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## 3.3 Mining and Mineral Resources

### **No Action Alternative**

Under the No Action Alternative, the 1999 Congressional land withdrawal of 201,933 acres from public domain (Public Law 106-65) would expire on November 5, 2021, and military training activities requiring the use of these public lands would cease. Expiration of the land withdrawal would terminate the Navy's authority to use nearly all of the Fallon Range Training Complex's (FRTC's) bombing ranges, affecting nearly 62 percent of the land area currently available for military aviation and ground training activities in the FRTC.

### **Alternative 1 – Modernization of the Fallon Range Training Complex**

Under Alternative 1, the Navy would request Congressional renewal of the 1999 Public Land Withdrawal of 202,864 acres, which is scheduled to expire in November 2021. The Navy would request that Congress withdraw and reserve for military use approximately 618,727 acres of additional Federal land and acquire approximately 65,153 acres of non-federal land. Range infrastructure would be constructed to support modernization, including new target areas, and expand and reconfigured existing Special Use Airspace (SUA) to accommodate the expanded bombing ranges. Implementation of Alternative 1 would potentially require the reroute of State Route 839 and the relocation of a portion of the Paiute Pipeline. Public access to B-16, B-17, and B-20 would be restricted for security and to safeguard against potential hazards associated with military activities. The Navy would not allow mining or geothermal development within the proposed bombing ranges or the Dixie Valley Training Area (DVTA). Under Alternative 1, the Navy would use the modernized FRTC to conduct aviation and ground training of the same general types and at the same tempos as analyzed in Alternative 2 of the *2015 Military Readiness Activities at Fallon Range Training Complex, Nevada, Final Environmental Impact Statement* (EIS). The Navy is not proposing to increase the number of training activities under this or any of the alternatives in this EIS.

### **Alternative 2 – Modernization of Fallon Range Training Complex with Managed Access**

Alternative 2 would have the same withdrawals, acquisitions, and SUA changes as proposed in Alternative 1. Alternative 2 would continue to allow certain public uses within specified areas of B-16, B-17, and B-20 (ceremonial, cultural, or academic research visits, land management activities) when the ranges are not operational and compatible with military training activities (typically weekends, holidays, and when closed for maintenance). Alternative 2 would also continue to allow grazing, hunting, off-highway vehicle (OHV) usage, camping, hiking, site and ceremonial visits, and large event off-road races at the DVTA. Additionally under Alternative 2, hunting would be conditionally allowed on designated portions of B-17, and geothermal and salable mineral exploration would be conditionally allowed on the DVTA. Large event off-road races would be allowable on all ranges subject to coordination with the Navy and compatible with military training activities.

### **Alternative 3 – Bravo-17 Shift and Managed Access (Preferred Alternative)**

Alternative 3 differs from Alternative 1 and 2 with respect to the orientation, size, and location of B-16, B-17, B-20 and the DVTA, and is similar to Alternative 2 in terms of managed access. Alternative 3 places the proposed B-17 farther to the southeast and rotates it slightly counter-clockwise. In conjunction with shifting B-17 in this manner, the expanded range would leave State Route 839 in its current configuration along the western boundary of B-17 and would expand eastward across State Route 361 potentially requiring the reroute of State Route 361. The Navy proposes designation of the area south of U.S. Route 50 as a Special Land Management Overlay rather than proposing it for withdrawal as the DVTA. This Special Land Management Overlay would define two areas, one east and one west of the existing B-17 range. These two areas, which are currently public lands under the jurisdiction of BLM, would not be withdrawn by the Navy and would not directly be used for land-based military training or managed by the Navy.

## Environmental Impact Statement

### Fallon Range Training Complex Modernization

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### 3.3 Mining and Mineral Resources

This discussion of mining and mineral resources summarizes existing conditions and analyzes impacts to planning, exploration, development, and production of mineral resources in the proposed Fallon Range Training Complex (FRTC) land boundaries (withdrawal areas). A mineral resource is defined as a concentration of naturally occurring solid, liquid, or gaseous materials in or on the Earth's crust in such form that economic extraction of a commodity is currently or potentially feasible (U.S. Geological Survey, 2001). The term "economic" implies that profitable extraction or production under defined investment assumptions has been established, analytically demonstrated, or assumed with reasonable certainty (U.S. Geological Survey, 2001).

#### 3.3.1 Methodology

The Navy performed a review of relevant mineral resource inventories and evaluations in and near the region of influence to address potential impacts to planning, exploration, development, and production of mineral resources. This mineral resource review is documented in a Mineral Potential Report (see Supporting Study: Mineral Potential Report for the Fallon Range Training Complex Modernization [available at <https://www.frtcmodernization.com>]).

The Mineral Potential Report utilizes multiple lines of evidence (e.g. geology, geophysics, geochemistry, seismology, hydrogeology) derived from many different applicable scientific sources to assess impacts. The Mineral Potential Report was developed in accordance with requirements for land withdrawals as defined in Bureau of Land Management (BLM) Manuals 3031 (Bureau of Land Management, 1985) and 3060 (Bureau of Land Management, 1994). The BLM requirements also apply to lands under the jurisdiction of the United States Fish and Wildlife Service (USFWS).

Given the volume of geologic and mineral resource information that has been acquired in the region of influence since the mid-1800s, direct field work was not considered necessary for the analysis and was not performed. All historical information and literature was carefully reviewed to assess data quality and accuracy and to ensure the data/info used is appropriate. Unless otherwise noted, the primary underlying assumption in the analysis is that the data in previously published sources is valid and does not need to be repeated.

The Mineral Potential Classification System used in the Mineral Potential Report and carried forward in the EIS is as defined in BLM Manual 3031 (Bureau of Land Management, 1985), as a schematic in Table 3.3-1. The Mineral Potential Classification System addresses the potential for the presence or occurrence of a mineral concentration, and the level of data available for consideration. The classification system does not require an estimate of the economic significance or the commercial viability of the concentration. It should be noted that the BLM uses the shortened term "mineral potential" to include both mineral and energy resource potential.

**Locatable minerals:** Includes metallic minerals (e.g., gold, copper, silver, molybdenum, tungsten, iron, and uranium) and industrial minerals (e.g., diatomaceous earth, fluorspar, gypsum, and barite) (General Mining Law of 1872).

**Leasable minerals:** Includes solid minerals (e.g., phosphate, coal, oil shale) and fluid minerals (e.g., oil, gas, and geothermal resources) (Mineral Leasing Act of 1920; Geothermal Steam Act of 1970).

**Salable minerals:** Minerals that are used mainly for construction materials and building roads (e.g., sand, stone, gravel, pumice, pumicite, cinders, and petrified wood) (Materials Act of 1947).

Table 3.3-1: Mineral Potential Classification System

Increasing Potential ----->>>	Increasing Certainty ----->>>				
	ND Unknown Potential	H/A High Potential	H/B High Potential	H/C High Potential	H/D High Potential
		M/A Medium Potential	M/B Medium Potential	M/C Medium Potential	M/D Medium Potential
		L/A Low Potential	L/B Low Potential	L/C Low Potential	L/D Low Potential
					O/D No Potential <sup>1</sup>

<sup>1</sup>Not commonly used and only in special circumstances

Source - Based on BLM Manual 3031 (Bureau of Land Management, 1985), Illustration 3

### 3.3.1.1 Level of Potential

- O = No Potential: The geologic environment, the inferred geologic processes, and the lack of mineral occurrences do not indicate potential for accumulation of mineral or energy resources.
- L = Low potential: The geologic environment and inferred geologic processes indicate a low potential for accumulation of mineral resources.
- M = Moderate potential: The geologic environment, the inferred geologic processes, and the reported mineral or energy occurrences or valid geochemical/geophysical anomaly indicate moderate potential for the accumulation of mineral resources.
- H = High potential: The geologic environment, inferred geologic processes, the reported mineral or energy occurrences and/or valid geochemical/geophysical anomaly, and the known mines or deposits indicate high potential for the accumulation of mineral or energy resources.
- ND = Potential not determined: Mineral and energy resource potential not determined due to a lack of useful data. This notation does not require a level-of-certainty qualifier.

### 3.3.1.2 Level of certainty

- A = The available data are insufficient and/or cannot be considered as direct or indirect evidence to support or refute the possible existence of mineral or energy resources within the respective area.
- B = The available data provide indirect evidence to support or refute the possible existence of mineral or energy resources.
- C = The available data provide direct evidence but are quantitatively minimal to support or refute the possible existence of mineral or energy resources.
- D = The available data provide abundant direct and indirect evidence to support or refute the possible existence of mineral and energy resources.

The impacts analysis summarizes several different geographic focused scenarios pertaining to locatable, leasable, and salable minerals. For the purposes of this Draft Environmental Impact Statement, a significant impact on the mineral resources is considered to be the withdrawal of those classified as either moderate or high potential. The resource potential classification takes into account the resource occurrences, geologic relationship, and historic production for each mineral resource.

To assess the extent of impacts for locatable minerals, the following questions were addressed:

- Does the withdrawal boundary overlie a mineral district partially or entirely?
- Does the extent of moderate or high mineral potential include all or a portion of the mineral district?
- What percentage of high or moderate mineral potential is included inside the withdrawal boundary?

To assess the extent of impacts for leasable and salable minerals, the percentage of high or moderate mineral potential inside the withdrawal boundary was evaluated.

### **3.3.1.3 Region of Influence**

The region of influence for mining and mineral resources includes the mineral resources within the proposed withdrawal areas as well as any mining claims or portions of historical mining districts that may be affected by the alternatives carried forward for analysis. Because the region of influence is defined as the land boundary of the “withdrawal areas,” these terms are used interchangeably.

### **3.3.1.4 Regulatory Framework**

In addition to state and local laws and regulations key Federal statutes, regulations, or executive direction that address mining and mineral resource exploration and development include the following:

- General Mining Law of 1872 (30 United States Code [U.S.C.] section 22 et seq.)
- Mineral Leasing Act of 1920 (30 U.S.C. section 181 et seq.)
- Geothermal Steam Act of 1970 (30 U.S.C. section 1001 et seq.)
- Materials Act of 1947 (“Common Varieties Act”) (30 U.S.C. sections 601–604)
- Mining and Mineral Policy Act of 1970 (30 U.S.C. section 21 et seq.)
- Amendment to the Stock Raising Homestead Act of 1916 (Public Law 103-23)
- Federal Land Policy Management Act of 1976 (43 U.S.C section 1701 et seq.)
- Defense Withdrawal (“Engle”) Act of 1958 (43 U.S.C. sections 155–158)
- Common Varieties Act (30 U.S.C. section 611)
- Material Site Right-of-Way (23 U.S.C. section 317)
- Regulations governing contracts and permits for mineral materials contained in 43 Code of Federal Regulations (CFR) subparts 3610 and 3620
- Executive Order 13817, A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals
- Strategic and Critical Materials Stock Piling Act (50 U.S.C. section 98)
- Military Lands Withdrawal Act of 1999, which was section 3011 of the National Defense Authorization Act for Fiscal Year 2000 (Public Law 106-65)

### **3.3.1.5 Public Scoping Concerns**

During scoping meetings, held October 3–7, 2016, the public raised several concerns for this Environmental Impact Statement. A primary concern was potential impacts on existing and future mining activities. The public was largely focused on how the Proposed Action would affect active mines like the Denton-Rawhide Mine near B-17 and other mining claims in the immediate area. Churchill County and the Governor of Nevada expressed concern with respect to how the Proposed Action would affect geothermal energy development throughout the withdrawal areas, with particular focus on the Dixie Valley area.

### **3.3.2 Affected Environment**

This section provides a summary of the existing mineral resources, which may be affected by the Proposed Action or alternatives.

#### **3.3.2.1 Assessment of Mineral Resource Potential**

The following text summarizes a mineral resource overview and the categories of minerals (as defined in the General Mining Law of 1872).

##### **3.3.2.1.1 Mineral Resource Overview**

Central Nevada has a long history of mining that began with indigenous cultures accessing various deposits of rock and minerals such as obsidian, opalite, chalcedony, agate, jasper, and quartz to fashion jewelry, arrowheads, spear points, and various cutting and scraping tools. As time passed, primitive hand dug mines for commodities such as turquoise and salt gave way to a more modern era of mining. More recent mining in Nevada dates back to 1849 with the discovery of placer gold in a tributary to the Carson River (Tingley et al., 1993). Copper was Nevada's premier commodity from 1940 until the late 1970s. As copper production fell, gold exploration increased. Gold and silver were Nevada's premier commodities throughout the 1980s (Tingley et al., 1993) and Nevada is currently in the midst of another productive period as a result of the discovery of large supplies of Carlin-type gold deposits, which occur where grains are too small to be visible by the naked eye (Nevada Bureau of Mines and Geology, 2017).

Nevada led the United States in the production of overall non-fuel (excluding oil, gas, coal, uranium, and geothermal) mineral production in 2016 (Nevada Bureau of Mines and Geology, 2017). Nevada was the largest producer of gold and barite in the United States in 2016 (Nevada Bureau of Mines and Geology, 2017). The United States was the fourth leading producer of gold in the world, and Nevada accounted for 81 percent of the U.S. gold production (Nevada Bureau of Mines and Geology, 2017). Nevada alone produced approximately 5.5 percent of the world's total gold production in 2016. Nevada was also the only state to produce lithium, magnesite, and the specialty clays (sepiolite and saponite) in 2016 (Nevada Bureau of Mines and Geology, 2017).

In addition to the hard rock minerals discussed above, Nevada's unique location within the Great Basin of the American West provides a favorable potential for geothermal energy development. Nevada is the second-largest geothermal power producing state in the United States, after California, with existing production capacity of approximately 600 megawatts (see Supporting Study: Mineral Potential Report for the Fallon Range Training Complex Modernization [available at <https://www.frtcmodernization.com>]). Some of the same characteristics that allow favorable conditions for geothermal energy development also allow favorable conditions for emergent critical mineral resources, such as lithium, in the form of brine and enriched clay.

##### **3.3.2.1.2 Locatable Minerals**

Locatable minerals are those for which the right to explore, develop, and extract on federal land open to mineral entry is established by the location (or staking) of lode or placer mining claims (General Mining Law of 1872, as amended). Locatable minerals are divided into metallic minerals and industrial minerals.

##### **3.3.2.1.3 Strategic and Critical Minerals**

In addition to the locatable mineral resources above, this analysis looked at critical minerals. The United States is heavily reliant on certain mineral commodities for the Nation's security and economic

prosperity. Executive Order 13817, *A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals*, defined a critical mineral as:

- “(i) a non-fuel mineral or mineral material essential to the economic and national security of the United States,
- (ii) the supply chain of which is vulnerable to disruption, and
- (iii) that serves an essential function in the manufacturing of a product, the absence of which would have significant consequences for our economy or our national security.”

In accordance with Executive Order 13817, the Secretary of Interior provided a draft list of the following 35 critical minerals or mineral material groups in February 2018: aluminum (bauxite), antimony, arsenic, barite, beryllium, bismuth, cesium, chromium, cobalt, fluorspar, gallium, germanium, graphite (natural), hafnium, helium, indium, lithium, magnesium, manganese, niobium, platinum group metals, potash, rare earth elements group, rhenium, rubidium, scandium, strontium, tantalum, tellurium, tin, titanium, tungsten, uranium, vanadium, and zirconium (82 Federal Register 60835). The Defense Logistics Agency also maintains a list of strategic and critical minerals in accordance with the Strategic and Critical Materials Stock Piling Act (50 U.S.C. section 98) (Office of the Under Secretary of Defense for Acquisition, 2017).

#### **3.3.2.1.4 Leasable Minerals**

Leasable minerals defined by the Mineral Leasing Act (February 1920; and 43 CFR 3000-3599, 1990) include the subsets leasable solid and leasable fluid minerals. Since 1920, the Federal government has leased fuels and certain other minerals, charging a royalty on the value of the mined and sold material. Today, solid minerals subject to lease include coal, oil shale, native asphalt, phosphate, diatomite, sodium, potash, potassium, and sulfur. Leasable fluid minerals include oil, gas, coal bed natural gas and geothermal. The BLM has developed rigorous guidelines to be used in development of a Resource Management Plan (RMP) for Fluid Minerals that are described in BLM Handbook H-1624-1, Planning for Fluid Mineral Resources (Bureau of Land Management, 1990). This handbook is supplemented by Information Memorandum No. 2004-089 (Bureau of Land Management, 2004) that presents the BLM’s Policy for Reasonably Foreseeable Development (RFD).

#### **3.3.2.1.5 Salable Minerals**

Salable Minerals are administered by the BLM under the Materials Act of July 31, 1947, the Wilderness 1015 Act, the Wilderness Study Act, Mineral Materials Disposal (43 CFR 3600 regulations for aggregate, sand, gravel, petrified wood, common variety materials, etc.). In addition, Material Site Rights-of-Way are granted to State Departments’ of Transportation (DOTs) under Title 23, Section 317 of the U.S. Code. Regulations governing contracts and permits for mineral materials are contained in 43 CFR, Subparts 3610 and 3620, respectively. The BLM conducts inspection and production verification to assure compliance with contract or permit terms and conditions and prevent and abate unauthorized use.

#### **3.3.2.2 Mineral and Energy Resource Potential Per Range**

This section briefly summarizes the key elements of locatable, critical, leasable, and salable mineral potential for the proposed FRTC Modernization for the B-16, B-17, B-20 and the Dixie Valley Training Area (DVTA) proposed withdrawal area as described in detail in the Navy Mineral Potential Report (see Supporting Study: Mineral Potential Report for the Fallon Range Training Complex Modernization [available at <https://www.frtcmodernization.com>]). Historical mining districts are shown on Figure 3.3-1 and Figure 3.3-2.

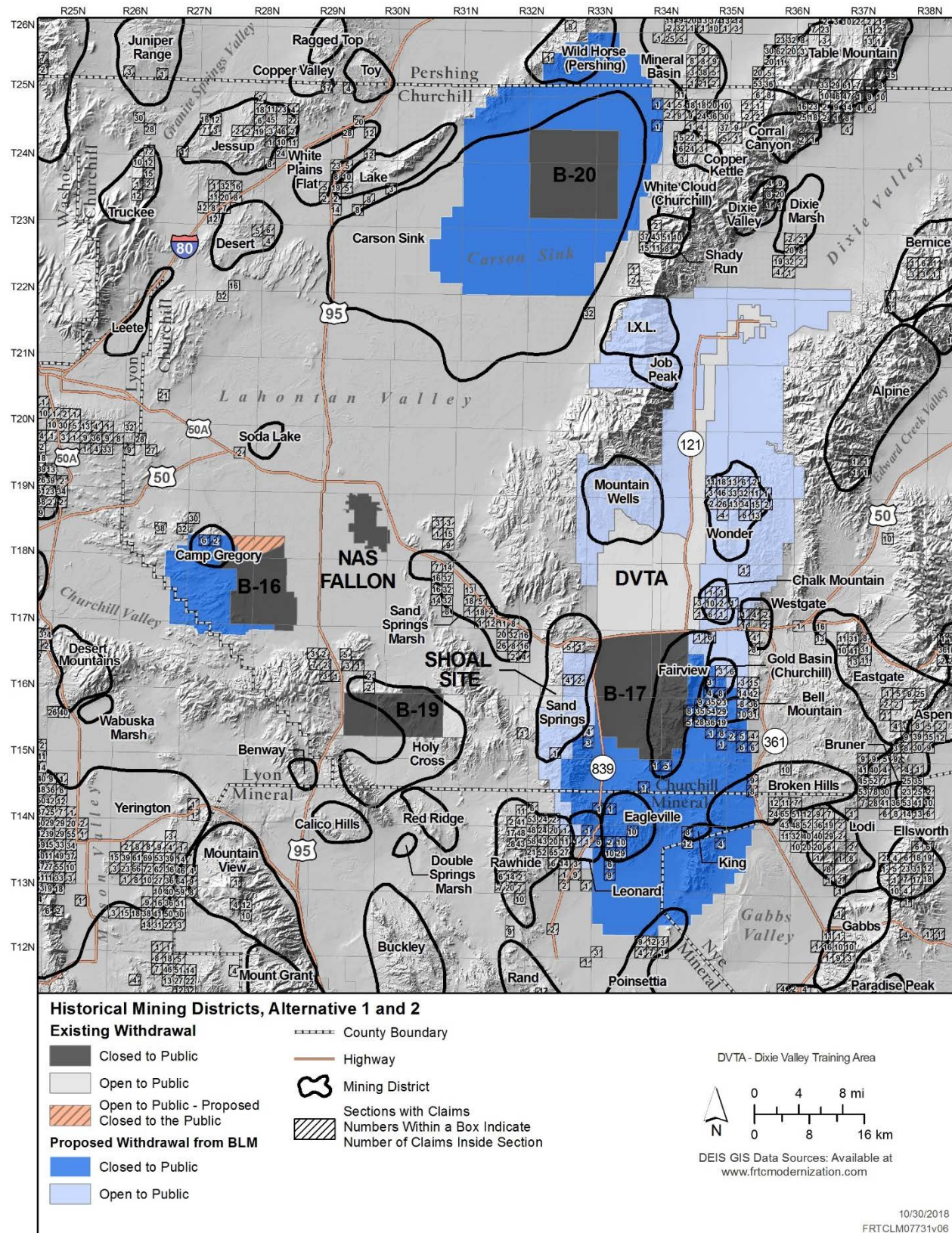


Figure 3.3-1: Historical Mining Districts, Alternative 1 and 2



### 3.3.2.3 Bravo-16

B-16 is located southwest of Naval Air Station (NAS) Fallon and west of U.S. Route 95. The proposed withdrawal (both renewal and expansion) consists of BLM and Bureau of Reclamation land (see Figure 3.2-1). Mining is not allowed within the existing B-16 under the Military Lands Withdrawal Act of 1999.

#### 3.3.2.3.1 Metallic Locatable Minerals

The mining districts may include mineral potentials of high, moderate, or low. For this analysis, metallic locatable minerals with low potential are not discussed because they are not considered to be significant. The following analysis describes the districts and occurrences of mineral resources.

