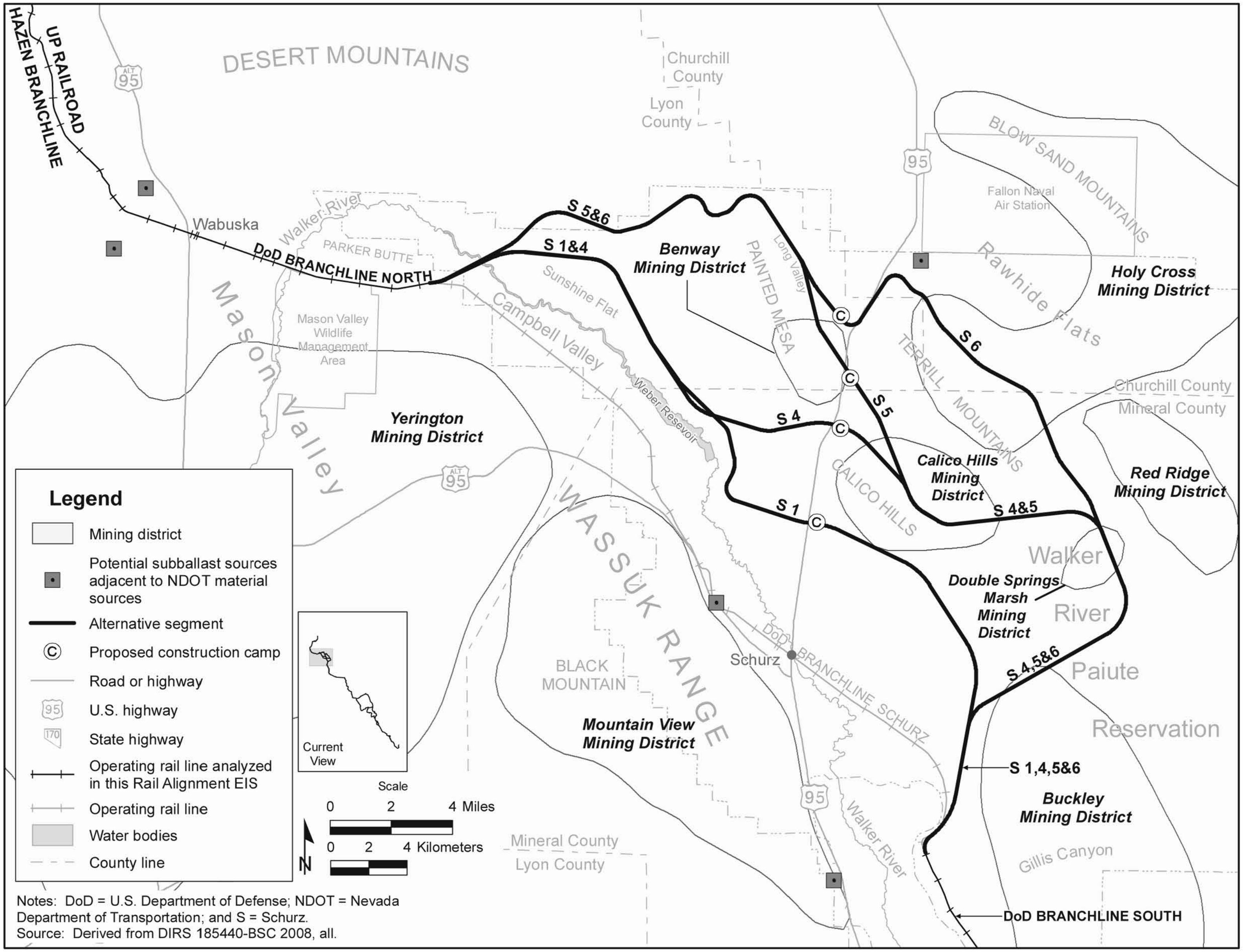


Figure 3-153. Mineral and energy resources within map area 1.

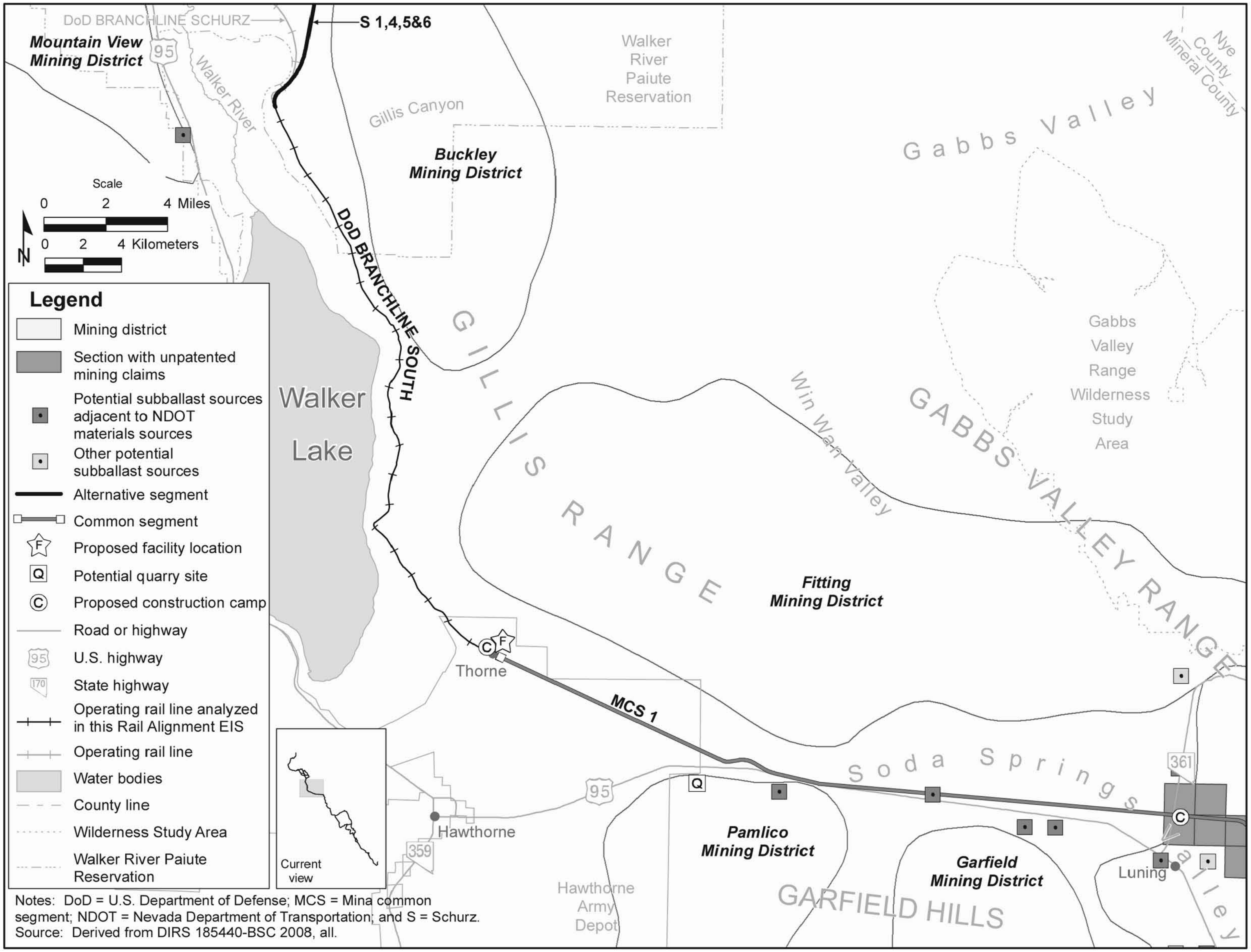


Figure 3-154. Mineral and energy resources within map area 2.

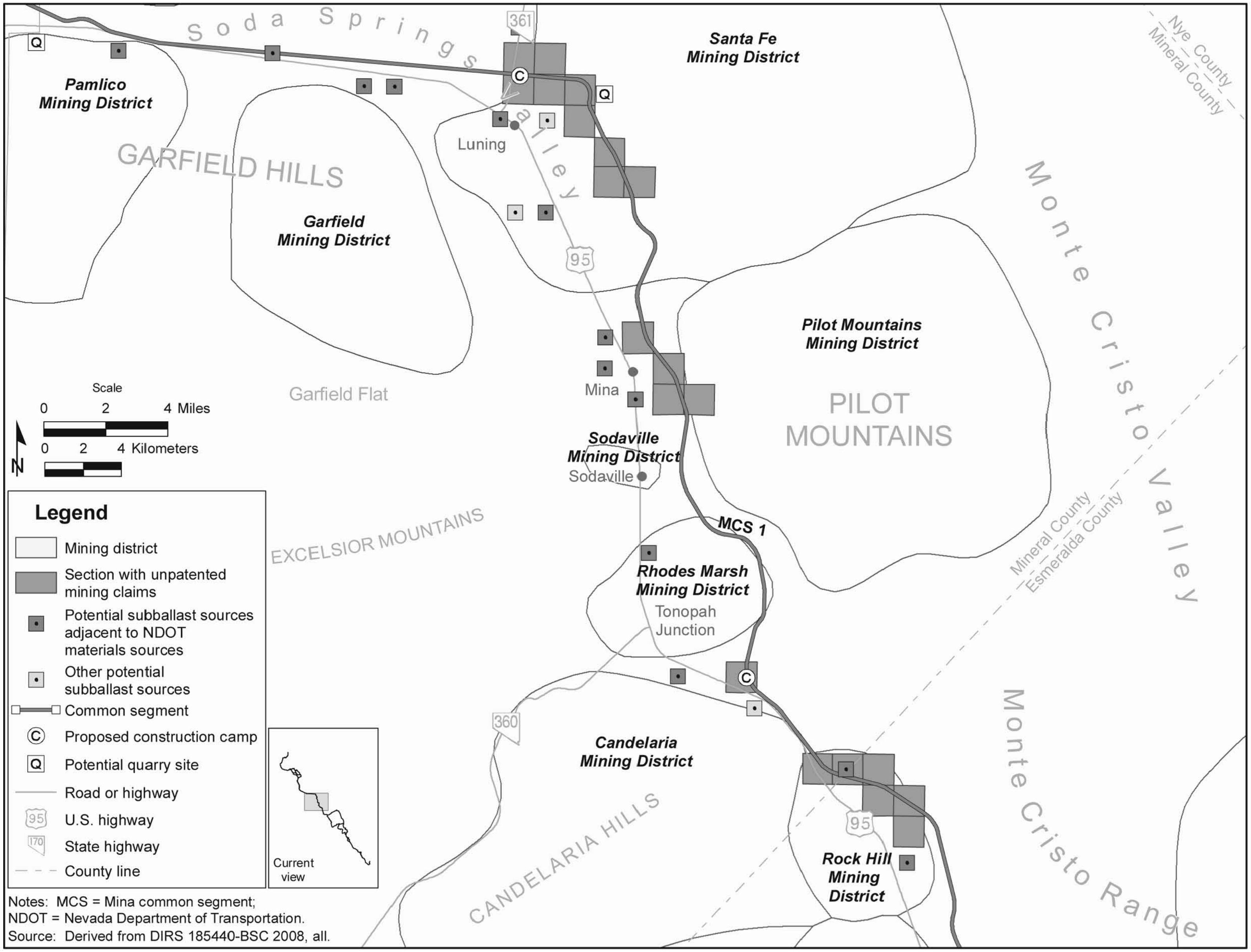


Figure 3-155. Mineral and energy resources within map area 3.

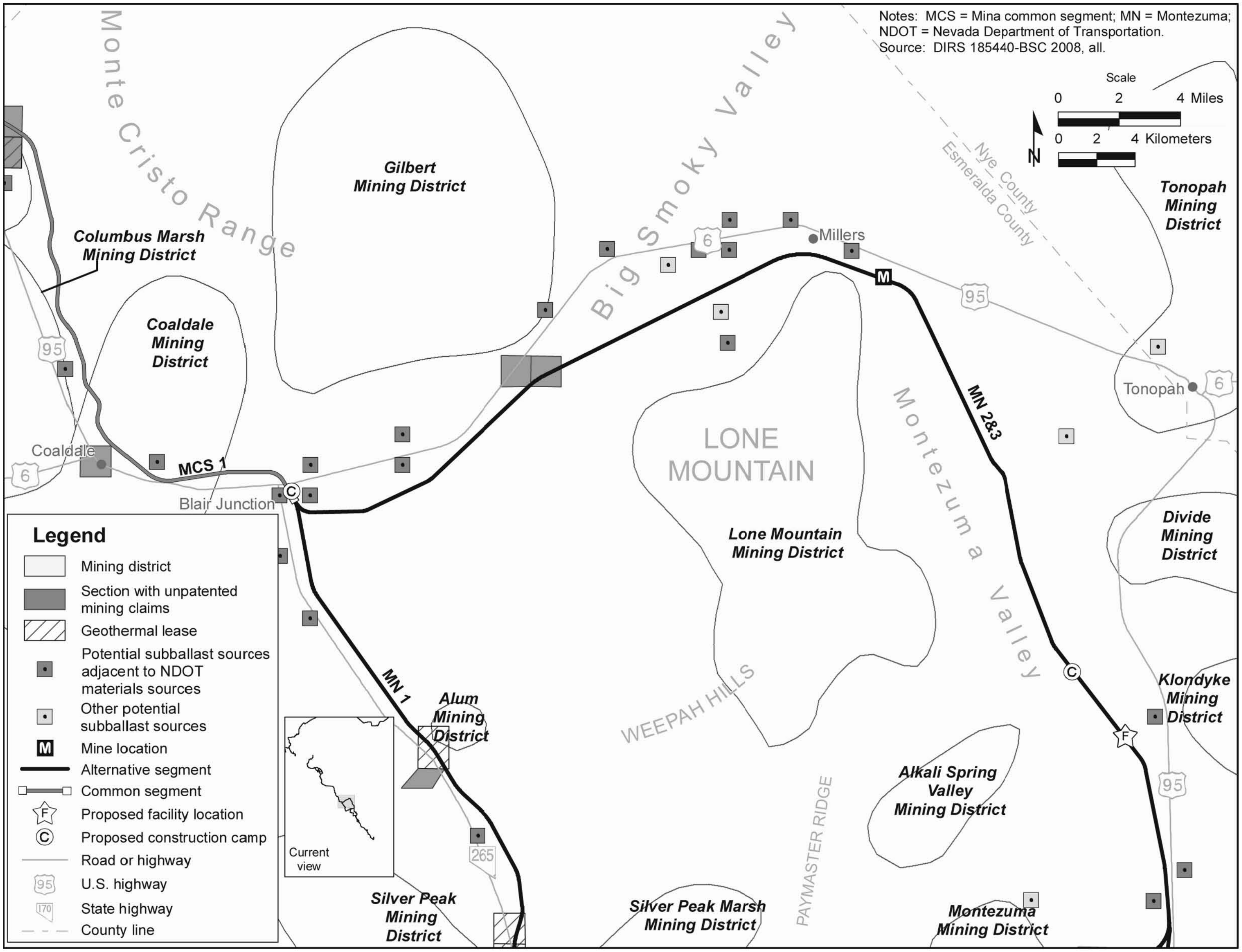


Figure 3-156. Mineral and energy resources within map area 4.

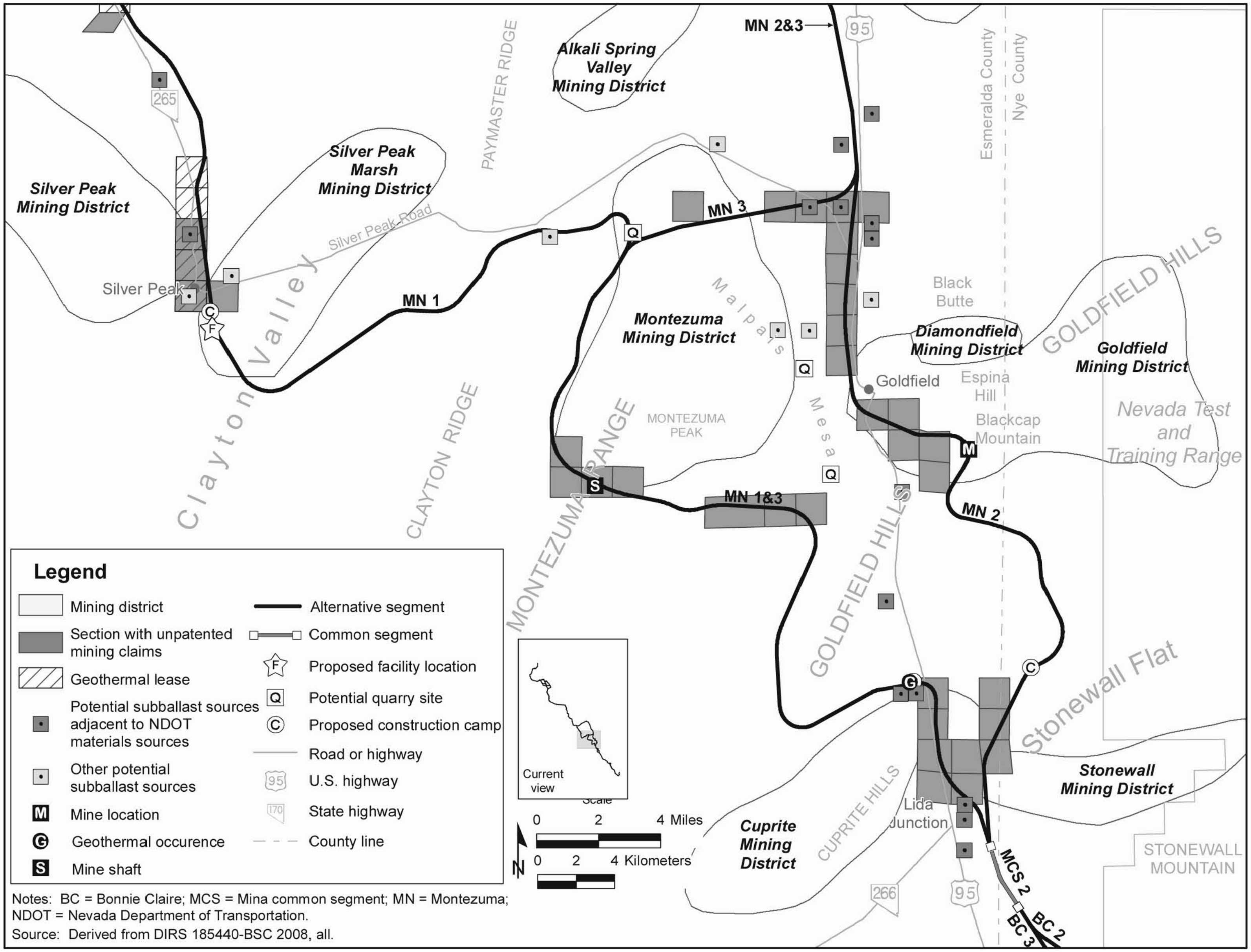


Figure 3-157. Mineral and energy resources within map area 5.

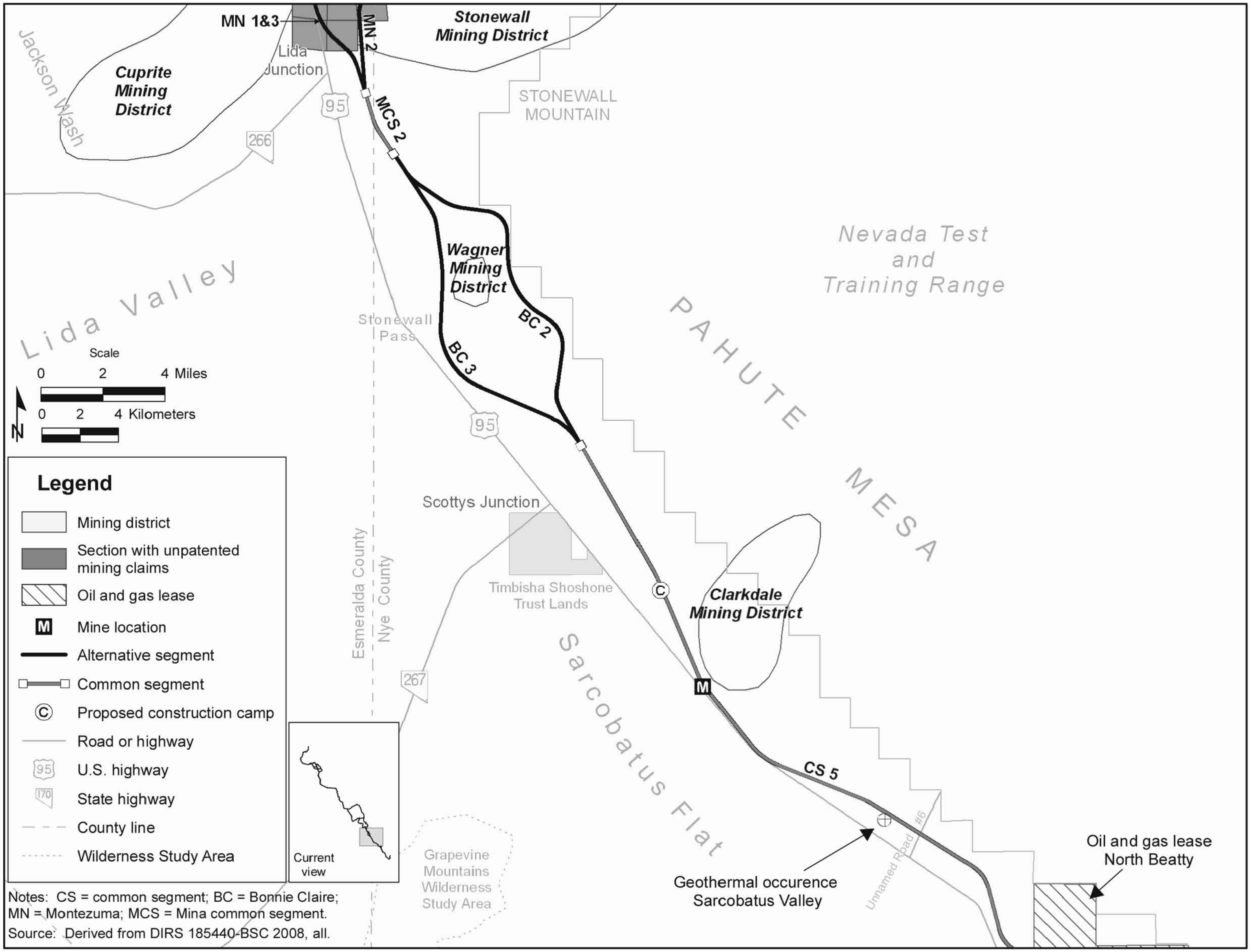


Figure 3-158. Mineral and energy resources within map area 6.

