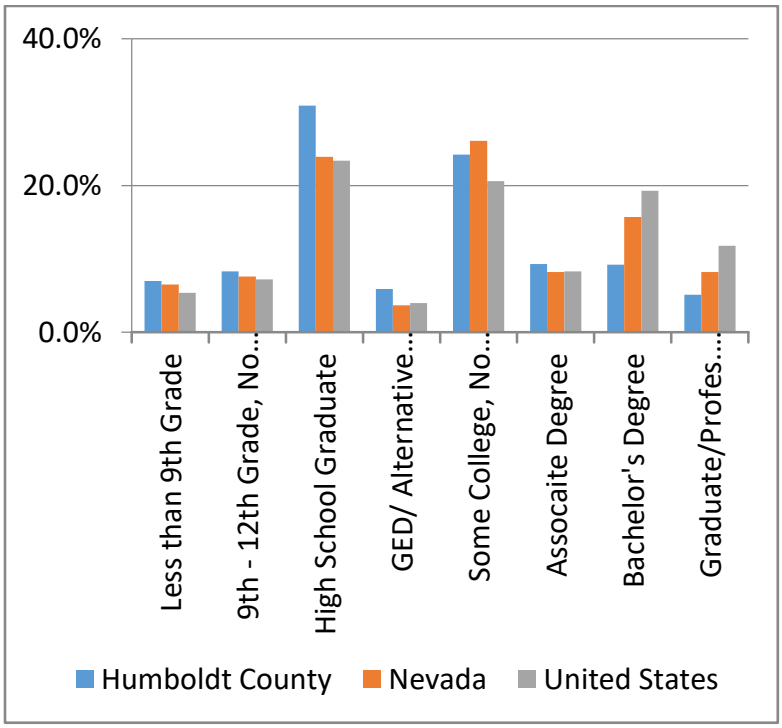
EDUCATION

Table 4. Educational Attainment – Population 25+ Years Old

	Humboldt		Nevada	US
	2017	Percent 2017	Percent 2017	Percent 2017
Less than 9th Grade	817	7.0%	6.5%	5.4%
9th – 12th Grade, No Diploma	969	8.3%	7.6%	7.2%
High School Graduate	3,618	30.9%	23.9%	23.4%
GED/Alternative Credentials	689	5.9%	3.7%	4.0%
Some College, No Degree	2,825	24.2%	26.1%	20.6%
Associate Degree	1,085	9.3%	8.2%	8.3%
Bachelor's Degree	1,074	9.2%	15.7%	19.3%
Graduate/Professional Degree	595	5.1%	8.2%	11.8%
Total	11,672	100%	100%	100%

Source: U.S. Census Bureau, ESRI

Figure 5. Percent Educational Attainment – Population 25+ Years Old, 2017



Summary:

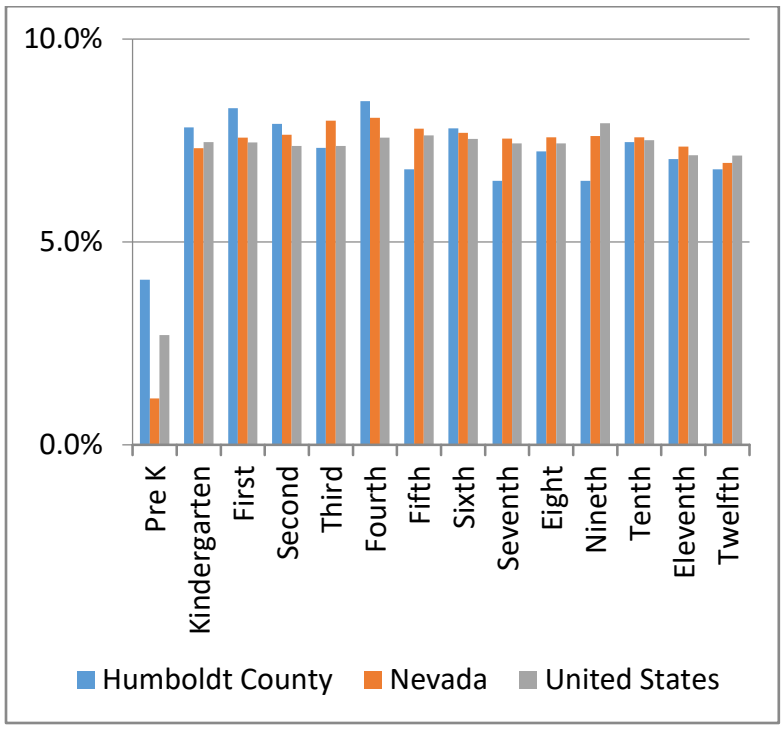
- In 2017, Humboldt County educational attainment for residents 25 years and older reported approximately 15 percent of the population with less than a 12 grade education. However, nearly 37 percent of the population 25 years and older have received a high school diploma or their GED.
- Nearly 48 percent of Humboldt residents 25 and older have received post high school education. This compares to Nevada that has 58.2 percent of residents 25 years and older receiving post high school education.

Table 5. School Enrollment, 2017

	Humboldt		Nevada	US
	2017	Percent 2017	Percent 2017	Percent 2017
Pre K	145	4.07%	1.15%	2.71%
Kindergarten	279	7.82%	7.31%	7.46%
First Grade	296	8.30%	7.57%	7.45%
Second Grade	282	7.91%	7.64%	7.37%
Third Grade	261	7.32%	7.99%	7.37%
Fourth Grade	302	8.47%	8.06%	7.57%
Fifth Grade	242	6.79%	7.79%	7.63%
Sixth Grade	278	7.80%	7.69%	7.54%
Seventh Grade	232	6.51%	7.55%	7.43%
Eight Grade	258	7.23%	7.58%	7.43%
Nine Grade	232	6.51%	7.61%	7.93%
Tenth Grade	266	7.46%	7.58%	7.51%
Eleventh Grade	251	7.04%	7.35%	7.14%
Twelve Grade	242	6.79%	6.95%	7.13%
Total	3,566	100%	100%	100%

Source: U.S. Census Bureau, ESRI

Figure 6. School Enrollment, 2017.



Summary:

- In 2017, Humboldt County school enrollment was 3,566 students and ranged from 145 students enrolled in Pre K to 302 students enrolled in the fourth grade.
- Approximately 58 percent of total school enrollment are in grades Pre K through sixth grade, followed by 14 percent enrolled in junior high (grades 7th & 8th), and 28 percent in high school (grades 9th through 12th).

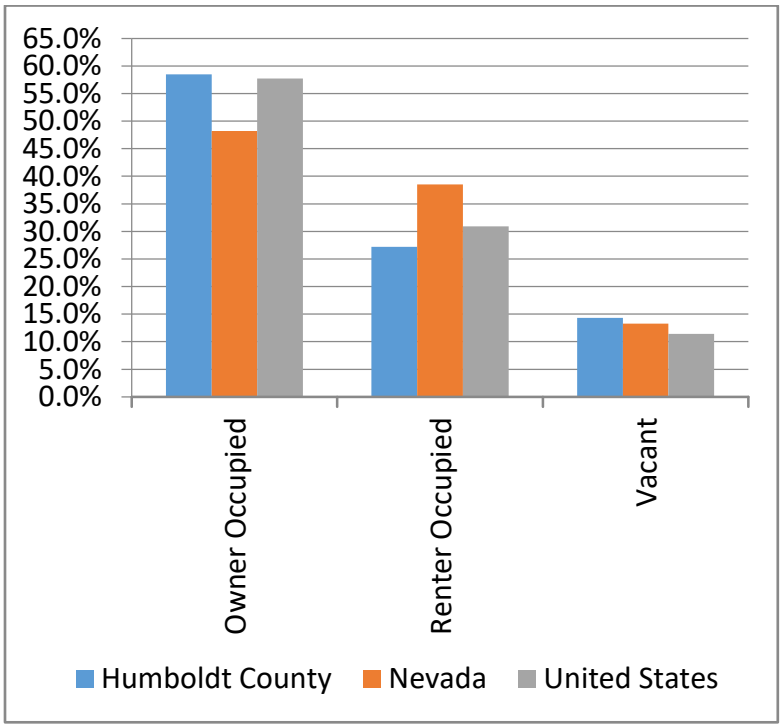
HOUSING

Table 6. Housing Units.

	Humboldt County				Nevada	US
	Forecast 2017	Percent 2017	Forecast 2022	Percent 2022	Percent 2017	Percent 2017
Housing Units (Total)	7,864	100%	8,297	100%	100%	100%
Owner Occupied	4,605	58.5%	4,791	57.7%	48.2%	57.7%
Renter Occupied	2,136	27.2%	2,215	26.7%	38.5%	30.9%
Vacant	1,124	14.3%	1,291	15.6%	13.3%	11.4%
Vacant Unit Types						
For Rent		17.7%				
Renter – Not Occupied		2.5%				
For Sale Only		5.6%				
Sold – Not Occupied		6.0%				
Seasonal/Recreational		31.8%				
For Migrant Workers		5.8%				
Other Vacant		30.6%				
Median Value	$167,845		$214,520		$234,172	$207,344
Average Value	$208,862		$267,308		$285,423	$286,484

Source: U.S. Census Bureau, ESRI

Figure 7. Housing Units, 2017.