The historical Camp Gregory District, Churchill County, is located on the northeast slope of the Dead Camel Mountains and is the only mining district that overlies the proposed withdrawal area (Table 3.3-2). Mining-related activity in this district is confined to just two small areas, neither of which have a record of metal production.

The majority of the Camp Gregory District lies within the proposed B-16 withdrawal area.

- Gold is classified as having a moderate potential with a certainty of B (Figure 3.3-3)
- Silver is classified as having a moderate potential with a certainty of B (Figure 3.3-4).

No other significant metallic locatable mineral resources are located within or near B-16.

**Table 3.3-2: Summary of Metallic Locatable Resources**

Withdrawal Area	Location	Mineral Resource	Recorded Production	Resource Potential	Certainty Level
B-16	Camp Gregory District	Au, Ag	N/A	Moderate	B
B-17	Leonard District	W	4,995,900 lbs.	High	D
		Au, Ag	N/A	High	C
		Cu	N/A	High	C
	Eagleville District	Au	\$28,000 USD	High	D
		Ag	N/A	Moderate	B
		Cu, Pb	N/A	High	C
	King District	Au	N/A	High	C
	Broken Hills District	Ag, Pb	\$250,000 USD	High	D
		Cu, Mo, Zn	N/A	High	C
B-17/DVTA	Poinsettia District	Au, Hg, Sb, Cu	N/A	Moderate	B
	Monte Cristo Prospect	Cu	N/A	Moderate	C
	Rawhide District	Au	17,927 oz. in	High	D
		Ag	105,413 oz. in	High	D
	Westgate District	Pb, Ag, Au	N/A	High	C
		Cu	N/A	Moderate	C
	Sand Springs District	Au	20,895 oz.	High	D
		Ag	1,262,655 oz.	High	D
		W	42,029 lbs.	High	D
		Cu	N/A	Moderate	B
	South Sand Springs Prospect	Au, Ag	N/A	Moderate	B

Table 3.3-2: Summary of Metallic Locatable Resources (continued)

Withdrawal Area	Location	Mineral Resource	Recorded Production	Resource Potential	Certainty Level
B-17/DVTA	Fairview District	Au	48,000 oz.	High	D
		Ag	4,700,000 oz.	High	D
		Cu, Mo, Pb, Zn	N/A	High	C
	Slate Mountains Prospect	Au, Ag	N/A	Moderate	B
	Gold Basin District	Au	N/A	High	C
	Bell Mountain District	Au	19.5 oz.	High	D
		Ag	639.6 oz.	High	D
B-20	Wild Horse (Pershing) District	W	200 tons of ore	High	D
		Sb	46 tons	High	D
		Cu, Mo	N/A	Moderate	C
		Pb, Zn	N/A	Moderate	C
DVTA	I.X.L Canyon District	Ag	\$20,000 USD	High	D
		Au	N/A	Moderate	B
		Pb, Zn, Cu	N/A	High	C
		W	N/A	Moderate	C
	Job Peak District	Cu, Mo	N/A	Moderate	C
	Mountain Wells (La Plata) District	Mo, W, Cu	N/A	High	C
		Ag	N/A	High	C
		Au	N/A	Moderate	B
		Zn	N/A	Moderate	C
	Wonder District	Au	69,000 oz.	High	D
		Ag	6,400,000 oz.	High	D
		Pb	N/A	High	C
		Cu	N/A	High	C
	Chalk Mountain District	Pb	861,355 lbs.	High	D
		Ag	59,651 oz.	High	D
		Au	99 oz.	High	D
		Cu	N/A	High	C
		Zn	N/A	Moderate	C

Notes: Au=Gold, Ag = Silver, Cu=Copper, Mo=Molybdenum, Pb=Lead, Zn=Zinc, W=Tungsten, Sb=Antimony, Hg=Mercury

### 3.3.2.3.2 Industrial Locatable Minerals

The mining districts may include mineral potentials of high, moderate, or low. For this analysis, industrial locatable minerals with moderate and low potential are not discussed because they are not considered to be significant. The following analysis describes the occurrences of industrial mineral resources.

Tingley (1998) reports diatomite is present in the Dead Camel Mountains near the Camp Gregory mining district (Table 3.3-3), however, in 2016 there was no reported exploration and/or production of diatomite within the Study Area (Muntean et al., 2017). Although not located within the B-16 area, diatomite deposits occur in dry lakebed sediments several miles south of the district. This resource is classified as having a high potential with a certainty of C. Lithium potential is not known to occur in B-16 (Figure 3.3-5). No other significant industrial locatable mineral resources are located within or near B-16.

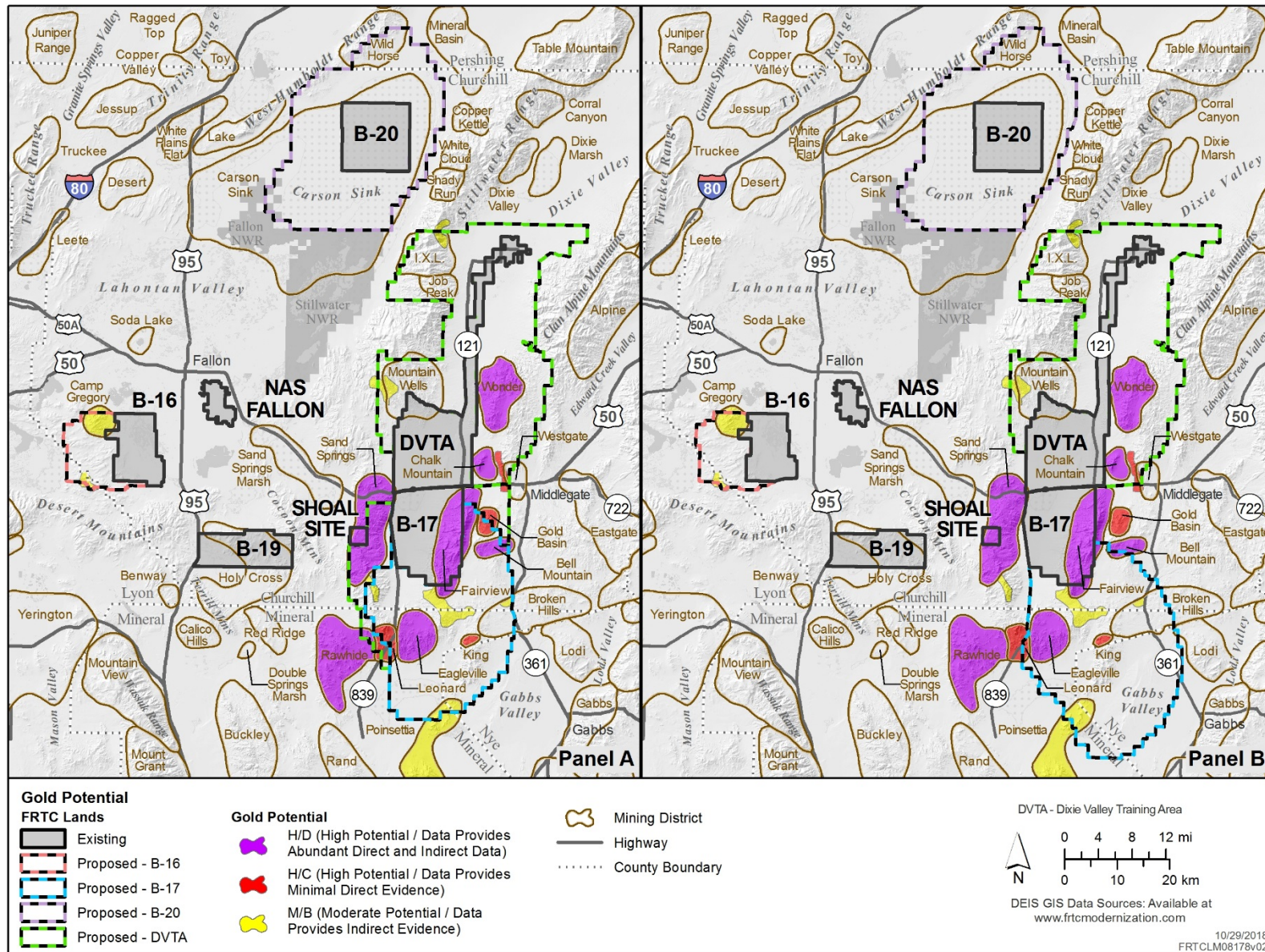


Figure 3.3-3: Gold Potential under Alternative 1 and 2 (Panel A) and Alternative 3 (Panel B)

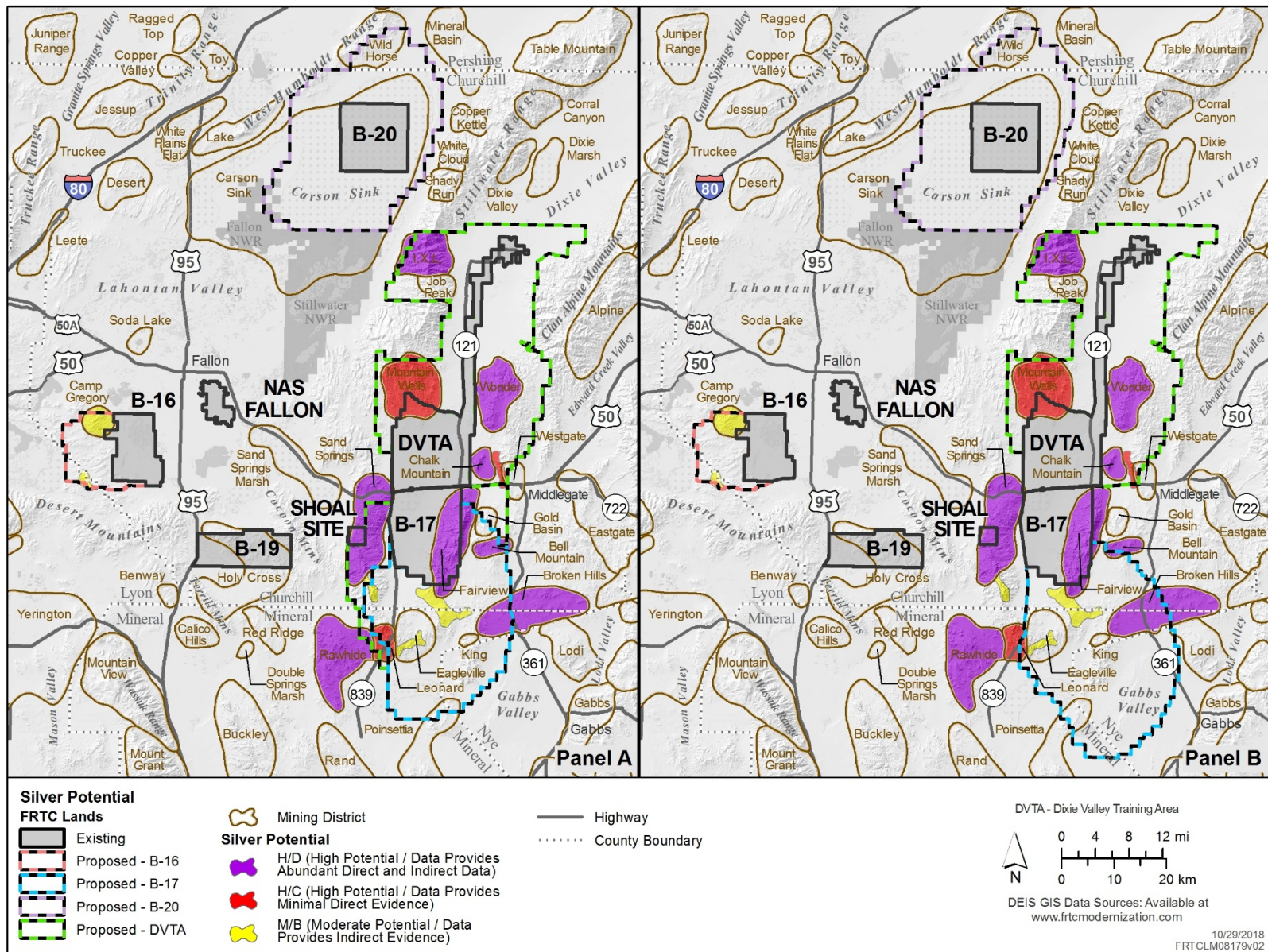


Figure 3.3-4: Silver Potential under Alternative 1 and 2 (Panel A) and Alternative 3 (Panel B)

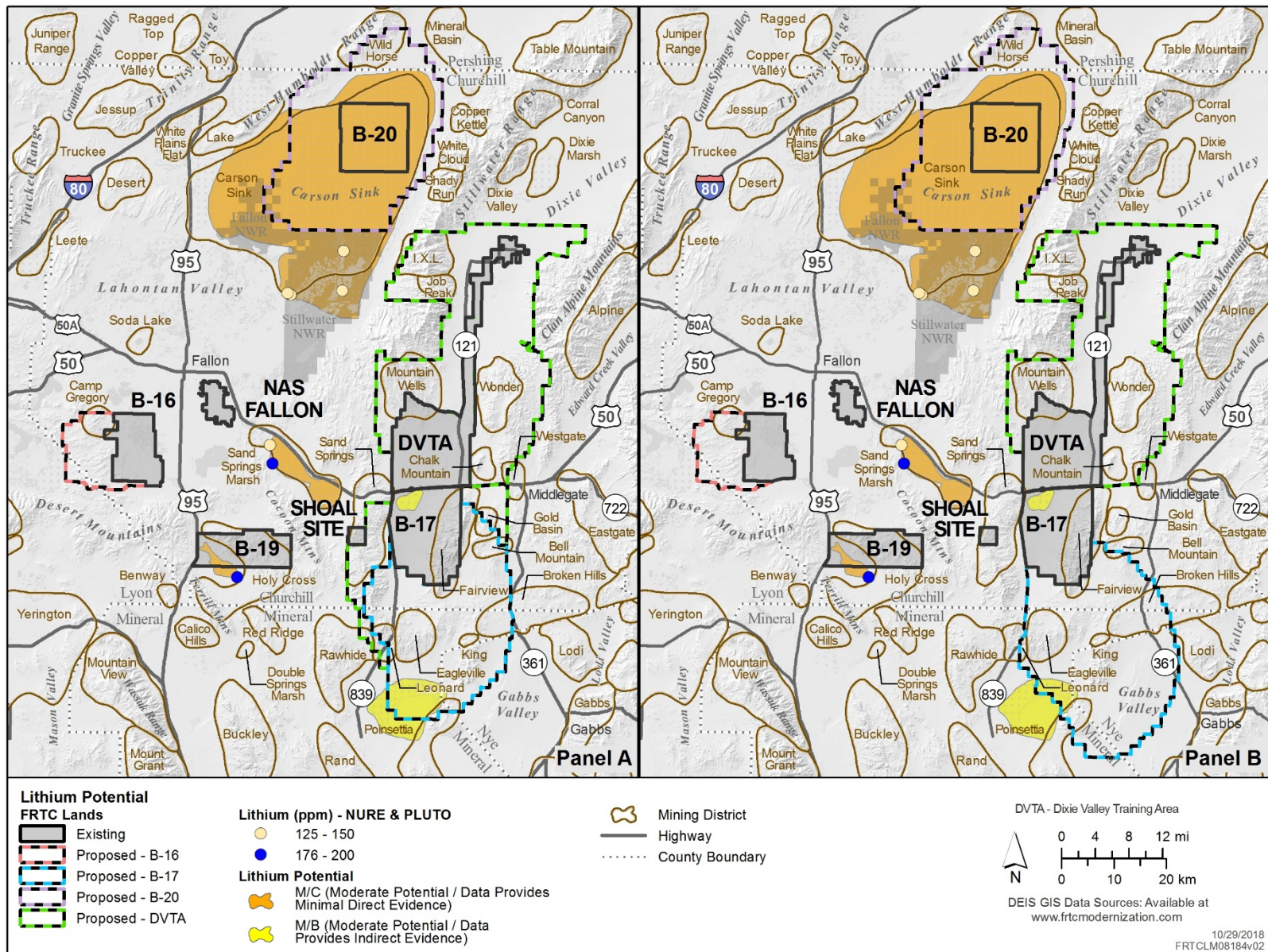


Figure 3.3-5: Lithium Potential under Alternative 1 and 2 (Panel A) and Alternative 3 (Panel B)

**Table 3.3-3: Summary of Industrial Locatable Resources**

Area	Location	Mineral Resource	Recorded Production	Resource Potential	Certainty Level
B-16	Near Camp Gregory District	Diatomite	N/A	High	C
B-17	Broken Hills District	Flourite	6,000,000	High	D
	Broken Hills District	Andorite, Boulangerite, Cerussite, Jamesonite, and Owyheeite	N/A	High	C
	Eagleview District	Barite	2,000 tons	High	D
	N/A	Petrified Wood	N/A	High	C
	N/A	Lithium	N/A	Moderate	B
	King District	Fire Opal	N/A	High	C
B-20	Wild Horse District	Barite	N/A	High	C
	N/A	Lithium	N/A	Moderate	C
DVTA	I.X.L Canyon District	Flourite	1,900 tons	High	D
	Mountain Wells (La Plata) District	Flourite	500 tons	High	D
	Rawhide District	Alunite and Barite	N/A	High	C
	Chalk Mountain District	Descloizite, McGuinnessite, Mimetite and Vanadinite	N/A	High	C
	Westgate District	Zeolites	N/A	High	C

### 3.3.2.3.3 Strategic and Critical Minerals

The proposed B-16 withdrawal is not known to include areas with high or moderate potential for critical minerals (see Figure 3.3-6).

### 3.3.2.3.4 Leasable Minerals

The proposed withdrawal areas may include mineral potentials of high, moderate, or low. The following analysis describes the areas and occurrences of leasable mineral resources.

The proposed B-16 withdrawal includes areas that have been evaluated as having high potential for geothermal resources (Figure 3.3-6). Geothermal potential is classified as shown below:

- High with certainty of B in the northeast section of the proposed withdrawal area.
- The remaining area is classified as having a low potential with a certainty of B.

There are no other leasable resources classified as having a high or moderate potential (Table 3.3-4). Other leasable mineral resources are classified as having a low potential (Table 3.3-4). These include

- oil and gas with a certainty of C (Figure 3.3-7),
- oil shale with a certainty of D,
- asphalt with a certainty of C,
- coal with a certainty of D,
- phosphate with a certainty of B,
- potash with a certainty of B (Figure 3.3-8),
- sodium minerals with certainty of D (Figure 3.3-9), and
- sulfur with certainty of D.

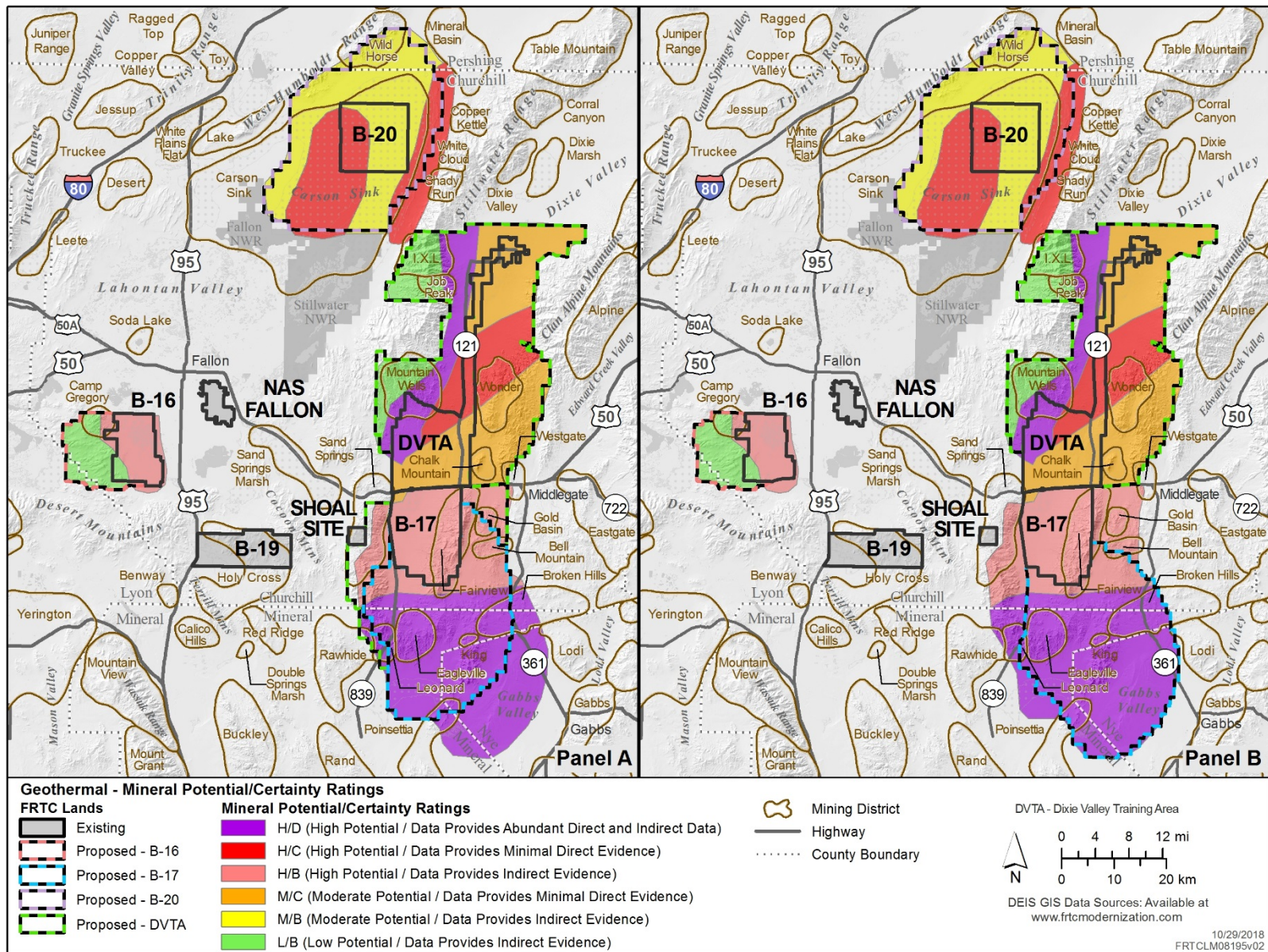


Figure 3.3-6: Geothermal - Mineral Potential/Certainty Ratings under Alternative 1 and 2 (Panel A) and Alternative 3 (Panel B)

Table 3.3-4: Summary of Leasable Resources

Area	Location	Mineral Resource	Resource Potential	Certainty Level
B-16	---	O&G	Low	C
	---	Oil Shale	Low	D
	---	Asphalt	Low	C
	---	Coal	Low	D
	---	Phosphate	Low	B
	Non-Playa	Potash	Low	B
	Non-Playa	Sodium Minerals	Low	D
	---	Sulfur	Low	D
	---	Geothermal	Low	B
B-17	Gabbs Valley	O&G	Low	C
	---	Oil Shale	Low	D
	---	Asphalt	Low	C
	---	Coal	Low	D
	---	Phosphate	Low	B
	Non-Playa	Potash	Low	B
	Non-Playa	Sodium Minerals	Low	D
	---	Sulfur	Low	D
	---	Geothermal	High	B (north) D (south)
B-20	Carson Sink	O&G	Low	C
	---	Oil Shale	Low	D
	---	Asphalt	Low	C
	---	Coal	Low	D
	---	Phosphate	Low	B
	Carson Sink	Potash	Moderate	B
	Non-Playa	Potash	Low	B
	Carson Sink	Sodium Minerals	Moderate	D
	Non-Playa	Sodium Minerals	Low	D
	---	Geothermal	Moderate to High	B to C
	---	Sulfur	Low	D
DVTA	---	O&G	Low	C
	---	Oil Shale	Low	D
	---	Asphalt	Low	C
	---	Coal	Low	D
	---	Phosphate	Low	B
	Non-Playa	Potash	Low	B
	Non-Playa	Sodium Minerals	Low	D
	---	Sulfur	Low	D
	---	Geothermal	High	C

### 3.3.2.3.5 Salable Minerals

The proposed withdrawal areas may include salable mineral potentials of high, moderate, or low. The following analysis describes the areas and occurrences of mineral resources, which are shown on Figure 3.3-10.