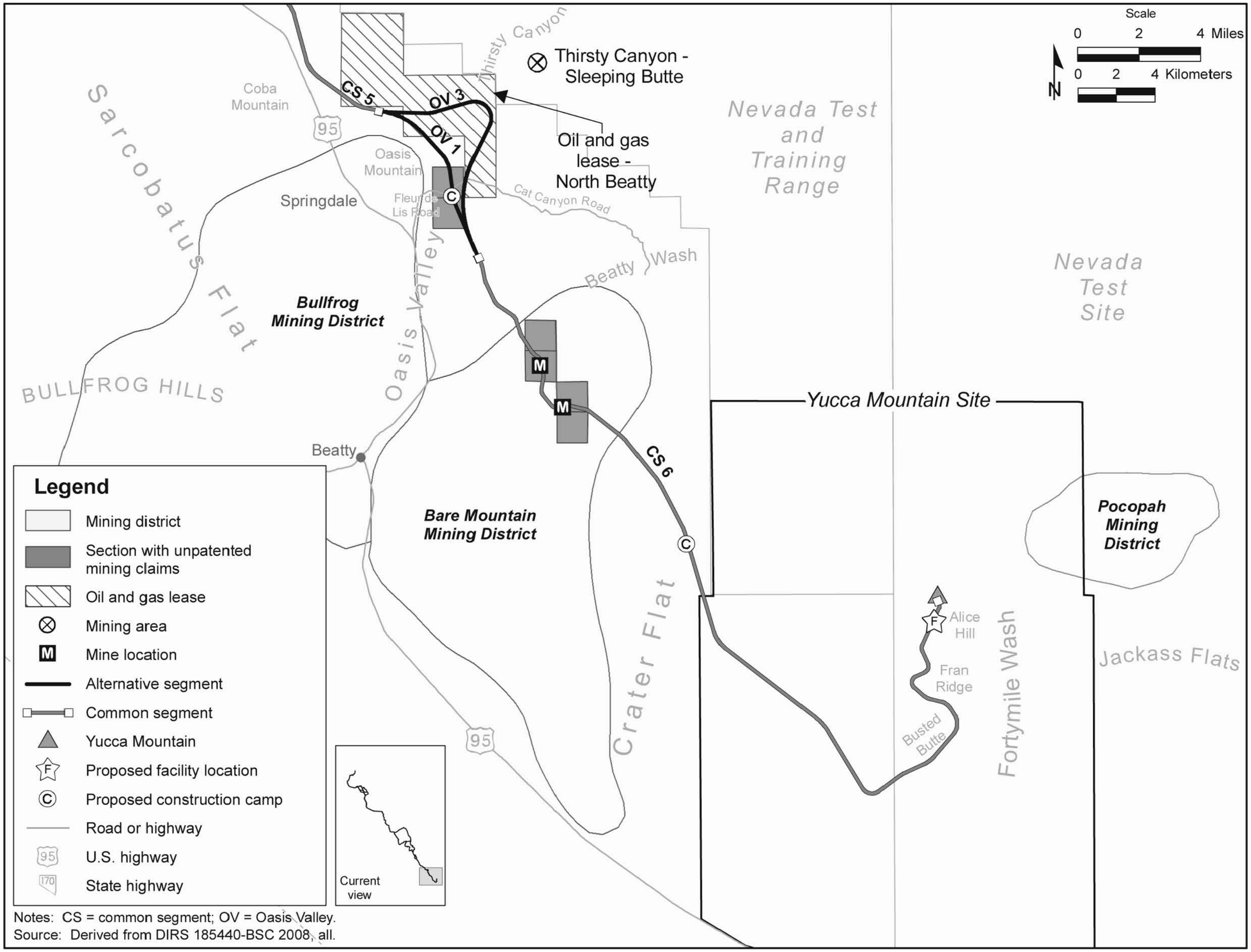


Figure 3-159. Mineral and energy resources within map area 7.

These districts are described below.

- Calico Hills: This mining district coincides with the Calico Hills, which are 5 to 8 kilometers (3 to 5 miles) north and east of the Walker River on the Walker River Paiute Reservation, about 10 kilometers 6 miles) north of Schurz, Nevada. Prospecting began after 1956 and based on limited drilling, the Calico deposit contains an estimated 181 million metric tons (200 million tons) of iron-copper ore. The precious metal content of the ore is reported to be very low and may not be profitable to mine (DIRS 183637-Shannon &Wilson 2007, pp. 28 and 29).
- Double Springs Marsh: This mining district coincides with an elliptical playa about 13 kilometers (8 miles) east of Schurz, Nevada. The only mining activity on the playa occurred around 1898 when the Occidental Alkali Company produced considerable amounts of high-grade soda from saline crust on the playa surface (DIRS 183637-Shannon & Wilson 2007, pp. 32 and 33).
- Buckley: Very little is known about this mining district. Activity in the district dates from around 1906 and there was no mining activity reported in the district as of the late 1980s. Deposits in the district typically contain small amounts of gold, silver, and copper minerals (DIRS 183637-Shannon and Wilson 2007, p. 34).
- Benway: This district is about 16 kilometers (10 miles) north of Schurz and 2 kilometers (1 mile) west of U.S. Highway 95 and lies entirely within the Walker River Paiute Reservation. Two types of ore deposits have been explored in this district – copper-silver-gold bearing quartz and calcite veins, and disseminated sulfide deposits. There are at least 10 veins containing gold, silver, and copper minerals that are as much as 6 meters (20 feet) wide and 2 kilometers long. Drilling at the disseminated sulfide deposits revealed extensive amounts of disseminated pyrite and only minor amounts of disseminated copper, lead, and zinc sulfides that were too deep or too low-grade to be of economic interest (DIRS 183637-Shannon & Wilson 2007, pp. 21 to 23).
- Holy Cross: Silver and gold were first discovered in the Holy Cross Mining District in 1910, on the Silver Star claim near what is now Camp Terrell. From 1911 to 1965, there was intermittent production of silver, gold, and other metals from mines in the southwest Holy Cross Mining District, and the Pyramid Mine in the Camp Terrell area operated for a short period in the 1980s. Although production was high in the past, the veins are narrow and the zones with ore grade are small and sparsely distributed. Therefore, it is doubtful if any of the small mines were profitable in the past and unlikely that enough ore remains undiscovered to make any of them profitable enough to reopen in the future (DIRS 183637-Shannon & Wilson 2007, pp. 19 and 20).

Mina common segment 1 would pass through the Santa Fe, Rhodes Marsh, Rock Hill, and Coaldale Mining Districts. The construction right-of-way would also intersect the outermost boundaries of the Pilot Mountains and Candelaria Mining Districts. These districts are described below.

- Santa Fe: The Santa Fe Mining District is large and diverse geologically and mineralogically. From 1883 to 1894, the Santa Fe Mine produced primarily silver. From 1900 to 1929, copper-lead deposits containing silver were mined. From 1988 to 1995, the Santa Fe-Calavada mine produced over 10 million metric tons (12 million tons) of ore containing 10 million grams (356,700 ounces) of gold, 20 million grams (721,523 ounces) of silver, and an unknown amount of mercury. The New York Canyon area has major copper deposits. The Canyon Copper Company recently staked 550 mining claims and now controls 1,003 claims encompassing more than 81 square kilometers (20,000 acres) in the New York Canyon area, and the company reports that it is planning more exploration of the area in 2007. Nevada Sunrise LLC currently holds claims to the New Boston and Blue Ribbon mines, reported to contain scheelite, molybdenite, chalcopyrite, pyrite, and fluorite, but the company's exploration plans are unknown (DIRS 183637-Shannon & Wilson 2007, pp. 41 to 44). Mina common segment 1 would bisect active mining claims and authorized or pending notice(s) of intent in the New York Canyon area east of Luning (DIRS 183637-Shannon & Wilson 2007, Table 1).

- Rock Hill: This mining district is 13 to 23 kilometers (8 to 14 miles) northwest of Coaldale. Mina common segment 1 would cross through the Redlich claim block in the northern part of the Rock Hill Mining District. The Miranda Gold Corporation is actively exploring this claim. Current exploration is focused on 122 lode claims near Redlich Summit that have geologic indicators for gold (DIRS 183637-Shannon & Wilson 2007, pp. 74 and 75).
- Coaldale: This district includes a clay mine (Blanco Mine) that is worked intermittently approximately 11 kilometers (6.7 miles) south-southwest of Mina common segment 1 (DIRS 183637-Shannon & Wilson 2007, p. 78).
- Pilot Mountains: The Pilot Mountains Mining District covers the entirety of the Pilot Mountains and has been referred to alternatively as the Pilot or Sodaville Mining District. It includes all of the Telephone Canyon and Graham Springs Mining Districts. The primary commodities produced from this district are mercury and tungsten, with minor production or reported occurrences of gold, copper, silver, molybdenum, antimony, turquoise, and montmorillonite. It appears that there has been no significant mining in this district since 1956 (DIRS 183637-Shannon & Wilson 2007, p. 54).
- Rhodes Marsh: This district is 8 kilometers (5 miles) south of Mina, Nevada, and coincides with Rhodes Salt Marsh. This area has been known as a source of saline minerals since the 1860s and part of the area is covered by patented mining claims. Mina common segment 1 would follow the eastern edge of the district. There are no production records after 1934 for any minerals at Rhodes Marsh. Neither active mining nor evidence of recent exploratory activity was observed on the marsh during an October 2006 site visit (DIRS 183637-Shannon & Wilson 2007, pp. 61 and 62).
- Candelaria: This district is in the Candelaria Hills and is bordered on the north by Rhodes Marsh and on the east by Rock Hill. From 1873 to 1996, the district produced 4 million grams (167,200 ounces) of gold, 18.1 million grams (63 million ounces) of silver, 32 million grams (72,000 pounds) of copper, 18.9 million grams (4.16 million pounds) of lead, and 10.2 million grams (2.26 million pounds) of zinc. Mina common segment 1 would pass more than 8 kilometers (5 miles) from major historic and recent mining areas in the district and would be generally separated from the district by U.S. Highway 95 (DIRS 183637-Shannon & Wilson 2007, pp. 63 and 64, and Table 1).

Montezuma alternative segment 1 would pass through the Silver Peak Marsh, Montezuma, and Cuprite Mining Districts. Montezuma alternative segment 2 would pass through the Goldfield and Stonewall Mining Districts. Montezuma alternative segment 3 would pass through the Montezuma and Cuprite Mining Districts (see Table 3-87). These districts are described below:

- Silver Peak Marsh: This district is entirely in Esmeralda County and is alternatively known as the Clayton Valley Mining District. Lithium, sylvite, and halite are the only commodities the district produces, but there are reported occurrences of halite, borates, and potash. At present, this district is the only domestic source of lithium. The Chemetall Foote Corporation and its predecessor companies have produced lithium, sylvite, and halite from this district since 1966 and production is ongoing (DIRS 183637-Shannon & Wilson 2007, pp. 96 and 97).
- Montezuma: This district covers the northern part of the Montezuma Range on and around Montezuma Peak in eastern Esmeralda County. Montezuma is primarily a silver-lead district, with minor production of gold and copper, and occurrences of mercury and bismuth. Historically, productive deposits have generally occurred in the western part of the district near the Montezuma townsite. The district was discovered in 1867 and the last production was reported as late as 1931 (DIRS 183637-Shannon & Wilson 2007, pp. 99 and 100).

Table 3-87. Mining districts the Montezuma alternative segments would cross.

Mining district	Montezuma alternative segment 1	Montezuma alternative segment 2	Montezuma alternative segment 3
Silver Peak Marsh	X		
Montezuma	X		X
Cuprite	X		X
Goldfield		X	
Stonewall		X	

- Cuprite: Copper ore was discovered in this district in 1905. The Cuprite district is about 19 to 24 kilometers (12 to 15 miles) south of Goldfield, Nevada. There is evidence of recent mining claims and recent trenching and drilling at the northeastern portion of the district, west of U.S. Highway 95. There appears to be a relatively large geothermal system in the area. There is also a silica quarry in the district (DIRS 183637-Shannon & Wilson 2007, pp. 112 to 114).
- Goldfield: Goldfield is the largest center of mining in the region of influence. This mining district consists of the Goldfield Main, McMahon Ridge, and Gemfield areas, and is in the Goldfield Hills that lie to the northeast and southwest of Goldfield, Nevada. An additional area (referred to as the Tom Keane area) has been the subject of recent (2003) exploration efforts. The Goldfield Project consists of 385 patented and 849 unpatented claims covering more than 83 square kilometers (20,600 acres) in Esmeralda and Nye Counties. Metallic Ventures Gold, Inc., has plans to explore the Gemfield area and has plans to conduct two phases of exploration. Gemfield Phase 2 would require the relocation of U.S. Highway 95 west of its current route (DIRS 185176-Siebel et al. 2006, p. 18-6). This exploration site would coincide with the location of a portion of Montezuma alternative segment 2. The company filed a plan of operations and an Environmental Assessment for exploration with the BLM Tonapah field office. The plan of operations will allow the company to continue with exploration activities in and around the Gemfield deposit, particularly to the west (DIRS 185176-Siebel et al. 2006, p. 18-12).
- Stonewall: Most of the past mining activity in this district is approximately 5 kilometers (3 miles) east of Montezuma alternative segment 2. This district was reportedly prospected for gold and silver as early as 1905 (DIRS 183644-Shannon & Wilson 2007, p. 54). Veins of gold and silver currently under exploration in this district are prominent at areas mined in the past and continue easterly away from the rail alignment.

Mina common segment 2 would not cross any mining districts.

The Bonnie Claire alternative segments would be west of the Scottys Junction Mining Area and the Wagner Mining District would lie between these segments. Neither segment's construction right-of-way would cross these mining locations. The Wagner Mining District has a number of patented mining claims, although none would fall within the construction right-of-way for either Bonnie Claire alternative segment. The main rock types within the Wagner Mining District are shale, quartzite, and intercalated limestone. There have been recent exploration efforts in this district by several companies (DIRS 183644-Shannon & Wilson 2007, p. 54).

The closest mining districts to common segment 5 would be Clarkdale Mining District to its east and Bullfrog Mining District to its south where it would meet the Oasis Valley alternative segments. The Oasis Valley alternative segments are between the Bullfrog Mining District and the Thirsty Canyon-Sleeping Butte Mining Area. The Clarkdale Mining District contains discontinuous, narrow zones containing some gold and silver mineralization (DIRS 183644-Shannon & Wilson 2007, p. 50). The

Bullfrog Mining District contains small, localized areas of gold, silver, and lesser copper mineralization (DIRS 183644-Shannon & Wilson 2007, p. 44). The Thirsty Canyon-Sleeping Butte Mining Area has been historically quarried for decorative rock and building stone (DIRS 183644-Shannon & Wilson 2007, p. 47).

Common segment 6 would cross the northeastern portion of the Bare Mountain Mining District, although the vast majority of past mining activity occurred more than 3 kilometers (2 miles) south of this common segment. The district contains gold-bearing veins, and some veins contain silver. The district also contains a variety of minerals and semi-precious stones, including opal, chalcopyrite, malachite, azurite, galena, pyrite, limonite, hematite, fluorite, and gypsum (DIRS 183644-Shannon & Wilson 2007, pp. 37 and 40).

The only patented mining claims that would fall within or intersect the Mina rail alignment construction right-of-way would be along Montezuma alternative segment 2. Table 3-88 lists the number of sections containing unpatented mining claims the rail line construction right-of-way would cross.

Table 3-88. Number of unpatented mining claims that may intersect the Mina rail alignment construction right-of-way.[a]

Rail line segment	Number of sections with unpatented mining claims[a]	Unpatented mining claims across all sections[b]
Mina common segment 1	20	355
Montezuma alternative segment 1	17	94
Montezuma alternative segment 2	24	362
Montezuma alternative segment 3	19	164
Oasis Valley alternative segment 1	2	7
Oasis Valley alternative segment 3	2	7
Common segment 6	4	19

a. Source: DIRS 185440-BSC 2008, all.
b. Data are provided by Township, Range, and Section and might not fall within the rail line construction right-of-way. DOE would need to verify the actual numbers and locations of unpatented mining claims before applying for a right-of-way grant.

The existence of abandoned or active mining tunnels and shafts near the rail alignment would also be a concern for safety reasons. There is one underground mine that would be within the Montezuma alternative segment 1 or 3 construction right-of-way, approximately 3 kilometers (2 miles) east of private land at Millers. There would be one tunnel/shaft within the Montezuma alternative segment 1 or 3 construction right-of-way and one tunnel/shaft within the Montezuma alternative segment 2 construction right-of-way in the Goldfield area, as shown in Figure 3-157. DOE obtained the data on locations of tunnels and caves, mining shafts, and underground mines from the Nevada Bureau of Mines and Geology (DIRS 185440-BSC 2008, all).

However, none of the tunnels, shafts, and underground mines in this dataset is identified as having been field verified by the Division of Mines. Furthermore, this dataset might not include very old tunnels, shafts, and underground mines that were not recorded.

The Mina rail alignment would be a "fill" project, because generally more fill material would be needed to maintain a level grade than what would be available from cuts within the construction right-of-way. Subsequently, for the Mina rail alignment, a portion of the subballast (sand and gravel) would be obtained from new borrow sites adjacent to existing Nevada Department of Transportation material and from other potential locations along the rail alignment. These sites are shown in Figure 2-33a and Figures 3-153 through 3-159.

3.3.2.5.2.2 Energy Resources. The Basin and Range Province is considered a favorable area for geothermal resources because it has higher-than-average heat flow and is an area of crustal expansion, where faults can provide permeable reservoirs and conduits for deep circulation of water, and the crust is so thin it has a higher-than-average heat flux. Several hundred wells have been drilled in Nevada to discover high-temperature geothermal steam resources (DIRS 183644-Shannon & Wilson 2007, p. 31).

Geothermal resources are present as hot springs and thermal waters near Hazen, Hawthorne, Mina, Redlich, Silver Peak, Sarcobatus Flat, Scottys Junction, Panaca (Owl Warm Springs), Cedar Spring, Stonewall Flat, and Beatty Warm Springs.

The following paragraphs describe energy leases, the geographic locations of which are identified based on the township-range system, the method by which public land in Nevada and many other states was surveyed before being made available for purchase or homesteading. The township is the major subdivision of land; it is numbered north to south and measures 36 square miles; range is the east/west location identifier; sections are 1-square-mile areas within townships. Township, range, and section are abbreviated T, R, and S; directional information is abbreviated N, S, E, and W. Thus, E/2 T2S R39E refers to the east half of Township 2 South, Range 39 East.

The following Mina rail alignment segments would cross geothermal leases:

- Mina common segment 1 (Warm Wells north of Columbus Marsh) – The BLM issued a block of leases (all but one are still active) located in T3N and T4N, R36E. Mina common segment 1 would cross the northeastern-most leased section of the lease block (Section 26, T4N, R36E). Figure 3-155 shows these leases (DIRS 183637-Shannon & Wilson 2007, pp. 130 and 131).
- Montezuma alternative segment 1 (Alum Mining District – Warm Wells) – A block of current and expired BLM geothermal leases are present in the southern Big Smoky Valley. Montezuma alternative segment 1 would cross several leases with an effective date of March 1, 2003, in T1N, R38, and 39E. Figure 3-156 shows these leases (DIRS 183637-Shannon & Wilson 2007, p. 130).
- Montezuma alternative segment 1 (Silver Peak Marsh Mining District – Silver Peak Hot Springs) – would cross several geothermal leases obtained by Western Geothermal Partners LLC in Section 34, T1S, R39E and several sections in E/2 T2S, R39E. Figure 3-157 shows these leases (DIRS 183637-Shannon & Wilson 2007, pp. 128 and 129).

There are geothermal occurrences (springs and wells) in Sarcobatus Valley along U.S. Highway 95 south of Scottys Junction (DIRS 183644-Shannon & Wilson 2005, p. 48).

There are no producing oil or gas wells within 16 kilometers (10 miles) of the Mina rail alignment north of common segment 5 (DIRS 183637-Shannon & Wilson 2007, p. 123). The rail alignment would cross several areas of expired or relinquished (closed) oil and gas leases. The closest oil and gas lease is approximately 3 kilometers (2 miles) northeast of Mina, Nevada, which is approximately 1.6 kilometers (1 mile) east of Mina common segment 1. The BLM authorized this lease in September 2006 (DIRS 183637-Shannon & Wilson 2007, p. 125). The BLM also authorized an oil and gas lease on the north slope of the Pilot Mountains in July 2006; however, Mina common segment 1, the rail line segment that would be closest to this lease, would pass approximately 6 kilometers (4 miles) west of this area (DIRS 183637-Shannon & Wilson 2007, p. 125).

Fourteen sections of land constitute a single oil and gas lease (one permittee) 19 kilometers (12 miles) north of Beatty, Nevada, along the southwest flank of Pahute Mesa in southern Nye County (DIRS 179587-Wilson 2007, all). Oasis Valley alternative segment 3 would cross seven of the 14 sections and Oasis Valley alternative segment 1 would cross two sections of this oil and gas lease block.

As of January 2007, no BLM coal leases (active or closed) have been identified within 16 kilometers (10 miles) of the Mina rail alignment (DIRS 183637-Shannon & Wilson 2007, p. 126).

3.3.2.5.3 Recreation and Access

This section describes the recreational areas within the Mina rail alignment region of influence and the secondary roads and trails the rail alignment would cross. Figures 3-160 through 3-167 show recreational areas in the region of influence.

3.3.2.5.3.1 Churchill County. Outdoor recreation in Churchill County includes a mixture of dispersed and location-specific activities (DIRS 180482-Churchill County Planning Department 2007, p. 9-1). There are no developed BLM recreation sites within 1.6 kilometers (1 mile) of the Mina rail alignment. U.S. Highway 50 intersects and parallels the Union Pacific Railroad Hazen Branchline for approximately 11 kilometers (7 miles) in Churchill and Lyon Counties. U.S. Highway 50, which traces the routes of the historic transcontinental Lincoln Highway, has recently been marketed as the "Loneliest Road in America" for its extreme remoteness (DIRS 180483-NPS 2004, p. 21).

The Union Pacific Railroad Hazen Branchline abuts the Lahontan State Recreation Area, tracing the area's northern boundary for approximately 6.5 kilometers (4 miles). The site, managed by the Nevada Division of State Parks, Department of Conservation and Natural Resources, is primarily focused on the Lahontan Reservoir and associated water-based activities (fishing, boating, waterskiing) as well as recreational vehicle and tent camping (DIRS 180481-Nevada Division of State Parks [n.d.], all).

3.3.2.5.3.2 Lyon County. Recreation on BLM lands in Lyon County is managed primarily for dispersed recreation, with developed recreation only at certain high-use sites. There are no developed BLM recreation areas along the portions of Union Pacific Railroad Hazen Branchline, Department of Defense Branchline North, or Schurz alternative segments in Lyon County.

In addition to Lahontan State Recreation Area, the State of Nevada manages two recreation areas in the region of influence of existing rail segments, Fort Churchill State Historic Park and the Mason Valley Wildlife Management Area.

Fort Churchill State Historic Park preserves the ruins of a Civil War-era U.S. Army fort and Pony Express station (DIRS 180459-Nevada Division of State Parks [n.d.], all). Department of Defense Branchline North crosses about 1 kilometer (0.6 mile) of this park.

The 54 square-kilometer (13,375-acre) Mason Valley Wildlife Management Area, administered by the Nevada Department of Wildlife, provides a mosaic of game habitats from open water to wetlands and upland areas (DIRS 180480-NDOW 2005, all). Department of Defense Branchline North runs adjacent to the northern boundary of the Wildlife Management Area for more than 5 kilometers (3 miles).

Schurz alternative segments 1 and 4 would come within 1 kilometer (0.6 mile) of Weber Reservoir, a recreational water body straddling the boundary of Lyon and Mineral Counties and managed by the Walker River Paiute Tribe.

The Fort Churchill to Wellington ***Back Country Byway*** begins on Nevada State Highway 2B at Fort Churchill State Historic Park and runs 80 kilometers (50 miles) west to Wellington, Nevada (DIRS 180461-BLM 2006, all). This unimproved road parallels the existing rail line at a distance of approximately 460 meters (1,500 feet) at its closest for 0.8 kilometer (0.5 mile) before the two diverge.

A **Back Country Byway** is a vehicle route that traverses scenic corridors utilizing secondary or back country road systems (DIRS 181598-BLM 2007).