Summary:

- In 2017, Humboldt County reported 7,864 housing units where 58.5% were owner occupied, 27.2% were renter occupied and 14.3% were vacant. Nearly 32% of the vacant housing is classified as seasonal or for recreational uses.
- It is forecasted that by 2022 housing unit inventory in Humboldt County will grow to 8,297 units (+5.5%)

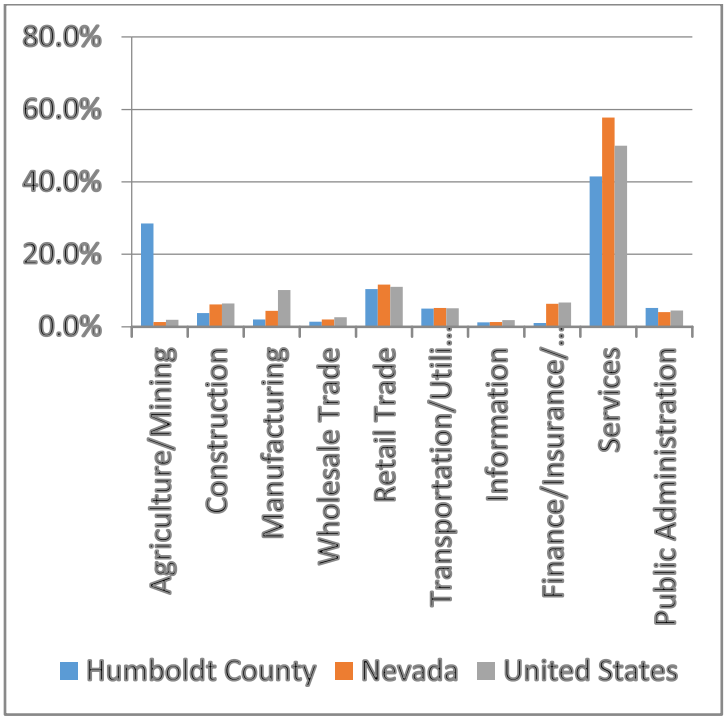
EMPLOYMENT

Table 7. Employed Population 16+ by Industry

	Humboldt County		Nevada	US
	2017	Percent 2017	Percent 2017	Percent 2017
Agriculture/Mining	2,253	28.5%	1.3%	1.9%
Construction	300	3.8%	6.2%	6.4%
Manufacturing	158	2.0%	4.4%	10.1%
Wholesale Trade	111	1.4%	2.0%	2.6%
Retail Trade	822	10.4%	11.6%	11.0%
Transportation/Utilities	395	5.0%	5.2%	5.1%
Information	95	1.2%	1.3%	1.8%
Finance/Insurance/Real Estate	79	1.0%	6.3%	6.7%
Services	3,280	41.5%	57.8%	50.0%
Public Administration	411	5.2%	4.0%	4.5%
Total	7,904	100%	100%	100%

Source: U.S. Census Bureau, ESRI

Figure 8. Percent Employment– Population 16+ Years Old, 2017



Summary:

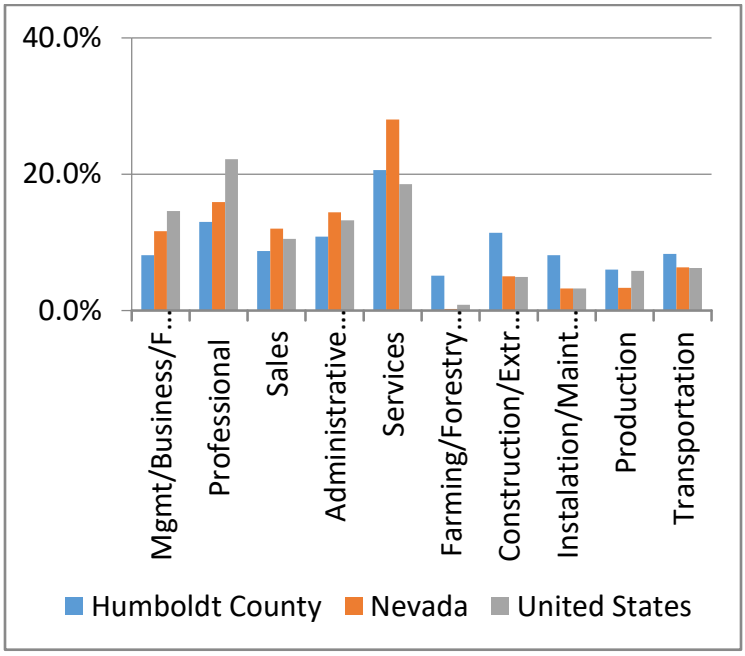
- In 2017 Humboldt County top three industries account for over 80 percent of the total county's employment. Service industry accounts for 41.5 percent of Humboldt County total employment, followed by Agriculture/Mining sector at 28.5% and retail trade at 10.4%.

Table 8. Employed Population 16+ by Occupation

	Humboldt County		Nevada	US
	2017	Percent 2017	Percent 2017	Percent 2017
White Collar	3,201	40.5%	53.9%	60.5%
Mgmt/Business/Finance	640	8.1%	11.6%	14.6%
Professional	1,019	13.0%	15.9%	22.2%
Sales	688	8.7%	12.0%	10.5%
Administrative Services	854	10.8%	14.4%	13.2%
Services	1,628	20.6%	28.0%	18.5%
Blue Collar	3,075	38.9%	18.1%	21.0%
Farming/Forestry/Fishing	403	5.1%	0.2%	0.8%
Construction/Extraction	901	11.4%	5.0%	4.9%
Installation/Maint./Repair	640	8.1%	3.2%	3.2%
Production	474	6.0%	3.3%	5.8%
Transport./Material Moving	656	8.3%	6.3%	6.2%
Total	7,904	100%	100%	100%

Source: U.S. Census Bureau, ESRI

Figure 9. Percent Employment– Population 16+ Years Old by Occupation, 2017



Summary:

- Approximately 80 percent of the Humboldt County residents 16 years and older are employed in white and blue collar jobs, 40.5 percent and 38.9 percent, respectively. The remaining 20 percent of the population is employed in service occupations.
- When compare to the State of Nevada and the U.S., Humboldt County has nearly double the percentage of total employment in blue collar occupations.

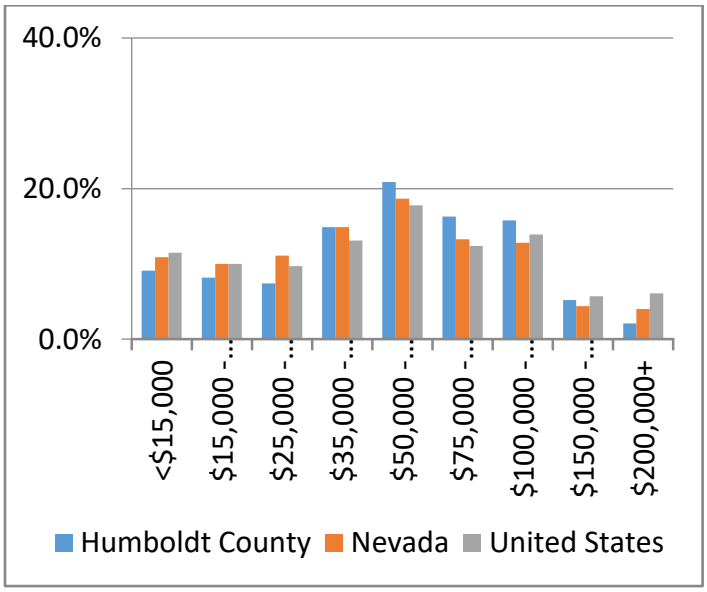
INCOME

Table 9. Household Income

	Humboldt County				Nevada	US
	Forecast 2017	Percent 2017	Forecast 2022	Percent 2022	Percent 2017	Percent 2017
<$15,000	613	9.1%	520	7.4%	10.9%	11.5%
$15,001-$24,999	550	8.2%	457	6.5%	10.0%	10.0%
$25,000 - $34,999	499	7.4%	407	5.8%	11.1%	9.7%
$35,000 - $49,999	1,005	14.9%	826	11.8%	14.9%	13.1%
$50,000 - $74,999	1,412	20.9%	1,653	23.6%	18.7%	17.8%
$75,000 - $99,999	1,098	16.3%	1,295	18.5%	13.3%	12.4%
$100,000 - $149,999	1,067	15.8%	1,255	17.9%	12.8%	13.9%
$150,000 - $199,999	353	5.2%	419	6.0%	4.4%	5.7%
$200,000+	143	2.1%	174	2.5%	4.0%	6.1%
Total		100%		100%	100%	100%
Median HH Income	$59,889		$67,589		$52,970	$56,124
Average HH Income	$72,207		$82,247		$71,502	$80,675
Per Capita Income	$28,570		$32,398		$26,780	$30,820

Source: U.S. Census Bureau, ESRI

Figure 10. Percent Income Distribution, 2017



Summary:

- Between 2017 and 2022 Humboldt County Household income is projected to increase approximately 12.8 percent. Nearly 54 percent of households have income between $35,000 and $99,999.
- In 2017 approximately 31 percent of Nevada and U.S. household income was less than $35,000 as compared to 24 percent in Humboldt County.