Salable resources are listed in Table 3.3-5.

Based on the Mineral Resource Potential Report, salable resources within the B-16 withdrawal area classified as having high resource potential include

- aggregate, sand & gravel, with certainty level D.

Moderate potential minerals consist of:

- clay, with certainty level D.

Low potential minerals include:

- pumice and cinder, with certainty level C;
- petrified wood, with certainty level C; and
- building, ornamental and specialty stone with certainty level B.

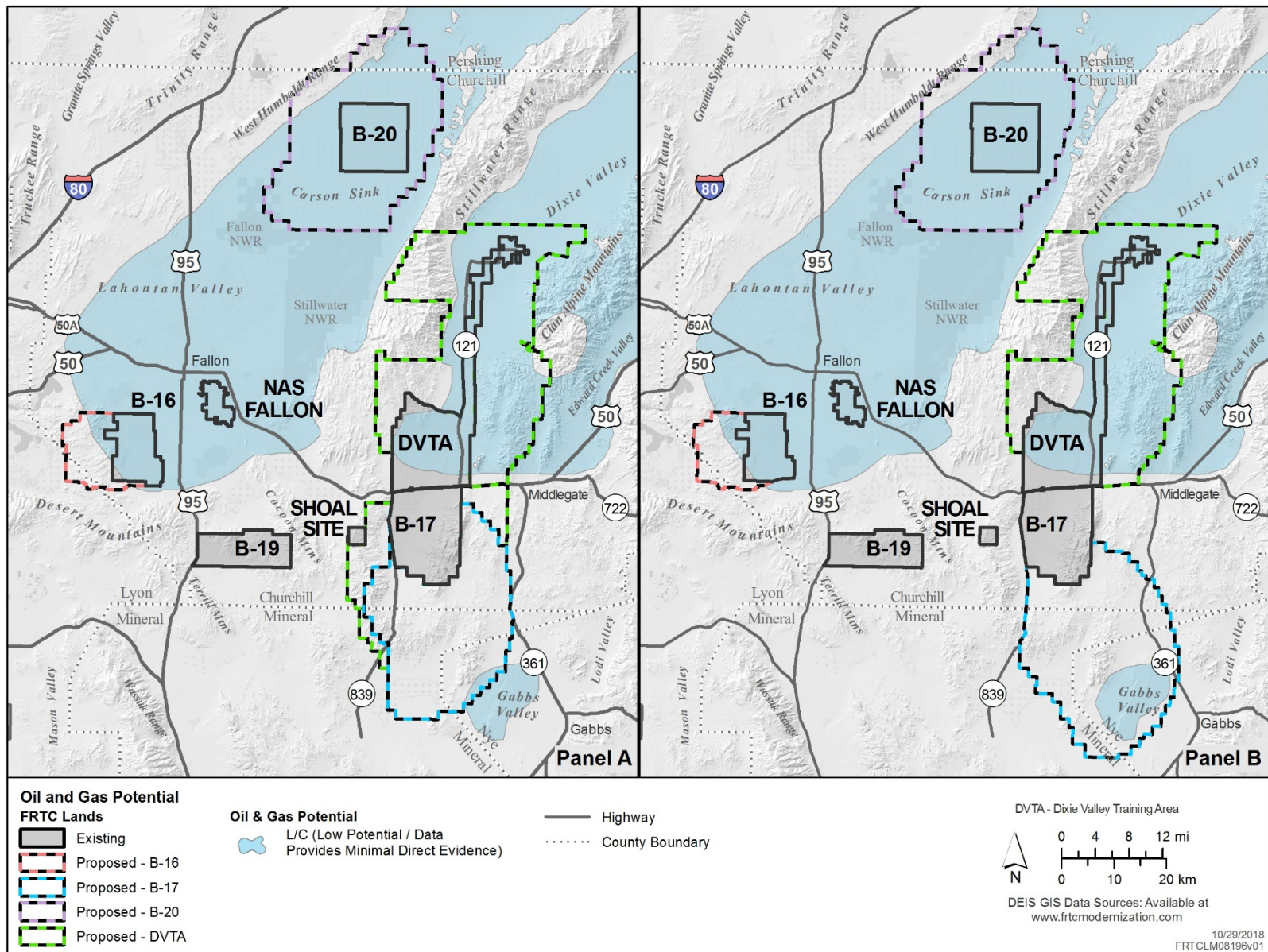


Figure 3.3-7: Oil and Gas Potential under Alternative 1 and 2 (Panel A) and Alternative 3 (Panel B)

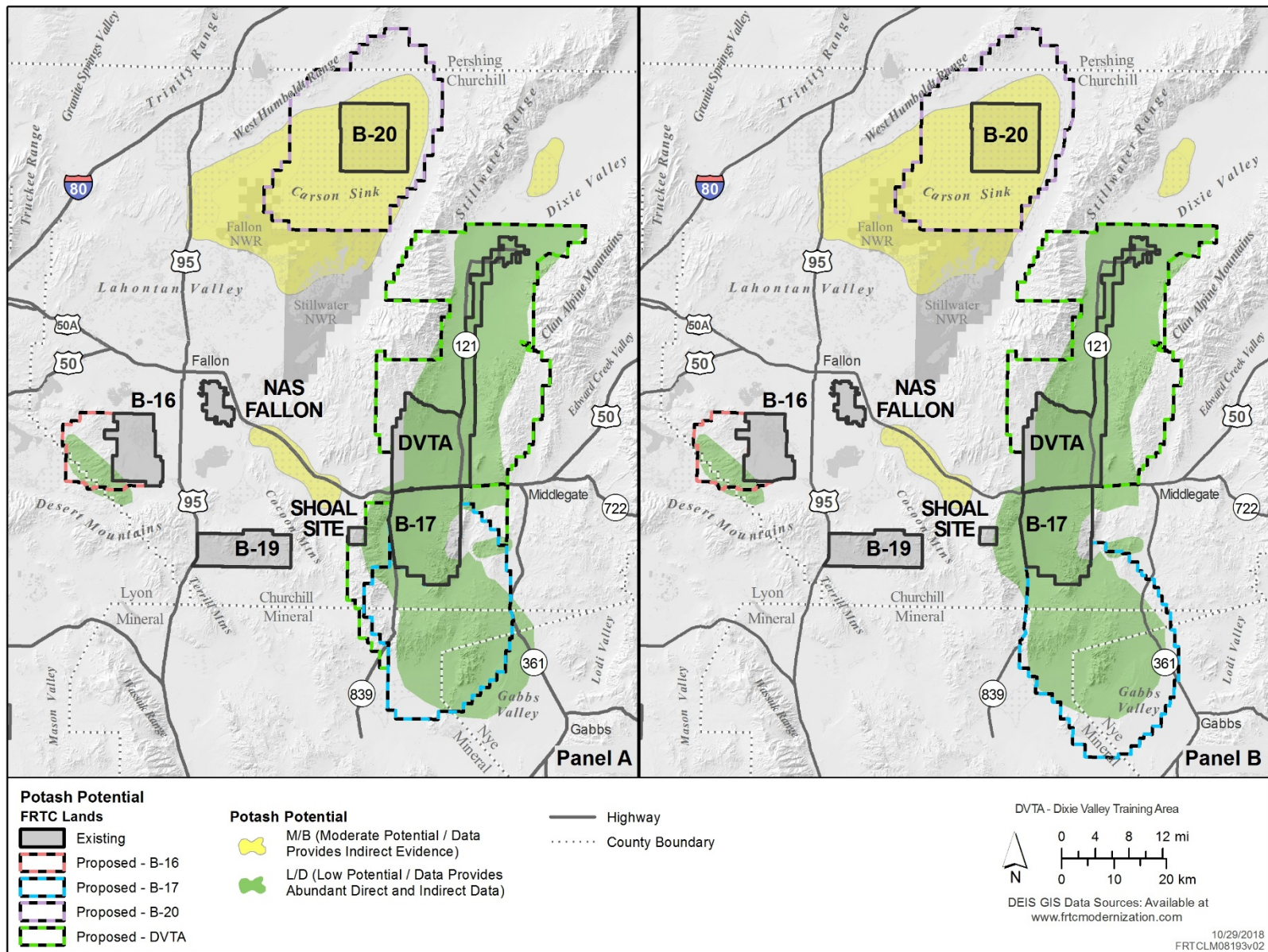


Figure 3.3-8: Potash Potential under Alternative 1 and 2 (Panel A) and Alternative 3 (Panel B)

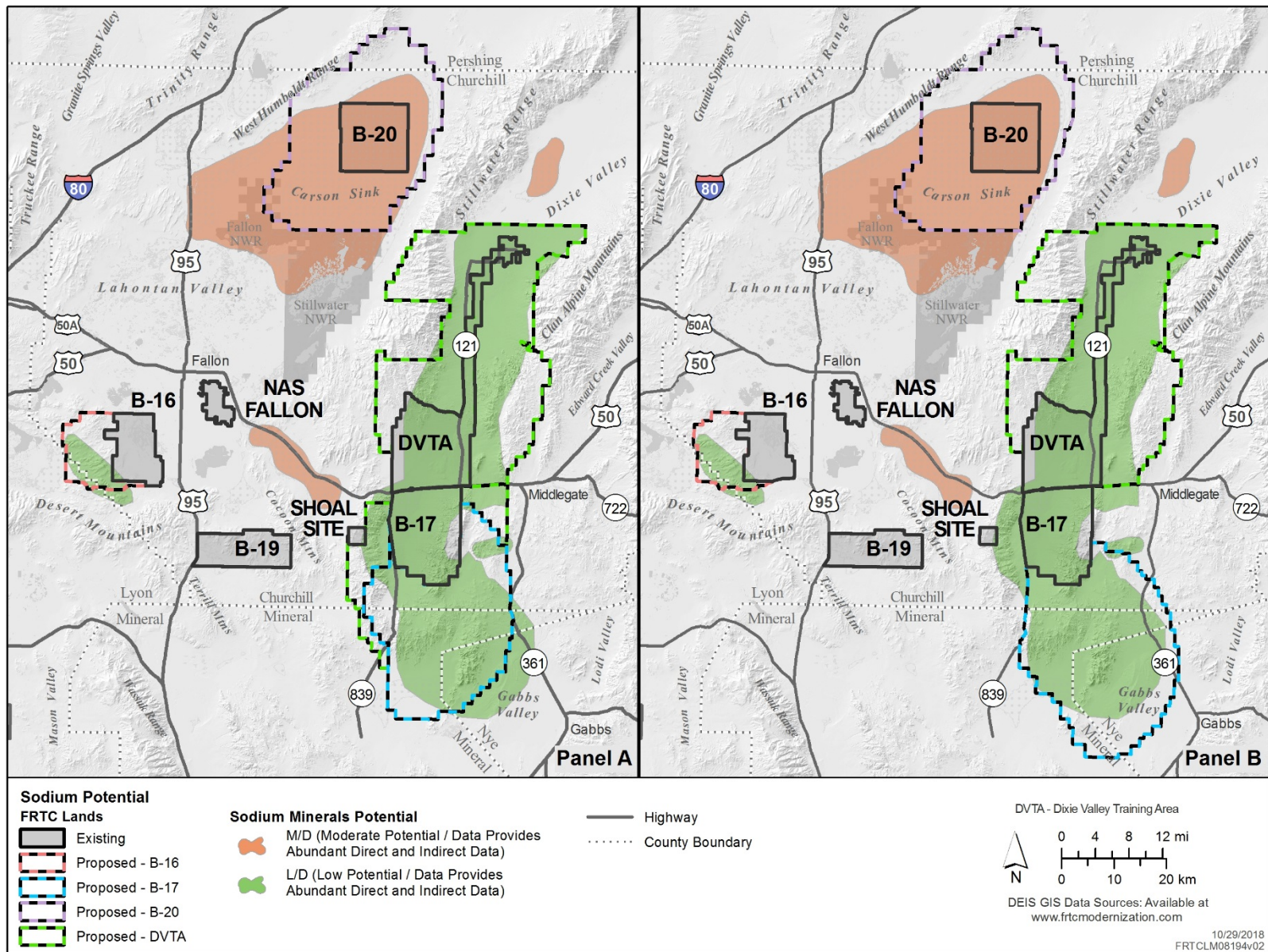


Figure 3.3-9: Sodium Potential under Alternative 1 and 2 (Panel A) and Alternative 3 (Panel B)

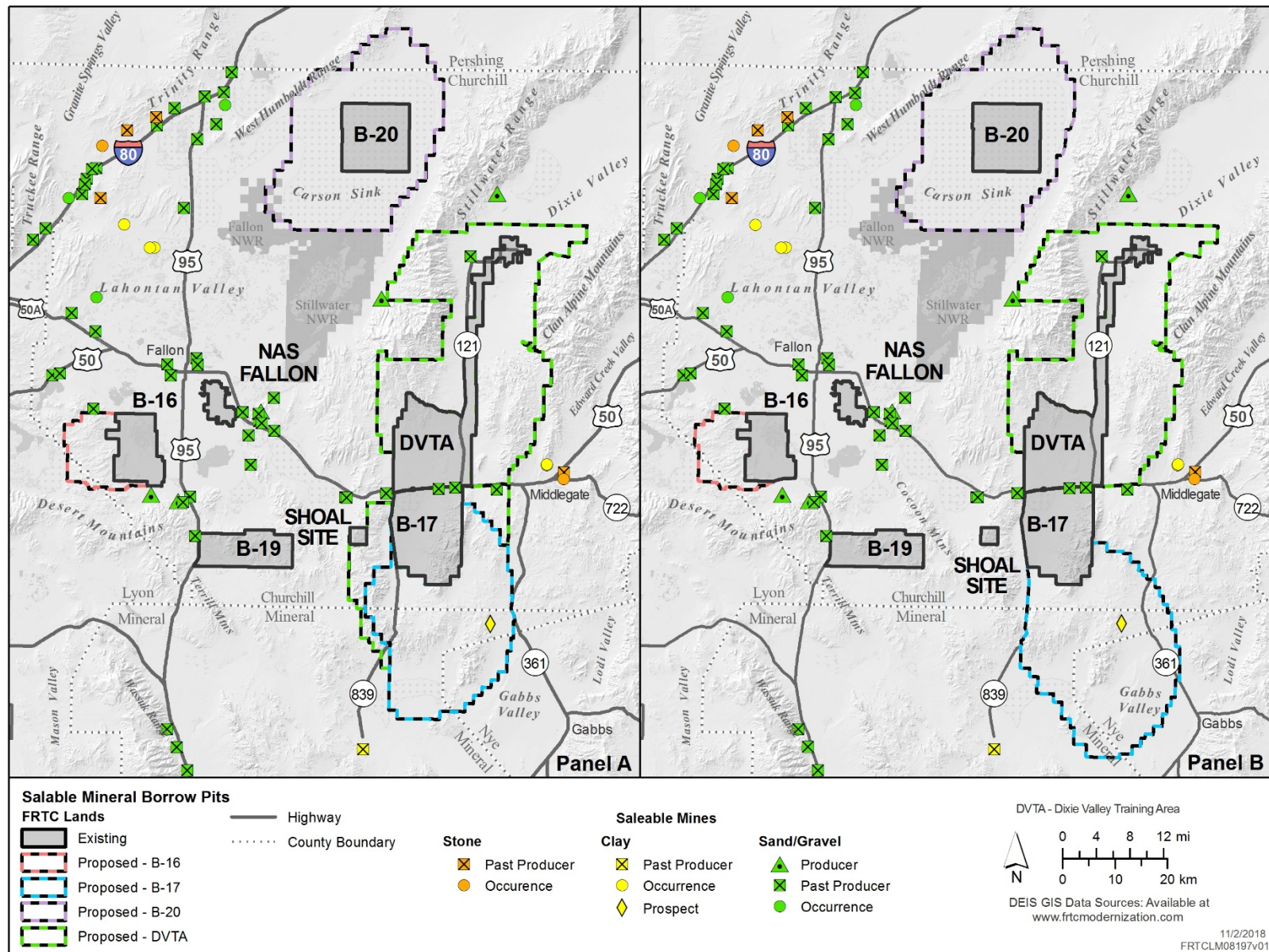


Figure 3.3-10: Salable Mineral Borrow Pits under Alternative 1 and 2 (Panel A) and Alternative 3 (Panel B)

Table 3.3-5: Summary of Salable Resources

Area	Mineral Resource	Resource Potential	Certainty Level	Comments
B-16	Aggregate, Sand & Gravel	High	D	Geologically favorable conditions
	Clay	Moderate	D	Defined by historic production
	Pumice & Cinder	Low	C	Defined by (Papke & Castor, 2003)
	Building, Ornamental, & Specialty Stone	Low	B	Geologically favorable conditions (bedrock only)
	Petrified Wood	Low	C	Geologically favorable conditions
B-17	Aggregate, Sand & Gravel	High	D	Geologically favorable conditions
	Clay	Moderate	D	Geologically favorable conditions
	Pumice & Cinder	Low	C	Defined by (Papke & Castor, 2003)
	Building, Ornamental, & Specialty Stone	High	B	Defined by historic production
	Petrified Wood	Moderate	C	Defined by Mustoe (2015)
B-20	Aggregate, Sand & Gravel	High	D	Geologically favorable conditions
	Clay	Moderate	D	Geologically favorable conditions
	Pumice & Cinder	Low	C	Defined by (Papke & Castor, 2003)
	Building, Ornamental, & Specialty Stone	Low	B	Geologically favorable conditions (bedrock only)
	Petrified Wood	Low	C	Geologically favorable conditions
DVT A	Aggregate, Sand & Gravel	High	D	Geologically favorable conditions
	Clay	Moderate	D	Geologically favorable conditions
	Pumice & Cinder	Low	C	Defined by (Papke & Castor, 2003)
	Building, Ornamental, & Specialty Stone	Low	B	Geologically favorable conditions (bedrock only)
	Petrified Wood	Low	C	Geologically favorable conditions

Table 3.3-6: Summary of Strategic and Critical Minerals

Critical Mineral	Potential & Certainty Assessment	Geological Description/Comments	Use	Potential & Certainty Comments
Aluminum (bauxite)	Low/B	Primary ore of aluminum, commonly found in lateritic bauxite deposits, used in almost all sectors of the economy	Used in almost all sectors of the economy	There are no observations of laterite deposits within the area of interest and other potential sources for Aluminum as secondary or by-products appear to be negligible.
Antimony	Moderate/B	Occurs in carbonate replacement deposits, skarns, epithermal and porphyry deposits, often as secondary or gangue minerals	Used in batteries and flame retardants	Historic records indicate some secondary Antimony production in the Poinsetta and Wild Horse districts. Antimony present in many deposits in the area but often treated as a deleterious mineral and are removed and disposed of during the recovery of precious minerals.
Arsenic	Moderate/B	Commonly found in minor concentrations and recovered as by-product in processing of copper, gold and lead ores or by direct processing of arsenopyrite and other arsenic-bearing minerals	Used in lumber preservatives, pesticides and semi-conductors	Arsenic is present in many deposits in the area but often treated as a deleterious mineral and are removed and disposed of during the recovery of precious minerals.
Barite (Ba)	High/D & Moderate/B	Commonly found in bedded-sedimentary, bedded-volcanic, vein, and replacement deposits	Used in cement and petroleum industries	Barite has been historically produced from two mines in the Eagleville District; not actively being explored for in the Study Area.
Beryllium	Moderate/B	Occur in uncommon geological settings and specific deposit types such as intrusion of fluorine and beryllium rich magmas into carbonate rocks as well as in Beryl-bearing pegmatites	Used as an alloying agent in aerospace and defense industries	Beryllium present in many deposits in the area but often treated as a deleterious mineral and are removed and disposed of during the recovery of precious minerals.