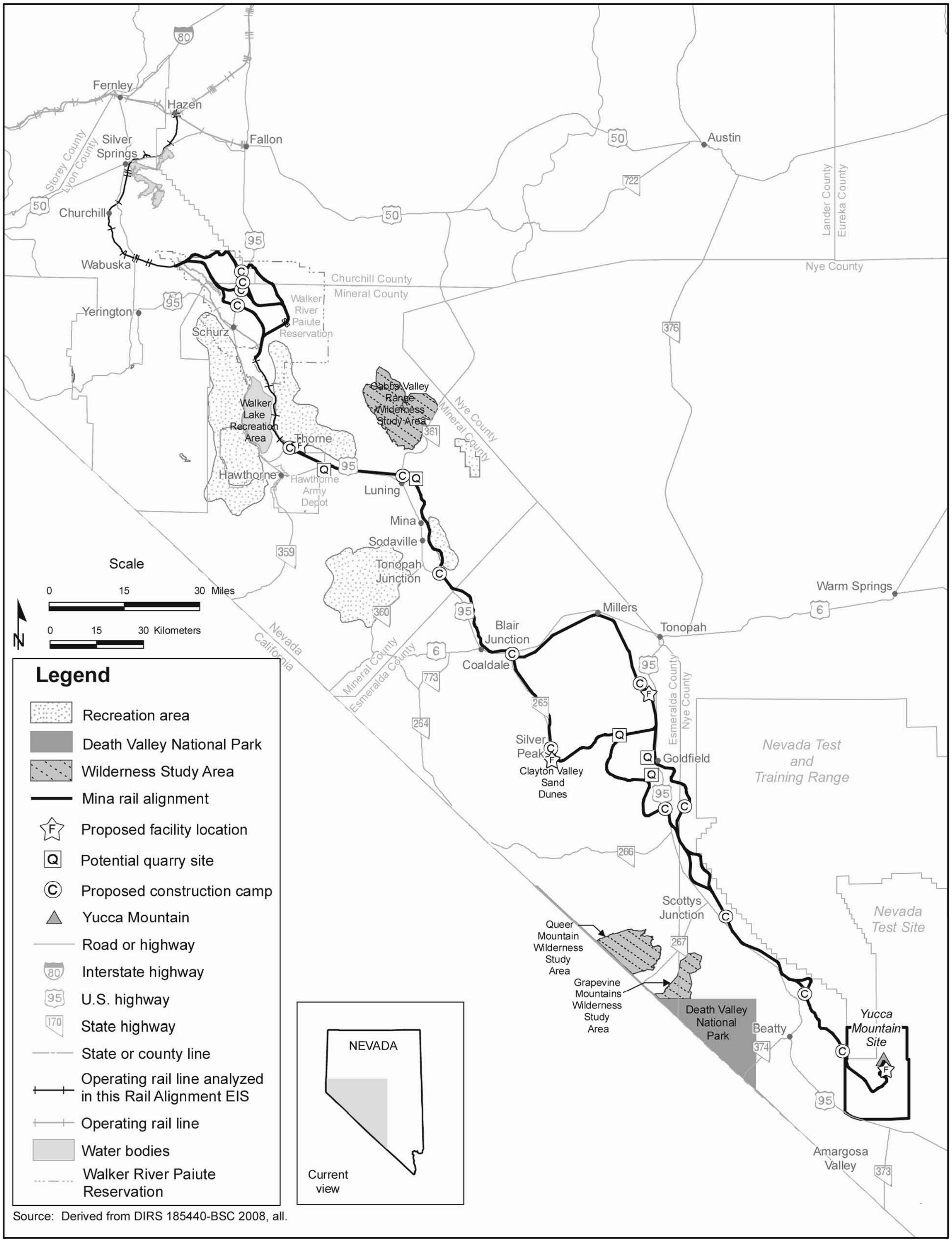


Figure 3-160. Recreation areas and roads along the Mina rail alignment.

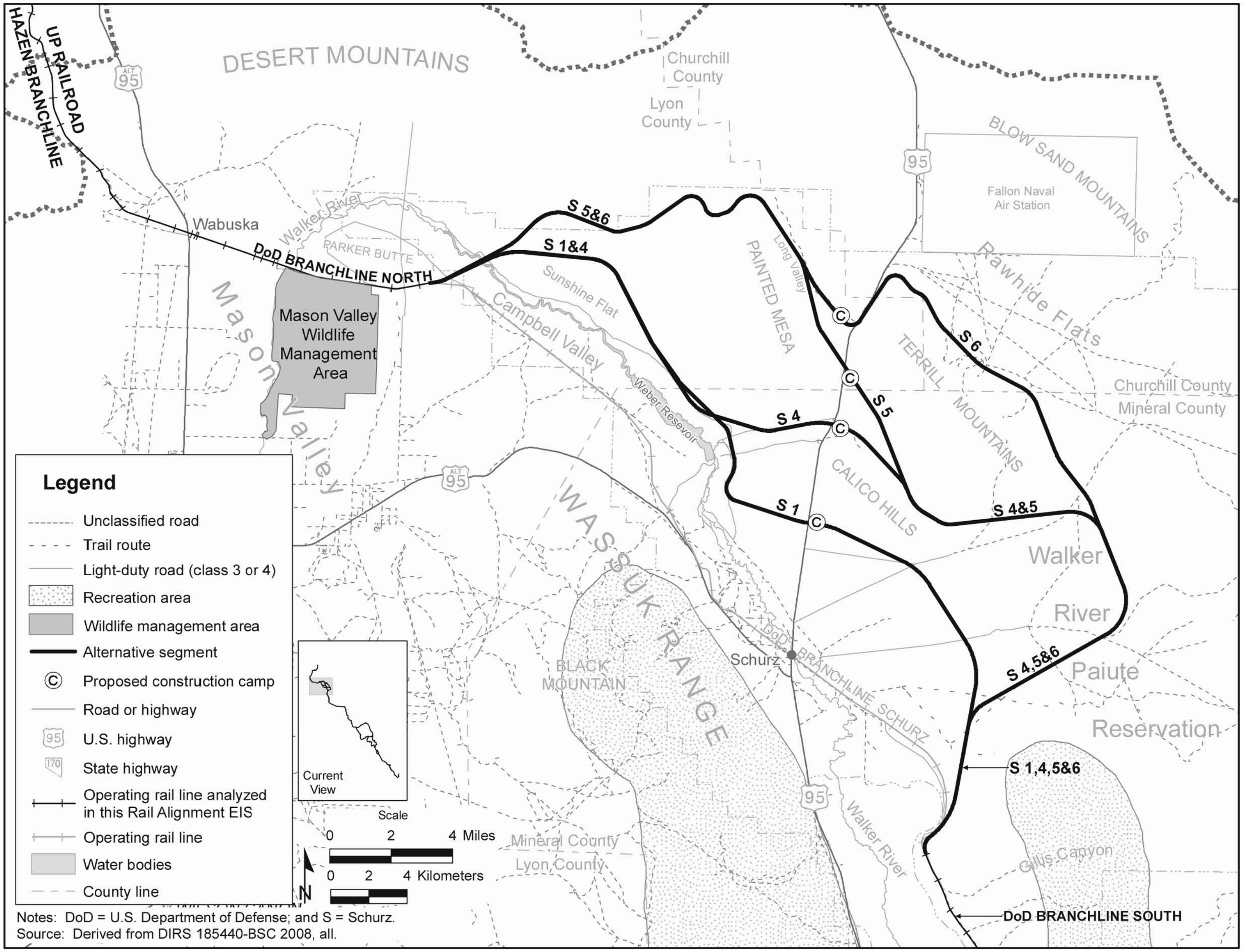


Figure 3-161. Recreation areas and roads within map area 1.

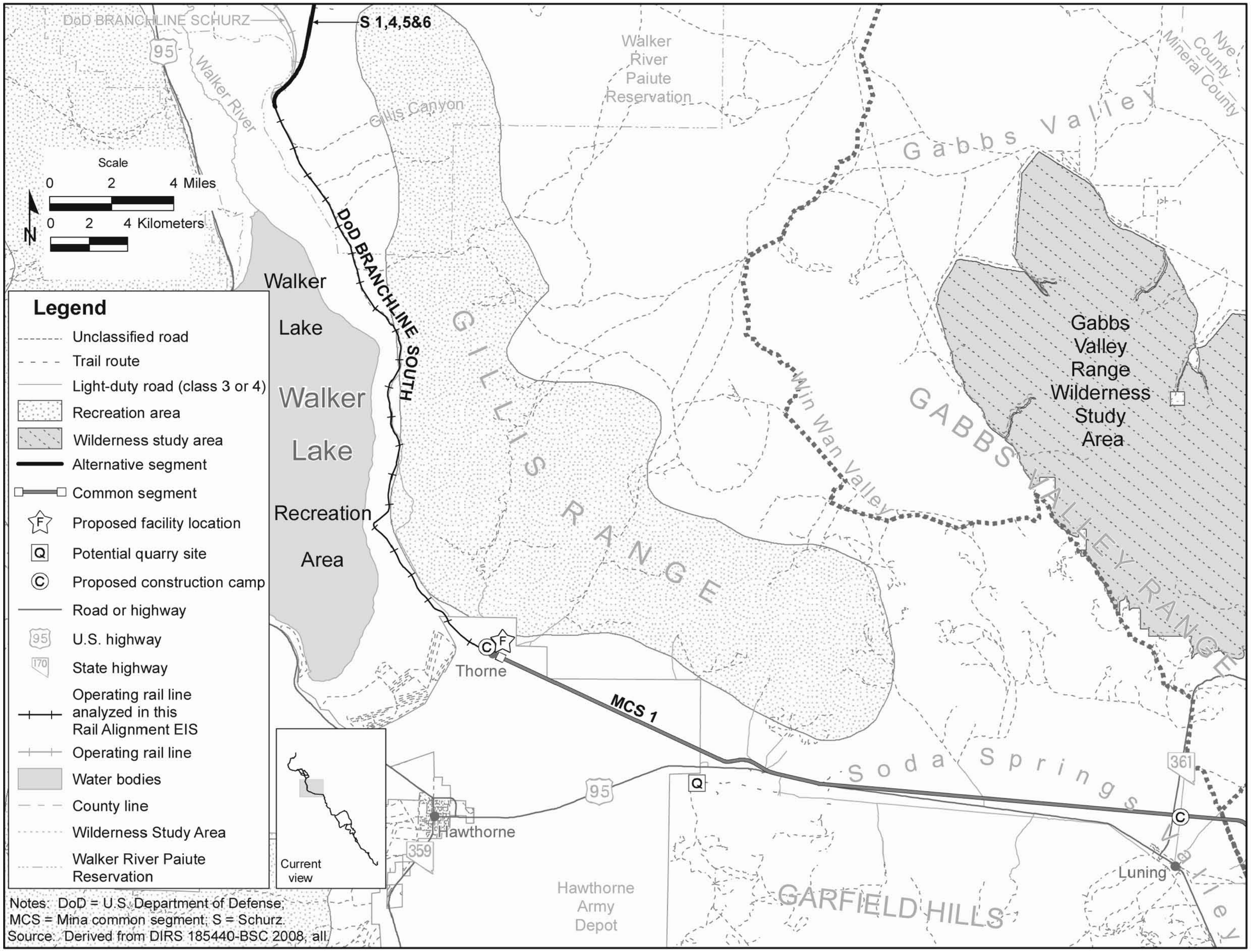


Figure 3-162. Recreation areas and roads within map area 2.

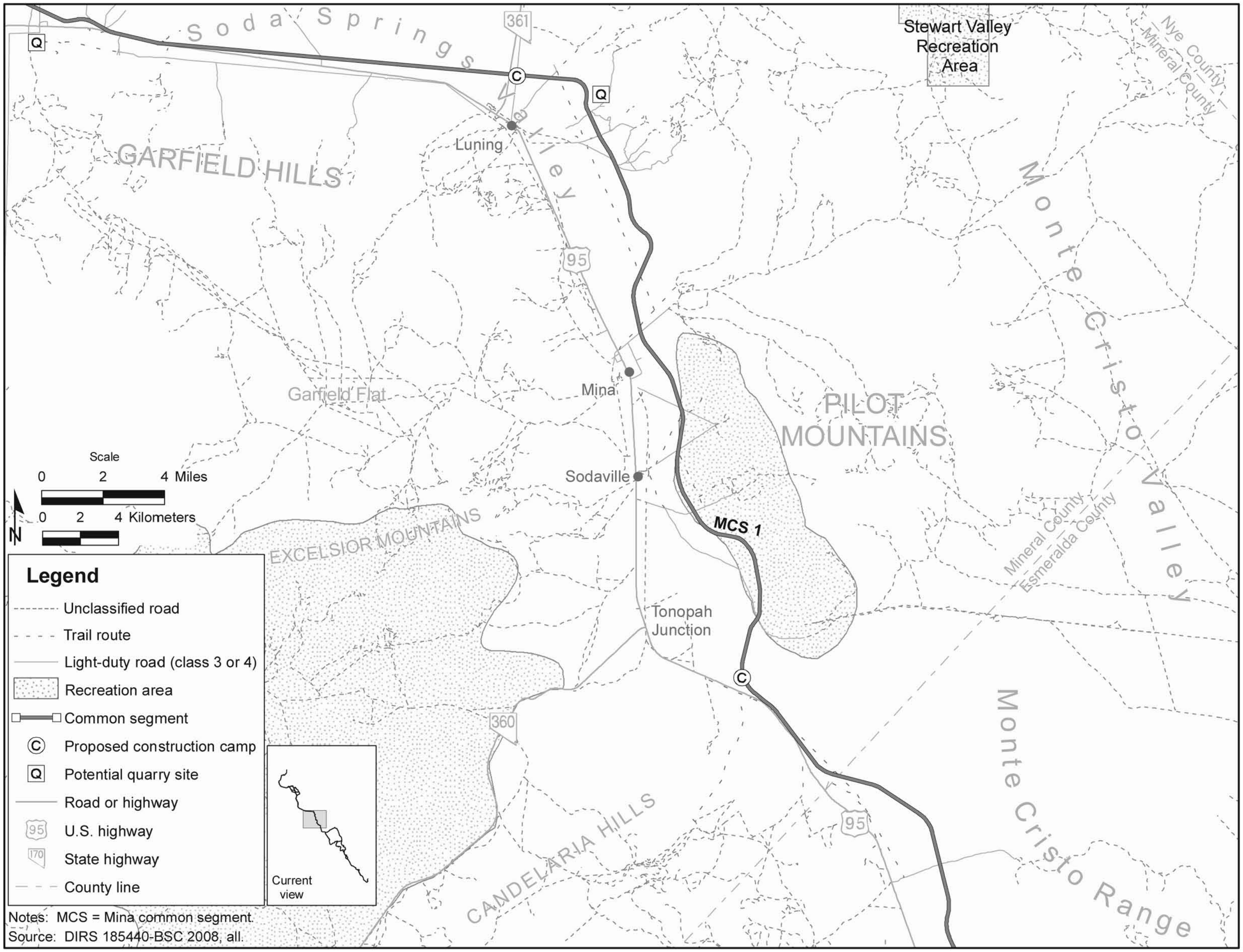


Figure 3-163. Recreation areas and roads within map area 3.

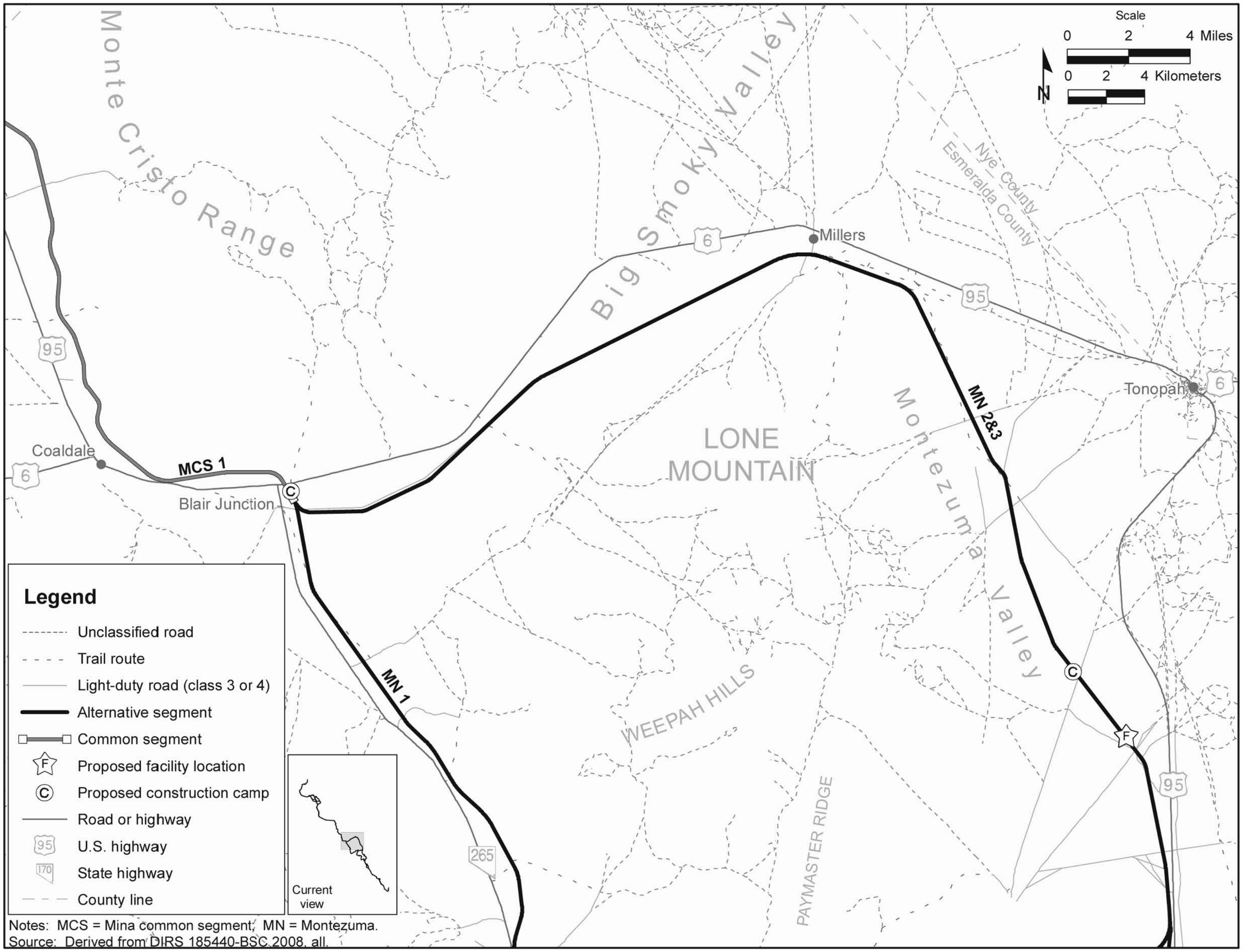


Figure 3-164. Recreation areas and roads within map area 4.

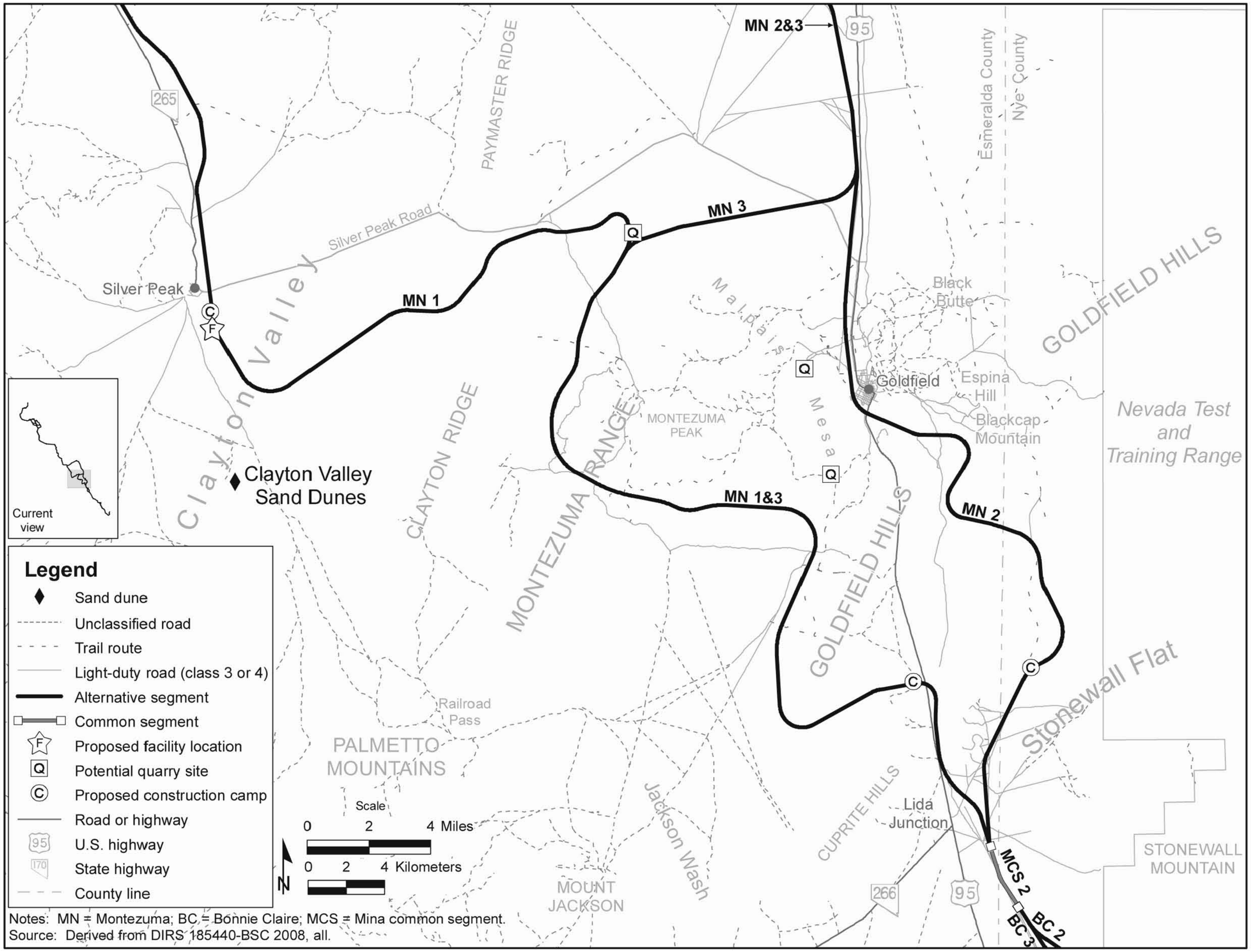


Figure 3-165. Recreation areas and roads within map area 5.