LITHIUM INDUSTRY

What is Lithium?

Lithium is the lightest metal in the periodic table with the symbol Li and atomic number 3. It is a soft, silver-white metal belonging to the alkali metal group. Under standard conditions, it is the least dense solid element. Like all alkali metals, lithium is highly reactive and flammable. The combination of lightness and high reactivity make it uniquely suited for use in batteries and many industrial processes. Pure lithium never occurs freely in nature, only in compounds. Lithium occurs in pegmatitic minerals, the most important of which is spodumene, but due to its solubility as an ion, is present in sea water and is commonly obtained from brines and clays.

Example of the lithium-rich clays found in the McDermitt Caldera.

Lithium has gained increased attention and importance due to the development of the lithium ion battery storage market. Over the past 5 years, electrification of transportation, as well as increased adoption of solar, wind and alternate energy production methods, has dramatically increased the demand for lithium in the market place. These markets demand specific chemical compounds of lithium with specific chemical and physical properties to meet the rigorous requirements of manufacturing lithium ion batteries.

Lithium Demand

As this decade began, the market for lithium chemicals could only be described as tiny compared to other metals such as copper or nickel. As recently as 2012, the entire global market for lithium chemicals was less than US$ 1 billion in sales. In 2017, based on both volume growth

and higher prices, the world market will exceed US$ 2 billion. If prices remain at 2017 levels, the market size is forecast to exceed US$ 4 billion in 2020. The recent rise in prices has not slowed demand growth. In major lithium applications such as rechargeable batteries, most uses in glass, multipurpose grease, and pharmaceuticals, lithium raw materials tend to be a low percentage of the final product cost across applications. Generally speaking, demand for lithium chemicals is relatively price inelastic.

The combination of a sustained period of high demand growth in the electric transportation and Energy Storage Systems (ESS) markets coupled with a tight supply situation exacerbated by the long lead times and difficulties bringing new lithium projects to market will create many attractive investment opportunities in the lithium space over the next decade.
In 2016, global demand for lithium chemicals was approximately 182,000 Metric tonnes (MT) of lithium carbonate equivalent (LCE). Global Lithium estimates the lithium ion battery share of demand was 44% or approximately 80,000 MT LCE. Glass related applications are the second largest demand at 22% followed by grease at 11%. The top three applications account for more than 75% of demand.

The bulk of the lithium ion battery market uses lithium carbonate to produce the cathode and electrolyte chemistries. The cells that require higher rates of charge and discharge coupled with longer lifecycle tend to use lithium hydroxide for high nickel materials. There is some evidence in the market that lithium hydroxide, due to a lower melting temperature, can improve other cathode chemistries by producing a better crystalline structure.

It has been projected by several market experts that the current production of lithium from existing mineral deposits will need to at least double in the next 5-8 years. Full

electrification of the transportation industry would require an order of magnitude more lithium production.

In the past, battery demand was driven by growth in the use of cell phones (and later smart phones), laptops, tablets, power tools, etc. The rapid growth anticipated in the next ten years will be led by the growth in electric transportation: automobiles, buses, delivery vehicles, bikes, scooters, etc., and Energy Storage Systems (ESS) for management of electrical grids and storage of energy generated from renewable sources – primarily wind and solar. Projections for the speed of development of both e-transportation and ESS vary widely. Global Lithium projects that in 2021 battery related demand will represent 68% of market demand or approximately 250,000 MT with total lithium demand increasing to ~ 370,000 MT.

Lithium in Nevada

There are a few companies that have the knowledge and ability to produce the right quality and quantities of these lithium compounds. Albemarle, Ganfeng and FMC currently produce high grade lithium hydroxide and carbonate in significant quantities, while SQM competes heavily in the lithium carbonate market. These compounds can be produced from several different types of lithium deposits (lithium brine, hard rock, and clay). Albemarle, SQM, Orocobre and FMC all have operating brine assets, while Albemarle and Tianqi have split ownership of the largest hard rock deposit in Australia. In North America, Nemaska is developing a hard-rock operation, while in Silver Peak, Nevada, Albemarle operates a small brine deposit which is the only operating lithium resource within the United States.

Hard rock deposits are usually an open pit mine. They require benefaction of the ore, roasting at high temperature in the presence of sulfuric acid to selectively leach the lithium from

the ore. The lithium enriched solution is then purified, and the lithium is converted to either lithium carbonate or lithium hydroxide.

Brine based lithium deposits are typically lithium chloride in a saturated sodium chloride solution. This requires a different purification process to the hard rock process. In areas with very high evaporation rates, natural evaporation is used to enrich the brine. Lithium is then precipitated as lithium carbonate to separate and purify it. The lithium carbonate is then used as the feedstock for other lithium compound production.

The southern-most deposit (photo above) near Thacker Pass contains 234 million short tons at a grade of 0.665 percent lithium

The only new, viable type of deposit currently under development are clay-based deposits. These clays are often found in or around old calderas with special geographic attributes. Within the State of Nevada, one such deposit has been identified in the McDermitt Caldera area. The deposit is located along the Nevada-Oregon border and presents a unique opportunity to develop a significant supply to satisfy the increasing demand.

According to the USGS, there is no global consensus on the definition for “strategic and critical” commodities. In general, it has been accepted as those materials that are considered vital to support societal requirements and Government policy (USGS 2016a). Lithium has been identified as a material that is not found or produced in sufficient quantity in the United States to meet the Nation’s requirements and the material is currently being stockpiled by the Defense Logistics Agency (USGS 2016a).

The USGS has identified the McDermitt Caldera (Kings Valley Lithium deposit) as among the world's most highly mineralized calderas which contains significant deposits of lithium in smectite and illite clays. Further, the USGS identifies the Kings Valley lithium resource as potentially critical to the United States development of clean energy economy as defined in the American Recovery and Reinvestment Act (USGS 2016b). To date, at least five distinct lithium deposits have been discovered by Lithium Nevada Corp. within the McDermitt Caldera. Currently one deposit is proposed for development; containing at least 234 million short tons at a grade of 0.665 percent lithium (USGS 2016b).

Aerial view of Lithium Nevada's Kings Valley Lithium Project site in Northern Nevada.

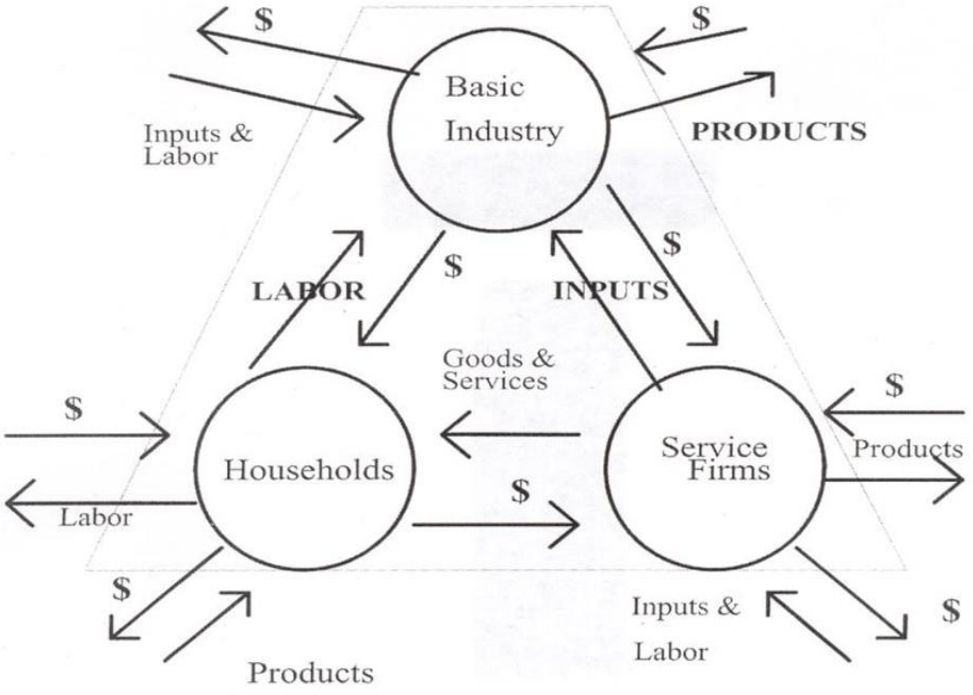
CONCEPTUAL ECONOMIC IMPACT MODEL

The most common methodology used for estimating the impacts of positive or negative economic shocks to an economy is Input-Output (I-O) analysis. I-O models offer a snapshot of an economy, detailing the sales and purchases of goods and services between all sectors in a defined economy (i.e. sub-county, county, state, or region). The transactions between sectors are measured in terms of dollars and segmented into two broad categories: non-basic, which includes transactions between local industries, households and other institutions, and basic, which includes transactions between industries, households, and other institutions outside the economic being modeled (i.e. imports and exports).