Table 3.3-6: Summary of Strategic and Critical Minerals (continued)

Critical Mineral	Potential & Certainty Assessment	Geological Description/Comments	Use	Potential & Certainty Comments
Bismuth	Low/B	Commonly found in minor concentrations and recovered as by-product in processing of lead and tungsten ores	Used in medical and atomic research	No indications of bismuth occurring in the Study Area; however, there are a number of zinc and Tungsten occurrences where Bismuth may be present.
Cesium	Unknown Potential	Occur in uncommon geological settings and specific deposit types such as in pollucite-bearing pegmatites and recovered as by-product in nuclear fission	Used in research and development	No indications of cesium occurring in the Study Area.
Chromium	Low/B	Occur in uncommon geological settings and specific deposit types such as chromite-bearing stratiform and podiform ultramafic intrusive deposits	Used primarily in stainless steel and other alloys	There are no observations of these special geological settings or deposits occurring within the Study Area.
Cobalt	Moderate/B	Commonly found in minor concentrations and recovered as by-product in processing of copper and nickel ore from sediment hosted stratiform copper deposits, magmatic nickel sulphide deposits and nickel laterite deposits	Used in rechargeable batteries and superalloys	There are no observations of these special geological settings or deposits occurring within the Study Area; however, there is potential for secondary cobalt associated with some of the other base metals deposits.
Fluorspar	High/D & Moderate/B	Commonly found in carbonate replacement deposits and in minor concentrations and recovered as by-product in processing of limestone and uranium ores	Used in the manufacture of aluminum, gasoline and uranium fuel	Fluorspar historically mined in the IXL Canyon, the Mountain Wells and Broken Hills districts

Table 3.3-6: Summary of Strategic and Critical Minerals (continued)

Critical Mineral	Potential & Certainty Assessment	Geological Description/Comments	Use	Potential & Certainty Comments
Gallium	Low/B	Commonly found in minor concentrations and recovered as by-product in processing of aluminum from bauxite deposits as well as from processing zinc ores	Used for integrated circuits and optical devices like LEDs	No indications of Gallium occurring in the Study Area; however, there is known zinc mineralization in the Study Area that may have potential associated Gallium mineralization.
Germanium	Low/B	Commonly found in minor concentrations and recovered as by-product in processing of zinc and other ores	Used for fiber optics and night vision applications	No indications of Germanium occurring in the Study Area; however, there is known zinc mineralization in the Study Area that may have potential associated Germanium mineralization.
Graphite C (t)	Unknown Potential	Commonly found as veins and or layers in metamorphosed marble, schist and gneiss	Used for lubricants, batteries, and fuel cells	No indications of Graphite occurring in the Study Area.
Hafnium	Low/A	Occurs in association with Zirconium in uncommon geological settings and specific rock types such as heavy mineral sands deposits	Used for nuclear control rods, alloys, and high-temperature ceramics	No indications of Hafnium occurring in the Study Area and no known mineral sands deposits in the Study Area.
Helium	Low/B	Commonly extracted as a by-product during natural gas processing	Used for MRIs, lifting agent and research	There are isolated natural gas seeps in the Study Area that may have the potential to include Helium.
Indium	Low/B	Commonly found in minor concentrations and recovered as by-product in processing of zinc and other ores	Mostly used in LCD screens	No indications of Indium in the Study Area; however, there are occurrences of Zinc that may have associated Indium.

Table 3.3-6: Summary of Strategic and Critical Minerals (continued)

Critical Mineral	Potential & Certainty Assessment	Geological Description/Comments	Use	Potential & Certainty Comments
Lithium	Moderate/C & Moderate/B	Occur in uncommon geological settings and specific deposit types such as closed-basin brines, pegmatites and related granites, lithium-enriched clays, oilfield brines, geothermal brines and lithium-enriched zeolite deposits	Used primarily for batteries	There are known isolated occurrences of lithium enrichment associated with playas in the Study Area; however, there have been no significant lithium resources identified to date in the Study Area.
Magnesium	Moderate/B	Commonly found in magnesium-bearing brines and also recovered as a by-product in processing of other ores	Used in furnace linings for manufacturing steel and ceramics	No indications of Magnesium in the Study Area; however, there is the potential for Magnesium-enriched brines associate with the playas and geothermal activity in the Study Area.
Manganese	Moderate/B	Commonly found in manganese oxide deposits, primarily as pyrolusite (Manganese dioxide); also common as gangue associated with gold mineralization.	Used in steelmaking	Manganese-oxides are known to occur in the study area; however, they are in the form of oxide staining gauge mineralization in association with gold mineralization are not considered to be present in economic concentrations.
Niobium	Unknown Potential	Occurs in association with Tantalum in uncommon geological settings and specific rock types such as silica-deficient alkaline igneous rocks, granite-syenite and carbonatite complexes	Used mostly in steel alloys	No indications of Niobium occurring in the Study Area.

Table 3.3-6: Summary of Strategic and Critical Minerals (continued)

Critical Mineral	Potential & Certainty Assessment	Geological Description/Comments	Use	Potential & Certainty Comments
Platinum Group Elements (PGE)	Unknown Potential	Occur in uncommon geological settings and specific deposit types such as magmatic Ni-Cu-PGE deposits, or placer deposits formed by the erosion of PGE bearing magmatic deposits	Used for catalytic agents	No indications of PGE mineralization occurring in the Study Area.
Potash (K)	Moderate/B & Low/D	Primary ore of potassium commonly found in evaporite and brine deposits	Primarily used as a fertilizer	There are no known deposits of potash or known potash-enriched brines in the study area; however, the potential exists for both near surface and deeper brine hosted Potash mineralization especially in the playas.
Rare Earth Element (REE) Group	Unknown Potential	Occur in uncommon geological settings and specific rock types such as carbonatites, silica-deficient alkaline igneous rocks, and specialized clays	Primarily used in batteries and electronics	No indications of REE mineralization occurring in the Study Area.
Rhenium	Low/B	Commonly found in minor concentrations and recovered as by-product in processing of copper, molybdenum ores from porphyry deposits	Used for lead-free gasoline and superalloys	No indications of Rhenium in the Study Area; however, there are occurrences of Copper and Molybdenum mineralization in the Study Area that may have associated Rhenium.
Rubidium	Low/B	Commonly found in minor concentrations and recovered as by-product in processing cesium, lithium, and strontium ores from evaporate and brine deposits	Used for research and development in electronics	No indications of Rubidium in the Study Area; however, there are occurrences of Lithium mineralization in the Study Area that may have associated Rubidium.

Table 3.3-6: Summary of Strategic and Critical Minerals (continued)

Critical Mineral	Potential & Certainty Assessment	Geological Description/Comments	Use	Potential & Certainty Comments
Scandium	Unknown Potential	Commonly found in minor concentrations and recovered as by-product in processing uranium ore and nickel and aluminum ores from bauxite deposits	Used for alloys and fuel cells	No indications of Scandium in the Study Area.
Strontium	Unknown Potential	Occur in uncommon geological settings and specific deposit types such as celestite-bearing clays and sedimentary deposits	Used for pyrotechnics and ceramic magnets	No indications of Strontium in the Study Area.
Tantalum	Unknown Potential	Occurs in association with Niobium in uncommon geological settings and specific rock types such as silica-deficient alkaline igneous rocks, granite-syenite, and carbonatite complexes	Used in electronic components	No indications of Tantalum in the Study Area.
Tellurium	Low/B	Commonly found in minor concentrations and recovered as by-product in processing of copper and gold ore from porphyry deposits and from volcanogenic massive sulfide (VMS) deposits	Used in steelmaking and solar cells	No indications of Tellurium in the Study Area; however, there are occurrences of Gold mineralization in the Study Area that may have associated Tellurium.
Tin	Low/B	Occur in uncommon geological settings and specific deposit types such as cassiterite-bearing pegmatites and granitic intrusions and placer deposits formed by the erosion of cassiterite-bearing felsic intrusive rocks	Used as protective coatings and alloys for steel	No indications of Tellurium in the Study Area; however, there may be Tin associated with other base and precious mineralization or associated with weathering of cassiterite bearing volcanic rocks.

Table 3.3-6: Summary of Strategic and Critical Minerals (continued)

Critical Mineral	Potential & Certainty Assessment	Geological Description/Comments	Use	Potential & Certainty Comments
Titanium	Unknown Potential	Occur in uncommon geological settings and specific deposit types such as heavy mineral sands deposits and ilmenite-bearing mafic intrusion-related deposits	Overwhelmingly used as a white pigment or metal alloys	No indications of Titanium in the Study Area.
Tungsten	Moderate/B	Occurs, often in association with molybdenum, tin, and other metals, in uncommon geological settings and specific deposit types such as pegmatites and hydrothermal deposits	Primarily used to make wear-resistant metals	Tungsten mineralization occurs in the Study Area in association with skarn and porphyry base and precious minerals deposits.
Uranium	Low/B	Occur in uncommon geological settings and specific deposit types associated with weathering and transport or fluid transport and deposition associated with uranium-rich source rocks	Primarily used for nuclear fuel	No indications of Uranium in the Study Area; however, there may be Uranium mineralization associated with felsic plutons in the Study Area.
Vanadium	Unknown Potential	Commonly recovered by secondary processing of by-products from magnetite- and titanium-bearing ores	Primarily used for titanium alloys	No indications of Vanadium in the Study Area.
Zirconium	Low/A	Occurs in association with Hafnium in uncommon geological settings and specific rock types such as heavy mineral sands deposits	Used in the high-temperature ceramics industries	No indications of Zirconium in the Study Area and no known mineral sands deposits in the Study Area.

#### 3.3.2.4 Bravo-17

B-17 is located southeast of NAS Fallon and south of U.S. Route 50. The proposed B-17 expansion areas (under the various action alternatives) are composed primarily of BLM land and a few private parcels (referred to as “inholdings”). See Section 3.2 (Land Use) for landownership in and around B-17. Mining is not allowed within the existing B-17 range under the Military Lands Withdrawal Act of 1999.

This section evaluates the locatable, critical, leasable, and salable minerals for the proposed B-17 withdrawal area.

##### 3.3.2.4.1 Metallic Locatable Minerals

Historical Mining Districts located south of U.S. Route 50 include Sand Springs, Gold Basin (Churchill), Bell Mountain Fairview, Rawhide, Leonard, Eagleville, King, Broken Hill and Poinsettia Districts (Table 3.3-2). Under the various action alternatives, the historical mining district boundaries overlie entirely or in part the proposed withdrawal areas (Figure 3.3-1 and Figure 3.3-2). The mining districts may include mineral potentials of high, moderate, or low. For this analysis, metallic locatable minerals with low potential are not discussed because they are not considered to be significant. The following analysis describes the districts and occurrences of mineral resources.

**The Fairview District**, Churchill County, encompasses the Fairview range, a roughly north-south trending mountain range which forms the eastern boundary of Fairview Valley.

The minerals showing high potential are shown below:

- Gold potential is classified as high with a certainty of D (Figure 3.3-3)
- Silver potential is classified as high with a certainty of D (Figure 3.3-4)
- Copper potential is classified as high with a certainty of C (Figure 3.3-11)
- Molybdenum potential is classified as high with a certainty of C (Figure 3.3-12)
- Lead potential is classified as high with a certainty of C (Figure 3.3-13)
- Zinc potential is classified as high with a certainty of C (Figure 3.3-14)

The mineral showing moderate potential is shown below:

- Tungsten potential is classified as moderate with a certainty of B (Figure 3.3-15).

**Bell Mountain**, Churchill County, is located immediately east of the Fairview District, and south of the Gold Basin District. There is an active locatables mine within this district, which overlaps all of the land withdrawal proposals.

The minerals showing high potentials are shown below:

- Gold potential is classified as high with a certainty of D

**Gold Basin District**, Churchill County, is located immediately east of the Fairview District. The minerals showing high potential are shown below:

- Gold potential is classified as high with a certainty of C
- Lead potential is classified as high with a certainty of C

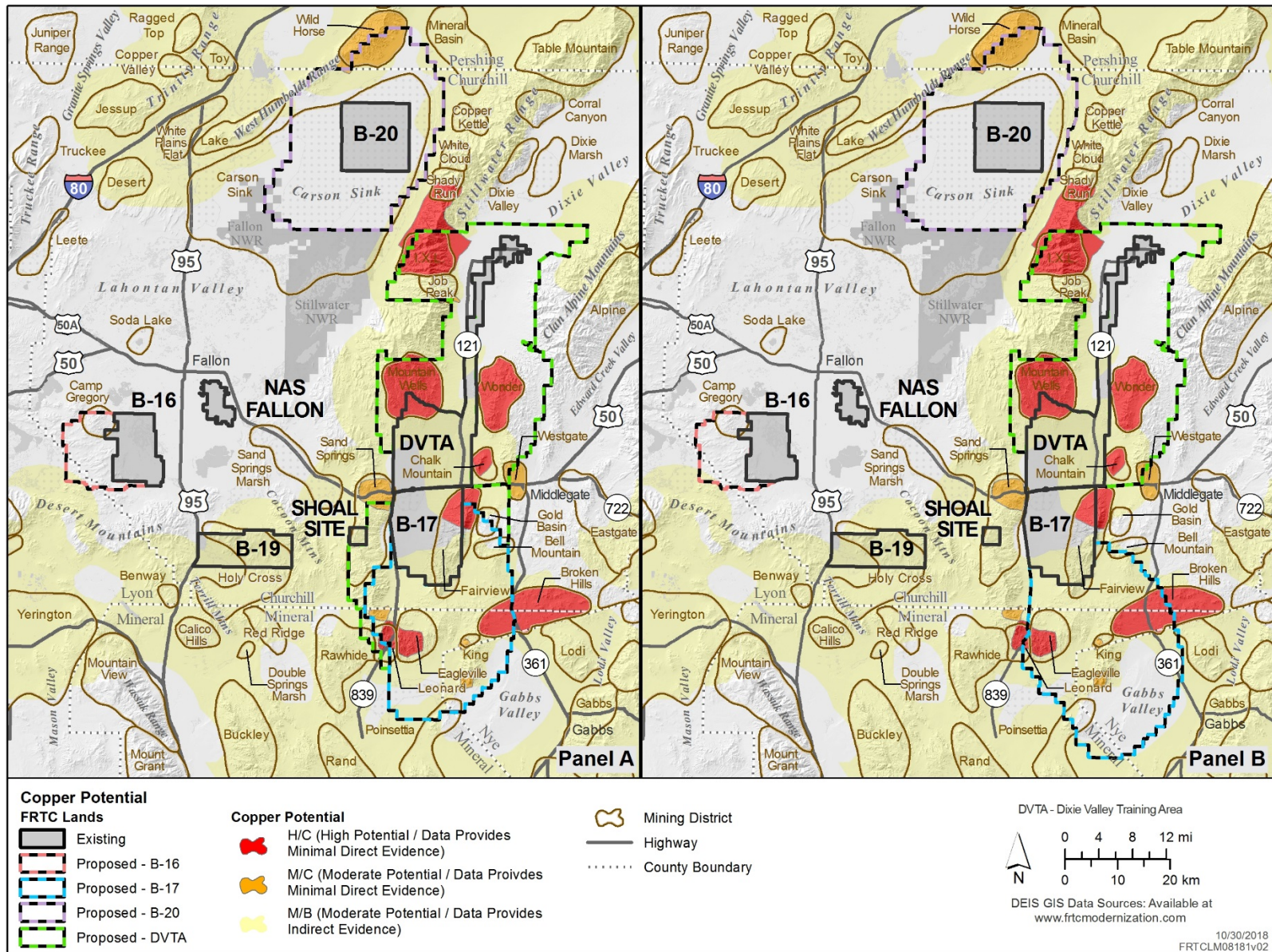


Figure 3.3-11: Copper Potential under Alternative 1 and 2 (Panel A) and Alternative 3 (Panel B)

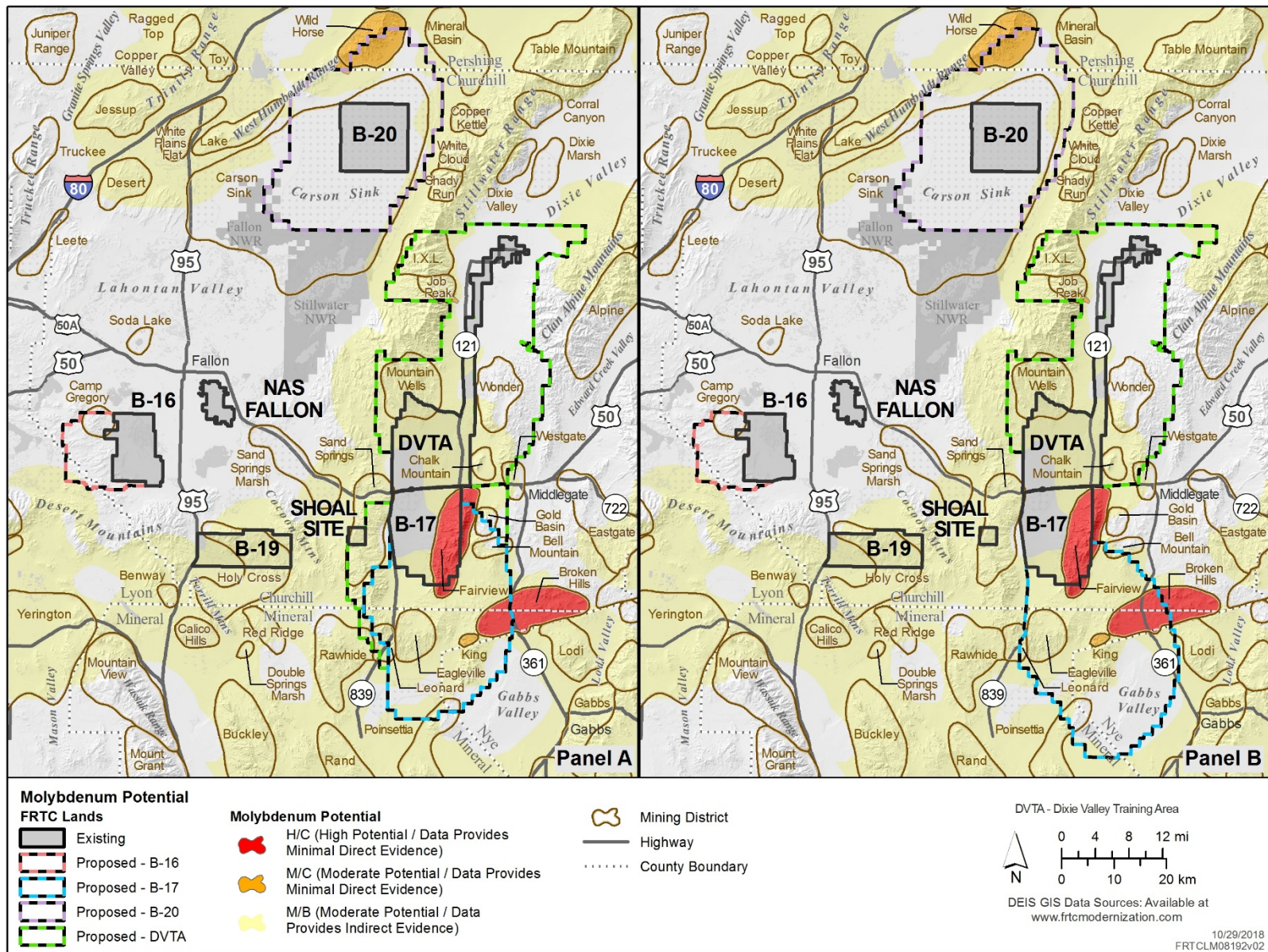


Figure 3.3-12: Molybdenum Potential under Alternative 1 and 2 (Panel A) and Alternative 3 (Panel B)

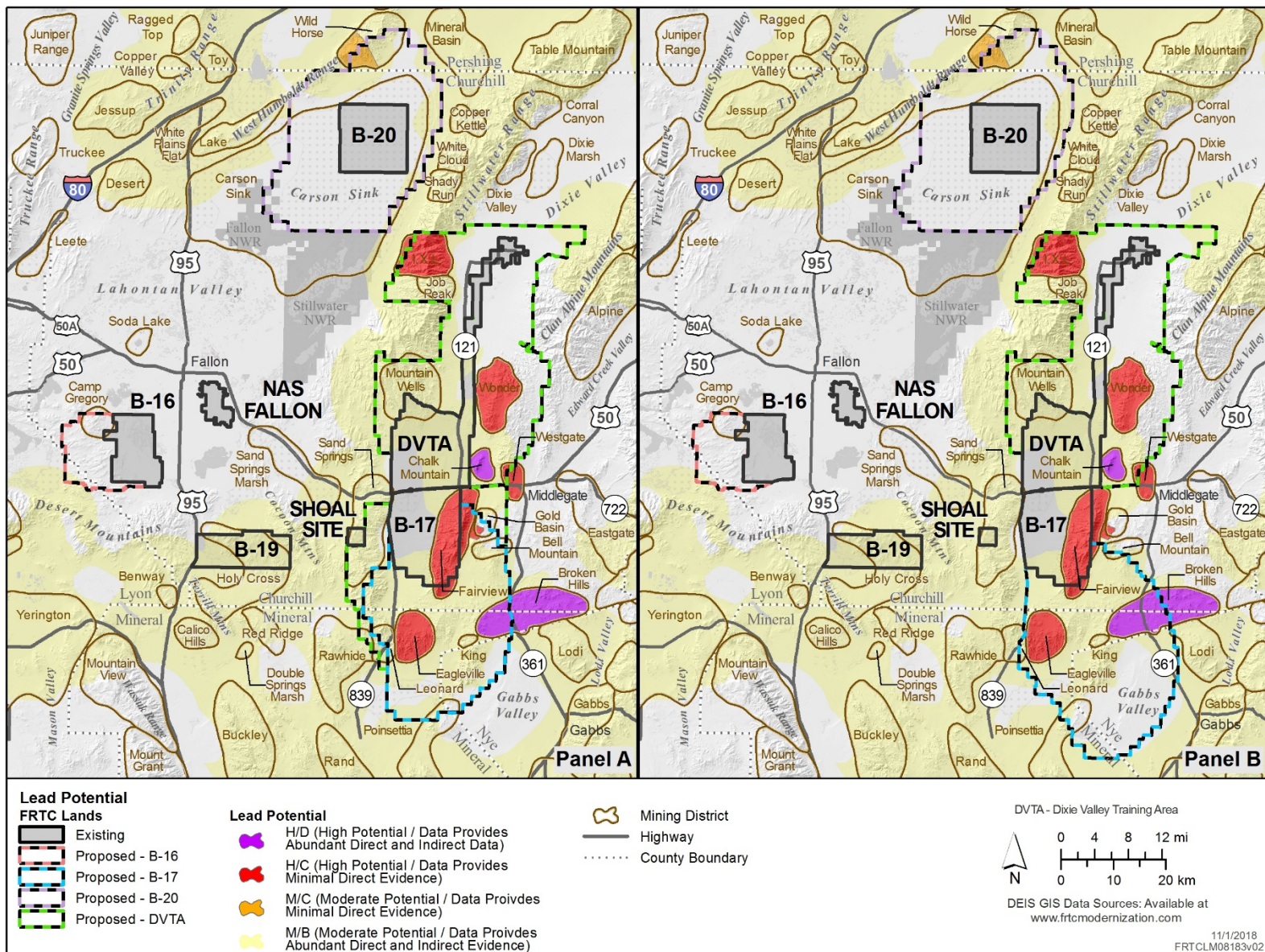


Figure 3.3-13: Lead Potential under Alternative 1 and 2 (Panel A) and Alternative 3 (Panel B)