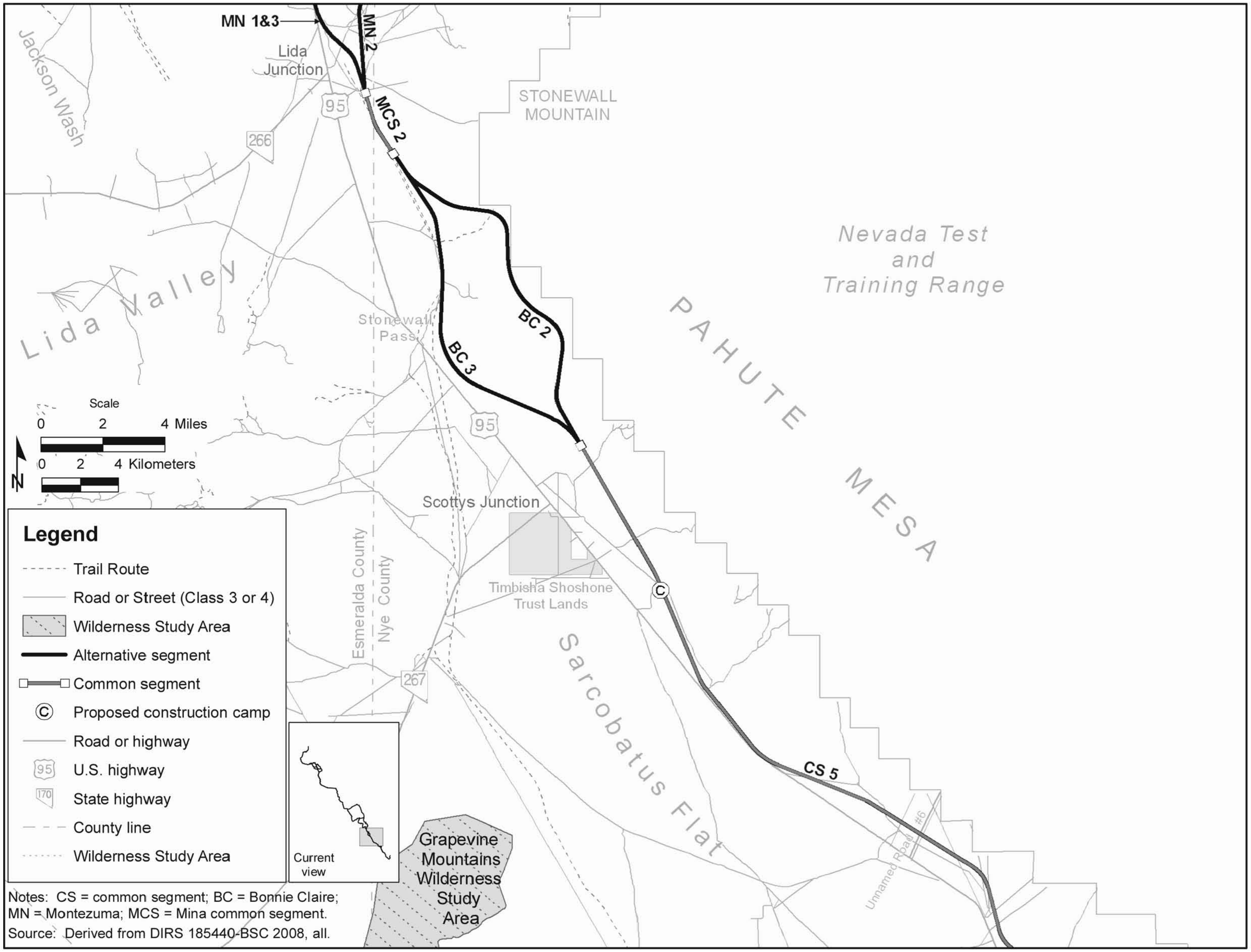


Figure 3-166. Recreation areas and roads within map area 6.

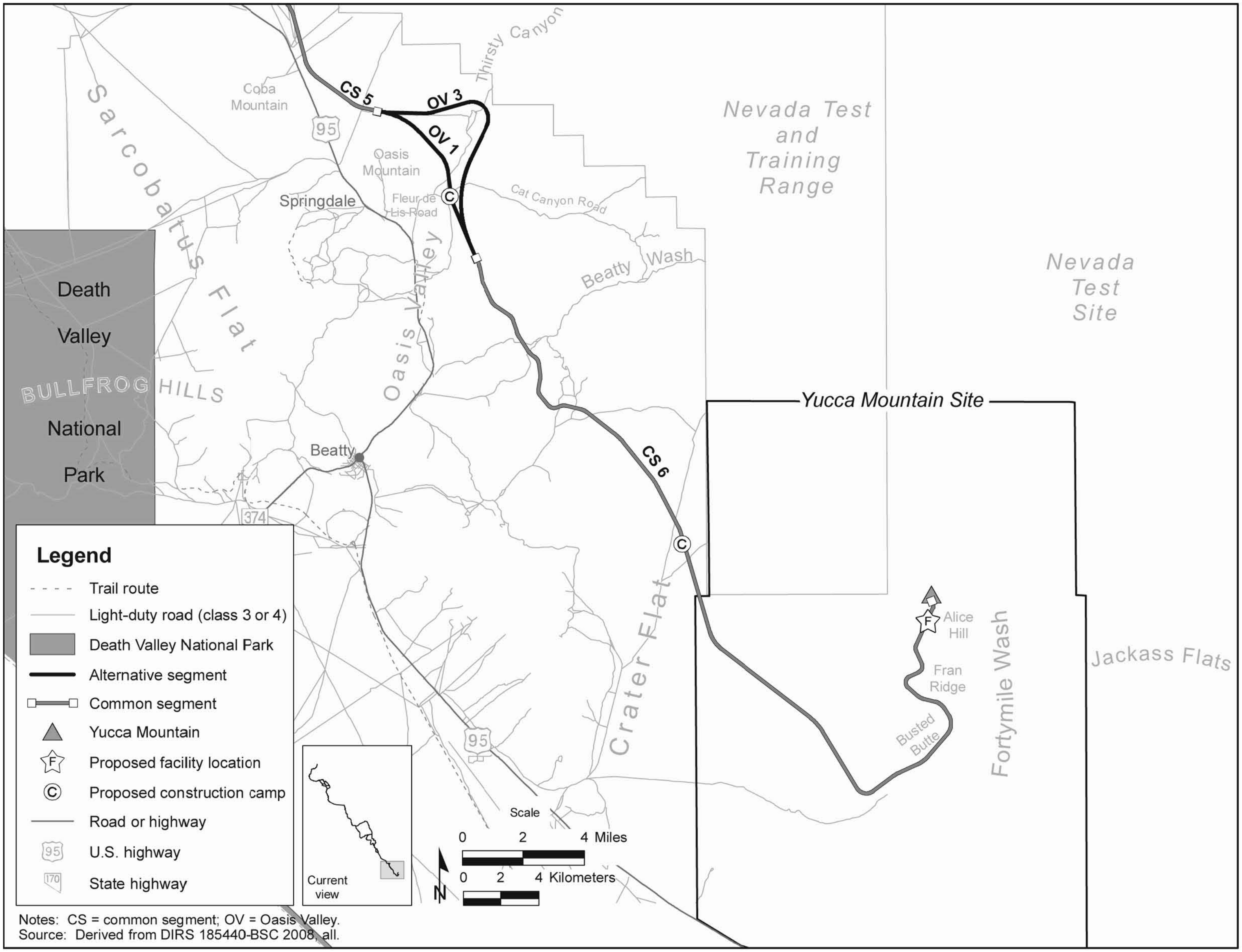


Figure 3-167. Recreation areas and roads within map area 7.

3.3.2.5.3.3 Mineral County. BLM lands in Mineral County are managed primarily for dispersed recreation, with developed recreation opportunities available only at a few sites. The BLM and Nevada Division of State Parks manage facilities at Walker Lake and the Walker River Paiute Tribe operates facilities at Weber Reservoir. Only one Wilderness Study Area, the Gabbs Valley Range Wilderness Study Area, is near any proposed or existing rail lines in the county, but at approximately 7.5 kilometers (4.6 miles) from Mina common segment 1, it would be outside the region of influence.

Existing Department of Defense Branchline South follows the periphery of Walker Lake, at a distance of no closer than 0.7 kilometer (0.44 mile), for approximately 20 kilometers (12 miles) of the lake's eastern shore. Walker Lake serves as a regional focal point for water-based recreational activities, and is a designated recreation area for the State of Nevada and the BLM (DIRS 180702-Mineral County Nuclear Projects Office 2005, pp. 15 and 30).

Mina common segment 1 would cross a BLM-designated recreation area south of Mina, Nevada, for approximately 19 kilometers (12 miles).

Organized, reoccurring recreation events near the proposed Mina rail alignment typically involve off-highway vehicle based recreation. These events have historically been of both a competitive (speed-based races) and non-competitive (road-rallies, scenic/***historic tourism***, etc.) nature and range widely in the number of participants and communication with BLM managers. The BLM requires that the organizers of these events submit applications for Special Recreation Permits that describe the details and logistics of each event, such as course and operations plans (DIRS 181599-BLM [n.d.] Special Recreation Permit requirements). Because part of the draw of these events is the wide open spaces and large distances participants are able to traverse, courses often cross several BLM administrative districts or counties. One of the largest of these annual off-highway vehicle events near the Mina rail corridor is the "Las Vegas to Reno" race, which crosses the Battle Mountain, Carson City, and Ely BLM districts (DIRS 181600-BLM 2005, all).

There are very few BLM-permitted off-highway vehicle races and special recreation events in the Mina rail alignment region of influence in Mineral County. Mina common segment 1 would cross approved race routes in several locations. Permitted off-highway vehicle events in the area have included the Las Vegas to Reno Race and Dual Sport Tour (DIRS 182283-Callan 2007). All approved race routes that the rail line would cross are on existing roads and trails.

3.3.2.5.3.4 Esmeralda County. Recreation in Esmeralda County is generally dispersed and includes off-highway vehicle events, sometimes near the Mina rail alignment. The county is home to numerous largely abandoned towns and historical sites, many of which are in old mining districts and areas for hunting and fishing (DIRS 176770-Duval et al. 1976, p. 28). The closest Wilderness Area or Wilderness Study Area to the rail alignment in Esmeralda County would be Silver Peak Wilderness Study Area, which would be approximately 21 kilometers (13 miles) away from Montezuma alternative segment 1, outside the region of influence. The closest BLM-designated Special Recreation Management Areas, the Clayton Valley Sand Dunes Special Recreation Management Areas and the Crescent Sand Dunes Special Recreation Management Area, are also outside the Mina rail alignment region of influence, approximately 4.5 kilometers (2.8 miles) and 14 kilometers (8.8 miles) away, respectively.

Mina common segment 1 would cross near the southwestern edge of the Monte Cristo Range, an area under consideration by the Nevada Legislature as a Nevada State Park. Proponents of the proposed state park cite the area's unique geology as its major appeal and justification for park designation (DIRS 180460-Robb-Bradick et al. 2006, all). At present, the BLM manages the area as open to all individual, commercial, or competitive recreational uses (DIRS 173224-BLM 1997, p. 34).

A number of BLM-permitted off-highway vehicle races and permitted special recreation events take place annually in areas around the Mina rail alignment common segments and alternative segments in Esmeralda County. Montezuma alternative segment 2 would cross previously used race routes approximately 10 times, with most crossings occurring as the alternative segment neared Goldfield. Montezuma alternative segment 3 would cross previously used race routes approximately 15 times, while Montezuma alternative segment 1 would cross race routes approximately five times, principally in areas south of Silver Peak. Most approved race routes are on existing roads and trails.

3.3.2.5.3.5 Nye County. Recreation on BLM-administered lands in Nye County is generally dispersed, and there would be no developed recreation sites within 1.6 kilometers (1 mile) of the Mina rail alignment. Dispersed recreation opportunities in Nye County include hunting, camping, exploration and sightseeing, and off-highway vehicle recreation and events.

There are very few off-highway vehicle events in the Mina rail alignment region of influence in Nye County. Common segment 6 would cross race routes several times. All approved race routes the rail line would cross are on existing roads and trails.

3.3.2.5.3.6 Land Access. The Mina rail alignment would cross a number of ***class 3 or 4 roads*** and unpaved trail routes (see Table 3-89).

A **class 3 road** is a light-duty, paved or improved road.

A **class 4 road** is an unimproved, unsurfaced road (includes track roads in back country).

Trail routes are trails and roads passable only with a 4-wheel drive vehicle (also called Jeep trails).

Source: DIRS 181598-BLM [n.d.].

3.3.2.5.4 Utility and Transportation Corridors

3.3.2.5.4.1 Utility Rights-of-Way. Figures 3-168 through 3-175 show the major utilities and utility corridor networks in the Mina rail alignment region of influence. The figures do not identify smaller, local electric distribution lines, typically in the 14- to 25-kilovolt range, with linear right-of-way reservations along major roads, or local water, sewer, power, or telephone lines serving individual residences or businesses, or their corresponding rights-of-way.

3.3.2.5.4.2 Utility Corridors. As stated in Section 3.3.2.4.1, BLM resource management plans designate utility and transportation corridors to consolidate the location of new and existing rights-of-way whenever feasible. Table 3-90 lists the extent to which DOE would construct each Mina rail alignment segment within BLM-designated corridors.

Table 3-91 identifies 38 locations of potential utility crossings. Because some of the locations are very close together, some of the individual crossings cannot be shown on the figures. Utility lines listed in Table 3-91 are depicted on the figures by their location number designated in the table. For clarification, see Volume III-B of this Rail Alignment EIS, Map Atlas. Table 3-92 lists utilities in the regions of influence of rail line support facilities. The locations of potential utility crossings shown on figures and listed in tables are approximate. Under the Mina Implementing Alternative, the Department would review and verify their locations during final rail line design.

Table 3-89. Trails and class 3 or 4 roads the Mina rail alignment alternative segments and common segments would cross.

Segment	Walker River Paiute Reservation roads/trails	Mineral County roads	Mineral County trails	Esmeralda County roads	Esmeralda County trails	Nye County roads	Nye County trails
Union Pacific Railroad Hazen Branchline[a]	Not applicable						
Department of Defense Branchline North[b]	Not applicable						
Schurz alternative segment 1 [c]	2	0	0	0	0	0	0
Schurz alternative segment 4 [c]	2	0	0	0	0	0	0
Schurz alternative segment 5 [c]	3	0	0	0	0	0	0
Schurz alternative segment 6 [c]	2	0	0	0	0	0	0
Department of Defense Branchline South[b]	Not applicable						
Mina common segment 1[c]	0	3	0	0	0	0	0
Montezuma alternative segment 1[c]	0	0	0	1	0	0	0
Montezuma alternative segment 2[c]	0	0	0	5	0	0	0
Montezuma alternative segment 3[c]	0	0	0	5	0	0	0
Mina common segment 2[c]	0	0	0	0	0	0	0
Bonnie Claire alternative segment 2	0	0	0	0	0	0	1
Bonnie Claire alternative segment 3	0	0	0	0	0	2	2
Common segment 5	0	0	0	0	0	14	0
Oasis Valley alternative segment 1	0	0	0	0	0	3	0
Oasis Valley alternative segment 3	0	0	0	0	0	3	0
Common segment 6	0	0	0	0	0	7	0

a. Use of the Union Pacific Railroad Hazen Branchline would not require new construction or new road crossings.
b. DOE would construct new sidings along Department of Defense Branchlines North and South within the existing rail line right-of-way; therefore DOE did not analyze these portions of the rail alignment. No other new construction would be required.
c. Source: DIRS 185440-BSC 2008, all.

Table 3-90. Rail line segments within designated utility or transportation corridors[a].

Segment	Resource management plan	Distance (miles)[b] within BLM-designated corridors	Total distance (miles) of segment	Percent within BLM-designated corridor
Union Pacific Railroad Hazen Branchline and Department of Defense Branchline North[c,d]	Carson City	Not applicable		
Schurz alternative segment 1[e]	Carson City	Not applicable	32	Not applicable
Schurz alternative segment 4[e]	Carson City	Not applicable	40	Not applicable
Schurz alternative segment 5[e]	Carson City	0[f]	44	0
Schurz alternative segment 6[e]	Carson City	0[f]	45	0
Department of Defense Branchline South[c,d]	Carson City	Not applicable		
Mina common segment 1	Carson City	32	50	64
Mina common segment 1	Tonopah	9.5	22	43
Montezuma alternative segment 1	Tonopah	32	73	44
Montezuma alternative segment 2	Tonopah	22	74	30
Montezuma alternative segment 3	Tonopah	31	88	35
Mina common segment 2	Tonopah	0	2.1	0
Bonnie Claire alternative segment 2	Tonopah	0	13	0
Bonnie Claire alternative segment 3	Tonopah	1.3	12	11
Common segment 5	Tonopah	13	25	52
Oasis Valley alternative segment 1	Tonopah	5.9	6	98
Oasis Valley alternative segment 3	Tonopah	7	9	78
Common segment 6	Tonopah	4.9	14	34
Common segment 6	Las Vegas	2.5	18	14

a. Source: DIRS 185440-BSC 2008, all.
b. To convert miles to kilometers, multiply by 1.6093.
c. Use of the Union Pacific Railroad Hazen Branchline would not require new construction.
d. DOE would construct new sidings along Department of Defense Branchlines North and South within the existing rail line right-of-way; therefore, DOE did not analyze these portions of the rail alignment. No other new construction would be required.
e. While there are BLM-designated corridors shown on the southern portion of the Walker River Paiute Reservation, the BLM does not have jurisdiction to authorize rights-of-way across the Reservation or designate corridors on the Reservation.
f. Schurz alternative segments 5 and 6 would travel 3 miles outside the Walker River Paiute Reservation and these portions of the segments do not fall within BLM-designated corridors.

Table 3-91. Potential Mina rail alignment utility crossings[a] (page 1 of 2).

Rail line segment/facility	Identified utilities and utility corridors[b,c,d]	Construction right-of-way crossings	Location number
Union Pacific Railroad Hazen Branchline[c]		Not applicable	
Department of Defense Branchline North[e]		Not applicable	
Schurz alternative segment 1	Telephone line	1	1
Schurz alternative segment 1	Unidentified line	1	2
Schurz alternative segment 1	Unidentified line	1	3
Schurz alternative segment 4	Telephone line	1	1
Schurz alternative segment 4	Unidentified line	1	2
Schurz alternative segment 4	Unidentified line	1	3
Schurz alternative segment 5	Telephone line	1	1
Schurz alternative segment 5	Unidentified line	1	2
Schurz alternative segment 5	Unidentified line	1	3
Schurz alternative segment 6	Telephone line	1	1
Schurz alternative segment 6	Unidentified line	1	2
Schurz alternative segment 6	Unidentified line	1	3
Department of Defense Branchline South[e]		Not applicable	
Staging Yard at Hawthorne	Transmission/power line	1	4
Staging Yard at Hawthorne	Transmission/power line	1	5
Mina common segment 1	Transmission/power line	2	5
Mina common segment 1	Transmission/power line	1	9
Mina common segment 1	Transmission/power line	1	10
Mina common segment 1	Transmission/power line	1	11
Mina common segment 1	Transmission/power line	1	12
Mina common segment 1	Transmission/power line	1	13
Mina common segment 1	Transmission/power line	2	14
Mina common segment 1	Transmission/power line	1	15
Mina common segment 1	Transmission/power line	4	16
Mina common segment 1	Telephone line	3	17
Mina common segment 1	Transmission/power line	1	18
Mina common segment 1	Transmission/power line	1	19
Mina common segment 1	Transmission/power line	2	20
Mina common segment 1	Transmission/power line	1	21
Mina common segment 1	Transmission/power line	1	22
Montezuma alternative segment 1	Transmission/power line	2	23
Montezuma alternative segment 1	Transmission/power line	1	24
Montezuma alternative segment 1	Telephone line	2	25
Montezuma alternative segment 1	Transmission/power line	2	26
Montezuma alternative segment 2	Transmission/power line	1	27
Montezuma alternative segment 2	Transmission/power line	2	28
Montezuma alternative segment 2	Transmission/power line	1	29
Montezuma alternative segment 2	Transmission/power line	1	30

Table 3-91. Potential Mina rail alignment utility crossingsa (page 2 of 2).

Rail line segment/facility	Identified utilities and utility corridors[b,c,d]	Construction right-of-way crossings	Location number
Montezuma alternative segment 2	Transmission/power line	1	31
Montezuma alternative segment 2	Transmission/power line	2	32
Montezuma alternative segment 2	Transmission/power line	1	33
Montezuma alternative segment 2	Telephone line	1	34
Montezuma alternative segment 2	Transmission/power line	1	35
Montezuma alternative segment 2	Telephone line	1	36
Montezuma alternative segment 3	Telephone line	2	25
Montezuma alternative segment 3	Transmission/power line	2	26
Montezuma alternative segment 3	Transmission/power line	1	27
Montezuma alternative segment 3	Transmission/power line	2	28
Montezuma alternative segment 3	Transmission/power line	1	29
Montezuma alternative segment 3	Transmission/power line	1	30
Montezuma alternative segment 3	Transmission/power line	1	31
Montezuma alternative segment 3	Transmission/power line	1	32
Montezuma alternative segment 3	Transmission/power line	1	33
Montezuma alternative segment 3	Transmission/power line	1	37
Mina common segment 2	None	None	None
Bonnie Claire alternative segments	None	None	None

a. Sources: DIRS 185440-BSC 2008, all.
b. Electric distribution lines along major roads may not have been identified. Utilities serving individual residences or businesses have not been identified.
c. Use of the Union Pacific Railroad Hazen Branchline would not require new construction or new utility crossings.
d. Lines listed as "unidentified" are so listed in the Geographic Information System database.
e. DOE would construct new sidings along Department of Defense Branchlines North and South within the existing rail line right-of-way; therefore, DOE did not analyze these portions of the rail alignment. No other new construction would be required.

Table 3-92. Potential quarry site utility crossings.[a]

Potential quarry site	Identified utilities and utility corridors	Number of crossings
Garfield Hills	Transmission/power line	1
Garfield Hills	Transmission/power line	1
Gabbs Range	None	None
North Clayton	Transmission/power line	1
Malpais Mesa	Pipeline	1
ES-7	Water line	1
ES-7	Water line	1
ES-7	Transmission/power line	1

a. Source: DIRS 185440-BSC 2008, all.

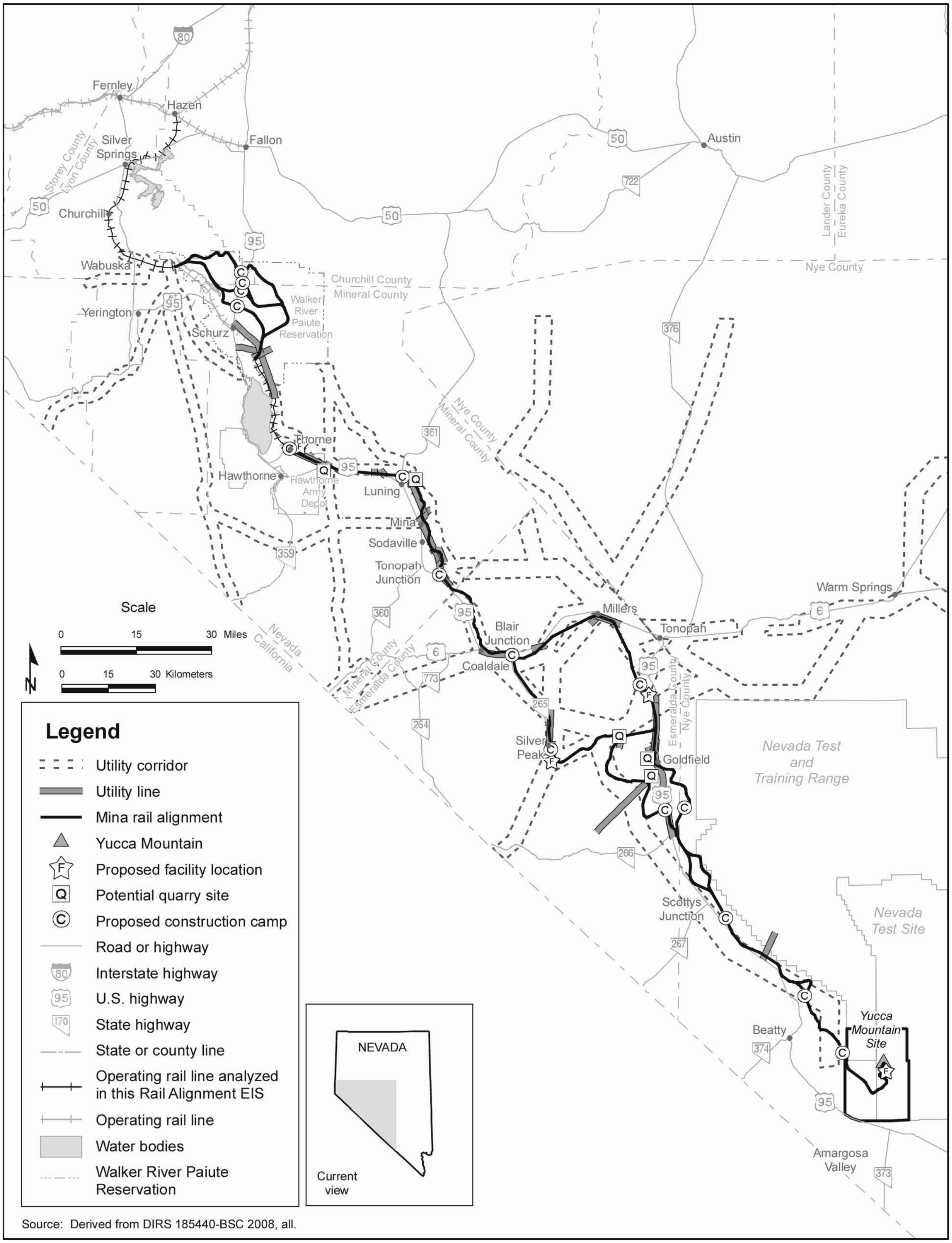


Figure 3-168. Utility corridors along the Mina rail alignment.