Figure 1 illustrates the major dollar flows of goods and services in any economy. The foundation of a state's economy is those businesses, which sell some or all of their goods and

services to byers outside the state. Such a business is a basic industry. The flow of products out of, and dollars into, a state is represented by the two arrows in the upper right portion of Figure 1. To produce these goods and services for "export" outside the state, the basic industry purchases inputs from outside of the state (upper left portion of Figure 1), labor from the residents or "households" of the state (left side of Figure 1), and inputs from service industries located within the state (right side of Figure 1). The flow of labor, goods, and services in the state is completed by households using their earnings to purchase goods and services from the state's service industries (bottom of Figure 1). It is evident from the interrelationships illustrated in Figure 1 that a change in any one segment of a state's economy will have reverberations throughout the entire economic system of the state.

Figure 11. Overview of an Economy



HUMBOLDT COUNTY AND NEVADA ECONOMIC MODELS

Economic impacts for the development of a new lithium mine and lithium processing plant in Humboldt County were estimated using a Humboldt County and state of Nevada hybrid IMPLAN economic impact model (IMPLAN Group. LLC, 2016). IMPLAN stands for "Impact Analysis for Planning" and is a commonly used analytical software tool to estimate socioeconomic impacts originally developed by researchers at the U.S. Forest Service. The IMPLAN software is an input-output based model that describes the inter-industry relationships between industries and commodity purchases within a local economy. The model relies on county and state level data that is continually updated by the U.S. government and, when possible, improved with locally collected primary data; thus resulting in hybrid models consisting of primary and secondary data. Input-output models can be used to analyze the economic structure of a regional economy and estimate the impacts of a new business or industry, loss of business or industry, or changes in government policies.

Out of the box input-output models developed by the IMPLAN software are a good initial model however the data needs to be verified and validated as stated by Holland et al. (1997). Also, some economic sectors are not delineated for analysis. For the lithium mining sector and the lithium processing sectors, these sectors were aggregated into an Other Metal Mining Sector and Other Chemical Products Manufacturing Sector. Therefore, the black box IMPLAN input-output model does not have the particular production functions of the lithium mine or the lithium processing sector required for this analysis. As Lahr (1993) notes the variation in technologies of the resource-based sectors would be expected to be exceptionally high from region to region. Therefore, using out of the box input-output models primarily derived from national averages

could cause errors and missed linkages that could occur in a regional industry such as lithium mining and lithium processing. For this analysis, primary data was collected by industry operators to develop a separate input-output sector for the Lithium Mining Sector and the Lithium Processing Sector. Consider, for instance a lithium mine and lithium processing plant and their potential impact on the economy of Humboldt County. The activities of the lithium mine and processing sectors could be considered a basic industry as they draw dollars from outside the area. These dollars hire people from the Humboldt County household sector such as administrative personnel, miners, and processing engineers employed at the lithium mine or lithium processing plant. Also, the lithium mine and processing plant will buy goods and services from the local service sector. This is characterized as business-to-business expenditures which for example could be expenditures for mining services, accountants, lawyers, etc. As earnings increase in the lithium mining and lithium processing sectors and locally linked sectors, they will hire additional local employees who will make additional purchases in the Humboldt County economy. Thus, the change in the economic base works its way throughout the entire Humboldt County economy and provides impetus for future economic development.

RESULTS

Economic and fiscal impacts for a new lithium mining and processing facility in Humboldt County were estimated using a county and state hybrid IMPLAN economic impact model. Economic impacts are defined as total expenditures, personal income and employment. Total impacts are estimated using the following components:

Direct Impact = Initial expenditures to produce a level of output to meet demand. This can also be interpreted as sales.

Indirect Effects = Represents the impacts caused by the iteration of industries purchasing from industries and local businesses resulting from direct final demand changes.

Induced Effects = Represents the impacts caused by the iteration of households purchasing from industries and local businesses resulting from direct final demand changes.

Total Impact = Sum of the direct, indirect and induced effects.

Total Output/Sales Multiplier = Total output generated in all sector in the economy per dollar of output change in an industry. For example an output multiplier of 1.5 indicates that for every $1 of output/sales and additional $0.50 of additional output is produced in the local economy.

Total Income Multiplier = Total labor income generated in all sectors of the economy per dollar of direct output change in an industry. For example, an income multiplier of 1.5 indicated that for every $1 of direct income generates an additional $0.5 of income in the local economy.

Total Employment Multiplier = Total number of jobs generated in all sectors of the economy per direct job change in the industry. For example, an employment multiplier of 1.5 indicates that for every direct job generates an additional 0.5 jobs in the local economy.

Fiscal impacts are defined as the total local, state and federal payments for total economic activity. Table 11 summarizes the different state, local and federal taxes included in this study.

Table 11. Components of Fiscal Impacts

State & Local Taxes		**Federal Taxes**
Dividends		Social Insurance
		Employee Contribution
Social Insurance:		Employer Contribution
Employee Contribution		
Employer Contribution		Tax on Production and Imports
		Excise
Tax on Production and Imports:		Custom Duty
Sales Tax		Fed Non Taxes
Property Tax		
Motor Vehicle License		Corporate Profit
Severance/Net Proceeds		
Other Taxes		Personal Income Tax
S/L Non Taxes		
Corporate Profits		
Personal Tax		
Income Tax		
Fine & Fees		
Motor Vehicle		
Other Tax		

Two phases of impacts are considered that have different levels of impacts on Humboldt County and Nevada. Phase one is the construction of the new lithium mine and lithium processing plant projected to last up to four years, which is considered a short-term impact that does not have long-term economic sustainability. Phase two consists of annual operations of the two new business enterprises (mine and processing facility), that will provide ongoing economic sustainability and positive impacts on Humboldt County and Nevada for several years. Description of each phase and economic impacts will be discussed in the following sections.

Lithium Construction Impacts

Phase one consists of the construction of two separate lithium enterprises; mining and processing plant. Each enterprise is projected to take up to four years to construct and during this construction period communities in Humboldt County will experience temporary increases in the levels of overall economic activity through the purchases of goods and services, employment and personal income. Also during this period, Humboldt County will experience an increase in property and sales tax collections. . For simplicity, and that construction estimates for the Humboldt projects have not been published, total economic and fiscal impacts were estimated for $1,000,000 of construction expenditures for each enterprise. Given the linear nature of I-O, larger construction expenditure impacts can be estimated by using the multiplier for corresponding total investment or sales projections. The following construction assumptions were estimated, and verified, by lithium mining and lithium processing industry operators and provides the best available data at the time of this study.

Direct Requirements for $1,000,000 of Lithium Construction Expenditures

	Mine Construction	Processing Construction
Direct Sales/Output	$1,000,000	$1,000,000
Direct Employment	7.1	7.4
Direct Income	$399,023	$435,802
Average Wage	$56,200	$58,892

Under each construction project, there are similar employment and income requirements for $1,000,000 of direct construction expenditures. Nearly 40 percent of construction costs are labor costs and supporting approximately seven jobs. . The construction jobs are estimated to average between $56,000 and $59,000, which is consistent with Humboldt County average construction wages.

Using the $1,000,000 scenario, Table 12 and 13, reports the summary economic and fiscal impacts on Humboldt County and Nevada. More detailed economic and fiscal impact tables are presented in the Appendix (Table A1 to A8). These impacts are estimated using the hybrid economic impact models discussed in the earlier section for Humboldt County and State of Nevada. Impacts are reported separately for the construction of a new lithium mine and construction of a new lithium processing plant. Some key results include:

- ***Humboldt County Mining Construction Impacts.*** For each $1,000,000 direct investment in lithium mine construction generates an additional $214,545 in secondary impacts for a total economic activity impact of $1,214,545. This includes $452,978 of personal income and supporting 8.6 jobs. This level of impact also generates $37,610 in state and local taxes and $96,079 in federal taxes.

- ***Humboldt County Processing Plant Construction Impacts.*** For each $1,000,000 direct investment in lithium mine construction generates an additional $222,994 in secondary impacts for a total economic activity impact of $1,222,994. This includes $492,435 of personal income and supporting 9.0 jobs. This level of impact also generates $28,085 in state and local taxes and $102,307 in federal taxes.

- ***Nevada Mining Construction Impacts.*** For each $1,000,000 direct investment in lithium mine construction generates an additional $569,341 in secondary impacts for a total economic activity impact of $1,569,341. This includes $572,876 of personal income and supporting 10.8 jobs. This level of impact also generates $54,101 in state and local taxes and $138,206 in federal taxes.

- ***Nevada Processing Plant Construction Impacts.*** For each $1,000,000 direct investment in lithium mine construction generates an additional $546,212 in secondary impacts for a total economic activity impact of $1,546,212. This includes $597,589 of personal income and supporting 11.1 jobs. This level of impact also generates $44,580 in state and local taxes and $142,707 in federal taxes.