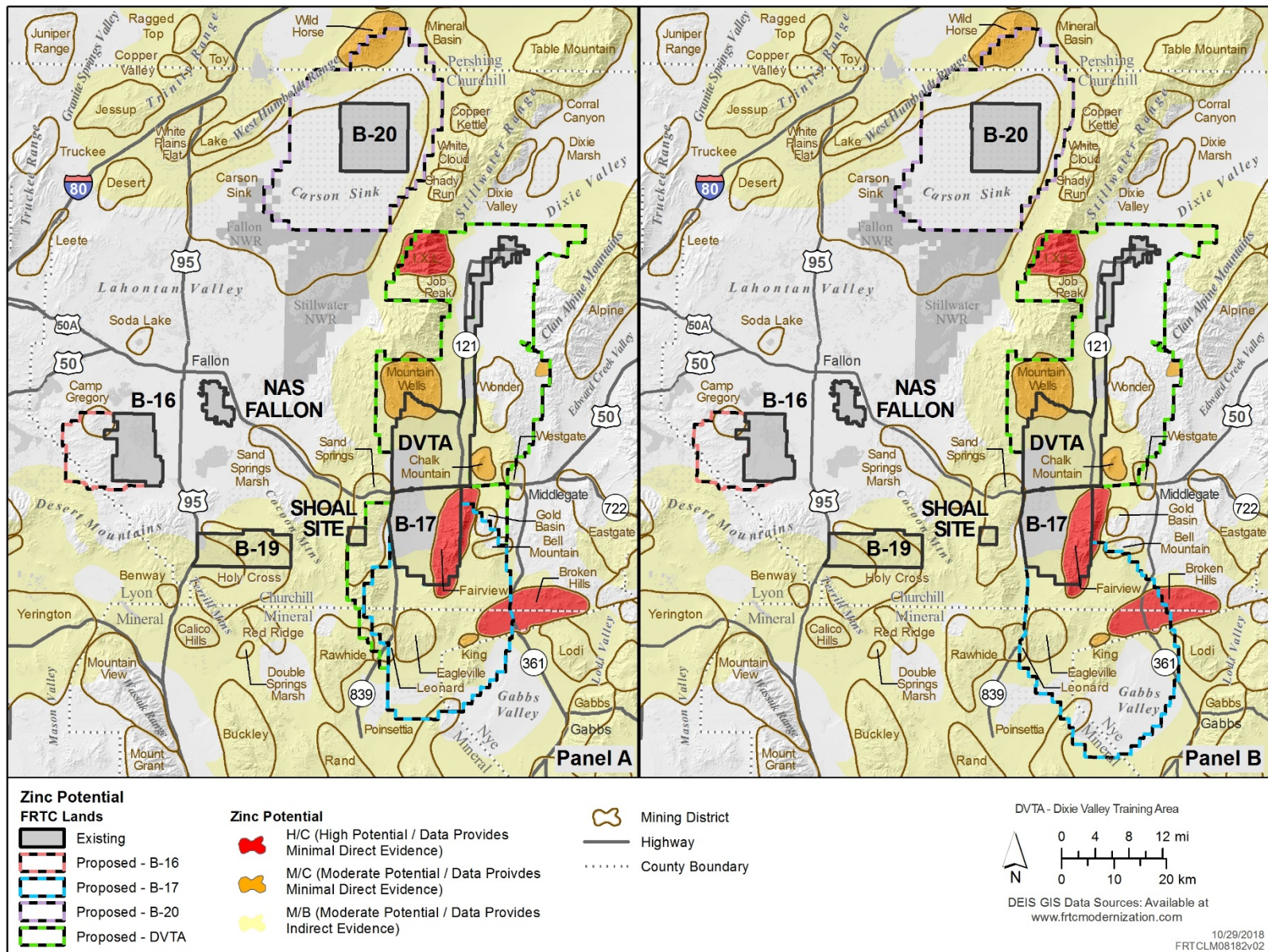


Figure 3.3-14: Zinc Potential under Alternative 1 and 2 (Panel A) and Alternative 3 (Panel B)

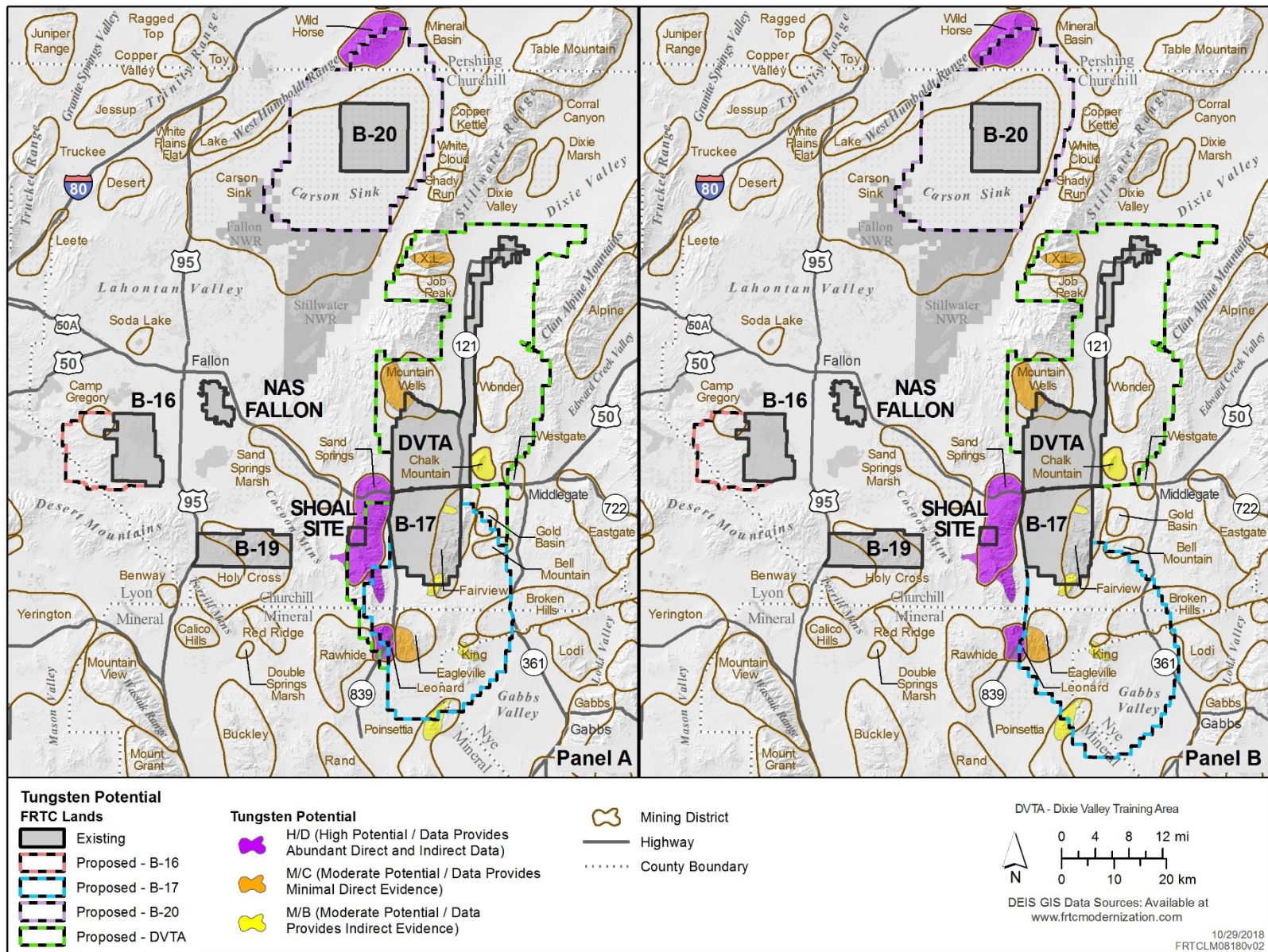


Figure 3.3-15: Tungsten Potential under Alternative 1 and 2 (Panel A) and Alternative 3 (Panel B)

**Broken Hills District**, Mineral County, includes the southern Broken Hills, a low range that defines the north end of Gabbs Valley, as well as small area on the east slope of the northern Monte Cristo Mountains.

The minerals showing high potentials are shown below:

- Silver potential is classified as high with a certainty of D
- Copper potential is classified as high with a certainty of C
- Molybdenum potential is classified as high with a certainty of C
- Lead potential is classified as high with a certainty of D
- Zinc potential is classified as high with a certainty of C

The minerals showing moderate potentials are shown below:

- Gold potential is classified as moderate with a certainty of B in a small area located in the north of the district

**King District**, Mineral County, is located on the western side of the Monte Cristo Mountains above Alkali Flats. The district is located between the Broken Hills District to the east and the Eagleville District to the west.

The minerals showing high potentials are shown below:

- Gold potential is classified as high with a certainty of C

The minerals showing moderate potentials are shown below:

- Copper (the western third of the district) potential is classified as moderate with a certainty of C
- Molybdenum potential is classified as moderate with a certainty of C
- Zinc potential is classified as moderate with a certainty of C
- Tungsten potential is classified as moderate with a certainty of B

**The Poinsettia District**, Mineral and Nye Counties, occupies a northeast trending ridge, Fissure Ridge, within the proposed withdrawal area. The district is positioned between Gabbs Valley to the east and Alkali Flat to the west.

The minerals showing moderate potentials are shown below:

- Gold potential is classified as moderate with a certainty of B
- Copper potential is classified as moderate with a certainty of B
- Molybdenum potential is classified as moderate with a certainty of B
- Lead potential is classified as moderate with a certainty of B
- Zinc potential is classified as moderate with a certainty of B
- Tungsten potential is classified as moderate with a certainty of B

**The Eagleville District**, Mineral County, is located due east of the Leonard District in rugged east-west trending hills. To the south is Alkali Flat, to the north is Fairview Valley.

The minerals showing high potentials are shown below:

- Gold potential is classified as high with a certainty of D
- Copper potential is classified as high with a certainty of C
- Lead potential is classified as high with a certainty of C

The minerals showing moderate potentials are shown below:

- Molybdenum potential is classified as moderate with a certainty of B
- Zinc potential is classified as moderate with a certainty of B
- Tungsten potential is classified as moderate with a certainty of C
- Silver (only located in small portion of the district) potential is classified as moderate with a certainty of B

**The Leonard District**, Mineral County, includes a small area south of Big Kasock Mountain in the southern Sand Springs Range. The Eagleville district is east of Leonard, and the Rawhide gold-silver district is west of Leonard. Important mines in the district are the Nevada Scheelite mine and other adjacent tungsten mines, and gold-silver prospects near the old camp of Sunnyside, about 1 mile southeast of Nevada Scheelite camp.

The minerals showing high potentials are shown below:

- Gold has a high potential with a certainty of C
- Silver has a high potential with a certainty of C
- Copper has a high potential with a certainty of C
- Tungsten potential is classified as high with a certainty of D

The minerals showing moderate potentials are shown below:

- Molybdenum potential is classified as moderate with a certainty of B
- Lead potential is classified as moderate with a certainty of B
- Zinc potential is classified as moderate with a certainty of B

**The Rawhide District**, Mineral County, occupies a low range between Alkali Flat to the southeast and the terminus of Rawhide Flats to the Northwest, and slightly overlaps the proposed B-17 withdrawal area. However, the most important mineral-producing areas are located just outside of the boundary, where there is an active locatable mine.

#### **3.3.2.4.2 Industrial Locatable Minerals**

The mining districts may include mineral potentials of high, moderate, or low. For this analysis, industrial locatable minerals with moderate and low potential are not discussed because they are not considered to be significant. The following analysis describes the districts and occurrences of mineral resources. The text below and Table 3.3-3 summarize industrial locatable resources within the proposed withdrawal area.

##### **Broken Hills District:**

- Fluorite potential is classified as high with a certainty of D
- Gemstone potential is classified as high with a certainty of C

##### **Eagleville District:**

- Barite potential is classified as high with a certainty of D

##### **King District:**

- Fire Opal potential is classified as high with a certainty of C

Although lithium has a moderate potential, with a certainty of B, in some parts of the B-17 withdrawal area, it is not necessarily associated with any particular mining district (Figure 3.3-10).

#### **3.3.2.4.3 Strategic and Critical Minerals**

The proposed B-17 withdrawal includes areas that have been evaluated as having high potential for the critical minerals barite, fluor spar, and tungsten. These potentials occur in the Eagleville (barite), Broken Hills (fluor spar), Leonard (tungsten) and Sand Springs (tungsten) mining districts (Table 3.3-6).

Although lithium has a moderate potential, with a certainty of B, in some parts of the B-17 withdrawal area, it is not necessarily associated with any particular mining district.

#### **3.3.2.4.4 Leasable Minerals**

The proposed withdrawal areas may include mineral potentials of high, moderate, or low. The following analysis describes the areas and occurrences of leasable mineral resources.

The proposed B-17 withdrawal includes areas that have been evaluated as having high potential for geothermal resources.

Geothermal potential is classified as shown below:

- High with certainty of B in the northern section of the proposed withdrawal area.
- High with certainty of D in the southern section of the proposed withdrawal area.

There are no leasable resources classified as having a moderate potential.

Other leasable mineral resources are classified as having a low potential (Table 3.3-4). These include:

- oil and gas with a certainty of C,
- oil shale with a certainty of D,
- asphalt with a certainty of C,
- coal with a certainty of D,
- phosphate with a certainty of B, and
- potash with a certainty of B.

#### **3.3.2.4.5 Salable Minerals**

The proposed withdrawal areas may include salable mineral potentials of high, moderate, or low. The following analysis describes the areas and occurrences of mineral resources. Salable resources are listed in Table 3.3-5.

Salable resources within the B-17 withdrawal area classified as having high potential include:

- aggregate, Sand & Gravel with certainty level D; and
- building, ornamental and specialty stone, with certainty level B.

Moderate potential salable resources consist of:

- clay, with certainty level D
- petrified wood, with certainty level C.

Low potential salable resources include:

- pumice and cinder with certainty level C.

### 3.3.2.5 Bravo-20

B-20 is north of NAS Fallon in the Carson Sink. The surrounding area is a checkerboard of non-federal and federal land with wildlife refuges to the south. Mining is not allowed within the existing B-20 range under the Military Lands Withdrawal Act of 1999.

This section evaluates the locatable, critical, leasable, and salable minerals for the proposed B-20 withdrawal area.

#### 3.3.2.5.1 Metallic Locatable Minerals

The mining districts may include mineral potentials of high, moderate, or low (Table 3.3-2). For this analysis, metallic locatable minerals with low potential are not discussed because they are not considered to be significant. The following analysis describes the mining districts and occurrences of mineral resources.

**The historical Wild Horse (Pershing) District** overlies a small portion of the proposed withdrawal area. No evidence of claims, active mines, recent exploration, or production is known to exist.

The minerals showing high potentials are shown below:

- Tungsten potential is classified as high with a certainty of D

The minerals showing moderate potentials are shown below:

- Copper has a moderate potential with a certainty of C
- Molybdenum has a moderate potential with a certainty of C
- Lead has a moderate potential with a certainty of C
- Zinc has a moderate potential with a certainty of C

No other significant locatable metallic mineral potentials are known to exist in the Carson Sink district.

#### 3.3.2.5.2 Industrial Locatable Minerals

The mining districts may include mineral potentials of high, moderate, or low. For this analysis, industrial locatable minerals with moderate and low potential are not discussed because they are not considered to be significant. The following analysis describes the occurrences of mineral resources.

Barite with a high resource potential and certainty level C was reported to exist in small amounts within the Wild Horse district; however, no recent barite exploration and/or production activities are known (Muntean et al., 2017).

Lithium-enhanced brines in the Carson Sink have a moderate potential with a certainty of C; however, no lithium production is known to have occurred in this area.

No other viable quantities of industrial locatable minerals are known to exist in the Carson Sink district.

#### 3.3.2.5.3 Strategic and Critical Minerals

The proposed withdrawal areas may include mineral potentials of high, moderate, or low (Table 3.3-6). For this analysis, strategic minerals with low potential are not discussed because they are not considered to be significant. The following analysis describes the areas and occurrences of critical mineral resources.

The proposed B-20 withdrawal has been evaluated as having high potential for the critical mineral tungsten. This potential occurs in the Wild Horse mining district at the northern edge of the proposed withdrawal area.

The Carson Sink area, including most of B-20, has been evaluated as having moderate potential for lithium brines. Although lithium has a moderate potential, with a certainty of C, in some parts of the B-20 withdrawal area, it is not necessarily associated with any particular mining district.

#### **3.3.2.5.4 Leasable Minerals**

The proposed withdrawal areas may include mineral potentials of high, moderate, or low (Table 3.3-4). For this analysis, leasable minerals with low potential are not discussed because they are not considered to be significant. The following analysis describes the areas and occurrences of leasable mineral resources.

The B-20 potential for leasable minerals include:

- Geothermal potentials classified as both as high with certainty level C, and moderate with certainty level of B. These areas cover the entire proposed withdrawal acreage.

Other leasable mineral resources in B-20 are classified as having a low potential. These include:

- oil and gas with a certainty of C,
- oil shale with a certainty of D,
- asphalt with a certainty of C,
- coal with a certainty of D,
- phosphate with a certainty of B,
- potash (non-playa) with a certainty of B,
- sodium minerals (playa) with certainty of D and,
- sulfur with certainty of D.

Leasable mineral resources in B-20 classified as having a moderate potential include:

- potash (playa) with a certainty of D, and
- sodium (non-playa) with a certainty of B.

#### **3.3.2.5.5 Salable Minerals**

The proposed withdrawal areas may include salable mineral potentials of high, moderate, or low. For this analysis, salable minerals with low potential are not discussed because they are not considered to be significant. The following analysis describes the areas and occurrences of these mineral resources. Salable resources are listed Table 3.3-5.

Based on the Mineral Potential Report, salable resources within the B-20 withdrawal area classified as having high resource potential include:

- aggregate, Sand & Gravel, with certainty level D.

Salable resources with moderate potential consist of:

- clay, with certainty level D.

Salable resources with low potential include:

- pumice and cinder, with certainty level C;

- petrified wood, with certainty level C; and
- building, ornamental and specialty stone, with certainty level B.

### 3.3.2.6 Dixie Valley Training Area

The DVTA is located east of NAS Fallon and mainly north of U.S. Route 50 (Alternatives 1 and 2 include sections south of U.S. Route 50). The proposed DVTA expansion areas (under the various alternatives) are composed primarily of BLM land and a few private parcels. See Figure 3.2-7 in Section 3.2 (Land Use) for landownership in and around the DVTA. This section evaluates the locatable, critical, leasable, and salable minerals for the proposed DVTA withdrawal area.

#### 3.3.2.6.1 Metallic Locatable Minerals

Historical Mining Districts in the DVTA study area include I.X.L, Job Peak, Mountain Wells, Wonder, Chalk Mountain, Sand Springs, Fairview, Gold Basin, Bell Mountain, Westgate, Leonard, and Rawhide (Table 3.3-2). The district boundaries overlie the proposed withdrawal area entirely or in part. The mining districts may include mineral potentials of high, moderate, or low. For this analysis, metallic locatable minerals with low potential are not discussed because they are not considered to be significant. The following analysis describes the districts and occurrences of mineral resources.

**The Rawhide District**, Mineral County, occupies a low range between Alkali Flat to the southeast, and the terminus of Rawhide Flats to the Northwest overlaps slightly the proposed B-17 withdrawal area. However, the most important mineral producing areas are located just outside of the boundary.

The minerals showing high potentials are shown below:

- Gold potential is classified as high with a certainty of D
- Silver potential is classified as high with a certainty of D

The minerals showing moderate potentials are shown below:

- Copper potential is classified as moderate with a certainty of B
- Molybdenum potential is classified as moderate with a certainty of B
- Lead potential is classified as moderate with a certainty of B
- Zinc potential is classified as moderate with a certainty of B

**The I.X.L District** is located in Churchill County, in the central Stillwater Range, and encompasses drainages on both the east and west sides of the mountain range. The mines and prospects in the I.X.L. District are concentrated into two canyons: I.X.L Canyon and Cox Canyon.