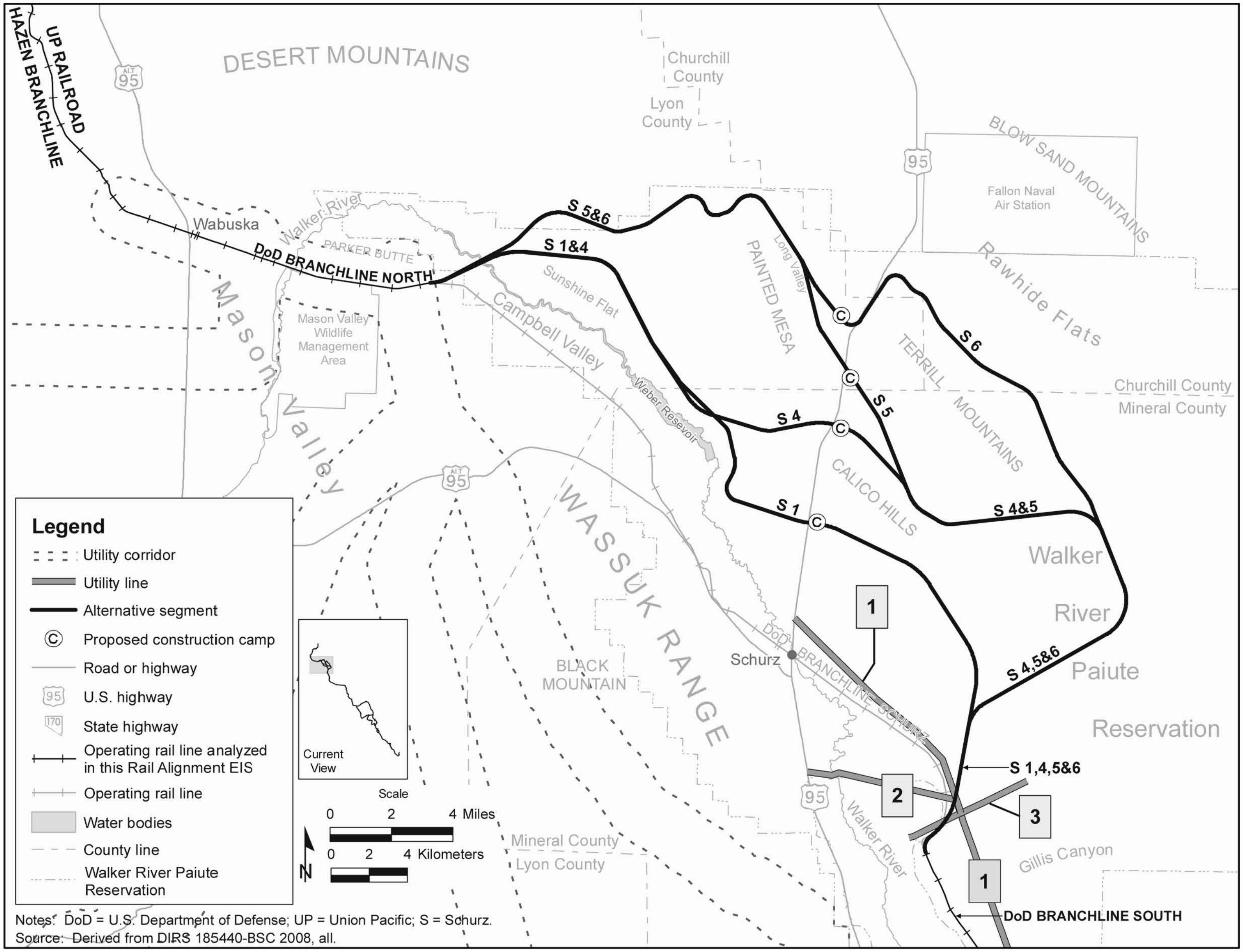
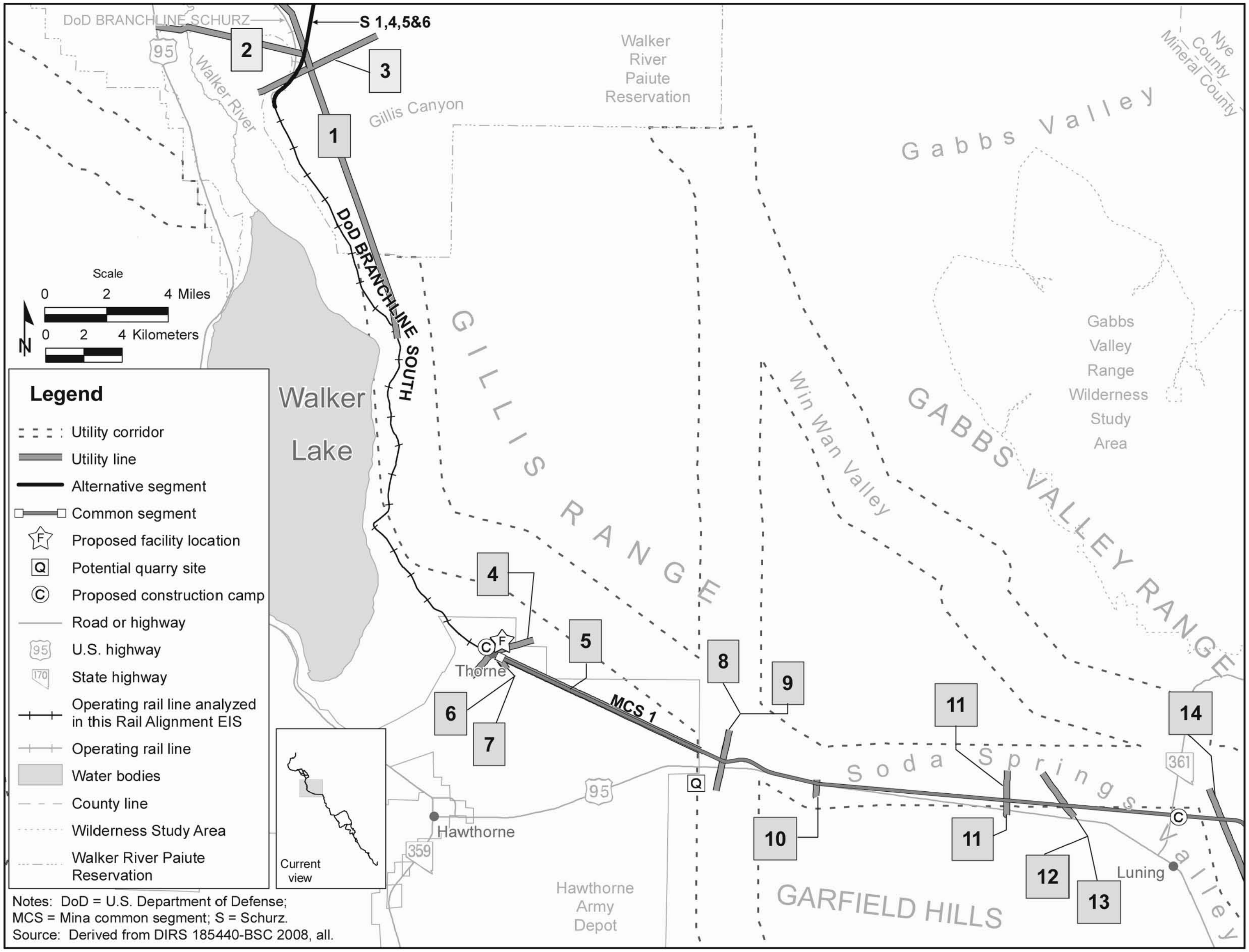


Figure 3-169. Utility corridors within map area 1.



Notes: DoD = U.S. Department of Defense; MCS = Mina common segment; S = Schurz.
Source: Derived from DIRS 185440-BSC 2008, all.

Figure 3-170. Utility corridors within map area 2.

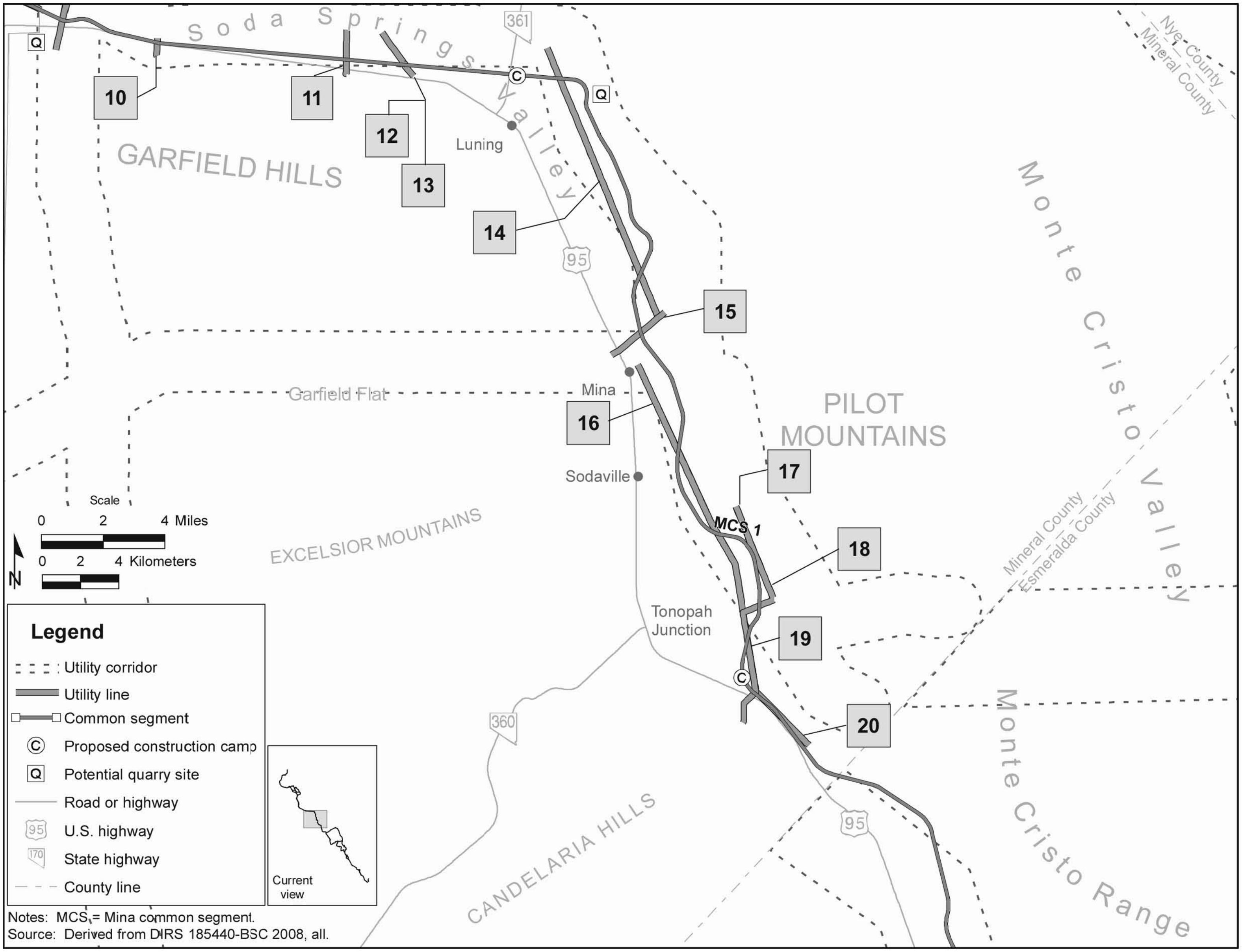
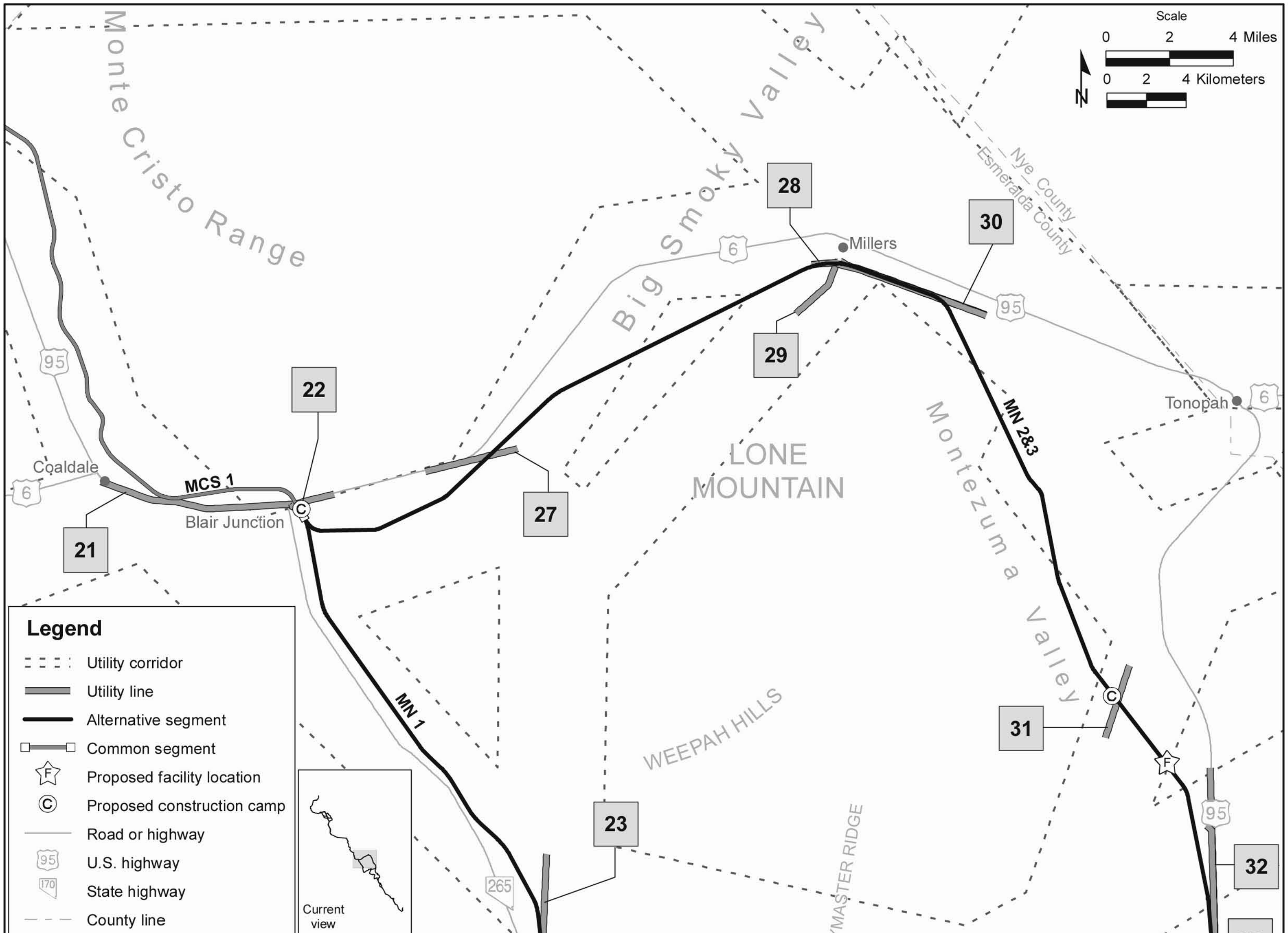


Figure 3-171. Utility corridors within map area 3.



Notes: MCS = Mina common segment; MN = Montezuma.
Source: Derived from DIRS 185440-BSC 2008, all.

Figure 3-172. Utility corridors within map area 4.

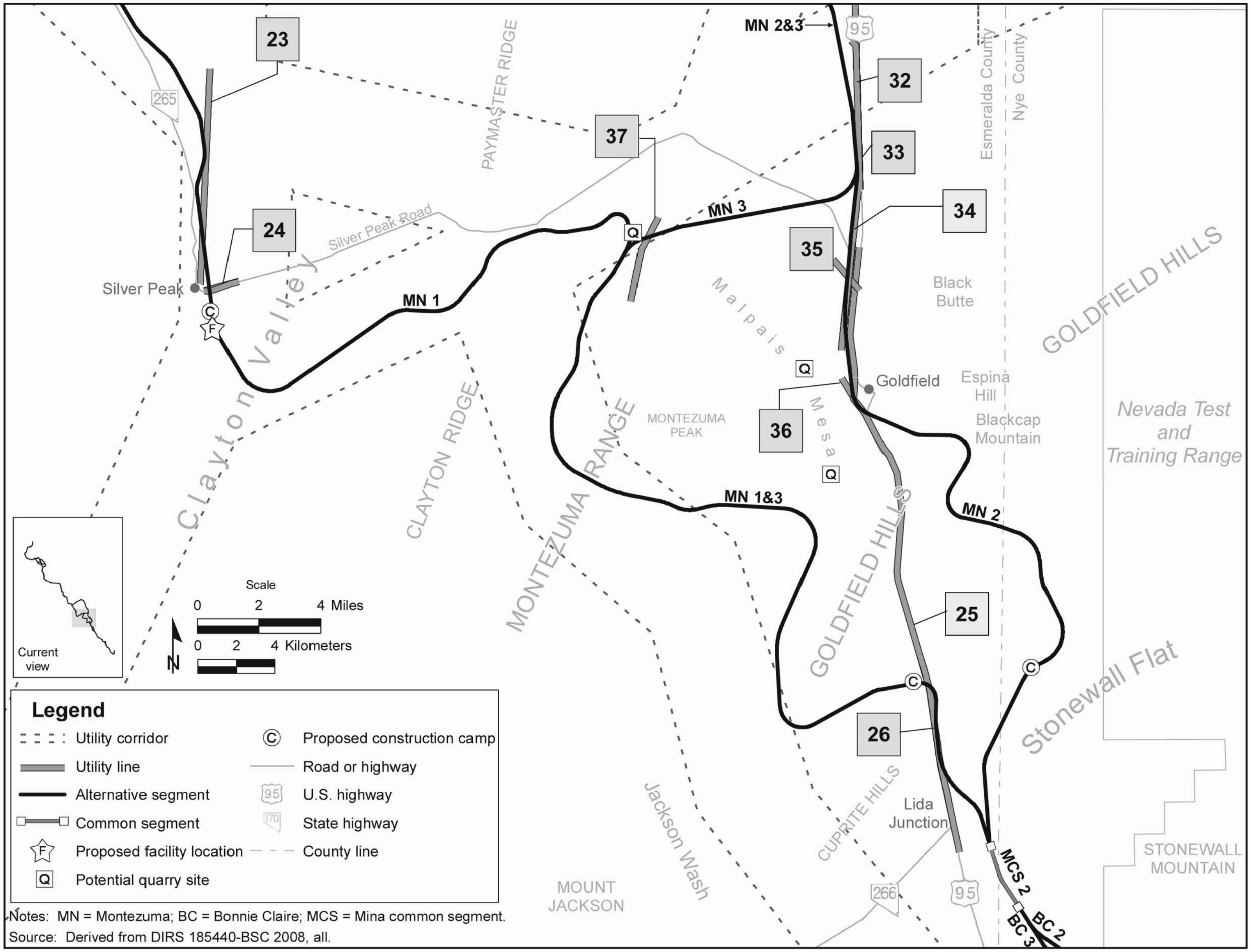


Figure 3.-173. Utility corridors within map area 5.

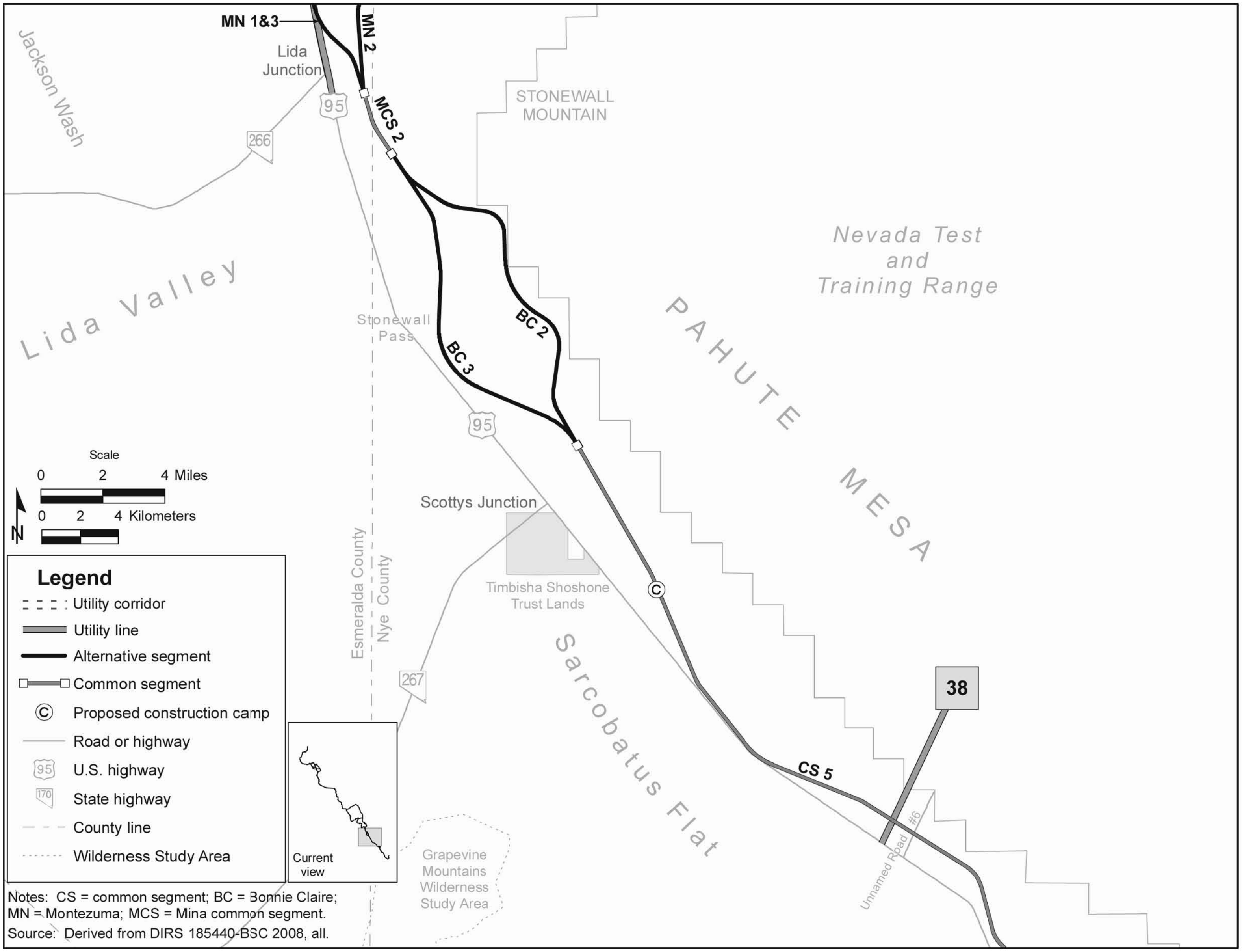


Figure 3-174. Utility corridors within map area 6.