Table 12. Estimated Lithium Construction Impacts for $1,000,000 Investment in Humboldt County

	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
Mine Construction				
Economic Activity	$1,000,000	$68,946	$145,599	$1,214,545
Personal Income	$399,023	$19,563	$34,392	$452,978
Employment	7.1	0.4	1.1	8.6
State & Local Taxes	$18,390	$5,158	$14,062	$37,610
Federal Taxes	$79,842	$4,983	$11,254	$96,079
Processing Construction				
Economic Activity	$1,000,000	$65,254	$157,740	$1,222,994
Personal Income	$435,802	$19,307	$37,326	$492,435
Employment	7.4	0.4	1.2	9.0
State & Local Taxes	$8,311	$4,542	$15,232	$28,085
Federal Taxes	$85,329	$4,785	$12,193	$102,307

Table 13. Estimated Lithium Construction Impacts for $1,000,000 Investment in Nevada

	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
Mine Construction				
Economic Activity	$1,000,000	$212,716	$356,625	$1,569,341
Personal Income	$395,546	$70,114	$107,216	$572,876
Employment	7.1	1.2	2.5	10.8
State & Local Taxes	$17,032	$12,332	$24,737	$54,101
Federal Taxes	$89,821	$17,902	$30,483	$138,206
Processing Construction				
Economic Activity	$1,000,000	$173,989	$372,223	$1,546,212
Personal Income	$427,684	$57,833	$112,072	$597,589
Employment	7.6	1.0	2.6	11.1
State & Local Taxes	$7,554	$11,215	$25,813	$44,580
Federal Taxes	$95,997	$14,896	$31,815	$142,707

Table 14 provides a summary the most impacted economic sectors in Nevada for the construction of a new lithium mine and lithium processing plant. Many of these business and industries are accessed in Humboldt County, but specialty industries such as hospitals, other financial investment activities and architectural, engineering and related services will be provided by businesses outside Humboldt County. These industries represent the indirect and induced linkages associated with lithium construction activity in Humboldt County. Each industry can be assessed for current business activity and new potential growth opportunities.

Table 14. Top Impacted Sectors from Lithium Construction Activity in Humboldt County

IMPLAN Sector	Description
57	Construction of new commercial structures
501	Full-Service Restaurants
395	Wholesale Trade
502	Limited-Service Restaurants
411	Truck Transportation
440	Real Estate
400	Retail – Food and Beverage Stores
405	Retail – General Merchandise Stores
407	Retail – Nonstore Retailers
504	Automotive Repair and Maintenance
475	Office of Physicians
49	Electric Power Transmission
464	Employment Services
441	Owner-Occupied Dwellings
482	Hospitals*
436	Other Financial Investment Activities*
449	Architectural, Engineering, and Related Services*

* Demand at State Level

Lithium Annual Operating Impacts

At the conclusion of the construction phase for a new lithium mine and new lithium processing plant (up to four years), communities in Humboldt County and throughout Nevada will realize a new level of sustainable economic and fiscal impacts through annual operations. Annual operations for both the mine and processing plant will require consistent purchases of labor, supplies, materials, services, and payment of local, state and federal taxes. Economic and fiscal impacts will occur annually as long as both enterprises keep operating. In addition new businesses may flourish as a response to the new primary mining and processing plant. Similar to the construction scenario described in the previous section, total economic and fiscal impacts were estimated for $1,000,000 of total final demand or sales at both the mine and processing plant levels. For example, company XYZ mines $1,000,000 worth of unprocessed lithium. Company XYZ then sells the raw Lithium to Humboldt County lithium processing plant which proceeds to add value that meets input requirements for several types of universal products. The lithium processing plant then sells the processed lithium to second level manufactures that more than likely uses in the process of finish goods (i.e. batteries, ceramics. etc.…). The following annual operating assumptions were estimated, and verified, by lithium mining and lithium processing industry operators and provides the best available data at the time of this study.

Direct Requirements for $1,000,000 of Annual Operating Expenditures

	Lithium Mining	Lithium Processing
Direct Sales/Output	$1,000,000	$1,000,000
Direct Employment	3.9869	1.3000
Direct Income	$303,271	$111,941
Average Wage	$76,066	$86,108

Using the $1,000,000 scenario, Tables 15 and 16, reports the summary economic and fiscal impacts on Humboldt County and Nevada. More detailed economic and fiscal impact tables are presented in the Appendix (Tables A1 – A8). These impacts are estimated using the hybrid economic impact models discussed in earlier section. Impacts are reported separately for the construction of a new lithium mine and construction of a new lithium processing plant. Some key results include:

- ***Humboldt County Mining Annual Operating Impacts.*** For each $1,000,000 direct investment in lithium mine construction generates an additional $299,522 in secondary impacts for a total economic activity impact of $1,299,522. This includes $374,603 of personal income and supporting 5.7 jobs. This level of impact also generates $57,260 in state and local taxes and $83,270 in federal taxes.

- ***Humboldt County Processing Plant Annual Operating Impacts.*** For each $1,000,000 direct investment in lithium mine construction generates an additional $351,515 in secondary impacts for a total economic activity impact of $1,351,515. This includes $204,897 of personal income and supporting 3.1 jobs. This level of impact also generates $44,075 in state and local taxes and $46,857 in federal taxes.

- ***Nevada Mining Annual Operating Impacts.*** For each $1,000,000 direct investment in lithium mine construction generates an additional $766,376 in secondary impacts for a total economic activity impact of $1,766,376. This includes $544,186 of personal income and supporting 8.4 jobs. This level of impact also generates $80,304 in state and local taxes and $135,614 in federal taxes.

- ***Nevada Processing Plant Annual Operating Impacts.*** For each $1,000,000 direct investment in lithium mine construction generates an additional $672,634 in secondary impacts for a total economic activity impact of $1,672,634. This includes $314,102 of personal income and supporting 4.8 jobs. This level of impact also generates $61,290 in state and local taxes and $84,647 in federal taxes.

Table 15. Estimated Lithium Operating Impacts for $1,000,000 Investment in Humboldt County

	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
Lithium Mining				
Economic Activity	$1,000,000	$179,982	$119,540	$1,299,522
Personal Income	$303,271	$42,259	$29,073	$374,603
Employment	4.0	0.8	0.9	5.7
State & Local Taxes	$36,309	$9,409	$11,542	$57,260
Federal Taxes	$62,993	$11,037	$9,240	$83,270
Lithium Processing				
Economic Activity	$1,000,000	$286,077	$65,428	$1,351,515
Personal Income	$111,941	$77,042	$15,914	$204,897
Employment	1.3	1.3	0.5	3.1
State & Local Taxes	$24,044	$13,712	$6,319	$44,075
Federal Taxes	$24,132	$17,693	$5,032	$46,857

Table 16. Estimated Lithium Operating Impacts for $1,000,000 Investment in Nevada

	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
Lithium Mining				
Economic Activity	$1,000,000	$425,289	$341,087	$1,766,376
Personal Income	$303,271	$136,061	$104,854	$544,186
Employment	3.9	2.1	2.4	8.4
State & Local Taxes	$37,529	$19,125	$23,650	$80,304
Federal Taxes	$70,250	$36,211	$29,153	$135,614
Lithium Processing				
Economic Activity	$1,000,000	$476,190	$196,444	$1,672,634
Personal Income	$111,941	$141,767	$60,394	$314,102
Employment	1.3	2.2	1.4	4.8
State & Local Taxes	$24,959	$21,660	$14,671	$61,290
Federal Taxes	$26,312	$40,252	$18,083	$84,647

Table 17 provides a summary the most impacted economic sectors in Nevada for the annual operation of a new lithium mine and lithium processing plant. All of these business and industries are available in Humboldt County, except architectural, engineering and related services that are probably located in a more urban setting such as Reno, Nevada. The indirect and induced economic industry linkages from lithium activity should be assessed for long-term growth and expansion opportunities as the lithium industry develops and matures in Humboldt County.

Table 17. Top Impacted Sectors from Lithium Operations Activity in Humboldt County

IMPLAN Sector	Description
34	Lithium Mining
163	Lithium Processing
62	Maintenance and Repair Construction - Nonresidential
501	Full-Service Restaurants
502	Limited-Service Restaurants
448	Accounting, Tax Prep, Bookkeeping & Payroll Tax
440	Real Estate
395	Wholesale Trade
400	Retail – Food and Beverage Stores
468	Services to Buildings
405	Retail – General Merchandise Stores
49	Electric Power Transmission
50	Natural Gas Distribution
411	Truck Transportation
42	Electric Power Generation – Fossil Fuel
438	Insurance Agencies, Brokerages, and Related Services
441	Owner-Occupied Dwellings
461	Management of Companies and Enterprises
409	Rail Transportation
504	Automotive Repair and Maintenance
40	Other Nonmetallic Minerals Services
449	Architectural, Engineering, and Related Services*

* Demand at State Level

OTHER HUMBOLDT COUNTY IMPACTS

The previous section reported that the development of a new lithium mine and processing plant will have positive employment impacts on Humboldt County and the State of Nevada. It is assumed that the new jobs created by these new enterprises will result in the increased demand for specialized jobs, thus resulting in the importing of labor to meet employment needs. Although the absolute constructions costs and sales levels have not been determined by lithium operators, estimating impacts for levels of $1,000,000 of construction investment and $1,000,000 of lithium sales does provide a baseline for Humboldt County to better understand future population growth trends and the demands on public and private goods and services.