The minerals with high potential are shown below:

- Silver has a high potential with a certainty of D
- Lead potential is classified as high with a certainty of C
- Zinc potential is classified as high with a certainty of C
- Copper has a high potential with a certainty of C
- Tungsten is indicated in a small area with a high potential, with a certainty of C

The minerals with moderate potential are shown below:

- Gold (a small portion of the district in the north) has a moderate potential with a certainty of B
- Molybdenum potential is classified as moderate with a certainty of B

**The Job Peak District** is located directly south of the I.X.L. district in the Stillwater Range in Churchill County.

There are no minerals evaluated as having high potential in the Job Peak district.

The minerals with moderate potential are shown below:

- Copper has a moderate potential with a certainty of C
- Molybdenum potential is classified as moderate with a certainty of B for the majority of the district, and moderate potential with certainty of C in a small area
- Lead has a moderate potential with a certainty of B
- Zinc has a moderate potential with a certainty of B

**The Mountain Wells District** is located in the southern part of the Stillwater Range in Churchill County. It is further south of the I.X.L. and Job Peak districts.

The minerals with high potential are shown below:

- Silver has a high potential with a certainty of C
- Copper has a high potential with a certainty of C

The minerals with moderate potential are shown below:

- Gold (in a small portion in the west part of the district) has a moderate potential with a certainty of B
- Molybdenum has a moderate potential with a certainty of B
- Lead has a moderate potential with a certainty of B
- Zinc has a moderate potential with a certainty of C
- Tungsten is indicated in a small area in the west part of the district, with a potential classification as moderate, with a certainty of C

**The Wonder District** is located in the Louderback Mountains, north of U.S. Route 50, in Churchill County.

The minerals with high potential are shown below:

- Gold has a high potential with a certainty of D
- Silver has a high potential with a certainty of D
- Copper has a high potential with a certainty of C
- Lead has a high potential with a certainty of C

The minerals with moderate potential are shown below:

- Molybdenum in the south and southwest areas has a moderate potential with a certainty of B
- Zinc (in the south and southwest part of the district) potential is classified as moderate with a certainty of B

**The Chalk Mountain District** is centered on Chalk Mountain just north of U.S. Route 50, on the east side of Dixie Valley, in Churchill County.

The minerals with high potential are shown below:

- Gold has a high potential with a certainty of D
- Silver has a high potential with a certainty of D
- Copper has a high potential with a certainty of C in the western half of the district

- Lead has a high potential with a certainty of C

The minerals with moderate potential are shown below:

- Copper has a moderate potential with a certainty of B in the eastern half of the district
- Molybdenum has a moderate potential with a certainty of B
- Zinc has a moderate potential with a certainty of C
- Tungsten has a moderate potential with a certainty of B

**The Westgate District** is located at the southern end of the Clan Alpine Mountains, in the low hills north and south of U.S. Route 50, in Churchill County.

The minerals with high potential are shown below:

- Gold has a high potential with a certainty of C
- Silver has a high potential with a certainty of C
- Lead has a high potential with a certainty of C

The minerals with moderate potential are shown below:

- Copper has a moderate potential with a certainty of C
- Molybdenum has a moderate potential with a certainty of B
- Zinc has a moderate potential with a certainty of B

**The Sand Springs District** is located in the Sand Springs Range in the vicinity of Sand Springs Pass on U.S. Route 50, in Churchill County. The district extends north of the pass a short distance, but extends south for over 12 miles and includes most of the Sand Springs Range.

The minerals with high potential are shown below:

- Gold has a high potential with a certainty of D
- Silver has a high potential with a certainty of D
- Tungsten has a high potential with a certainty of D

The minerals with moderate potential are shown below:

- Copper has a moderate potential with a certainty of C in a portion of the north and south parts of the district; and a potential of moderate with a certainty of B in the remaining areas
- Molybdenum has a moderate potential with a certainty of B
- Lead has a moderate potential with a certainty of B
- Zinc has a moderate potential with a certainty of B

**The Fairview District** is located in Churchill County; it encompasses an area on both sides of Fairview Peak extending from U.S. Route 50 on the north to Crown (Bell) Canyon on the south. The main Fairview district is located on the west slope of Fairview Peak, while the South Fairview area is in the vicinity of Slate Mountain, south of Fairview Peak.

The minerals with high potential are shown below:

- Gold has a high potential with a certainty of D
- Silver has a high potential with a certainty of D
- Copper has a high potential with a certainty of C in the northern third of the district
- Molybdenum has a high potential with a certainty of C

- Lead has a high potential with a certainty of C
- Zinc has a high potential with a certainty of C

The minerals with moderate potential are shown below:

- Copper has a moderate potential with a certainty of B in the southern half of the district
- Tungsten has a moderate potential with certainty of B in small areas located in the north and south parts of the district

**The Gold Basin District** is located in low hills east of Fairview Peak, and is sometimes included in the adjacent Fairview district, in Churchill County.

The minerals with high potential are shown below:

- Gold has a high potential with a certainty of C
- Lead has a high potential with a certainty of C in the western half of the district

The minerals with moderate potential are shown below:

- Molybdenum has a moderate potential with a certainty of B

**The Bell Mountain District** surrounds Bell Mountain, southeast of Fairview Peak, in Churchill County; it has sometimes been included in the adjacent Fairview district.

The minerals with high potential are shown below:

- Gold has a high potential with a certainty of D
- Silver has a high potential with a certainty of D

The minerals with moderate potential are shown below:

- Copper has a moderate potential with a certainty of B
- Molybdenum has a moderate potential with a certainty of B
- Lead has a moderate potential with a certainty of B
- Zinc has a moderate potential with a certainty of B

**The Leonard District**, Mineral County, includes a small area south of Big Kasock Mountain in the southern Sand Springs Range. The Eagleville district is east of Leonard, and the Rawhide gold-silver district is west of Leonard. Important mines in the district are the Nevada Scheelite mine and other adjacent tungsten mines, and gold-silver prospects near the old camp of Sunnyside, about 1 mile southeast of Nevada Scheelite camp.

The minerals showing high potentials are shown below:

- Gold has a high potential with a certainty of C
- Silver has a high potential with a certainty of C
- Copper has a high potential with a certainty of C
- Tungsten potential is classified as high with a certainty of D

The minerals showing moderate potentials are shown below:

- Molybdenum potential is classified as moderate with a certainty of B
- Lead potential is classified as moderate with a certainty of B
- Zinc potential is classified as moderate with a certainty of B

### 3.3.2.6.2 Industrial Locatable Minerals

A summary of industrial locatable resources within the proposed withdrawal area are shown below and in Table 3.3-3. The mining districts may include mineral potentials of high, moderate, or low. Industrial locatable minerals with low and moderate potential are not discussed, as they are not considered to be significant for this analysis. The following paragraphs describe the mining districts and occurrences of mineral resources.

#### Rawhide District:

- Alunite and Barite potential is classified as high with a certainty of C

**I.X.I Canyon District.** Fluorite potential is classified as high with a certainty of D. Historical fluorite production is reported at 1,900 tons.

**Mountain Wells (La Plata) District.** Fluorite potential is classified as high with a certainty of D. Historical fluorite production is reported at 500 tons.

Based on the Mineral Potential Report, the other mining districts do not have high potential for industrial minerals.

### 3.3.2.6.3 Strategic and Critical Minerals

Part of the proposed DVTA withdrawal area has been evaluated as having high potential for the critical mineral tungsten (Table 3.3-6). This potential occurs in the Sand Springs mining district on the west edge of the DVTA south of U.S. Route 50. This district is affected by Alternatives 1 and 2, but not by Alternative 3.

### 3.3.2.6.4 Leasable Minerals

The proposed withdrawal areas may include mineral potentials of high, moderate, or low (Table 3.3-4). The following analysis describes the areas and occurrences of leasable mineral resources. The DVTA potential for leasable minerals include:

- geothermal potentials:
  - classified as high with certainty ranging from B to D on the east side of Dixie Valley and in the center of the range
  - classified as moderate with certainty C in the northeast and southeast sections of the range
  - classified as low with certainty of B in the western mountainous sections of the range

Other leasable mineral resources in the DVTA are classified as having a low potential. These include:

- oil and gas with a certainty of C,
- oil shale with a certainty of D,
- asphalt with a certainty of C,
- coal with a certainty of D,
- phosphate with a certainty of B,
- potash (non-playa) with a certainty of B,
- sodium minerals (non-playa) with a certainty of D, and
- sulfur with a certainty of D.

### 3.3.2.6.5 Salable Minerals

The proposed withdrawal areas may include mineral potentials of high, moderate, or low (Table 3.3-5). The following analysis describes the areas and occurrences of leasable mineral resources.

Salable resources within the DVTa withdrawal area classified as having high resource potential include:

- aggregate, Sand & Gravel, with certainty level D.

Salable resources with moderate potential consist of:

- clay, with certainty level D.

Salable resources with low potential include:

- pumice and cinder, with certainty level C;
- petrified wood, with certainty level C; and
- building, ornamental and specialty stone, with certainty level B.

### 3.3.3 Reasonably Foreseeable Development

A rough order of magnitude projection of the possible commodities associated with hard rock mines, hard rock exploration projects, geothermal sources, and borrow pits for the Proposed Action is provided below. Given historical interest, geology, logistics, the economy, and other applicable variables, predicting the type and location of potential future mines, exploration projects, geothermal energy sites, or borrow pits is extremely difficult.

While the Navy attempts to estimate and portray the likely nature and scope of potential future mining operations, the values cited for mining claims, mines, geothermal plants, or borrow pits are considered estimates and not absolute values. These estimates and analysis were derived using multiple lines of evidence and are intended only to help Congress and the Navy in their decision making process with respect to the Proposed Action and Alternatives.

#### 3.3.3.1 Metallic Locatable Minerals

The occurrence of metallic locatable mineral resources has been assessed within the Study Area and classified as having either a high, moderate, or low potential. For this analysis, minerals with low potential are not discussed because they are not considered to be significant. The resource potential classification takes into account the resource occurrences, geologic relationship, and historic production for each mineral resource.

Historically, locatable metallic mineral resources were produced in 11 of the 19 mining districts in the Study Area (Table 3.3-2). The precious metals, silver and gold, were the most common metals produced. Silver production occurred at eight mining districts and gold production occurred at seven of the mining districts. However, neither gold or silver are being mined within the withdrawal areas at present. All the precious metal occurrences are associated with vein-hosted epithermal mineralization.

Other metals historically produced include tungsten at three mining districts, lead at two mining districts, and antimony at one of the districts. However, none of these minerals are being mined within the withdrawal areas at present. With exception of the B-16 area, all the withdrawal areas have a history of metallic mineral resource production. Either copper, molybdenum or zinc minerals were identified, but not produced, at 15 of the mining districts.

Typically, the development of a mine goes through five stages, with each stage using progressively more sophisticated (and more expensive) techniques over a successively smaller area to identify, develop, and produce an economic mineral deposit. The full sequence of developing a mineral project involves reconnaissance, prospecting, exploration, economic evaluation, and development.

Mine development and permitting is a multiple-year process. Although actual mine site construction can normally be completed in two to three years for most surface mining locations, the permitting process can typically take 5–10 years. Further, investments in power lines, securing water sources, and building roads or rail for transportation may require an investment larger than the mine and milling facilities, per the Supporting Study: Minerals Potential Report for the Fallon Range Training Complex Modernization (<https://www.frtcmodernization.com>). Depending on the market for gold, multiple exploration projects for gold deposits could be expected within the area over the next 20 years. Exploration activity could result in the discovery of one open-pit deposit, which could employ between 100 and 300 people. During construction the number of employees on site could typically be two to three times larger than the long-term staff for mine and milling operations. Any such potential deposit could be located in or adjacent to areas of known potential for gold/silver. Of critical importance to the economic viability of a new deposit is the long-term commodity prices used for the metals that will be produced from the discovery in the economic and financial modeling. A typical Nevada open-pit metal mine is expected to contain between 5 to 90 million tons of ore, with a probable size of 15 million tons, averaging 0.06 troy ounces of gold per ton. Outside of a metal mine for gold/silver, exploration activity is not expected to result in the discovery of an economically mineable deposit.

#### **3.3.3.2 Industrial Locatable Minerals**

The resource potential classification takes into account the resource occurrences, geologic relationship, and historic production for each mineral resource. Based on historic mineral exploration activity and known occurrences in the planning area, a moderate amount of exploration for industrial minerals, mainly lithium, could occur during the life of this plan. Depending on market conditions, several exploration projects could be expected for lithium and other industrial minerals.

Lithium is of special interest due to the development and use of lithium-ion batteries; it is also one of the 35 strategic and critical minerals listed by the U.S. government. At present Nevada is host to the only active lithium producer in the U.S.; lithium is produced from leasable lithium-enriched brine in the Clayton Valley. The Clayton Valley is not located within the Study Area. Elevated concentrations of lithium have been detected in playa sediments in and adjacent to the proposed withdrawal areas, and a moderate potential exists for lithium-enriched brines within playa areas, as well as lithium mineralization in other areas in the form of lithium-bearing clay, carbonate, or evaporite rocks. A comparison of playas in the Study Area to playas in Clayton Valley, located in central Nevada and well outside of the Study Area, and where lithium is being recovered from brine, suggests that the conditions responsible for economic lithium concentrations at Clayton Valley do not exist in the Study Area. Although no economically viable lithium deposits have been identified in the study area to date, it is possible that one lithium brine operation would be developed in the study area. Typical lithium carbonate operations produce 30,000–35,000 tons per year of finished product.

#### **3.3.3.3 Strategic and Critical Minerals**

The resource potential classification takes into account the resource occurrences, geologic relationship, and historic production for each mineral resource.

The critical minerals that have some areas of high potential in the Study Area are barite, fluorspar, and tungsten. Barite, fluorspar, and tungsten were historically produced from mines in the Study Area but there is no current production or exploration activity for these minerals in the proposed withdrawal areas. Exploration activity is not expected to result in the discovery of an economically mineable deposit of these minerals. Lithium has some areas of moderate potential in the study area. However, no economically viable lithium deposits have been identified in the study area to date.

#### **3.3.3.4 Leasable Minerals**

The Study Area is in an area of the Great Basin province with a high concentration of producing geothermal power plants, other geothermal occurrences (e.g., hot springs, hot wells, hot gradient holes), and active geothermal exploration activity. The region is characterized by high geothermal gradients resulting from crustal and lithospheric thinning caused by the tectonic extension of the Great Basin. The geothermal gradient in the Study Area is high relative to most other areas of the Great Basin. The Late Quaternary seismicity and high crustal strain rate, which characterize the Study Area, are factors associated with geothermal potential. Range-front faults along the margins of the mountain ranges are favorable structural settings as these structures provide highly permeable conduits for deep circulating groundwater.

Until actual geothermal exploration and development begins, it is difficult to quantify the resource potential and possible future intensified production measures necessary to develop the resources. In order to assess environmental impacts resulting from an action as general as geothermal exploration, development, and production, it is necessary to assume levels of intensities of such development.

Per the Supporting Study: Minerals Potential Report for the Fallon Range Training Complex Modernization (<https://www.frtcmodernization.com>), over the next 20 years, it is reasonably foreseeable that exploration drilling could occur on all existing geothermal leases, some of which might lead to more detailed exploration drilling and a few of which might lead to the discovery of geothermal resources capable of developing one 15-megawatt (MW) geothermal power plant. It is reasonably foreseeable over the next 20 years that additional leases could be sought within the study area, including in the proposed DVTA, and that exploration drilling could occur, some of which might lead to a more detailed exploration and a few of which might lead to discovery of geothermal resources capable of developing one 15 MW geothermal plant. The 15 MW power plant is used as a typical size to estimate the amount of disturbance that could be involved for the Reasonably Foreseeable Development. These calculations are meant to be used as an indicator of the impacts involved, not as a cap or bound on the size of any geothermal power plant development

Since development could occur in about 5 MW increments over a period of several years, the degree of surface disturbance at any given time is less than the total impact of surface disturbance from construction of a geothermal power facility.

The potential for oil and gas, oil shale, native asphalt and coal resources in the Study Area is low. Outside of development of a geothermal resource, exploration activity is not expected to result in the discovery of an economically developable leasable mineral deposit within the proposed withdrawal areas.

#### **3.3.3.5 Salable Minerals**

The resource potential classification for salable minerals takes into account the resource occurrences, geologic relationship, and historic production for each mineral resource.

The possible development of saleable minerals in the study area includes sand/gravel and rock aggregates. The major use of saleable minerals (primarily sand and gravel and crushed/broken rock) would continue to be for road construction and maintenance. Much of this activity would be routine seasonal maintenance on county roads, which would result in a moderate increase in demand for these materials. Because the population of the area is expected to increase over the life of this plan, it is likely that public demand for saleable minerals would increase slightly over current levels. In addition to sand and gravel, and rock aggregate, a small amount of demand for decorative stone may also develop.

Over the next 20 years, it is possible that one new sand and gravel deposit with good-quality material could be developed in easily accessible areas (such as within a few miles of major roads). It is also possible that one new rock aggregate deposit of good-quality material could be developed in easily accessible areas (such as within a few miles of major roads). It is possible that one new decorative stone-collecting site could be designated to meet the increase in demand.

This site could be located throughout the planning area and will generally be reached by existing roads. Site-specific NEPA assessments and inventories for cultural resources and threatened and endangered species will be required prior to designation.

#### **3.3.4 Environmental Consequences**

This section assesses the potential impacts from the Proposed Action and alternatives on access to and availability of mineral resource exploration and development. Since the mid-1850s, private citizens, as well as entities such as public and private companies, and various local, State, and Federal agencies have performed exploration and developed the land for mineral resource extraction. These efforts have contributed to identifying areas of high, moderate, and low locatable, leasable, and salable mineral resource potential in the proposed withdrawal areas. The analysis assesses the reasonably foreseeable impacts in terms of context (affects to individuals and/or industry at the local regional and national level) and intensity (severity of impact).

The results of the impacts analysis presented in Section 3.3.1 (Methodology) are summarized in Table 3.3-7 and Table 3.3-8 and are expressed as approximate percentages of individual mineral districts and mineral potential in a given area that are inside the proposed withdrawal boundaries. All mineral districts affected by the withdrawal are shown in the tables.

##### **3.3.4.1 No Action Alternative**

Under the No Action Alternative, the Proposed Action would not occur. The Navy would not renew its current withdrawal, which would expire on November 5, 2021. Mining exploration and development would presumably continue within the proposed withdrawal areas, consistent with present levels of activity. Existing claims and leases would not be affected and would be operated under any stipulations currently in effect. Surface disturbance and other disruptive activities could continue at authorized mining sites. Those areas of the existing withdrawal that could be rendered safe for public access would potentially be usable for future mineral exploration and development, potentially opening up to 202,864 acres for mineral development (where resources, geology, and topography permit).

Implementation of the No Action Alternative could potentially result in some beneficial impacts if the economy for specific commodities supported potential profitable extraction. Except for areas with high geothermal potential, the Navy's current withdrawn lands do not extensively overlap known economically viable volumes of mineral commodities. In addition, the DVTA is currently open for

geothermal exploration. Therefore, implementation of the No Action Alternative would have a minimal yet favorable impact on mineral resource exploration and development.