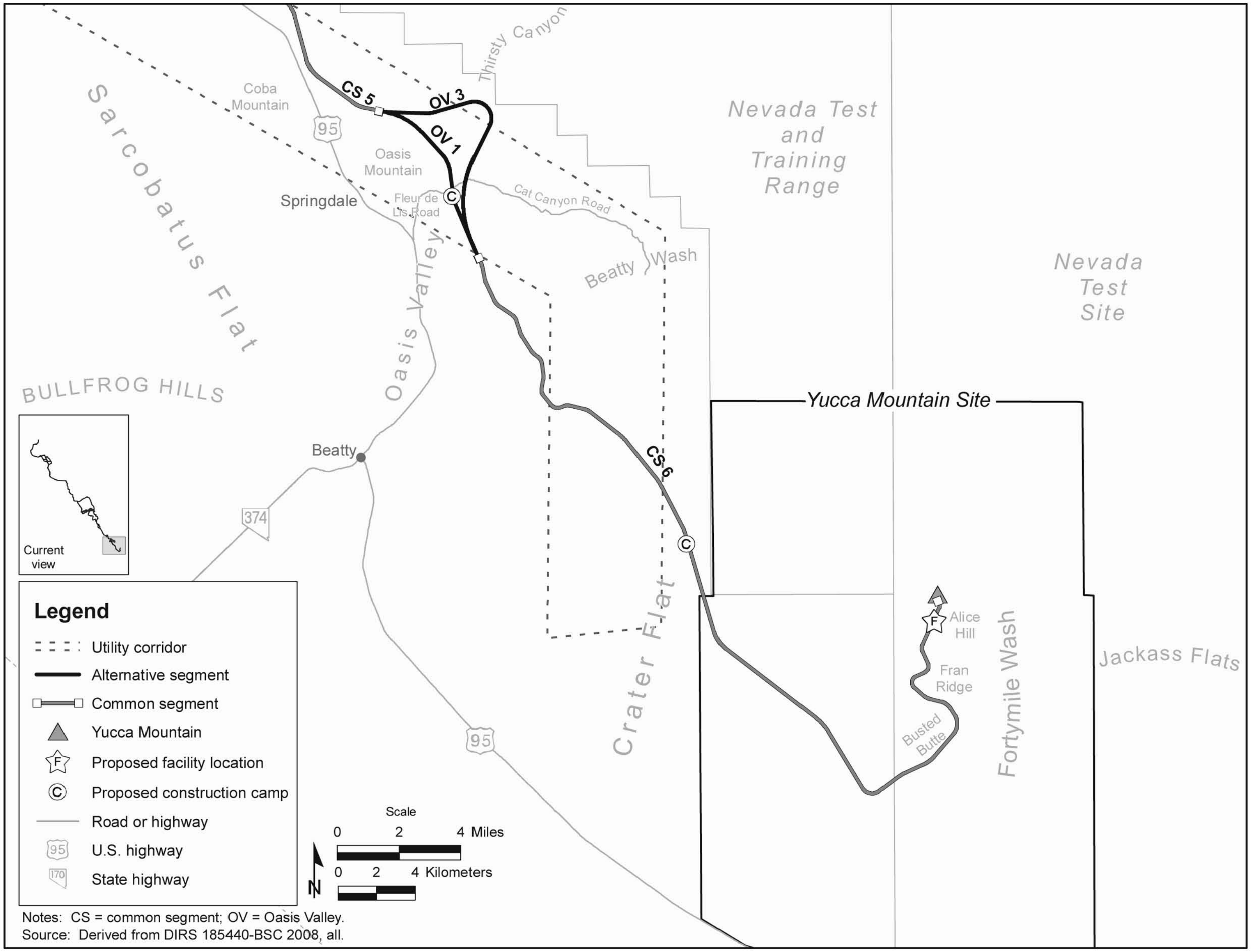


Figure 3-175. Utility corridors within map area 7.

3.3.3 AESTHETIC RESOURCES

This section describes the aesthetic (visual) setting in the region of influence along the Mina rail alignment. Section 3.3.3.1 describes the region of influence for aesthetic resources; Section 3.3.3.2 describes the methods DOE used to classify visual values; Section 3.3.3.3 describes the environmental setting and characteristics for aesthetic resources along the Mina rail alignment.

3.3.3.1 Region of Influence

The region of influence for aesthetic resources is the viewshed around all Mina rail alignment alternative segments, common segments, and proposed locations of rail line construction and operations support facilities.

BLM guidance subdivides landscapes into three ***distance zones*** based on relative visibility from travel routes or observation points. “Foreground-middleground” zone includes areas less than 5 to 8 kilometers (3 to 5 miles) away. “Background” zone includes areas visible beyond the foreground-middleground zone but usually less than 24 kilometers (15 miles) away. Areas not seen as foreground-middleground or background are in the “seldom-seen” zone (DIRS 101505-BLM 1986, Section IV). To ensure that seldom-seen views were included in this analysis, DOE used a conservative region of influence extending 40 kilometers (25 miles) on either side of the centerline of the Mina rail alignment.

Scenic quality is a measure of the visual appeal of a tract of land. Areas are rated based on key factors including landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications (DIRS 101505-BLM 1986, Section II).

Sensitivity levels are a measure of public concern for scenic quality. Areas are ranked high, medium, or low based on types of users, amount of use, public interest, adjacent land uses, and whether they are special areas (DIRS 101505-BLM 1986, Section III).

3.3.3.2 Methodology for Classifying Visual Values

Most of the lands along the Mina rail alignment are BLM-administered public lands, with the remainder owned or administered by the Walker River Paiute Tribe, the U.S. Army, or private entities. Because of the predominance of BLM-administered land, and because neither the Walker River Paiute Tribe nor the U.S. Army assign visual quality ratings to lands in their jurisdiction, DOE used BLM methodologies for evaluating visual values. The BLM considers visual resources when addressing aesthetic issues during BLM planning. These resources include natural or manmade physical features that give a landscape its character and value as an environmental factor. The BLM uses a visual resource management system to classify the aesthetic value of its lands and to set management objectives (DIRS 173052-BLM 1984, all).

The BLM classification of visual resource value, the visual resource inventory, involves assessing visual resources and assigning them to one of four visual resource management classes based on three factors: ***scenic quality***, visual sensitivity (***sensitivity levels***), and distance from travel or observation points (DIRS 101505-BLM 1986, all). The BLM uses a combination of the ratings of these three factors to assign a visual resource inventory class to a piece of land, ranging from Class I to Class IV, with Class I representing the highest visual values. Each visual resource class is subsequently associated with a management objective, defining the way the land may be developed or used. Each BLM district assigns visual resource management classes to its lands during the resource management planning process. Table 3-93 lists the BLM management objectives for visual resource classes.

Table 3-93. BLM visual resource management classes and objectives.[a]

Visual resource class	Objective	Acceptable changes to land
Class I	Preserve the existing character of the landscape.	Provides for natural ecological changes but does not preclude limited management activity. Changes to the land must be small and must not attract attention.
Class II	Retain the existing character of the landscape.	Management activities may be seen but should not attract the attention of the casual observer. Changes must repeat the basic elements of form, line, color, and texture of the predominant natural features of the characteristic landscape.
Class III	Partially retain the existing character of the landscape.	Management activities may attract attention but may not dominate the view of the casual observer. Changes should repeat the basic elements in the predominant natural features of the characteristic landscape.
Class IV	Provides for management activities that require major modifications of the existing character of the landscape.	Management activities may dominate the view and be the major focus of viewer attention. An attempt should be made to minimize the impact of activities through location, minimal disturbance, and repeating the basic elements.

a. Source: DIRS 101505-BLM 1986, Section V.B.

The BLM uses visual resource contrast ratings to assess the visual impacts of proposed projects and activities on the existing landscape (DIRS 173053-BLM 1986, all). The Bureau looks at basic elements of design to determine levels of contrast created between a proposed project and the existing viewshed. Depending on the visual resource management objective for a particular location, varying levels of contrast are acceptable.

Contrast ratings are determined from locations called “key observation points,” which are usually along commonly traveled routes such as highways or frequently used county roads or in communities. To identify key observation points along the Mina rail alignment, DOE considered the following factors: angle of observation, number of viewers, how long the project would be in view, relative project size, season of use, and light conditions. BLM guidance (DIRS 173053-BLM 1986, Section IIC) recommends that key observation points for linear projects, such as the proposed railroad, include the following:

- Most-critical viewpoints (for example, views from communities at road crossings)
- Typical views encountered in representative landscapes, if not covered by critical viewpoints
- Any special project or landscape features such as river crossings and substations

3.3.3.3 Visual Setting and Characteristics

3.3.3.3.1 General Visual Setting and Characteristics

The Class IV lands in the region of influence consist of landscapes that are generally flat in form and horizontal in line, with gray and brown colors from soil and rock, and texture ranging from flat to slightly rough, depending on whether the broad flat valleys and alluvial fans include any topographic features such as hills, buttes, or eroded stream channels. Vegetation is usually small, low, and rounded in form (for example, grasses, shrubs, and small trees), horizontal in line, brown or gray-green in color, and light-to-medium in texture with irregular spacing. Structures are rare, but could include transmission towers, ranch buildings, or similar structures. Class III lands generally include more varied forms, lines, colors, and textures, including vertical lines in topography and vegetation, brighter greens in vegetation, visible blues from water, and dense texture from forested lands or rough texture in eroded rock. Some Class III areas in the Carson City BLM District will not necessarily fit this description, because the district has not inventoried most of the lands adjacent to the Mina rail alignment. The BLM manages uninventoried lands as Class III under district policy (DIRS 179571-Knight 2007, all). Class II lands are mostly in mountains that include forested areas and open rock exposures, with mixed forms including slopes and ridges; rounded lines; a wide range of rock and soil colors, and vegetation that changes color with the seasons; and variable texture that is often dense in forested areas. There are no Class I areas along the Mina rail alignment.

Sections 3.3.3.3.2.1 through 3.3.3.3.2.11 describe visual resources along and near the Mina rail alignment alternative segments and common segments. The discussions highlight resources of high visual value, identify current visual resource management classifications, ***special areas***, and key observation points.

Special areas are lands where visual values may be a management concern. Special areas often include designated natural areas, Wilderness Study Areas, scenic rivers, and scenic roads. Special areas are not necessarily unique or picturesque, but the management objective for a special area is to preserve its natural characteristics (DIRS 101505-BLM 1986, Section III.5).

DOE excerpted visual resource management classifications for lands along the Mina rail alignment primarily from BLM resource management plans from districts the alignment would cross (DIRS 173224-BLM 1997, all; DIRS 103079-BLM 1998, all; DIRS 179560-BLM 2001, all). DOE confirmed these classifications through telephone communications, electronic mail, and meetings with BLM personnel responsible for visual resource management for the Las Vegas, Carson City, and Battle Mountain Districts (DIRS 174631-Quick 2005, all; DIRS 174632-Quick 2005, all; DIRS 176988-Quick 2006, all; DIRS 179571-Knight 2007, all). The BLM Las Vegas and Carson City Districts provided Geographic Information System data from their resource management plans as a source for mapping the visual resource management classes in their districts (DIRS 103079-BLM 1998, Map 2-9; DIRS 179560-BLM 2001, Map VRM-1). Geographic Information System data provided by the BLM Carson City District were augmented with direction based on the district policy to treat uninventoried lands as Class III; specifically "the Mina Corridor should be evaluated against a Class III objective for its entire length within the boundaries of the CCFO [Carson City Field Office]" (DIRS 179571-Knight 2007, all). The Department based visual resource classifications for the Battle Mountain BLM District on the *Tonopah Resource Management Plan and Record of Decision* (DIRS 173224-BLM 1997, all), and GIS files provided by the Nevada State BLM office.

DOE developed visual resource management classifications for non-BLM lands (tribal lands, lands administered by other federal or state agencies, and private lands) using BLM methodology (DIRS 173053-BLM 1986, all; DIRS 173052-BLM 1984, all), considering scenic quality ratings reported in the Yucca Mountain FEIS (DIRS 155970-DOE 2002, pp. 3-158 and 3-159) where available. Non-BLM areas adjacent to lands managed by the Carson City BLM District were analyzed as Class III unless their scenic qualities warranted more restrictive classifications.

Figure 3-176 is a map of visual resource management classifications for lands surrounding the Mina rail alignment based on the sources identified above. There are no locations where the alternative segments and common segments would cross or be close to Class I lands, and few where the alternative segments would cross or be close to Class II lands. As the figure shows, most of the lands surrounding the alternative segments and common segments are Class IV or Class III lands.

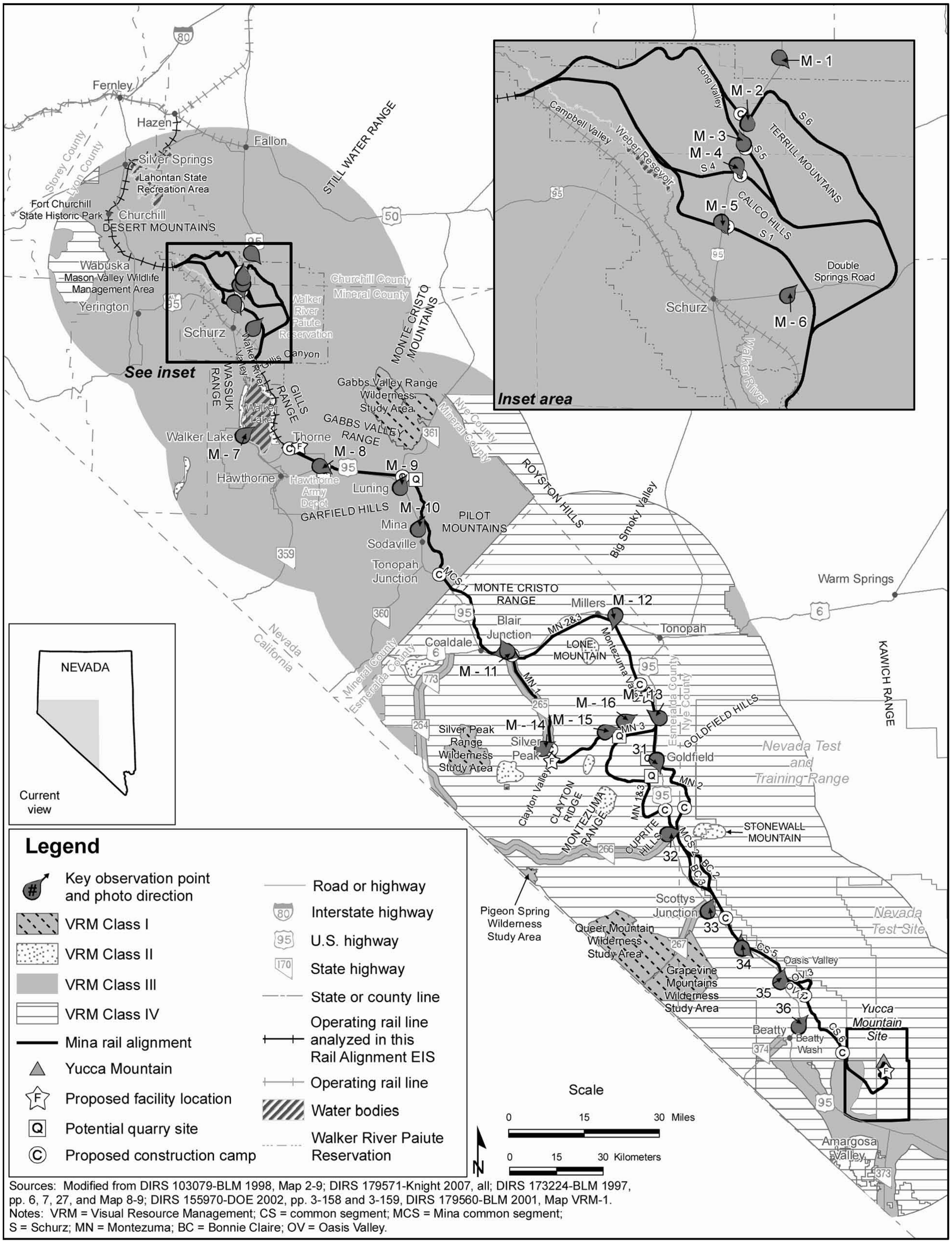


Figure 3-176. Visual resource management classifications and key observation points along the Mina rail alignment.

DOE selected 22 key observation points along the Mina rail alignment to evaluate the visual impacts of constructing and operating the proposed railroad. (Note: Key observation points M-1 through M-16 are unique to the Mina rail alignment. Points 31 through 36 are along the portion of the Mina rail alignment that is the same as the Caliente rail alignment and DOE has not renumbered them for the Mina analysis.) Figure 3-176 shows the locations of key observation points.

Appendix D, Aesthetics, contains photos taken at each key observation point. Table 3-94 lists visual resource management classes in the viewshed of each key observation point. Following BLM guidance, DOE selected most key observation points along travel routes or at use areas or potential use areas, and included critical viewpoints and typical views. Section 3.3.3.3.2 highlights areas of high visual value and other special areas, and identifies key observation points from which DOE analyzed impacts to these areas.

3.3.3.3.2 Specific Visual Settings and Characteristics along Alternative Segments and Common Segments

3.3.3.3.2.1 Union Pacific Railroad Hazen Branchline. The Mina rail alignment would begin on an existing Union Pacific Railroad branchline near Hazen, Nevada. This existing rail segment crosses primarily Class III areas between Alternate U.S. Highway 50 and the former town site of Wabuska. The existing Union Pacific Railroad Hazen Branchline borders the boundaries of the Lahontan State Recreation Area and Fort Churchill State Historic Park, both considered Class III areas for this analysis.

Because DOE does not anticipate that it would make any modifications to this existing rail line (except during routine maintenance during the operations phase), DOE did not select key observation points along this portion of the Mina rail alignment. Figure 3-177 shows the existing line south of this segment through the Walker River Paiute Reservation as a point of reference for the appearance of an existing rail line in this general area.

3.3.3.3.2.2 Department of Defense Branchline North (Existing Rail Line from Wabuska to the Boundary of the Walker River Paiute Reservation). This existing rail line extends from the former town site of Wabuska to near the boundary of the Walker River Paiute Reservation. Along its route, the line borders the Mason Valley Wildlife Management Area. Department of Defense Branchline North passes exclusively through Class III areas.

Because DOE does not anticipate that it would make any modifications to this existing rail line (except during routine maintenance during the operations phase), DOE did not select key observation points along this portion of the Mina rail alignment. Figure 3-177 shows the existing line south of this segment through the Walker River Paiute Reservation as a point of reference for the appearance of an existing rail line in this general area.

3.3.3.3.2.3 Schurz Alternative Segments (Walker River Paiute Reservation). The Schurz alternative segments would cross exclusively through areas considered Class III by DOE for the purpose of this analysis, primarily on the Walker River Paiute Reservation. At present, Department of Defense Branchlines North and South are linked by a rail line that runs near the western bank of the Walker River through the Reservation and the town of Schurz. DOE would remove this existing section of rail line, leaving the railbed and structures such as bridges and culverts in place. Figure 3-177 provides a view of this section of existing rail line from Alternate U.S. Highway 95.

Each Schurz alternative segment would begin in Campbell Valley west of the Walker River and south of the Desert Mountains, but each would take a different route shortly after crossing the Walker River.

Table 3-94. Key observation points and visual resource management classes in the Mina rail alignment viewshed[a] (page 1 of 2).

Key observation point[b]	Location	Visual resource management classes[c]
M-1	U.S. Highway 95 looking over Rawhide Flats and the rail alignment against hills	Surrounding lands (III)
M-2[d]	U.S. Highway 95 at intersection with county/Reservation road to Rawhide Flats, view of Schurz alternative segment 6 rail-over-road crossing	Surrounding lands (III)
M-3[d]	U.S. Highway 95 in Long Valley, view of road-over-rail crossing of Schurz alternative segment 5	Surrounding lands (III)
M-4[d]	U.S. Highway 95 at intersection with Weber Dam Road, view of Schurz alternative segment 4 road-over-rail crossing	Surrounding lands (III)
M-5[d]	U.S. Highway 95, view of Schurz alternative segment 1 road-over-rail crossing	Surrounding lands (III)
M-6[d]	Double Springs Road, view of Schurz alternative segment 1 at-grade crossing	Surrounding lands (III)
M-7	Town of Walker Lake, view across lake to Department of Defense Branchline South	Surrounding lands (II), western and eastern perimeters of Walker Lake (II)
M-8	U.S. Highway 95 just west of Hawthorne, view of potential Garfield Hills quarry facilities	Surrounding lands (III)
M-9	Town of Luning just off U.S. Highway 95, view of potential Gabbs Valley Range quarry site	Surrounding lands (III)
M-10	Town of Mina, corner of C Street and Hilda, view of Mina common segment 1	Surrounding lands (III)
M-11	Intersection State Route 265 and U.S. Highway 95 (Blair Junction), views of Mina common segment 1 toward Monte Cristo Range; south/southeast over State Route 265 to Montezuma alternative segment 1; west over Mina common segment 1	Surrounding lands (III and IV), State Route 265 (III), Monte Cristo Range (IV)
M-12	U.S. Highway 95 in Montezuma Valley, view south across Montezuma alternative segments 2 and 3 toward Lone Mountain	Surrounding lands (IV)
M-13	U.S. Highway 95, view toward Montezuma alternative segments 2 and 3 and potential Maintenance-of-Way Facility at Klondike	Surrounding lands (IV)
M-14	Main Street in Silver Peak (just past Chemetall Foote Corporation processing plant), view east over Montezuma alternative segment 1	Surrounding lands (III), State Route 265 (III)
M-15	Silver Peak Road, view toward Montezuma alternative segment 1 and potential North Clayton quarry	Surrounding lands (IV)
M-16	Silver Peak Road intersection with road to Klondike, views over Montezuma alternative segments 2 and 3	Surrounding lands (IV)
31[b]	Alignment crossing U.S. Highway 95 south of Goldfield, view south-southeast over Montezuma alternative segment 2	Surrounding lands (IV)

Table 3-94. Key observation points and visual resource management classes in the Mina rail alignment viewshed[a] (page 2 of 2).

Key observation point[b]	Location	Visual resource management classes[c]
32	U.S. Highway 95 at State Route 266, view east over Montezuma alternative segments 1, 2, and 3	Surrounding lands (IV), State Route 266 (III), Stonewall Mountain (II)
33	U.S. Highway 95 at State Route 267, view north-northeast over common segment 5	Surrounding lands (IV), State Route 267 (III)
34	U.S. Highway 95 (typical cut), view toward common segment 5 hill cuts	Surrounding lands (IV)
35	U.S. Highway 95 north of Oasis Valley (typical landscape)	Surrounding lands (IV)
36	U.S. Highway 95 and Beatty Wash access road, view northeast to construction access road	Surrounding lands (IV)

a. Appendix D contains photographs taken from each key observation point.
b. Key observation points M-1 through M-16 are unique to the Mina rail alignment. Points 31 through 36 are along the portion of the Mina rail alignment that is the same as the Caliente rail alignment and DOE has not renumbered them for the Mina analysis.
c. Sources: DIRS 155970-DOE 2002, pp. 3-158 and 3-159; DIRS 173224-BLM 1997, pp. 6, 7, and 27, and Map 8; DIRS 103079-BLM 1998, Map 2-9; DIRS 101811-DOE 1996, pp. 4-152 to 4-154; DIRS 179560-BLM 2001, Map VRM-1; DIRS 179571-Knight 2007, all.
d. Key observation point is located on the Walker River Paiute Reservation.