This section of the report uses the total job impacts estimated in the previous section and simulates various scenarios to estimate changes in total population, total housing, and total education. Although there are several additional segments of a community that will be impacted by an increase in employment in Humboldt County, this is a good start and needs to be further studies and expanded by Humboldt County planners and leaders.

Four simulated scenarios are considered and based off estimated increased levels of lithium mining and lithium processing plant employment reported in the results section. Given that some new employment opportunities may be filled by existing Humboldt County residents, these scenarios provide varying levels of imported labor and local labor.

Scenario One	100% of total estimated employment impact on Humboldt County will come from outside the county
Scenario Two	75% of the total estimated employment impact on Humboldt County will come from outside the county and 25% will come from within Humboldt County
Scenario Three	50% of the total estimated employment impact on Humboldt County will come from outside the county and 50% will come from within Humboldt County
Scenario Four	25% of the total estimated employment impact on Humboldt County will come from outside the county and 75% will come from within Humboldt County

Table 18 summarizes the total employment impacts estimated for $1,000,000 investment and/or sales for lithium mining and lithium processing plant construction and annual operations. Under the mining and processing plant construction four scenarios, total employment will range between 17.6 jobs to 4.5 jobs. What this means is that under the 100% scenario all 17.6 new jobs created will be imported from outside Humboldt County, resulting in an addition to overall population. Conversely, under the 25% scenario translate to 4.5 jobs coming from outside Humboldt County and 13.1 jobs being filled by current Humboldt County residents. When considering annual operations, long-term sustainable jobs, the 100% scenario estimates all 8.8 new jobs coming from outside Humboldt County and no new employment filled from existing Humboldt County residents. When considering the 25% scenario only 2.2 new jobs will come from outside Humboldt County and 6.6 new jobs will be filled by Humboldt County residents.

Table 18. Employment Impact Scenarios per $1,000,000 investment and/or sales on Humboldt County.

New Jobs Scenarios	Construction Phase - Total Jobs			Annual Operating Phase - Total Jobs		
	Mine	Processing	Total	Mine	Processing	Total
100%	8.6	9.0	17.6	5.7	3.1	8.8
75%	6.5	6.8	13.3	4.3	2.3	6.6
50%	4.3	4.5	8.8	2.9	1.6	4.5
25%	2.2	2.3	4.5	1.4	0.8	2.2

Population Impacts

Using the total job creation across scenarios presented in Tables 12 & 15, total population changes are estimated by multiplying total jobs by the current average household size in Humboldt County.

Employment Impacts * Average Household Size = Estimated New Population

Table 19 shows the estimated increases in new population per $1,000,000 construction investment and $1,000,000 in annual operating sales of mined and processed lithium. Under the construction scenarios it is estimated that new Humboldt County population will range from 45.8 under the 100% scenario to 11.7 new residents under the 25% scenario. Considering annual operations Humboldt County might expect an increase of 22.8 new residents at the 100% scenario and an increase of 5.7 new residents under the 25% scenario.

Table 19. Estimated New Population per $1,000,000 of Lithium Construction Investment and $1,000,000 of Lithium Annual Operating Sales, Humboldt County.

New Jobs Scenarios	Construction Phase - Population			Annual Operating Phase - Population		
	Total Jobs	HH Size	New Population	Total	HH Size	New Population
100%	17.6	2.6	45.8	8.8	2.6	22.8
75%	13.3	2.6	34.6	6.6	2.6	17.1
50%	8.8	2.6	22.9	4.5	2.6	11.7
25%	4.5	2.6	11.7	2.2	2.6	5.7

Housing Unit Impacts

Housing impacts are estimated using the total housing, total population and new population estimated in Table 19. The base formula used includes:

Total Housing Units / Total Population = Housing Units Per Capita (HUPC)

7,864 / 17,675 = 0.445

HUPC X New Population = Housing Demand

0.445 X 50.4 = 22.4

Table 20 reports the housing demands per $1,000,000 construction investment in lithium mine and processing plant and $1,000,000 of annual operating lithium mining and processing sales. Under each scenario for construction and operating phases, Humboldt County needs to also consider standing vacant housing to help fill the immediate needs. Also housing conditions and values of current inventory should be factored in determining if new housing needs to be built.

Table 20. Estimated Housing Demand per $1,000,000 of Lithium Construction Investment and $1,000,000 of Lithium Annual Operating Sales, Humboldt County.

	Construction Phase Jobs			Operating Phase Jobs		
New Jobs Scenarios	Total Jobs	HUPC	Housing Units	Total	HUPC	Housing Units
100%	45.8	0.445	20.4	22.8	0.445	10.1
75%	34.6	0.445	15.4	17.1	0.445	7.6
50%	22.9	0.445	10.2	11.7	0.445	5.2
25%	11.7	0.445	5.2	5.7	0.445	2.5

Education Impacts

Educational impacts are estimated using new population (Table 19) and percent of school age kids under 19 years of age. In addition, estimates are calculated for the distribution by grade by using the current grade distribution in Humboldt County.

New population * Percent of Population under 19 Years of Age = School Age Kids

School Age Kids * Percent Distribution by Grade = Estimated New Population by Grade

Table 21 shows the estimated education demand per $1,000,000 of lithium construction investment and $1,000,000 of lithium annual operating sales. It was estimated that 28% of Humboldt County population is under the age of 19 years and considered attending K-12 schools. Table's 22 and 23 reports the grade distribution for new populations under each scenario for the lithium construction and operating phases.

Table 21. Estimated Education Demand per $1,000,000 of Lithium Construction Investment and $1,000,000 of Lithium Annual Operating Sales, Humboldt County.

	Construction Phase Jobs			Operating Phase Jobs		
New Population	Total New Population	School Age Kids Under 19*	Adult Over 19 Years	Total New Population	School Age Kids Under 19*	Adult Over 19 Years**
100%	45.8	12.8	32.9	22.8	6.4	16.4
75%	34.6	9.7	24.9	17.1	4.8	12.3
50%	22.9	6.4	15.5	11.7	3.3	8.4
25%	11.7	3.3	8.4	5.7	1.6	4.1

* 28% of population 19 years of age and under and 72% of population over 19 years of age.

Table 22. Grade Distribution , Humboldt County. (Construction Impact)

		New Jobs Scenarios			
	Percent	100%	75%	50%	25%
Pre K	4.07%	0.5	0.4	0.3	0.1
Kindergarten	7.82%	1.0	0.8	0.5	0.3
First Grade	8.30%	1.1	0.8	0.5	0.3
Second Grade	7.91%	1.0	0.8	0.5	0.3
Third Grade	7.32%	0.9	0.7	0.5	0.2
Fourth Grade	8.47%	1.1	0.8	0.5	0.3
Fifth Grade	6.79%	0.9	0.7	0.4	0.2
Sixth Grade	7.80%	1.0	0.8	0.5	0.3
Seventh Grade	6.51%	0.8	0.6	0.4	0.2
Eighth Grade	7.23%	0.9	0.7	0.5	0.2
Ninth Grade	6.51%	0.8	0.6	0.4	0.2
Tenth Grade	7.46%	1.0	0.7	0.5	0.2
Eleventh Grade	7.04%	0.9	0.7	0.5	0.2
Twelve Grade	6.79%	0.9	0.7	0.4	0.2
Total	100%	12.8	9.7	6.4	3.3

Table 23. Grade Distribution, Humboldt County. (Operating Impacts)

		New Jobs Scenarios			
	Percent	100%	75%	50%	25%
Pre K	4.07%	0.3	0.2	0.1	0.1
Kindergarten	7.82%	0.5	0.4	0.3	0.1
First Grade	8.30%	0.5	0.4	0.3	0.1
Second Grade	7.91%	0.5	0.4	0.3	0.1
Third Grade	7.32%	0.5	0.4	0.2	0.1
Fourth Grade	8.47%	0.5	0.4	0.3	0.1
Fifth Grade	6.79%	0.4	0.3	0.2	0.1
Sixth Grade	7.80%	0.5	0.4	0.3	0.1
Seventh Grade	6.51%	0.4	0.3	0.2	0.1
Eighth Grade	7.23%	0.5	0.3	0.2	0.1
Ninth Grade	6.51%	0.4	0.3	0.2	0.1
Tenth Grade	7.46%	0.5	0.4	0.2	0.1
Eleventh Grade	7.04%	0.5	0.3	0.2	0.1
Twelve Grade	6.79%	0.4	0.3	0.2	0.1
Total	100%	6.4	4.8	3.3	1.6

CONCLUSIONS & DISCUSSION

This report provides an analysis for estimating the economic and fiscal impacts on Humboldt County and the State of Nevada from the development and operation of new lithium mining and lithium processing operation in Humboldt County. Due to the limited disaggregated data available for both sectors in secondary economic impact modeling platforms (IMPLAN), it was essential to collect primary industry data to construct new lithium sectors. In cooperation with mining industry operators and trade associations, the authors were able to add a new lithium mining and lithium processing sectors that best reflect Humboldt County and Nevada's overall economy. By taking these steps, communities and agencies are equipped with better and reliable information to assess how these two new lithium operations (mining and processing) located in Humboldt County will economically and fiscally impact Nevada. In addition, using the results produced by these economic models, Humboldt County leaders can then further simulate and estimate impacts on various government services and infrastructure demands.