**Table 3.3-7: Summary of Locatable Mineral Potential Impacts**

Area	Mining District	Percent of District in Withdrawal		Commodity	Percent Withdrawn in District Under Alternative 1 and 2		Percent Withdrawn in District Under Alternative 3	
		Alt 1 & 2	Alt 3		High Potential	Moderate Potential	High Potential	Moderate Potential
B-16	Camp Gregory	80%	80%	Gold	0%	80%	0%	80%
				Silver	0%	80%	0%	80%
				Copper	0%	0%	0%	0%
				Molybdenum	0%	0%	0%	0%
				Lead	0%	0%	0%	0%
				Zinc	0%	0%	0%	0%
				Tungsten	0%	0%	0%	0%
				Lithium	0%	0%	0%	0%
B-17	Bell Mountain	80%	15%	Gold	80%	0%	15%	0%
				Silver	80%	0%	15%	0%
				Copper	0%	60%	0%	15%
				Molybdenum	0%	80%	0%	15%
				Lead	0%	80%	0%	15%
				Zinc	0%	5%	0%	10%
				Tungsten	0%	0%	0%	0%
				Lithium	0%	0%	0%	0%
B-17	Broken Hills	30%	50%	Gold	0%	100%	0%	10%
				Silver	30%	0%	50%	0%
				Copper	30%	0%	50%	0%
				Molybdenum	30%	0%	50%	0%
				Lead	30%	0%	50%	0%
				Zinc	30%	0%	50%	0%
				Tungsten	0%	0%	0%	0%
				Lithium	0%	0%	0%	0%
B-17	Eagleville	100%	100%	Gold	100%	0%	100%	0%
				Silver	0%	100%	0%	100%
				Copper	40%	60%	40%	60%
				Molybdenum	0%	100%	0%	100%
				Lead	100%	0%	100%	0%
				Zinc	0%	100%	0%	100%
				Tungsten	50%	0%	50%	0%
				Lithium	0%	0%	0%	0%

Table 3.3-7: Summary of Locatable Mineral Potential Impacts (continued)

Area	Mining District	Percent of District in Withdrawal		Commodity	Percent Withdrawn in District Under Alternative 1 and 2		Percent Withdrawn in District Under Alternative 3	
		Alt 1 & 2	Alt 3		High Potential	Moderate Potential	High Potential	Moderate Potential
B-17	Fairview	30%	20%	Gold	90%	0%	60%	0%
				Silver	90%	0%	60%	0%
				Copper	30%	30%	20%	30%
				Molybdenum	30%	0%	20%	0%
				Lead	90%	0%	60%	0%
				Zinc	90%	0%	60%	0%
				Tungsten	0%	10%	0%	10%
				Lithium	0%	0%	0%	0%
B-17	Gold Basin	50%	0%	Gold	50%	0%	0%	0%
				Silver	0%	0%	0%	0%
				Copper	0%	0%	0%	0%
				Molybdenum	0%	20%	0%	0%
				Lead	10%	100%	0%	0%
				Zinc	0%	50%	0%	0%
				Tungsten	0%	0%	0%	0%
				Lithium	0%	0%	0%	0%
B-17	King	100%	100%	Gold	100%	0%	100%	0%
				Silver	0%	0%	0%	0%
				Copper	25%	100%	25%	75%
				Molybdenum	0%	100%	0%	100%
				Lead	0%	100%	0%	100%
				Zinc	100%	0%	100%	0%
				Tungsten	0%	10%	0%	10%
				Lithium	0%	0%	0%	0%
B-17	Leonard	50%	20%	Gold	50%	0%	20%	0%
				Silver	50%	0%	20%	0%
				Copper	25%	25%	10%	10%
				Molybdenum	0%	50%	0%	20%
				Lead	0%	50%	0%	20%
				Zinc	0%	50%	0%	20%
				Tungsten	50%	0%	20%	0%
				Lithium	0%	0%	0%	0%

Table 3.3-7: Summary of Locatable Mineral Potential Impacts (continued)

Area	Mining District	Percent of District in Withdrawal		Commodity	Percent Withdrawn in District Under Alternative 1 and 2		Percent Withdrawn in District Under Alternative 3	
		Alt 1 & 2	Alt 3		High Potential	Moderate Potential	High Potential	Moderate Potential
B-17	Lodi	0%	1%	Gold	0%	0%	0%	0%
				Silver	0%	0%	0%	0%
				Copper	0%	0%	0%	100%
				Molybdenum	0%	0%	0%	1%
				Lead	0%	0%	1%	0%
				Zinc	0%	0%	0%	100%
				Tungsten	0%	0%	0%	0%
				Lithium	0%	0%	0%	0%
B-17	Poinsettia	5%	10%	Gold	0%	5%	0%	10%
				Silver	0%	0%	0%	0%
				Copper	0%	5%	0%	5%
				Molybdenum	0%	2%	0%	5%
				Lead	0%	5%	0%	5%
				Zinc	0%	2%	0%	5%
				Tungsten	0%	30%	0%	50%
				Lithium	0%	50%	0%	50%
B-17	Sand Springs	1%	0%	Gold	1%	0%	0%	0%
				Silver	1%	0%	1%	0%
				Copper	1%	0%	0%	0%
				Molybdenum	0%	1%	0%	0%
				Lead	0%	1%	0%	0%
				Zinc	0%	1%	0%	0%
				Tungsten	1%	0%	0%	0%
				Lithium	0%	0%	0%	0%
B-20	Pershing	50%	50%	Gold	0%	0%	0%	0%
				Silver	0%	0%	0%	0%
				Copper	0%	50%	0%	50%
				Molybdenum	0%	50%	0%	50%
				Lead	0%	50%	0%	50%
				Zinc	0%	50%	0%	50%
				Tungsten	50%	0%	50%	0%
				Lithium	0%	0%	0%	0%

Table 3.3-7: Summary of Locatable Mineral Potential Impacts (continued)

Area	Mining District	Percent of District in Withdrawal		Commodity	Percent Withdrawn in District Under Alternative 1 and 2		Percent Withdrawn in District Under Alternative 3	
		Alt 1 & 2	Alt 3		High Potential	Moderate Potential	High Potential	Moderate Potential
B-20	Carson Sink	60%	60%	Gold	0%	0%	0%	0%
				Silver	0%	0%	0%	0%
				Copper	0%	20%	0%	20%
				Molybdenum	0%	20%	0%	20%
				Lead	0%	20%	0%	20%
				Zinc	0%	20%	0%	20%
				Tungsten	0%	0%	0%	0%
				Lithium	0%	100%	0%	100%
DVTA	I.X.L. District	90%	90%	Gold	0%	100%	0%	100%
				Silver	90%	0%	90%	0%
				Copper	90%	0%	90%	0%
				Molybdenum	0%	0%	0%	0%
				Lead	90%	0%	90%	0%
				Zinc	90%	0%	90%	0%
				Tungsten	0%	100%	0%	100%
				Lithium	0%	0%	0%	0%
DVTA	Fairview	10%	0%	Gold	10%	0%	0%	0%
				Silver	10%	0%	0%	0%
				Copper	10%	0%	0%	0%
				Molybdenum	10%	0%	0%	0%
				Lead	10%	0%	0%	0%
				Zinc	10%	0%	0%	0%
				Tungsten	0%	0%	0%	0%
				Lithium	0%	0%	0%	0%
DVTA	Leonard	25%	0%	Gold	25%	0%	0%	0%
				Silver	25%	0%	0%	0%
				Copper	10%	15%	0%	0%
				Molybdenum	0%	25%	0%	0%
				Lead	0%	25%	0%	0%
				Zinc	0%	25%	0%	0%
				Tungsten	25%	0%	0%	0%
				Lithium	0%	0%	0%	0%

Table 3.3-7: Summary of Locatable Mineral Potential Impacts (continued)

Area	Mining District	Percent of District in Withdrawal		Commodity	Percent Withdrawn in District Under Alternative 1 and 2		Percent Withdrawn in District Under Alternative 3	
		Alt 1 & 2	Alt 3		High Potential	Moderate Potential	High Potential	Moderate Potential
DVTa	Gold Basin	50%	0%	Gold	10%	0%	50%	0%
				Silver	10%	0%	0%	0%
				Copper	10%	0%	0%	0%
				Molybdenum	10%	0%	0%	0%
				Lead	10%	0%	0%	0%
				Zinc	10%	0%	0%	0%
				Tungsten	0%	0%	0%	0%
				Lithium	0%	0%	0%	0%
DVTa	Job Peak	95%	95%	Gold	0%	0%	0%	0%
				Silver	0%	0%	0%	0%
				Copper	0%	100%	0%	100%
				Molybdenum	0%	100%	0%	100%
				Lead	0%	0%	0%	0%
				Zinc	0%	0%	0%	0%
				Tungsten	0%	0%	0%	0%
				Lithium	0%	0%	0%	0%
DVTa	Mountain Wells	95%	95%	Gold	0%	100%	0%	100%
				Silver	95%	0%	95%	0%
				Copper	95%	0%	95%	0%
				Molybdenum	0%	0%	0%	0%
				Lead	0%	0%	0%	0%
				Zinc	0%	95%	0%	95%
				Tungsten	0%	100%	0%	100%
				Lithium	0%	0%	0%	0%
DVTa	Rawhide	5%	0%	Gold	5%	0%	0%	0%
				Silver	5%	0%	0%	0%
				Copper	0%	5%	0%	0%
				Molybdenum	0%	5%	0%	0%
				Lead	0%	5%	0%	0%
				Zinc	0%	5%	0%	0%
				Tungsten	0%	0%	0%	0%
				Lithium	0%	0%	0%	0%

Table 3.3-7: Summary of Locatable Mineral Potential Impacts (continued)

Area	Mining District	Percent of District in Withdrawal		Commodity	Percent Withdrawn in District Under Alternative 1 and 2		Percent Withdrawn in District Under Alternative 3	
		Alt 1 & 2	Alt 3		High Potential	Moderate Potential	High Potential	Moderate Potential
DVTA	Sand Springs	75%	0%	Gold	75%	0%	0%	0%
				Silver	75%	0%	0%	0%
				Copper	0%	20%	0%	0%
				Molybdenum	0%	0%	0%	0%
				Lead	0%	0%	0%	0%
				Zinc	0%	0%	0%	0%
				Tungsten	75%	0%	<3%	0%
				Lithium	0%	0%	0%	0%
DVTA	Chalk Mountain	100%	100%	Gold	100%	0%	100%	0%
				Silver	100%	0%	100%	0%
				Copper	100%	0%	100%	0%
				Molybdenum	0%	0%	0%	0%
				Lead	100%	0%	100%	0%
				Zinc	0%	100%	0%	100%
				Tungsten	0%	100%	0%	100%
				Lithium	0%	0%	0%	0%
DVTA	Westgate	15%	15%	Gold	100%	0%	100%	0%
				Silver	100%	0%	100%	0%
				Copper	0%	15%	0%	15%
				Molybdenum	0%	0%	0%	0%
				Lead	15%	0%	15%	0%
				Zinc	0%	0%	0%	0%
				Tungsten	0%	0%	0%	0%
				Lithium	0%	0%	0%	0%
DVTA	Bell Mountain	10%	0%	Gold	10%	0%	0%	0%
				Silver	10%	0%	0%	0%
				Copper	0%	0%	0%	0%
				Molybdenum	0%	0%	0%	0%
				Lead	0%	0%	0%	0%
				Zinc	0%	0%	0%	0%
				Tungsten	0%	0%	0%	0%
				Lithium	0%	0%	0%	0%

Table 3.3-7: Summary of Locatable Mineral Potential Impacts (continued)

Area	Mining District	Percent of District in Withdrawal		Commodity	Percent Withdrawn in District Under Alternative 1 and 2		Percent Withdrawn in District Under Alternative 3	
		Alt 1 & 2	Alt 3		High Potential	Moderate Potential	High Potential	Moderate Potential
DVTA	Wonder	100%	100%	Gold	100%	0%	100%	0%
				Silver	100%	0%	100%	0%
				Copper	100%	0%	100%	0%
				Molybdenum	0%	0%	0%	0%
				Lead	100%	0%	100%	0%
				Zinc	0%	0%	0%	0%
				Tungsten	0%	0%	0%	0%
				Lithium	0%	0%	0%	0%

Table 3.3-8: Summary of Leasable Mineral Potential Impacts

Area	Commodity	High Potential	Moderate Potential	Low Potential	Zero Potential
B-16	Geothermal	50%	0%	50%	0%
	Oil & Gas	0%	0%	60%	40%
	Oil Shale	0%	0%	60%	40%
	Potash	0%	0%	30%	70%
	Sodium	0%	0%	30%	70%
B-17	Geothermal	100%	0%	0%	0%
	Oil & Gas	0%	0%	100%	0%
	Oil Shale	0%	0%	100%	0%
	Potash	0%	0%	75%	0%
	Sodium	0%	0%	75%	0%
B-20	Geothermal	40%	60%	0%	0%
	Oil & Gas	0%	0%	90%	10%
	Oil Shale	0	0%	90%	10%
	Potash	0	80%	0%	20%
	Sodium	0	80%	0%	20%
DVTA	Geothermal	40%	40%	20%	0%
	Oil & Gas	0%	0%	75%	25%
	Oil Shale	0%	0%	75%	25%
	Potash	0%	0%	60%	40%
	Sodium	0%	0%	60%	40%

### 3.3.4.2 Alternative 1: Modernization of the Fallon Range Training Complex (Proposed Action)

Under Alternative 1, the Navy proposes renewal by Congress of the current public land withdrawal for the FRTC. Additional public lands would be requested for withdrawal (approximately 618,727 acres), and non-federal lands are proposed for acquisition (approximately 65,153 acres). Subject to valid existing rights, all proposed FRTC lands, which would otherwise remain subject to the operation of the public

land laws, would be withdrawn from all forms of appropriation under the public land laws, including the mining laws and the mineral leasing and geothermal leasing laws.

Federal land withdrawn from mineral entry would no longer be open to new mining claims. Withdrawing the land from mineral entry would also prohibit future mineral exploration and development within the proposed boundaries of the public land withdrawal. Ultimately, withdrawing an area from mining development would remove the possibility of those mineral resources being extracted during the period of the withdrawal. In addition, operators may choose to relocate outside the proposed boundaries of the public land withdrawal, potentially affecting other public and private lands.

While a mineral withdrawal affects new mining claims, it does not affect existing, valid claims on public lands. Existing mining claims on public lands may have to undergo a validity exam, which is a formal process that determines whether the claim holder has a valid existing right. The Secretary of the Interior determines which claims are valid. For there to be a valid existing right, the claim holder must demonstrate that the claim contains a discovery of a valuable mineral deposit. Having a valid existing claim would exclude any such claim from any moratorium imposed by the requested withdrawal legislation. Therefore, under this alternative, the Navy would acquire any valid existing claims within the proposed withdrawal. With regard to patented claims, the Government passed the title of these lands to the claimant, making these lands private lands. The Navy would therefore need to acquire any such lands within the proposed FRTC land boundary.

Alternative 1 would close access to and withdraw all or portions of 19 historical mining districts from mining locatable minerals. Alternative 1 would also withdraw public land from the mineral leasing law and the geothermal laws, subject to valid existing rights. BLM would not renew existing leases under this alternative. Surface occupancy and mineral exploration and development for leasable minerals would not be allowed within the proposed FRTC boundary. This would restrict the availability of leasable minerals for development or extraction. Operators may relocate to nearby areas outside the FRTC (factoring in resources, geology, and topography), potentially reducing the number of operations on federal land but also potentially affecting other public and private lands.

This alternative would also not allow for access to or extraction of salable minerals within the proposed FRTC boundary. This alternative could potentially eliminate or reduce state and local government's ability to use nearby materials at no cost for the benefit of public projects, like the creation or maintenance of rural roads. This alternative could result in requiring developers to transport mineral materials from other locations, which would potentially increase their operating costs.

Closing the property may also affect mineral management by limiting the availability of mineral transport within certain areas. For example, new public roads, railroads, or other rights of way that would transport minerals could not be located within the proposed closed areas of the Bravo ranges, which would limit the availability to access and transport locatable and salable minerals. Closing the property would also limit the available means to transport mineral resources like oil/gas pipelines or geothermal energy transmission lines.

#### **3.3.4.2.1 Bravo-16**

##### ***Land Withdrawal and Acquisition***

Alternative 1 would expand B-16 to approximately 59,560 acres, which would be an increase of approximately 32,201 acres from existing conditions (Table 2-1). Implementing Alternative 1 would expand the B-16 range west into Lyon County and would close these areas for future locatable hard rock

mineral exploration and development, leasable geothermal exploration and development, and salable borrow pit exploration and development.

The proposed withdrawal would prohibit access to parts of the Camp Gregory Mining District for gold and silver exploration and development. Details such as the percentage of the withdrawn land in the district with significant mineral potential are summarized in Table 3.3-7 and Table 3.3-8. Industrial locatable minerals are summarized in Table 3.3-6. For the purposes of this analysis, a significant impact on the mineral resources is considered to be the withdrawal from access of the minerals classified as either moderate or high potential. Moderate or high potential leasable impacts are limited to geothermal resources, and high or moderate potential salable impacts include petrified wood, aggregate, sand, gravel, and clay. Details for leasable impacts are summarized in Table 3.3-4. Additional information for salable impacts are in Table 3.3-5.

There is potential for sand, gravel, clay or other building materials to exist in the proposed withdrawal area; however, due to an abundance of sand, gravel, and other salable material elsewhere, it is not anticipated that exploration and development for these materials would be more attractive and economically viable in the B-16 withdrawal area as compared to other areas. In the reasonably foreseeable future, this analysis supports the conclusion that there are no known comparative significant impacts at the individual or industry level in the short and long term for salable minerals.

#### ***Training Activities***

Training activities would be located within the proposed boundary of B-16, and the public would not be able to access B-16 under this alternative. In accordance with Navy policy, mining is not compatible within a surface danger zone of an operational range. The Navy would continue to follow existing operating procedures that prohibit the collection of materials from any mining area and prohibit entry to mine shafts and mines. Navy training activities would not impact mining activities outside of the proposed withdrawal boundaries.

#### ***Public Accessibility***

Under Alternative 1, the mining of locatable, leasable, and salable minerals would not be allowed within the proposed boundary of B-16, the perimeter of which would be fenced and closed entirely (except for Simpson Road and south) for public safety. There would be no significant affects to the public outside of the proposed withdrawal boundary.

#### ***Construction***

Other than potentially requiring the use of raw materials and temporarily increasing traffic, construction activities would not be anticipated to affect mining activities on adjoining lands. Any potential consumption of raw materials would be minimal.

#### **3.3.4.2.2 Bravo-17**

##### ***Land Withdrawal and Acquisition***

Alternative 1 would expand B-17 to approximately 232,799 acres, which would be an increase of approximately 178,013 acres from existing conditions (Table 2-1). Implementing Alternative 1 would expand the B-17 range south into Mineral and Nye Counties and would close these areas for future locatable hard rock mineral exploration and development, leasable geothermal exploration and development, and salable borrow pit exploration and development.

Although there are 10 Historical Mining Districts located south of U.S. Route 50 (see Figure 3.3-1), this environmental consequences analysis focuses on mineral resource areas with either moderate or high potential, because these are the areas that could be attractive for future exploration or development.

The proposed withdrawal would prohibit access to parts of the Bell Mountain, Broken Hills, Fairview, Gold Basin, Leonard, Poinsettia, and Sand Springs mining districts. In addition, the proposed withdrawal would prohibit all access to the King and Eagleville Districts. For the purposes of this analysis, a significant impact on the mineral resources is considered to be the withdrawal from access of those minerals classified as either moderate or high potential. Affected commodities with high or moderate potential include gold, silver, copper, molybdenum, lead, zinc, lithium and tungsten. Details such as the percentage of the withdrawn land in the district with significant mineral potential are summarized in Table 3.3-7 and 3.3-8. The moderate or high potential leasable impact is limited to geothermal resources, and high or moderate potential salable impacts include aggregate-sand, gravel, and clay (these commodities are not directly tied to the mineral districts). Details for leasable impacts are summarized in Table 3.3-4. Additional information for salable impacts are in Table 3.3-5.

### ***Training Activities***

Training activities would be located within the proposed boundary of B-17, and the public would not be able to access B-17 under this alternative. In accordance with Navy policy, mining is not compatible within a WDZ of an operational range. The Navy would continue to follow existing operating procedures that prohibit the collection of materials from any mining area and prohibit entry to mine shafts and sites. Navy training activities would not impact mining activities outside of the proposed withdrawal boundaries.

### ***Public Accessibility***

Under Alternative 1, mining and development of locatable, leasable, and salable minerals would not be allowed within the proposed boundary of B-17. There would be no significant effects to the public outside of the proposed withdrawal boundary.

### ***Construction***

Other than potentially requiring the use of raw materials and temporarily increasing traffic, construction activities would not be anticipated to affect mining activities on adjoining lands. Any potential consumption of raw materials would be minimal.

#### **3.3.4.2.3 Bravo-20**

### ***Land Withdrawal and Acquisition***

Alternative 1 would expand B-20 to approximately 221,334 acres, which would be an increase of approximately 180,329 acres from existing conditions (Table 2-1). Implementing Alternative 1 would expand the B-20 range north into Pershing County. This alternative would close these lands from future locatable mineral exploration and development, geothermal development, and mining for salable minerals.

The proposed withdrawal would prohibit access to parts of Wild Horse (Pershing) and Carson Sink mining districts. For the purposes of this analysis, a significant impact on the mineral resources is considered to be the withdrawal of access to minerals classified as either moderate or high potential. Affected commodities with high or moderate potential include copper, molybdenum, lead, zinc, lithium, and tungsten. Details such as the percentage of the withdrawn land in the district with significant

mineral potential are summarized in Table 3.3-7 and Table 3.3-8. The moderate or high potential leasable mineral impact is limited to geothermal resources, and high or moderate potential salable mineral impacts include aggregate-sand, gravel, and clay. Details for leasable impacts are summarized in Table 3.3-4. Additional information for salable impacts are in Table 3.3-5.

### ***Training Activities***

Training activities would be located within the proposed boundary of B-20 and the public would not be able to access B-20 under this alternative. In accordance with Navy policy, mining is not compatible within a WDZ of an operational range. The Navy would continue to follow existing operating procedures that prohibit the collection of materials from any mining area and prohibit entry to mine shafts and sites. Navy training activities would not impact mining activities outside of the proposed withdrawal boundaries.

### ***Public Accessibility***

Under Alternative 1, the mining of locatable, leasable, and salable minerals would not be allowed within the proposed boundary of B-20. With the exception of East County Road and a small portion of the range east of East County Road, the perimeter of B-20 would be fenced and closed for public safety. There would be no significant impacts to the public outside of the proposed withdrawal boundary.

### ***Construction***

Other than potentially requiring the use of raw materials and temporarily increasing traffic, construction activities would not be anticipated to affect mining activities on adjoining lands. Any potential consumption of raw materials would be minimal.

#### **3.3.4.2.4 Dixie Valley Training Area**

##### ***Land Withdrawal and Acquisition***

Alternative 1 would expand the DVTA to approximately 370,903 acres, which would be an increased withdrawal of approximately 302,065 acres from existing conditions, and would withdraw 68,809 acres in the DVTA which previously were not withdrawn from the mineral leasing laws (Table 2-1).

Implementing Alternative 1 would expand the DVTA south into Mineral County and would close these areas for future locatable hard rock mineral exploration and development, leasable geothermal exploration and development, and salable borrow pit exploration and development.

The proposed withdrawal would prohibit access to parts of the I.X.L, Job Peak, Leonard, Mountain Wells, Sand Springs, Rawhide, Fairview, Gold Basin, Bell Mountain, and Westgate mining districts. In addition, the proposed withdrawal would prohibit all access to the Wonder and Chalk Mountain districts. For the purposes of this analysis, a significant impact on the mineral resources is considered to be the withdrawal of access to the minerals classified as either moderate or high potential. Affected commodities with high or moderate potential include gold, silver, copper, molybdenum, lead, zinc, and tungsten. Details such as the percentage of the withdrawn land in the district with significant mineral potential are summarized in Table 3.3-7 and Table 3.3-8. The moderate or high potential leasable mineral impact is limited to geothermal resources, and high or moderate potential salable mineral impacts include aggregate-sand, gravel, and clay. Details for leasable impacts are summarized in Table 3.3-4. Additional information for salable impacts are in Table 3.3-5.

### ***Training Activities***

Training activities would be located within the proposed boundary of the DVTA and the public would not be able to access the DVTA under this alternative for mining or mineral resource exploration or development.