Schurz alternative segment 1 would run east of the Walker River, passing within 1 kilometer (0.6 mile) of the Weber Reservoir. The alternative segment would travel through the Walker River Valley along the southeastern edge of the Calico Hills and around the northern end of the Gillis Range.

Schurz alternative segment 4 would run east of the Walker River, passing within 1 kilometer (0.6 mile) of the Weber Reservoir. The alternative segment would pass near the Calico Hills, and would travel east between the Terrill Mountains and the Calico Hills and around the northern end of the Gillis Range.

Schurz alternative segment 5 would skirt the southern edge of the Desert Mountains before crossing into Long Valley. From there, the alternative segment would run south down Long Valley and travel east between the Terrill Mountains and the Calico Hills and around the northern end of the Gillis Range.

Schurz alternative segment 6 would pass the southern edge of the Desert Mountains before crossing into Long Valley. The alternative segment would cross the Terrill Mountains into Rawhide Flats and travel east between the Terrill Mountains and the Calico Hills and around the northern end of the Gillis Range. Each Schurz alternative segment would connect to Department of Defense Branchline South near the northern edge of the Gillis Range.

Key observation points from U.S. Highway 95 include views toward the road-over-rail crossing of Schurz alternative segment 2 (M-4), north toward the road-over-rail crossing of Schurz alternative segment 5 in Long Valley (M-3), north toward the rail-over-road crossing of Schurz alternative segment 6 in the Terrill Mountains (M-2), southeast over Schurz alternative segment 6 crossing Rawhide Flats along the base of the Terrill Mountains (M-1), and south toward the road-over-rail crossing of Schurz alternative segment 1 in the Walker River Valley (M-5). A final point, east of the town of Schurz, looks northeast from Double Springs Road toward the ***at-grade crossing*** of Schurz alternative segment 1 (M-6).

3.3.3.3.2.4 Department of Defense Branchline South (Existing Rail Line, Walker Lake Area). Department of Defense Branchline South is an existing rail line extending south toward Walker Lake east of the Walker River. It comes no closer than 0.40 kilometer (.25 mile) from the shore as it traces the eastern edge of Walker Lake and proceeds southeast toward the Hawthorne Army Depot on the outskirts of the town of Hawthorne. The area around the Walker River north of the lake and the area around the Hawthorne Army Depot south of the lake are considered Class III areas. The eastern and western shores

Figure 3-177. View from Alternate U.S. Highway 95 along the existing Department of Defense Branchline through Schurz on the Walker River Paiute Reservation.

of Walker Lake are Class II areas. The existing rail line crosses the Class II lands on the eastern shore of the lake for 18 kilometers (11 miles).

A key observation point, in the town of Walker Lake on the western shore of Walker Lake, provides a view east over the lake toward the existing rail line (M-7). DOE chose this point to show the appearance of the existing rail line from the more heavily traveled western shore of Walker Lake and to demonstrate the view of an existing rail line at a distance (approximately 8 kilometers [5 miles]).

3.3.3.3.2.5 Mina Common Segment 1 (Hawthorne Army Depot to Blair Junction). Mina common segment 1 would cross through Class III lands as it heads southeast from Hawthorne between the Gabbs Valley Range and the Garfield Hills, and then south on the western side of the Pilot Mountains toward the Monte Cristo Range. Common segment 1 would then pass through Class IV areas as it passed the west and southwestern sides of the Monte Cristo Range. Key observation points provide views from U.S. Highway 95 looking west toward the potential Garfield Hills quarry site (M-8), from the town of Luning looking east toward Mina common segment 1 and the potential Gabbs Range quarry site (M-9), from a residential area in the town of Mina looking east toward Mina common segment 1 (M-10), and views both west and north across Mina common segment 1 from the intersection of State Route 265 and U.S. Highway 95 (M-11).

3.3.3.3.2.6 Montezuma Alternative Segments. Each Montezuma alternative segment would begin near Blair Junction (at the intersection of State Route 265 and U.S. Highway 95).

The southwestern segment, Montezuma alternative segment 1, would first pass south through a Class III area running the length of State Route 265 to the town of Silver Peak, and then turn east through the Class IV Clayton Valley and Montezuma Range. Parts of the Clayton Ridge and Montezuma Ranges are Class II, and Montezuma alternative segment 1 would come within 2.4 kilometers (1.5 miles) of the Class II Clayton Ridge area as it crossed Clayton Valley and within 2.1 kilometers (1.3 miles) of the Class II areas in the Montezuma Range as it crossed those mountains. Montezuma alternative segment 1 would continue in Class IV areas as it traveled through the hills near the town of Goldfield to a location just south of the intersection of U.S. Highway 95 and State Route 266. The BLM manages State Route 266 west of U.S. Highway 95 as a Class III area.

Montezuma alternative segment 2 would proceed northeast through Class IV areas along the Monte Cristo Range, and would come within 4 kilometers (2.5 miles) of the Class II Lone Mountain area. Montezuma alternative segment 2 would then cross exclusively through Class IV lands as it traveled south through the Montezuma Valley west of Tonopah to the hills near the town of Goldfield, then through Stonewall Flats near the border of the Nevada Test and Training Range, and finally west of Stonewall Mountain to just south of the intersection of U.S. Highway 95 and State Route 266. Montezuma alternative segment 2 would come no closer than 6.9 kilometers (4.3 miles) to the Class II Stonewall Mountain area.

Montezuma alternative segment 3 would proceed northeast through Class IV areas along the Monte Cristo Range, and would come within 4 kilometers (2.5 miles) of the Class II Lone Mountain area. Montezuma alternative segment 2 would then cross exclusively through Class IV lands as it traveled south through the Montezuma Valley west of Tonopah. Before leaving Montezuma Valley, the alternative segment would turn west into the Class IV Montezuma Valley area and south between Clayton Ridge and the Montezuma Range. Montezuma alternative segment 3 would come within 2.1 kilometers (1.3 miles) of the Class II areas in the Montezuma Range as it crossed those mountains. Montezuma alternative segment 3 would continue in Class IV areas as it traveled through the hills near the town of Goldfield to a location just south of the intersection of U.S. Highway 95 and State Route 266. The BLM manages State Route 266 west of U.S. Highway 95 as a Class III area.

Key observation points with views over Montezuma alternative segment 1 include the intersection of U.S. 95 and State Route 265 looking south (M-11), the main street in the town of Silver Peak looking east (M-14), and Silver Peak Road looking east (M-15). Key observation points with views over Montezuma alternative segments 2 and 3 are on U.S. Highway 95 looking west toward the proposed rail segment and Lone Mountain (M-12), U.S. Highway 95 west toward the proposed rail segment and the Maintenance-of-way Facility (M-13), and Silver Peak Road east toward the proposed rail segment (M-16). A key observation point shows where Montezuma alternative segment 2 would cross U.S. Highway 95 at the south end of the town of Goldfield (31). A key observation point provides a view from the intersection of U.S. Highway 95 and State Route 266 over Montezuma alternative segments 1, 2, and 3 toward Stonewall Mountain (32).

3.3.3.3.2.7 Mina Common Segment 2 (Stonewall Flat Area). Common segment 2 would begin west of Stonewall Mountain and south of the intersection of U.S. Highway 95 and State Route 266. Mina common segment 2 would be in Class IV land and would never pass closer than 6.9 kilometers (4.3 miles) to the Class II Stonewall Mountain area.

Note: At this point, the Mina rail alignment becomes the same as the Caliente rail alignment. Although descriptions of the remaining alternative segments and common segments are the same as for the Caliente rail alignment, DOE has repeated them here for continuity. There are no Mina common segments numbered 3 and 4; instead, DOE has retained the numbering (common segments 5 and 6) used in the description of the Caliente alternative segment.

3.3.3.3.2.8 Bonnie Claire Alternative Segments. The Bonnie Claire alternative segments would cross Class IV lands to the southwest of the Nevada Test and Training Range and past Scottys Junction at the intersection of U.S. Highway 95 and State Route 267, which the BLM manages as a Class III area west of U.S. Highway 95. A key observation point at Scottys Junction provides a view northeast toward the alternative segments (33).

3.3.3.3.2.9 Common Segment 5 (Sarcobatus Flat Area). Common segment 5 would cross Class IV land between the Bonnie Claire area and the Oasis Valley area. There are no visual resources of concern along this common segment and, therefore, no key observation points.

3.3.3.3.2.10 Oasis Valley Alternative Segments. The Oasis Valley alternative segments would cross Class IV areas through Oasis Valley. A key observation point (35) is located north of Springdale, looking east over the Oasis Valley, showing a typical landscape. A key observation point (34) provides a view of a typical cut.

3.3.3.3.2.11 Common Segment 6 (Yucca Mountain Approach). Common segment 6 would pass from the Oasis Valley area, near Beatty and across Beatty Wash, through the Nevada Test Site to the Yucca Mountain Site. State Route 374, entering Beatty, is a Class III area. Common segment 6 would cross approximately 10 kilometers (6.2 miles) of Class III lands before it entered the Nevada Test Site, but the segment would be more than 15 kilometers (9.3 miles) from U.S. Highway 95 in this section. Land on the Nevada Test Site is not under BLM jurisdiction. Land on the Nevada Test Site that is visible from U.S. Highway 95 and that the rail alignment would cross is considered Class IV in this evaluation. A key observation point (36) is located north of Beatty, with views from U.S. Highway 95 over the Class IV lands surrounding the access road to Beatty Wash. The viewshed within the wash is considered a contributing element to cultural resources within the wash that are important to American Indians (DIRS 174205-Kane et al. 2005, p. 17). Beatty Wash and the rail alignment through it would not be visible from the highway. Therefore, DOE did not select key observation points in this area.

3.3.4 AIR QUALITY AND CLIMATE

This section describes the present air quality and climate characteristics along the Mina rail alignment and summarizes information from ***ambient air*** monitoring and meteorological data collection in the region. Section 3.3.4.1 describes the region of influence for air quality and climate; Section 3.3.4.2 describes general air quality characteristics in the Mina rail alignment region of influence; and Section 3.3.4.3 describes the climate characteristics in the Mina rail alignment region of influence.

3.3.4.1 Region of Influence

The region of influence of air quality and climate along the Mina rail alignment includes a small portion of Churchill County near Hazen, Lyon, Mineral (including the Walker River Paiute Reservation), Esmeralda, and Nye Counties. Historic data on pollutant emissions inventories and compliance status for the State of Nevada are calculated at the county level, and these data provide a basis for determining existing air quality in the region of influence and for use in analyzing potential impacts to air quality (see Section 4.3.4).

However, air-emissions fixed-point sources such as quarries and linear sources such as operating railroads can subject certain locations (known as receptors; for example, population centers) to higher localized levels of pollutants than a regional analysis would suggest. Therefore, DOE also selected more focused study locations within the region of influence in which to assess air quality impacts on specific receptors. These locations are the population centers near the Mina rail alignment (Schurz, Hawthorne, Mina, and Silver Peak) and two potential quarry sites northeast of Luning (Gabbs Valley Range) and southwest of Goldfield (Malpais Mesa).

In addition to regulated air pollutants that affect air quality, greenhouse gas emissions have been identified as an air pollutant with a potential impact on climate. However, unlike regulated air pollutants, greenhouse gas emissions are only important as to their contribution globally so their regions of influence are at the global scale.

3.3.4.2 Existing Air Quality

Air quality is determined by measuring concentrations of certain pollutants in the atmosphere. The U.S. Environmental Protection Agency designates an area as being ***in attainment*** for a particular pollutant if ambient concentrations of that pollutant are below the National ***Ambient Air Quality Standards***. The pollutants regulated under the State of Nevada and National Ambient Air Quality Standards are ***ozone***, ***carbon monoxide***, ***nitrogen dioxide***, ***sulfur dioxide***, ***particulate matter*** (***PM_{10}*** and ***$PM_{2.5}$***), and lead. Collectively, these pollutants are referred to as ***criteria air pollutants***. Table 3-95 lists the National Ambient Air Quality Standards for both the primary public health standard and the secondary public welfare standards in comparison to State of Nevada Ambient Air Quality Standards. Although emissions of principal anthropogenic greenhouse gas, carbon dioxide, are not currently subject to State of Nevada or federal standards, the impact of CO_2 on global climate change is a topic of increasing awareness and concern to members of the public.

Areas in violation of one or more of these standards are classified as ***nonattainment areas***. If there is not enough air quality data to determine the status of a remote or sparsely populated area, then the U.S. Environmental Protection Agency lists the area as unclassifiable. However, for regulatory purposes, unclassifiable areas are considered to be in attainment. All portions of the Mina rail alignment would be within areas classified as in attainment for all National Ambient Air Quality Standards.

Table 3-95. State of Nevada and National Ambient Air Quality Standards[a] (page 1 of 2).

Pollutant[b]	Averaging time[c]	Nevada standards concentration[b]	National primary standards[b]	National secondary standards[b]	Notes regarding the air quality standard
Ozone	1 hour	0.12 ppm (235 μg/m^3)	None	None	Not to be exceeded where the general public has access.
	8 hours	None	0.075 ppm (147 μg/m^3)	Same as primary	To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm.
Ozone, Lake Tahoe Basin	1 hour	0.10 ppm (195 μg/m^3)	None	None	Not to be exceeded where the general public has access.
Carbon monoxide	8 hours	9 ppm (10,500 μg/m^3) for elevations less than 5,000 feet[d] above mean sea level	9 ppm (10,500 μg/m^3) at any elevation	None	Not to be exceeded more than once per year.
		6 ppm (7,000 μg/m^3) for elevations greater than 5,000 feet above mean sea level			
Carbon monoxide (at any elevation)	1 hour	35 ppm (40,500 μg/m^3)	35 ppm (40,500 μg/m^3)		
Nitrogen dioxide	Annual arithmetic mean	0.053 ppm (100 μg/m^3)	0.053 ppm (100 μg/m^3)	Same as primary	Not to be exceeded.
Sulfur dioxide	Annual arithmetic mean	0.03 ppm (80 μg/m^3)	0.03 ppm (80 μg/m^3)	None	Not to be exceeded.
	24 hours	0.14 ppm (365 μg/m^3)	0.14 ppm (365 μg/m^3)		Not to be exceeded more than once per year.
	3 hours	0.5 ppm (1,300 μg/m^3)	None	0.5 ppm (1,300 μg/m^3)	
Particulate matter as PM_{10}	Annual arithmetic mean	50 μg/m^3	Revoked[e]	Revoked[e]	The 3-year average of the weighted annual mean concentration at each monitor within an area.
	24 hours	150 μg/m^3	150 μg/m^3		Not to be exceeded more than once per year.[f]

Table 3-95. State of Nevada and National Ambient Air Quality Standards[a] (page 2 of 2).

Pollutant[b]	Averaging time[c]	Nevada standards concentration[b]	National primary standards[b]	National secondary standards[b]	Notes regarding the air quality standard
Particulate matter as $PM_{2.5}$	Annual arithmetic mean	None	15 μg/m^3	Same as primary	The 3-year average of the weighted annual mean concentration from single or multiple community-oriented monitors.
	24 hours	35 μg/m^3	35 μg/m^3		The 3-year average of the 98th percentile of 24-hr concentrations at each population-oriented monitor within an area.[g]
Lead[h]	Quarterly arithmetic mean	1.5 μg/m^3	1.5 μg/m^3	Same as primary	Not to be exceeded.
Hydrogen sulfide[h]	1 hour	0.08 ppm (112 μg/m^3)	None	None	Not to be exceeded.

a. Sources: Nevada Administrative Code Section 445B.22097 and 40 CFR 50.4 through 50.11.
b. PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 micrometers; $PM_{2.5}$ = particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers; ppm = parts per million; μg/m^3 = micrograms per cubic meter.
c. Time over which pollutant is measured.
d. To convert feet to meters, multiply by 0.3048.
e. The U.S. Environmental Protection Agency revoked the annual PM_{10} standard effective December 18, 2006 (71 *FR* 60853, October 17, 2006).
f. The 24-hour state standard is attained when the expected number of days per calendar year with a 24-hour average concentration above the standard is equal to or less than 1. The expected number of days per calendar year is based on an average of the number of exceedances per year for the last 3 years.
g. The 24-hour state standard is attained when the second highest of a 3-year rolling average of the 24-hour concentration at each monitor is less than the standard.
h. The proposed railroad would not emit lead or hydrogen; they are included here for completeness.

The most representative air quality data for the northern portion of the Mina rail alignment (Churchill, Lyon, and Mineral Counties and the Walker River Paiute Reservation) consists of historical monitoring data collected at three locations: Schurz for particulate matter; the Fort Churchill Power Plant (near Wabuska) for carbon monoxide, nitrogen dioxide, and sulfur dioxide (DIRS 182287-Hoelscher 2007, all); and Fallon for ozone (DIRS 179933-State of Nevada 2007, all). The Schurz data are recent ambient air quality data collected and reported on the Tribal Environmental Exchange Network; the Fort Churchill Power Plant data was collected in preparation for a Prevention of Significant Deterioration

Permit Application for the Sierra Pacific Power Company during the late 1990s; and the nearest representative ozone data were data collected from Fallon by the Nevada Department of Environmental Protection. While the Fort Churchill air quality data are somewhat outdated, the little development or population growth in the region since that time strongly suggests that the Fort Churchill air quality data remains representative of the region in the vicinity of the Mina rail alignment. Additional air quality data are available, such as carbon monoxide from Minden and particulate matter from Fernley and Gardnerville, but these locations are more than 50 kilometers (30 miles), 18 kilometers (11 miles), and 50 kilometers, respectively, from the Mina rail alignment at its closest and are influenced by local emissions sources not representative of the region near the rail alignment.

The only gas-phase monitoring study made in the southern portion (Esmeralda and Nye Counties) of the Mina rail alignment is a special study at Yucca Mountain covering a 4-year period from October 1991 to September 1995 (DIRS 102877-CRWMS M&O 1999, all). The limited amount of air quality data reflects choices made by national and state agencies to focus monitoring resources either on population centers or pristine areas such as national parks. Additional data on particulate matter are available based on monitoring in the vicinity of Yucca Mountain from 1989 to 1997 (DIRS 102877-CRWMS M&O 1999, all; DIRS 102876-CRWMS M&O 1997, all; DIRS 147777-SAIC 1992, all; DIRS 147780-SAIC 1992, all), from three sites from 1998 to 2001 (DIRS 173738-DOE 2002, p. 42), and from two sites from 2002 through 2005 (DIRS 168842-DOE 2003, p. 42; DIRS 173740-DOE 2004, p. 36; DIRS 176801-Wills 2005, p. 38; DIRS 179948-DOE 2006, p. 40). While these data sets pertain to locations more than 110 kilometers (70 miles) from the Goldfield area, DOE believes they are representative of the ambient air quality along the southern portion of the Mina rail alignment, because no large emission sources or metropolitan areas are located in the region that would otherwise affect air quality. However, local natural sources of particulate matter, such as barren land or dry lake beds (such as Sarcobatus Flat), could generate higher localized concentrations of particulate matter.

In the vicinity of the southern portion of the Mina rail alignment, the closest location (other than the Yucca Mountain Site) for which there are recent air quality data is Pahrump, Nevada. However, Pahrump, which is in the extreme southern tip of Nye County, is 65 kilometers (40 miles) southeast of the Mina rail alignment and only monitors particulate matter. In recent years there have been exceedances of the National Ambient Air Quality Standards for particulate matter in Pahrump because there has been substantial construction activity and population growth in the Pahrump Valley. In September 2003, Pahrump entered into a Memorandum of Understanding (DIRS 178128-Nevada Division of Environmental Protection 2003, p. 5) with the U.S. Environmental Protection Agency, the State of Nevada, and Nye County to develop an air quality improvement plan, with quantified emission-reduction measures so that the emission reduction strategies will be adequate to ensure the area stays in attainment of the particulate matter standards and with the objective that the area would be in attainment by 2009. Pahrump has a background monitoring site intended to represent natural background concentrations of the northern Mojave Desert; however, some disturbed land in the vicinity of the monitor makes the site only representative of the local background in the Pahrump Valley. Because of Pahrump's distance from the Mina rail alignment and heavy construction activity and population growth, its air quality is not representative of the area of the Mina rail alignment.

Along the northern portion of the Mina rail alignment (Churchill, Lyon, and Mineral Counties, and the Walker River Paiute Reservation), the most representative air quality data was collected at three locations depending on the air pollutant. Particulate matter data for Schurz are available for the period 2004 to 2006 (DIRS 180073-Tribal Environmental Exchange Network 2007, all). Sierra Pacific Power Company collected data at the Fort Churchill Power Plant from January 1996 through May 1998; these data contain information on sulfur dioxide, nitrogen dioxide, and carbon monoxide (DIRS 182287-Hoelscher 2007, all). The nearest representative ozone information is data the Nevada Department of Environmental Protection collected at Fallon, Nevada, from 2000 through 2003 (DIRS 179933-State of Nevada 2007, all). Figure 3-178 shows meteorological and air quality monitoring station locations along the Mina rail alignment.

The Fort Churchill Power Plant data and the Nevada Bureau of Air Quality Planning data were designed to comply with the U.S. Environmental Protection Agency's *On-Site Meteorological Program Guidance for Regulatory Modeling Applications* (DIRS 101822-EPA 1987, all) and *Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD)* (DIRS 108989-EPA 1987, all).