Study results show that both operations have positive economic and fiscal contributions to Humboldt County and the State of Nevada through increased economic activity, employment, household incomes and tax receipts. In this study, economic impacts were estimated for every $1,000,000 of lithium construction investment in Humboldt County and $1,000,000 of lithium mining and processing sales in Humboldt County. Given the linear nature of input-output models, higher levels of investments and sales can be expanded by using model generated multipliers. For example, if $200 million is invested in constructing a new lithium mine, short-term impacts lasting up to 4 years under the construction phase, this activity will generate an additional $42 million for total economic activity of over $242 million, including over $10.3 million in total personal income and supporting nearly 1,728 total jobs for Humboldt County.

Under this scenario total state and local taxes collected annually are estimated to be approximately $7.5 million. Impacts are even greater when expanding the economic region to include the entire State of Nevada. When considering the long-term sustainable impacts through ongoing annual operations, after the construction phase, estimated impacts are positive for Humboldt County and State of Nevada. Under the hypothetical scenario of $200 million of processed lithium sales in Humboldt County will generate an additional $70.3 million for total economic activity of over $270.3 million, including over $40.9 million in total personal income and supporting 148 total annual jobs. Under this scenario total state and local taxes collected annually are estimated to be approximately $8.8 million. Again annual economic impacts will be greater when expanding the economic region to include the entire State of Nevada.

Considering the population, housing and educational impacts on Humboldt County resulting from the development of a new lithium mine and processing plant were estimated through simulation models using current social economic characteristic trends. Ratios were calculated and then applied to the estimated total employment impacts under the $1,000,000 construction investment and $1,000,000 operating sales scenarios. This is an attempt to provide county leaders and officials with a very simplified understanding what demands may be put on various governmental services and infrastructure. Additional factors need to be locally identified and considered for future planning purposes.

Both the Humboldt County and State of Nevada economic and fiscal impact models will continue to be improved and developed as this lithium industry develops in Humboldt County. This will be accomplished in cooperation with lithium operators and supporting industries, associations, agencies and communities to best reflect economic linkages.

APPENDIX

Table A1. Economic and Fiscal Annual Impacts of Lithium Mine Construction on Humboldt County. (4 Year Build)

	Direct	Indirect	Induced	Total	Employment	Income	Income Per Job
Agriculture	$0	$546	$275	$821	0.0066	$339	$51,138
Lithium Mining	$0	$0	$0	$0	0.0000	$0	$0
Mining	$0	$239	$140	$379	0.0037	210	$57,486
Construction	$1,000,000	$538	$2,545	$1,003,083	7.1011	$399,023	$56,192
Lithium Processing	$0	$0	$0	$0	0.0000	$0	$0
Manufacturing	$0	$2,859	$314	$3,173	0.0121	$451	$37,096
TIPU[a]	$0	$22,703	$16,454	$39,156	0.1472	$8,389	$57,009
Trade	$0	$22,187	$31,028	$53,215	0.4681	$17,644	$37,689
Services	$0	$19,490	$94,572	$114,062	0.8960	$26,413	$29,477
Government	$0	$384	$271	$655	0.0082	$509	$62,046
Total	$1,000,000	$68,946	$145,599	$1,214,545	8.6431	$452,978	$52,409
State & Local Taxes	$18,390	$5,158	$14,062	$37,610			
Federal Taxes	$79,842	$4,983	$11,254	$96,079			
Total Taxes	$98,232	$10,141	$25,316	$133,689			

[a]TIPU stands for the Transportation, Insurance, and Public Utilities Sector.

Total Output Multiplier 1.21

Total Employment Multiplier 1.22

Total Income Multiplier 1.14

Table A2. Economic and Fiscal Annual Impacts of Lithium Processing Plant Construction on Humboldt County. (4 Year Build)

	Direct	Indirect	Induced	Total	Employment	Income	Income Per Job
Agriculture	$0	$211	$298	$508	0.0038	$219	$57,303
Lithium Mining	$0	$0	$0	$0	0.0000	$0	$0
Mining	$0	$174	$152	$327	0.0033	$188	$57,019
Construction	$1,000,000	$417	$2,755	$1,003,173	7.4254	$435,802	$58,690
Lithium Processing	$0	$0	$0	$0	0.0000	$0	$0
Manufacturing	$0	$3,406	$340	$3,746	0.0140	$512	$38,529
TIPU[a]	$0	$20,884	$17,844	$38,728	0.1494	$8,390	$56,174
Trade	$0	$20,376	$33,620	$53,996	0.4651	$17,813	$38,300
Services	$0	$19,410	$102,437	$121,847	0.9692	$28,991	$29,913
Government	$0	$376	$293	$669	0.0084	$521	$62,046
Total	$1,000,000	$65,254	$157,740	$1,222,994	9.0386	$492,436	$54,481
State & Local Taxes	$8,311	$4,542	$15,232	$28,085			
Federal Taxes	$85,329	$4,785	$12,193	$102,307			
Total Taxes	$93,640	$9,327	$27,425	$130,392			

[a]TIPU stands for the Transportation, Insurance, and Public Utilities Sector.

Total Output Multiplier 1.22

Total Employment Multiplier 1.22

Total Income Multiplier 1.13

Table A3. Economic and Fiscal Annual Impacts of Lithium Mine Construction on the State of Nevada. (4 Year Build)

	Direct	Indirect	Induced	Total	Employment	Income	Income Per Job
Agriculture	$0	$405	$240	$645	0.0069	$266	$38,395
Lithium Mining	$0	$0	$0	$0	0.0000	$0	$0
Mining	$0	$904	$286	$1,190	0.0104	$392	$37,805
Construction	$1,000,000	$1,847	$5,541	$1,007,388	7.1624	$395,546	$55,225
Lithium Processing	$0	$0	$0	$0	0.0000	$0	$0
Manufacturing	$0	$33,495	$3,417	$36,912	0.1249	$8,037	$64,349
TIPU[a]	$0	$32,236	$34,934	$67,170	0.2526	$15,144	$59,944
Trade	$0	$51,007	$55,050	$106,056	0.7405	$38,259	$51,665
Services	$0	$90,562	$250,941	$341,503	2.4335	$111,956	$46,005
Government	$0	$2,260	$6,217	$8,478	0.0396	$3,277	$82,713
Total	$1,000,000	$212,716	$356,625	$1,569,341	10.7709	$572,876	$53,187
State & Local Taxes	$17,032	$12,332	$24,737	$54,101			
Federal Taxes	$89,821	$17,902	$30,483	$138,206			
Total Taxes	$106,853	$30,234	$55,220	$192,307			

[a]TIPU stands for the Transportation, Insurance, and Public Utilities Sector.

Total Output Multiplier	1.57
Total Employment Multiplier	1.50
Total Income Multiplier	1.45

Table A4. Economic and Fiscal Annual Impacts of Lithium Processing Plant Construction on the State of Nevada. (4 Year Build)

	Direct	Indirect	Induced	Total	Employment	Income	Income Per Job
Agriculture	$0	$158	$251	$409	0.0040	$163	$40,732
Lithium Mining	$0	$0	$0	$0	0.0000	$0	$0
Mining	$0	$746	$298	$1,045	0.0094	$347	$36,945
Construction	$1,000,000	$1,427	$5,782	$1,007,209	7.6033	$427,684	$56,250
Lithium Processing	$0	$0	$0	$0	0.0000	$0	$0
Manufacturing	$0	$16,164	$3,567	$19,731	0.0602	$3,709	$61,656
TIPU[a]	$0	$28,881	$36,470	$65,351	0.2502	$14,895	$59,542
Trade	$0	$49,784	$57,454	$107,238	0.7310	$38,449	$52,595
Services	$0	$74,840	$261,907	$336,747	2.4277	$109,058	$44,922
Government	$0	$1,989	$6,494	$8,483	0.0397	$3,285	$82,834
Total	$1,000,000	$173,898	$372,223	$1,546,212	11.1254	$597,589	$53,714
State & Local Taxes	$7,554	$11,215	$25,813	$44,582			
Federal Taxes	$95,997	$14,896	$31,815	$142,708			
Total Taxes	$103,551	$26,111	$57,628	$187,290			

[a]TIPU stands for the Transportation, Insurance, and Public Utilities Sector.

Total Output Multiplier 1.55

Total Employment Multiplier 1.46

Total Income Multiplier 1.40

Table A5. Economic and Fiscal Impacts of $1,000,000 of Lithium Mining Annual Operations on Humboldt County.