The public may observe and hear aircraft, and support vehicles from adjacent or nearby areas during training activities; however, Navy training activities would not impact mining activities outside of the proposed withdrawal boundaries. The Navy would continue to follow existing operating procedures that prohibit the collection of materials from any mining area and prohibit entry to mine shafts and sites.

### ***Public Accessibility***

Under Alternative 1, mining and development of locatable and salable minerals would not be allowed within the proposed boundary of the DVTA and the public would not be allowed to enter the DVTA for these purposes. There would be no significant affects to the public outside of the proposed withdrawal boundary.

### ***Construction***

Other than potentially requiring the use of raw materials and temporarily increasing traffic, construction activities would not be anticipated to affect mining activities on adjoining lands. Any potential consumption of raw materials would be minimal.

#### **3.3.4.2.5 Fallon Range Training Complex Special Use Airspace**

Changes to special use airspace would not impact mining or mineral resources. In accordance with the National Environmental Policy Act process, the Navy would prepare a formal Range Air Installations Compatible Use Zones update to formalize the recommendation for new safety zones and confirm existing safety zones. The Navy would continue to work with the local counties and municipalities as well as federal property land managers to plan for compatible land use development.

#### **3.3.4.2.6 Summary of Effects and Conclusions**

Alternative 1 would close, subject to valid existing rights, approximately 916,168 acres from all forms of appropriation, including the mining laws, the mineral leasing laws, and the geothermal leasing laws, which includes lands with variable potential for locatable, leasable, and salable minerals.

Alternative 1 would prohibit future exploration and production of locatable mineral resources, potentially impacting this industry, especially if future market conditions were to prove favorable for exploration leading to development. This alternative would not allow the exploration and development of leasable resources within the proposed boundaries of the FRTC. Therefore, this would eliminate the opportunity for expansion of this geothermal resource in areas of known high favorability for viable energy production. There are several very small-scale salable materials borrow sites within the proposed withdrawal area but due to the abundance of these materials in many areas of the state, impacts to these commodities would not be significant.

#### **3.3.4.3 Alternative 2: Modernization of Fallon Range Training Complex and Managed Access**

Alternative 2 is essentially identical to Alternative 1 but attempts to minimize impacts to geothermal development and the mining of salable minerals within the DVTA by allowing managed access in portions of the DVTA. The Navy would allow salable mining activities and, subject to conditions established in conjunction with BLM leasing procedures, allow geothermal development west of State

Route 121. The Navy is currently proposing the following required design features for geothermal development:

- Expand Right of Way only on west side of current transmission corridor (close to current line as possible)
- Construct underground transmission line connection from facility to existing transmission line Right of Way along State Route 121
- Use compatible lighting with downward facing shades, lighting with frequency that doesn't "wash out" night-vision devices
- Coordinate with Navy on frequency spectrum
- Use cooling towers and other structures no higher than 40 feet
- Avoid steam field piping blocking current access roads to/from State Route 121 and canyon areas
- Avoid photovoltaic solar/geothermal hybrid design

Portions of the Clan Alpine Wilderness Study Area (WSA), Job Peak WSA, and Stillwater WSA have high potential for geothermal resources. Removing the WSA designation from portions of WSAs would open these areas to geothermal and salable mineral development, potentially offsetting impacts to geothermal development in other areas. The BLM would continue to manage any remaining WSA portions of Clan Alpine WSA, Job Peak WSA, and Stillwater Range WSAs as WSAs. Any exploration or development on the de-designated lands would still need to meet the proposed required design features before any activities could occur.

#### **3.3.4.3.1 Training Activities**

Training activities would be located within the proposed boundary of the DVTA. The public may observe and hear aircraft, small arms fire, various explosive munitions, and support vehicles from adjacent or nearby areas during training activities; however, Navy training activities would not impact mining activities outside of the proposed withdrawal boundaries. The Navy would continue to follow existing operating procedures that prohibit the collection of materials from any mining area and prohibit entry to mine shafts and sites.

#### **3.3.4.3.2 Public Accessibility**

Under Alternative 2, mining and development of locatable minerals would not be allowed within the proposed boundary of the DVTA. However, the Navy would allow salable mining activities and, subject to conditions established in conjunction with BLM leasing procedures, allow geothermal development west of State Route 121, given the above listed required design features are met. There would be no significant effects to the public outside of the proposed withdrawal boundary.

#### **3.3.4.3.3 Construction**

Other than potentially requiring the use of raw materials and temporarily increasing traffic, construction activities would not be anticipated to affect mining activities on adjoining lands. Any potential consumption of raw materials would be minimal.

#### **3.3.4.3.4 Summary of Effects and Conclusions**

Alternative 2 would prohibit future exploration and production of locatable mineral resources, potentially impacting this industry, especially if future market conditions were to prove favorable for exploration leading to development. This alternative would not allow the exploration and development

of leasable geothermal resources within the proposed boundaries of the FRTC bombing ranges and would therefore eliminate the potential expansion of this important resource in areas of known high favorability for viable energy production. However, there are areas of high geothermal potential and certainty in the proposed DVTA areas west of State Route 121. With implementation of required design features, limited geothermal development could be allowed in the DVTA. There are several very small-scale salable materials borrow sites within the proposed bombing ranges but due to the abundance of these materials in many areas of the state, impacts to these commodities would not be significant. The DVTA has high potential for sand and gravel, and moderate potential for clay. Alternative 2 would allow exploration for and development of these salable resources, reducing the impact to this resource in comparison to Alternative 1.

Alternative 2 includes changes meant to reduce impacts to mineral resources in the DVTA. This alternative would withdraw lands with high potential for locatable, leasable, and salable minerals and may have an economic impact if market conditions were favorable for more mineral resource development. With implementation of required design features, the impacts to geothermal exploration and development, as well as salable exploration and development, would be reduced in comparison to Alternative 1.

#### **3.3.4.4 Alternative 3: Bravo-17 Shift and Managed Access (Preferred Alternative)**

Under Alternative 3, the land requested for withdrawal for the DVTA north of U.S. Route 50 would remain the same as in Alternative 1. However, the Navy would not withdraw land south of U.S. Route 50 as DVTA. Rather, the Navy proposes that Congress categorize this area as a Special Land Management Overlay. This Special Land Management Overlay would define two areas (one east and one west of the proposed B-17 range) as Military Electromagnetic Spectrum Special Use Zones. These two areas, which are public lands under the jurisdiction of BLM, would not be included in the withdrawal proposal and would not directly be used for land-based military training or managed by the Navy. The area does include an existing right-of-way for a current Navy communication site. Otherwise, these two areas would remain open to public access and would be available for all appropriate uses, including mining for locatable and leasable mineral resources. However, prior to issuing any decisions on projects, permits, leases, studies, and other land uses within the two special use zones, BLM would be required to consult with NAS Fallon. This consultation would inform the Navy of proposed projects, permits, leases, studies, and other land uses and afford the Navy an opportunity to collaborate with BLM to preserve the training environment near B-17.

This alternative is similar to Alternative 1 for B-16 and B-20 with regard to land withdrawal and acquisition and similar to Alternative 2 with regard to access and design features for salable and limited leasable mining activities in the DVTA. The primary difference of this alternative is that the expansion areas proposed for B-17 would be located farther to the south and east and rotated slightly counterclockwise (Figure 3.3-16). The expansion to the southwest and counterclockwise rotation allows public access to areas with higher mineral resource potential on the west side of the proposed B-17 withdrawal. With the implementation of the Special Land Management Overlay, active mine workings west of State route 839 (Rawhide and Leonard Mining Districts) would not overlap the proposed B-17 withdrawal area. Alternative 3 would allow exploration and development of a large area of high geothermal favorability also located on the west side of the existing B-17; and, allow public access to mining in portions of the Fairview, Bell Mountain, and Gold Basin Mining Districts. Further, the shifting of the B-17 proposed withdrawal area and the creation of the Special Land Management Overlay would not encumber State Route 839.

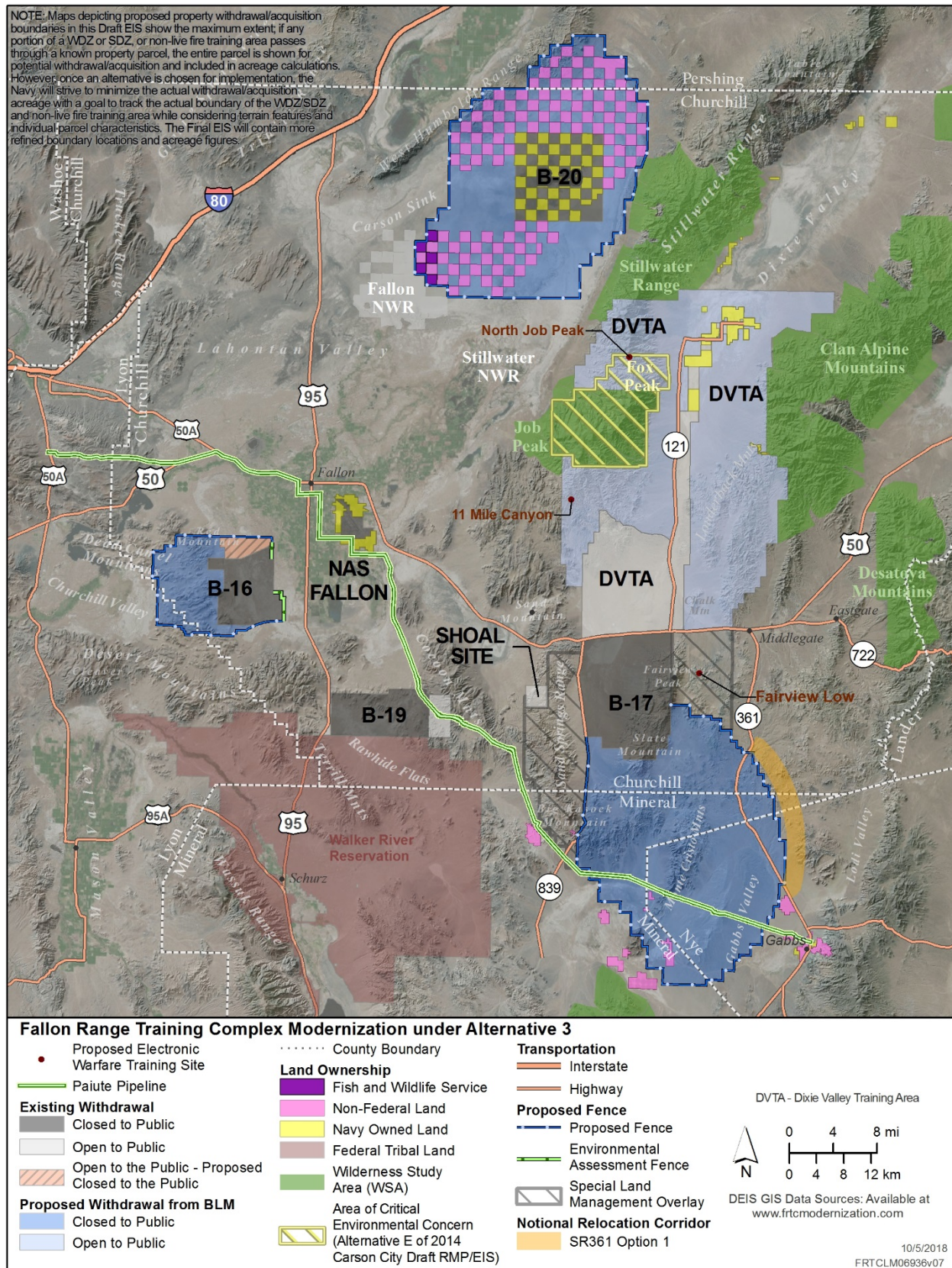


Figure 3.3-16: Fallon Range Training Complex Modernization Under Alternative 3

State Route 839 would not need to be potentially relocated under this Alternative, and would continue to provide an access corridor for commodities from active mine sites west of State Route 839.

In B-17, the proposed withdrawal would prohibit access to parts of the Bell Mountain, Broken Hills, Leonard, Lodi, and Poinsettia Mining Districts. In addition, the proposed withdrawal would prohibit all access to King and Eagleville districts. For the purposes of this analysis, a significant impact on the mineral resources is considered to be the withdrawal from access of the minerals classified as either moderate or high potential. Affected commodities with high or moderate potential include gold, silver, copper, molybdenum, lead, zinc, lithium, and tungsten. Details such as the percentage of the withdrawn land in the district with significant mineral potential are summarized in Table 3.3-7 and Table 3.3-8. The moderate or high potential leasable impact is limited to geothermal resources, and high or moderate potential salable impacts include aggregate-sand, gravel, and clay. Details for leasable impacts are summarized in Table 3.3-4. Additional information for salable impacts are in Table 3.3-5.

In the DVTA, the proposed withdrawal would prohibit access for locatable mining to parts of I.X.L, Job Peak, Mountain Wells, and Westgate Mining Districts. In addition, the proposed withdrawal would prohibit all access to Wonder and Chalk Mountain districts. For the purposes of this analysis, a significant impact on the mineral resources is considered to be the withdrawal of the commodities classified as either moderate or high potential. Affected commodities with high or moderate potential include gold, silver, copper, molybdenum, lead, zinc, and tungsten. Details such as the percentage of the withdrawn land in the district with significant mineral potential are summarized in Table 3.3-7 and Table 3.3-8. The moderate or high potential leasable mineral impact is limited to geothermal resources, and high or moderate potential salable mineral impacts include aggregate-sand, gravel, and clay. Details for leasable impacts are summarized in Table 3.3-4. Additional information for salable impacts are in Table 3.3-5.

#### **3.3.4.4.1 Training Activities**

Training activities would be located within the proposed boundary of all Bravo ranges and the DVTA, and the public would not be able to access the Bravo ranges for mining or mineral resource exploration or development.

#### **3.3.4.4.2 Public Accessibility**

Under Alternative 3, mining and development of locatable minerals would not be allowed within the proposed boundary of the Bravo ranges and the DVTA, and the public would not be allowed to enter the Bravo ranges and the DVTA for these purposes. The Navy would allow salable mining activities and, subject to conditions established in conjunction with BLM leasing procedures, would allow geothermal development west of State Route 121 managed under the Geothermal Steam Act of 1970, given the listed required design features are met. There would be no significant effects to the public mining and mineral resources outside of the proposed Bravo ranges and the DVTA boundaries.

#### **3.3.4.4.3 Construction**

Other than potentially requiring the use of raw materials and temporarily increasing traffic, construction activities would not be anticipated to affect mining activities on adjoining lands. Any potential consumption of raw materials would be minimal.

#### 3.3.4.4.4 Summary of Effects and Conclusions

Alternative 3 would prohibit future exploration and production of locatable mineral resources, potentially impacting this industry, especially if future market conditions were to prove favorable for exploration leading to development. This alternative would not allow the exploration and development of leasable geothermal resources within the proposed boundaries of the FRTC and would eliminate the potential expansion of this important resource in areas of known high favorability for viable energy production. There are several very small scale salable materials borrow sites within the proposed withdrawal area but due to the abundance of these materials in many areas of the state, impacts to these commodities would not be significant.

Although Alternative 3 includes changes meant to reduce impacts to mineral resources around B-17 in the Special Land Management Overlay areas and the DVTA, this alternative would still withdraw lands with high potential for locatable, leasable (geothermal), and salable minerals and may have an economic impact if market conditions were favorable for more mineral resource development.

#### 3.3.4.5 Proposed Management Practices, Monitoring, and Mitigation

Alternative 2 and Alternative 3 incorporate mitigation by proposing that the Navy allow salable mining activities and, subject to conditions established in conjunction with BLM leasing procedures, would allow geothermal development west of State Route 121 in the DVTA. The Navy is currently proposing the following required design features for geothermal development:

- Expand Rights of Way only on west side of current transmission corridor (close to current line as possible)
- Construct underground transmission line connection from facility to existing transmission line ROW along State Route 121
- Use compatible lighting with downward facing shades, lighting with frequency that doesn't "wash out" night-vision devices
- Coordinate with Navy on frequency spectrum
- Use cooling towers and other structures no higher than 40 feet
- Avoid steam field piping blocking current access roads to/from State Route 121 and canyon areas
- Avoid photovoltaic solar/geothermal hybrid design

#### 3.3.4.6 Summary of Effects and Conclusions

Table 3.3-9 summarizes the effects of the alternatives on mining and mineral resources.

Table 3.3-9: Summary of Effects for Mining and Mineral Resources

Summary of Effects and National Environmental Policy Act Determinations	
<b>No Action Alternative</b>	
Summary	<ul style="list-style-type: none"> <li>Existing withdrawal areas at FRTC could potentially be used for mining and mineral resource development following clean-up</li> <li>Areas that cannot be rendered safe for public access would remain off limits</li> </ul>
Impact Conclusion	The No Action Alternative would not result in significant impacts on mining and mineral resources.
<b>Alternative 1</b>	
Summary	<ul style="list-style-type: none"> <li>Would prohibit future exploration and production of locatable mineral resources potentially impacting this industry to the extent future market conditions may be favorable for exploration leading to development.</li> <li>Would not allow the exploration and development of geothermal resources within the proposed boundaries of the FRTC and eliminate expansion of this important resource in areas of known high favorability for viable energy production.</li> </ul>
Impact Conclusion	Alternative 1 would result in potential significant impacts to exploration and development of all applicable locatable, leasable, and salable mineral resources.
<b>Alternative 2</b>	
Summary	<ul style="list-style-type: none"> <li>Would prohibit future exploration and production of locatable mineral resources potentially impacting this industry to the extent future market conditions may be favorable for exploration leading to development.</li> <li>Removing the WSA designation from at least portions of WSAs that overlap the proposed withdrawal in DVTA would open these areas to geothermal and salable mineral development, potentially offsetting impacts to geothermal development in other areas under the Proposed Action. The BLM would continue managing the remaining WSA portions of Clan Alpine WSA, Job Peak WSA, and Stillwater Range WSAs as WSAs.</li> </ul>
Impact Conclusion	With the exception of some geothermal exploration and salable mineral resources and development in the DVTA, Alternative 2 would result in significant impacts of exploration and development of all applicable locatable, leasable, and salable mineral resources.

Table 3.3-9: Summary of Effects for Mining and Mineral Resources (continued)

Summary of Effects and National Environmental Policy Act Determinations	
Alternative 3	
Summary	<ul style="list-style-type: none"> <li>• Would prohibit future exploration and production of locatable mineral resources potentially impacting this industry to the extent future market conditions may be favorable for exploration leading to development.</li> <li>• Removing the WSA designation from at least portions of WSAs that overlap the proposed withdrawal in DVTA would open these areas to geothermal and salable mineral development, potentially offsetting impacts to geothermal development in other areas under the proposed action. The BLM would continue managing the remaining WSA portions of Clan Alpine WSA, Job Peak WSA, and Stillwater Range WSAs as WSAs.</li> <li>• Would provide more public access to areas with higher mineral resource potential (relative to Alternatives 1 and 2) on the west side of the proposed B-17 withdrawal,</li> <li>• Would remove the overlap between active mine workings west of the B-17 withdrawal area (Leonard Mining District) and proposed withdrawn lands.</li> <li>• This Alternative would open up for exploration development a large area of high geothermal favorability also located on the west side of B-17, and allow more public access to mining in Fairview, and Gold Basin Mining Districts).</li> </ul>
Impact Conclusion	Though anticipated to have fewer impacts than Alternative 1 and 2, Alternative 3 would result in potential significant impacts of exploration and development of all applicable locatable, leasable, and salable mineral resources.

Notes: BLM = Bureau of Land Management, FRTC = Fallon Range Training Complex, DVTA = Dixie Valley Training Area, WSA = Wilderness Study Area.

## **REFERENCES**

- Bureau of Land Management. (1985). *Energy and Mineral Resource Assessment*. Washington, DC: U.S. Department of the Interior.
- Bureau of Land Management. (1990). *Bureau of Land Management Handbook H-1624-1, Planning for Fluid Mineral Resources*. Washington, DC: U.S. Department of the Interior.
- Bureau of Land Management. (1994). *Mineral Reports – Preparation and Review, BLM Manual 3060*. Washington, DC: U.S. Department of the Interior.
- Bureau of Land Management. (2004). *Memorandum No. 2004-089 that presents the BLM’s Policy for Reasonably Foreseeable Development (RFD)*. Washington, DC: U.S. Department of the Interior.
- Muntean, J. L., D. A. Davis, and B. Ayling. (2017). *The Nevada Mineral Industry 2016* (Special Publication: MI-2016). Reno, NV: Nevada Bureau of Mines and Geology.
- Mustoe, G. E. (2015). Late Tertiary Petrified Wood from Nevada, USA: Evidence of Multiple Silicification Pathways. *Geosciences*, 5, 289–309.
- Nevada Bureau of Mines and Geology. (2017). *The Nevada Mineral Industry 2015* (Special Publication MI-2015). Reno, NV: University of Nevada, Reno.
- Office of the Under Secretary of Defense for Acquisition, T., and Logistics,. (2017). *Strategic and Critical Materials Operations Report To Congress Operations under the Strategic and Critical Materials Stock Piling Act during Fiscal Year 2016*. Washington, DC: U.S. Department of Defense.
- Papke, K. G., and S. B. Castor. (2003). *Map 142 Industrial Mineral Deposits in Nevada*. Reno, NV: Mackay School of Mines University of Nevada.
- Tingley, J. V., R. C. Horton, and F. C. Lincoln. (1993). *Outline of Nevada Mining History Special Publication 15*. Carson City, NV: Nevada Bureau of Mines and Geology.
- Tingley, J. V. (1998). *Mining Districts of Nevada Nevada Bureau of Mines and Geology Report 47*. Reno, NV: University of Nevada, Reno.
- U.S. Geological Survey. (2001). *Mineral Commodity Summaries 2001. Appendix B*. Washington, DC: U.S. Department of the Interior.