	Direct	Indirect	Induced	Total	Employment	Income	Income Per Job
Agriculture	$0	$1,893	$226	$2,119	0.0182	$842	$46,264
Lithium Mining	$1,000,000	$0	$0	$1,000,000	3.9869	$303,271	$76,067
Mining	$0	$10,805	$115	$10,920	0.0473	$4,048	$85,581
Construction	$0	$30,661	$2,086	$32,747	0.1947	$10,974	$56,364
Lithium Processing	$0	$0	$0	$0	0.0000	$0	$0
Manufacturing	$0	$608	$258	$866	0.0038	$130	$34,211
TIPU[a]	$0	$85,414	$13,539	$98,953	0.1610	$14,456	$89,789
Trade	$0	$11,993	$25,482	$37,475	0.3565	$12,560	$35,231
Services	$0	$38,259	$77,612	$115,871	0.9224	$27,879	$30,224
Government	$0	$349	$223	$572	0.0072	$445	$61,806
Total	$1,000,000	$179,982	$119,541	$1,299,523	5.6980	$374,605	$65,743
State & Local Taxes	$36,309	$9,409	$11,542	$57,260			
Federal Taxes	$62,993	$11,037	$9,240	$83,270			
Total Taxes	$99,302	$20,446	$20,782	$140,530			

[a]TIPU stands for the Transportation, Insurance, and Public Utilities Sector.

Total Output Multiplier 1.29

Total Employment Multiplier 1.42

Total Income Multiplier 1.23

Table A6. Economic and Fiscal Impacts of $1,000,000 of Lithium Mining Annual Operations on the State of Nevada.

	Direct	Indirect	Induced	Total	Employment	Income	Income Per Job
Agriculture	$0	$1,384	$230	$1,614	0.0187	$684	$36,578
Lithium Mining	$1,000,000	$0	$0	$1,000,000	3.9869	$303,271	$76,067
Mining	$0	$43,811	$273	$44,084	0.1561	$13,243	$84,839
Construction	$0	$50,844	$5,299	$56,143	0.3241	$18,802	$58,013
Lithium Processing	$0	$0	$0	$0	0.0000	$0	$0
Manufacturing	$0	$6,368	$3,267	$9,635	0.0210	$1,361	$64,810
TIPU[a]	$0	$89,659	$33,431	$123,090	0.2717	$21,598	$79,492
Trade	$0	$29,235	$52,646	$81,881	0.6322	$30,123	$47,648
Services	$0	$197,122	$239,988	$437,110	2.8930	$150,577	$52,049
Government	$0	$6,866	$5,953	$12,819	0.0546	$4,527	$82,912
Total	$1,000,000	$425,289	$341,087	$1,766,376	8.3583	$544,186	$65,005
State & Local Taxes	$37,529	$19,125	$23,650	$80,304			
Federal Taxes	$70,250	$36,211	$29,153	$135,614			
Total Taxes	$107,779	$55,336	$52,803	$215,918			

[a]TIPU stands for the Transportation, Insurance, and Public Utilities Sector.

Total Output Multiplier 1.76

Total Employment Multiplier 2.09

Total Income Multiplier 1.79

Table A7. Economic and Fiscal Impacts of $1,000,000 of Lithium Processing Annual Operations on Humboldt County.

	Direct	Indirect	Induced	Total	Employment	Income	Income Per Job
Agriculture	$0	$262	$124	$386	0.0031	$158	$50,968
Lithium Mining	$0	$133,276	$0	$133,276	0.5471	$40,419	$73,879
Mining	$0	$2,184	$63	$2,247	0.0156	$1,329	$85,192
Construction	$0	$8,126	$1,142	$9,268	0.0549	$3,097	$56,412
Lithium Processing	$1,000,000	$0	$0	$1,000,000	1.3000	$111,941	$86,108
Manufacturing	$0	$9,156	$141	$9,297	0.0143	$1,071	$74,895
TIPU[a]	$0	$71,669	$7,409	$79,078	0.1939	$13,981	$72,104
Trade	$0	$18,949	$13,949	$32,898	0.2805	$10,887	$38,813
Services	$0	$41,924	$42,488	$84,412	0.6958	$21,522	$30,931
Government	$0	$467	$122	$589	0.0074	$458	$61,892
Total	$1,000,000	$286,013	$65,438	$1,351,451	3.1126	$204,863	$66,149
State & Local Taxes	$24,044	$13,712	$6,319	$44,075			
Federal Taxes	$24,132	$17,693	$5,032	$46,857			
Total Taxes	$48,176	$31,405	$11,351	$90,932			

[a]TIPU stands for the Transportation, Insurance, and Public Utilities Sector

Total Output Multiplier 1.35

Total Employment Multiplier 2.39

Total Income Multiplier 1.83

Table A8. Economic and Fiscal Impacts of $1,000,000 of Lithium Processing Annual Operations on the State of Nevada.

	Direct	Indirect	Induced	Total	Employment	Income	Income Per Job
Agriculture	$0	$373	$132	$505	0.0056	$211	$37,679
Lithium Mining	$0	$133,276	$0	$133,276	0.5471	$40,419	$73,879
Mining	$0	$4,291	$157	$4,448	0.0176	$1,560	$88,628
Construction	$0	$16,477	$3,052	$19,529	0.1125	$6,524	$57,991
Lithium Processing	$1,000,000	$0	$0	$1,000,000	1.3000	$111,941	$86,108
Manufacturing	$0	$13,165	$1,883	$15,048	0.0244	$1,797	$73,648
TIPU[a]	$0	$104,828	$19,246	$124,074	0.2630	$21,559	$81,973
Trade	$0	$39,591	$30,322	$69,913	0.4514	$24,915	$55,195
Services	$0	$154,038	$138,225	$292,263	2.0172	$100,325	$49,735
Government	$0	$10,151	$3,427	$13,578	0.0578	$4,851	$83,927
Total	$1,000,000	$476,190	$196,444	$1,672,634	4.7966	$314,102	$65,484
State & Local Taxes	$24,959	$21,660	$14,671	$61,290			
Federal Taxes	$26,312	$40,252	$18,083	$84,647			
Total Taxes	$51,271	$61,912	$32,754	$145,937			

[a]TIPU stands for the Transportation, Insurance, and Public Utilities Sector

Output Multiplier 1.67

Employment Multiplier 3.68

Income Multiplier 2.80

REFERENCES

Holland, D., H. Geier, and E. Schuster. (1997) Using Implan to Identify Rural Opportunities. United States department of Agriculture, Forest Service, Intermountain Research station, General technical review INT-GTR-350.

IMPLAN Group, LLC. (2016). **IMPLAN System (data and software).** 16740 Birkdale Commons Parkway, Suite 206, Huntersville, NC 28078, www.IMPLAN.com

Lahr, M. (1993) "A Review of the Literature Supporting the Hybrid Approach to Constructing Regional Input-Output Models", **Economic Systems Research**, 5(3): 277-293.

USGS 2016a.

Overview with Methods and Procedures of the U.S. Geological Survey Mineral-Resource Assessment of the Sagebrush Focal Areas of Idaho, Montana, Nevada, Oregon, Utah, and Wyoming. Chapter A of Mineral Resources of the Sagebrush Focal Areas of Idaho, Montana, Nevada, Oregon, Utah, and Wyoming.

By Peter G. Vikre, Mary Ellen Benson, Donald I. Bleiwas, Joseph P. Colgan, Pamela M. Cossette, Jacob DeAngelo, Connie L. Dicken, Ronald M. Drake II, Edward A. du Bray, Gregory L. Fernette, Jonathan M.G. Glen, Jon E. Haacke, Susan M. Hall, Albert H. Hofstra, David A. John, Stephen Ludington, Mark J. Mihalasky, James J. Rytuba, Brian N. Shaffer, Lisa L. Stillings, John C. Wallis, Colin F. Williams, Douglas B. Yager, and Lukas Zürcher

Edited by Warren C. Day, Thomas P. Frost , Jane M. Hammarstrom, and Michael L. Zientek

Scientific Investigations Report 2016-5089-A. U.S. Department of the Interior, U.S. Geological Survey.

USGS 2016b.

Geology and Mineral Resources of the Sheldon-Hart Mountain National Wildlife Refuge Complex (Oregon and Nevada), the Southeastern Oregon and North-Central Nevada, and the Southern Idaho and Northern Nevada (and Utah) Sagebrush Focal Areas

By Peter G. Vikre, Mary Ellen Benson, Donald I. Bleiwas, Joseph P. Colgan, Pamela M. Cossette, Jacob DeAngelo, Connie L. Dicken, Ronald M. Drake II, Edward A. du Bray, Gregory L. Fernette, Jonathan M.G. Glen, Jon E. Haacke, Susan M. Hall, Albert H. Hofstra, David A. John, Stephen Ludington, Mark J. Mihalasky, James J. Rytuba, Brian N. Shaffer, Lisa L. Stillings, John C. Wallis, Colin F. Williams, Douglas B. Yager, and Lukas Zürcher

Chapter B of Mineral Resources of the Sagebrush Focal Areas of Idaho, Montana, Nevada, Oregon, Utah, and Wyoming

Edited by Warren C. Day, Thomas P. Frost , Jane M. Hammarstrom, and Michael L. Zientek

Scientific Investigations Report 2016-5089-B. U.S. Department of the Interior, U.S. Geological Survey. Version 1.1, October 28, 2016