DOE collected data from the Tribal Environmental Exchange Network. The data includes hourly meteorological and air quality monitoring data that starts in May 2003. Hourly air quality monitoring

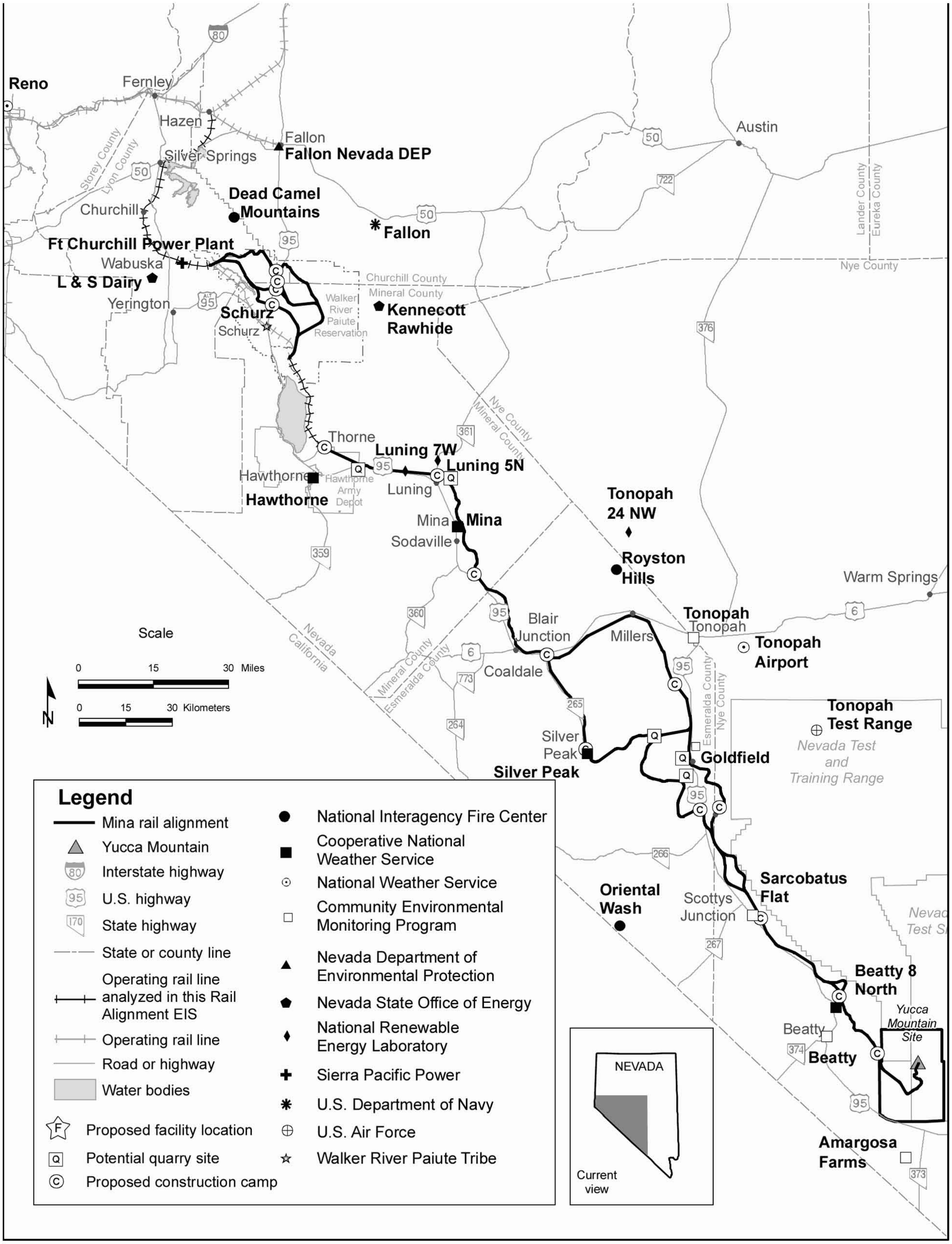


Figure 3-178. Meteorological and air quality monitoring stations along the Mina rail alignment.

data includes PM_{10} and $PM_{2.5}$, using a method equivalent to the U.S. Environmental Protection Agency's integrated filter reference method, for continuous monitoring of PM_{10} and $PM_{2.5}$. DOE collected, processed, and conducted some limited quality assurance reviews on the meteorological and hourly air quality values to characterize the background PM_{10} and $PM_{2.5}$ concentration for the Walker River Paiute Reservation. To verify and assure the quality of the monitoring values, DOE performed statistical checks for reasonableness in the monitored values. Additionally, DOE prepared statistics on the rate of change to identify periods with possible equipment malfunction and remove data with extreme change in hourly concentrations.

DOE then screened the PM_{10} and $PM_{2.5}$ data for cases when the $PM_{2.5}$ was reported to be higher than the PM_{10} concentration. If the PM_{10} concentration was within three standard deviations of the mean hourly PM_{10} concentration, then the PM_{10} concentration was assumed correct and the $PM_{2.5}$ concentration set to missing; otherwise the PM_{10} was set to missing. After screening, DOE summarized both the PM_{10} and $PM_{2.5}$ concentrations for the daily and annual averages from the available dataset. To determine annual values, the Department determined quarterly averages of PM_{10} and $PM_{2.5}$ for those periods in which the hourly PM_{10} and $PM_{2.5}$ measurements, respectively, met a completeness criterion of at least 75 percent (DIRS 179932-EPA 1999, pp. 5 to 16).

Tables 3-96 through 3-98 summarize the particulate matter air quality monitoring at Schurz, the air quality monitoring at Fort Churchill Power Plant, and the ambient ozone monitoring at Fallon, Nevada, respectively. These represent the best available information on the air quality along the northern portion of the Mina rail alignment. The second highest 24-hour and annual PM_{10} measurements were 99 and 23 micrograms per cubic meter, respectively. These measurements, made at Schurz in 2005, are approximately 66 and 46 percent of the national and state regulatory standard of 150 and 50 micrograms per cubic meter. Ambient concentrations of carbon monoxide, nitrogen dioxide, and sulfur dioxide measured at Fort Churchill were also well below the ambient air quality standards with their maximum percentages at 16, 8, and 18 percent of their respective national and state regulatory standards. For ozone there has been no exceedance of the 1- or 8-hour standard. The highest percentage was for the 8-hour ozone standard (0.08 parts per million), at 88 percent.

No ambient monitoring data were available for lead. However, DOE expects concentrations of lead to be far below the regulatory standard because there are no industrial sources in the region of influence (or near enough to transport this ***contaminant*** into the region of influence), and lead-based gasoline, previously the principal source of lead in the air, has been phased out.

Along the southern portion of the Mina rail alignment, the most representative data are from the DOE Environmental Safety and Health Department, which began air quality monitoring in the Yucca Mountain vicinity in 1989. The air quality network originally consisted of Sites YMP1 and YMP5; DOE added Sites YMP6 and YMP9 in 1992.

DOE designed the air quality and meteorological monitoring program to comply with the U.S. Environmental Protection Agency's *On-Site Meteorological Program Guidance for Regulatory Modeling Applications* (DIRS 101822-EPA 1987, all) and *Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD)* (DIRS 108989-EPA 1987, all), and with U.S. Nuclear Regulatory Commission meteorological monitoring guidance (ANSI/ANS-2.5-1984, *Standard for Determining Meteorological Information at Nuclear Power Sites,* and Regulatory Guide 1.23, Rev. 0, *Onsite Meteorological Programs*).

DOE monitored the criteria gaseous pollutants of carbon monoxide, nitrogen dioxide, ozone, and sulfur dioxide at YMP1 from October 1991 through September 1995. DOE also monitored the concentration of PM_{10} at YMP1; the ambient air quality monitoring program included sampling of PM_{10} every sixth day, based on the U.S. Environmental Protection Agency's representative schedule of sampling.

Table 3-96. Maximum observed ambient air quality concentrations at Schurz, Nevada (2004 to 2006) compared to the Nevada and National Ambient Air Quality Standards for particulate matter.[a,b]

Pollutant[c]	Averaging time	2004	2005	2006	High	Nevada and NAAQS[d]
PM_{10}	24-hour highest	NA[d]	136	73	136	None
	24-hour second highest	NA	99	70	99	150
	Annual average	NA	23	11	23	50[e]
$PM_{2.5}$	24-hour 98th percentile	12	24	11	24[f]	35
	Annual average	3.4	3.9	5.4	5.4	15

a. Source: DIRS 180073-TREX 2007, all.
b. Concentrations are shown in micrograms per standard cubic meter.
c. PM_{10} = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers; $PM_{2.5}$ = particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometers.
d. NA = not applicable. NAAQS = National Ambient Air Quality Standard
e. The U.S. Environmental Protection Agency revoked the annual PM_{10} standard effective December 18, 2006 (71 *FR* 60853, October 17, 2006). The Nevada state standard remains in effect and is reported here.
f. For comparison to the air quality standard, the three-year average is 16 micrograms per cubic meter.

Table 3-97. Fort Churchill maximum observed ambient gaseous air quality concentrations in comparison to the Nevada Standards for Air Quality and the National Ambient Air Quality Standards (in parts per million by volume).[a]

Pollutant	Nevada and NAAQS[b]	(1/10/96 to 12/31/96)	(1/1/97 to 12/31/97)	(1/1/98 to 03/1/98)	(4/1/98 to 5/11/98)
Carbon monoxide	35 (1 hour)	1.1	1.8	0.8	0.5
	9[c] (8 hour)	1.0	1.4	0.7	0.4
Nitrogen dioxide	0.053 (annual)	0.004	0.004	0.002	NA[d]
Sulfur dioxide	0.50 (3 hour)	0.072	0.020	0.005	0.004
	0.14 (24 hour)	0.025	0.019	0.003	0.003
	0.03 (annual)	0.002	0.002	0.002	NA

a. Source: DIRS 182287-Hoelscher 2007, all.
b. NAAQS = National Ambient Air Quality Standards.
c. Nevada Standards for Air Quality: less than 5,000 feet above mean sea level.
d. NA = not applicable.

Table 3-98. Fallon, Nevada, highest 1-hour and fourth highest 8-hour observed ozone concentrations in comparison to the Nevada Standards for Air Quality and the National Ambient Air Quality Standards (in parts per million by volume).[a]

Pollutant	Nevada and NAAQS[b]	2000	2001	2002	2003
Ozone	0.12 (1 hour)	0.080	0.070	0.070	0.080
	0.075 (8 hour)	0.070	0.059	0.058	0.067

a. Source: DIRS 179933-State of Nevada 2007, all.
b. NAAQS = National Ambient Air Quality Standards; Nevada, federal standard is for 8-hour; state standard is for 1-hour.

YMP5, the second site measuring PM_{10}, represented background conditions away from site activities at Yucca Mountain. Measurements at YMP5 began in April 1989 and continued until 2002.

In October 1992, DOE added two sites to measure PM_{10}:

- YMP6, along the western border of the Nevada Test Site where the Test Site meets the U.S. Air Force land in upper Yucca Wash, measured particulate matter that might be transported from Midway Valley toward the northwest through Yucca Wash (discontinued in September 1999).
- YMP9, at Gate 510 on the southern border of the Nevada Test Site, north of Amargosa Valley.

Tables 3-99 and 3-100 summarize the results of the particulate matter air quality monitoring programs. More information on the results of the sampling program is available in *Environmental Baseline File for Meteorology and Air Quality* (DIRS 102877-CRWMS M&O 1999, all); *Meteorological Monitoring Program Particulate Matter Ambient Air Quality Monitoring Report January through December 1996* (DIRS 102876-CRWMS M&O 1997, all); *Particular Matter Ambient Air Quality Data Report for 1989 and 1990* (DIRS 147777-SAIC 1992, all); and *Particular Matter Ambient Air Quality Data Report for 1991* (DIRS 147780-SAIC 1992, all).

Between 1989 and 1997, the highest 24-hour PM_{10} measurement was 67 micrograms per cubic meter. This measurement, made at Site YMP5 in 1995, is approximately 45 percent of the regulatory standard of 150 micrograms per cubic meter (40 CFR 50.4 through 50.11). The second-highest value at any site, which is the regulatory level for an exceedance of the air quality standard, was 49 micrograms per cubic meter at Site YMP1 in 1990, which is 33 percent of the standard (the second-highest value would be used to determine whether there was a violation of the PM_{10} standard).

The annual averages were between 6 and 13 micrograms per cubic meter (Site YMP9 [1998] and Site YMP5 [1989], respectively), which is less than 30 percent of the Nevada annual standard (50 micrograms per cubic meter).

Table 3-100 lists the annual highest and second-highest 24-hour concentrations, and the annual average PM_{10} concentration for the period 1998 to 2005 for YMP1, YMP5, and YMP9, and shows the measured levels of ambient particulate matter were well below the federal and Nevada particulate matter standards.

Table 3-101 lists YMP1 results for monitoring of gaseous criteria pollutants (carbon monoxide, nitrogen dioxide, ozone, and sulfur dioxide) for each year of the 4-year monitoring period (1991 to 1995); for comparison, the National Ambient Air Quality Standards are also shown.

Ambient concentrations of carbon monoxide and sulfur dioxide were below the threshold of reliable detection of the instrument. Nitrogen dioxide occasionally registered values of a few hundredths of parts per million by volume, typically associated with nearby vehicle activity. The number of hours per operating quarter with measurements above the threshold was between 1 hour and 161 hours, which occurred from October through December 1993. The results listed in Table 3-101 are expressed in the units of the applicable standard (annual average of nitrogen dioxide), and the listed values are based on the threshold of reliable detection for that instrument.

DOE believes these measurements of particulate matter, carbon monoxide, nitrogen dioxide, and sulfur dioxide are representative of the air quality along the southern portion of the Mina rail alignment (Esmeralda County and south) because the region of influence has no large emission sources or metropolitan areas that would otherwise affect its air quality. However, in areas close to barren land or dry lake beds, there could be higher particulate matter concentrations.

Table 3-99. Summary of PM_{10} concentrations at sites in the vicinity of Yucca Mountain (1989 to 1997).[a,b,c]

Sampler	Averaging time	1989	1990	1991	1992	1993	1994	1995	1996	1997	High
Site YMP1	24-hour highest	41	62	33	30	30	39	21	60	31	62
	Second highest	27	49	25	24	22	26	20	23	21	49
	Annual average	12	12	10	12	10	10	10	10	9	12
Site YMP5	24-hour highest	40	51	45	49	21	42	67	57	26	67
	Second highest	38	43	33	27	20	23	21	35	19	43
	Annual average	13	10	10	12	9	9	10	10	9	13
Site YMP6	24-hour highest	NA	NA	NA	NA	21	25	14	32	59	59
	Second highest	NA	NA	NA	NA	21	20	13	21	18	21
	Annual average	NA	NA	NA	NA	9	7	7	9	8	9
Site YMP9	24-hour highest	NA	NA	NA	31	21	39	15	57	29	57
	Second highest	NA	NA	NA	31	21	19	14	28	19	31
	Annual average	NA	NA	NA	NA	9	8	7	10	8	10

a. Sources: DIRS 102877-CRWMS M&O 1999, p. 13; DIRS 102876-CRWMS M&O 1997, p. 13; DIRS 147777-SAIC 1992, p. 13; DIRS 147780-SAIC 1992, p. 13.
b. Concentrations are shown in micrograms per standard cubic meter ($\mu g/m^3$).
c. PM_{10} = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers; NA = samples were not taken during the corresponding monitoring period.

Table 3-100. Summary of PM_{10} concentrations at sites in the vicinity of Yucca Mountain (1998 to 2005).[a,b,c]

Sampler	Averaging time	1998	1999	2000	2001	2002	2003	2004	2005	High
Site YMP1	24-hour highest	30	18	38	23	52	33	24	32	52
	Second highest	17	34	34	19	37	17	19	29	37
	Annual average	8	8	11	8	10	8	8	9	11
Site YMP5	24-hour highest	26	24	45	27	NA	NA	NA	NA	45
	Second highest	18	21	39	25	NA	NA	NA	NA	39
	Annual average	7	8	12	10	NA	NA	NA	NA	12
Site YMP9	24-hour highest	22	18	36	22	43	39	27	26	43
	Second highest	20	17	33	19	39	38	21	26	39
	Annual average	6	8	11	9	10	11	9	9	11

a. Sources: DIRS 173738-DOE 2002, p. 42; DIRS 168842-DOE 2003, p. 44; DIRS 173740-DOE 2004, p. 36; DIRS 176996-DOE 2005, p. 38; DIRS 179948-DOE 2006, p. 40.
b. Concentrations are shown in micrograms per standard cubic meter ($\mu g/m^3$).
c. PM_{10} = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers; NA = samples were not taken during the corresponding monitoring period.

Ozone was the only gaseous criteria pollutant to routinely register ambient levels above the instrument threshold. Ozone levels never exceeded the regulatory limit for the 1-hour average standard (0.12 parts per million by volume). The highest 1-hour average was 0.096 parts per million. Note that the 1-hour average standard was withdrawn in 2005, and has now been replaced with an 8-hour average standard (0.08 parts per million). Ozone is formed in the atmosphere under the presence of sunlight,

Table 3-101. Site YMP1 maximum observed ambient gaseous air quality concentrations in comparison to the Nevada Standards for Air Quality and the National Ambient Air Quality Standards (in parts per million by volume).[a]

Pollutant	Nevada and NAAQS[b]	Year 1 (10/91 to 9/92)	Year 2 (10/92 to 9/93)	Year 3 (10/93 to 9/94)	Year 4 (10/94 to 9/95)
Carbon monoxide	35 (1 hour)	0.2	0.2	0.2	0.2
	9[c] (8 hour)	0.2	0.2	0.2	0.2
Nitrogen dioxide	0.053 (annual)	0.0020	0.0020	0.0021	0.0021
Ozone[d] (for Nevada ambient air quality only)	0.12 (1 hour) 0.75 (8 hour)	0.096 (1 hour)	0.093 (1 hour)	0.081 (1 hour)	0.083 (1 hour)
Sulfur dioxide	0.50 (3 hour)	0.002	0.002	0.002	0.002
	0.14 (24 hour)	0.002	0.002	0.002	0.002
	0.03 (annual)	0.002	0.002	0.002	0.002

a. Source: DIRS 102877-CRWMS M&O 1999, p. 14; 40 CFR 50.4 through 50.11.
b. NAAQS = National Ambient Air Quality Standards.
c. Nevada Standards for Air Quality: less than 5,000 feet above mean sea level.
d. The 1-hour average primary and secondary standards of 0.12 parts per million for ozone were withdrawn in 2005, and were replaced with 8-hour average standards of 0.08 parts per million. On March 12, 2008, the U.S. Environmental Protection Agency revised these primary and secondary 8-hour ozone standards from 0.08 parts per million to 0.075 parts per million. The final rule was published in the *Federal Register* on March 27, 2008 (73 *FR* 16436), to be effective on May 27, 2008.

nitrogen oxides, and ***volatile organic compounds***. Ozone typically has the highest concentrations during warm weather because strong sunlight and high temperatures are more conducive to higher ambient concentrations. Approximately 90 percent of the warm-season hours had concentrations between 0.020 and 0.060 parts per million; only 44 hours had concentrations in excess of 0.080 parts per million.

Available data for Death Valley National Park (for 1995 to 2004), 50 kilometers (30 miles) to the west of the southern portion of the Mina rail alignment, reported a highest 1-hour average concentration of 0.095 parts per million (DIRS 176115-EPA 2005, all), which is similar to the ozone values measured at Yucca Mountain. Ozone concentrations to the east are anticipated to be even lower because of their greater distance from emission sources.

Again, no ambient monitoring data were available along the southern portion of the rail alignment for lead. However, DOE expects concentrations of lead to be far below the regulatory standard because there are no industrial sources in the region of influence (or near enough to transport this contaminant into the region of influence), and lead-based gasoline, previously the principal source of lead in the air, has been phased out.

No ambient monitoring data were available for $PM_{2.5}$ and PM_{10}, but $PM_{2.5}$ can be estimated from measurements of ambient PM_{10}. In the region of influence, nearly all PM_{10} would be generated from the resuspension of surface-level soil and mineral materials. A U.S. Department of Agriculture study on wind erosion in the western United States found that over all soils, the fraction of PM_{10} as $PM_{2.5}$ was about 15 percent, ranging from 10 to 30 percent (DIRS 173838-Hagen 2001, p. 1). To be conservative, DOE applied the upper end of this range (30 percent) to the ambient PM_{10} data collected at Yucca Mountain (Sites YMP1, YMP5, and YMP9), and the resulting data indicated the highest expected 24-hour concentration of $PM_{2.5}$ would be 16 micrograms per cubic meter, and the highest expected annual average concentration would be 4 micrograms per cubic meter. These figures are 46 and 26 percent of the standards for $PM_{2.5}$. Table 3-102 summarizes these results and indicates that $PM_{2.5}$ would be well below the National Ambient Air Quality Standards at all locations along the Mina rail alignment.

Table 3-102. Maximum observed ambient air quality concentrations at sites in the vicinity of Yucca Mountain (1998 to 2003) compared to the Nevada and National Ambient Air Quality Standards for particulate matter.[a,b,c]

Sampler	Nevada and NAAQS[d]	1998	1999	2000	2001	2002	2003	2004	2005	High
PM_{10}	24 hour: 150	30	24	45	27	52	39	27	32	52
	Annual: 50[e]	8	8	12	10	10	11	9	9	12
Estimated[f] $PM_{2.5}$	24 hour: 35	9	7	14	8	16	12	8	10	16
	Annual: 15	2	2	4	3	3	3	3	3	4

a. Sources: DIRS 173738-DOE 2002, p. 42; DIRS 168842-DOE 2003, p. 44; DIRS 173740-DOE 2004, p. 36; DIRS 176996-DOE 2005, p. 38; DIRS 179948-DOE 2006, p. 40; 40 CFR 50.4 through 50.11.
b. PM_{10} = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers; $PM_{2.5}$ = particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometers.
c. Concentrations are shown in micrograms per standard cubic meter.
d. NAAQS = National Ambient Air Quality Standards.
e. The U.S. Environmental Protection Agency revoked the annual PM_{10} standard effective December 18th, 2006 (71 *FR* 60853, October 17, 2006).
f. Estimated based on upper-end range of PM_{10} data assuming 30 percent of PM_{10} is $PM_{2.5}$ (DIRS 173838-Hagen 2001, p. 1).

3.3.4.3 Climate

The Mina rail alignment would cross desert and ***semi-desert*** areas that generally have abundant hours of cloud-free days, low annual precipitation, and large daily ranges in temperature.

To characterize the existing climate, DOE collected meteorological data from 41 meteorological monitoring stations within the Mina rail alignment region of influence (see Figure 3-178 and Table 3-103).

The following eight groups operated these stations:

- National Oceanic and Atmospheric Administration
- Community Environmental Monitoring Program
- DOE Environment, Safety and Health Programs Department Network
- Tribal Environmental Exchange Network
- National Renewable Energy Laboratories
- Nevada State Office of Energy
- National Interagency Fire Center - Remote Automated Weather Station
- U.S. Air Force

The Meteorological Data Acquisition Network is a network of meteorological stations operated by the National Oceanic and Atmospheric Administration, Air Resources Laboratory/Special Operations and Research Division. The Community Environmental Monitoring Program is a joint effort between the DOE Nevada Operations Office, the University of Nevada Desert Research Institute, and the Community College System of Nevada, and is a network of monitoring stations in communities surrounding the Nevada Test Site that check the ***environment*** for ***radioactivity*** and check a variety of meteorological parameters. The Walker River Paiute Reservation station is part of a national network of meteorological stations operated by each tribe and is reported through the Tribal Environmental Exchange Network. The National Renewable Energy Laboratories supports the collection of wind data operated by the Desert Research Institute for potential site locations for wind energy development. The Nevada State Office of Energy operates a similar program for the collection of wind monitoring data on potential site locations for wind energy development. The Remote Automated Weather Station operated by the National Interagency Fire Center is a network of meteorological stations that monitor weather data that assists

Table 3-103. Meteorological stations in the Mina rail alignment air quality and climate region of influence[a,b] (page 1 of 2).

Station name	Elevation (in feet)[c]	Source	Wind data
Reno	4,400	WRCC	Yes
Fallon	3,934	WRCC	Yes
Dead Camel Mtn	4,490	RAWS	Yes
L & S Dairy	4,340	NSOE	Yes
Kennecott Rawhide	5,100	NSOE	Yes
Schurz	4,198	TREX	Yes
Hawthorne	4,218	WRCC	NA
Luning 7W	4,443	NREL	Yes
Luning 5N	4,998	NREL	Yes
Mina	4,545	WRCC	NA
Tonopah 24NW	5,035	NREL	Yes
Royston Hills	5,100	RAWS	Yes
Tonopah	6,023	CEMP	Yes
Tonopah Airport	5,428	WRCC	NA
Silverpeak	4,258	WRCC	NA
Goldfield	5,688	CEMP	Yes
Tonopah Test Range	5,546	Air Force	Yes
Sarcobatus Flat	4,021	CEMP	Yes
Oriental Wash	4,100	RAWS	Yes
Beatty 8 North	3,548	WRCC	NA
Beatty	3,302	CEMP	Yes
Amargosa Farms	2,447	CEMP	Yes
Mercury	3,309	WRCC	Yes
07	5,455	MEDA	NA
14	4,697	MEDA	NA
18	5,030	MEDA	NA
21	4,960	MEDA	NA
24	4,937	MEDA	NA
25	2,741	MEDA	NA
26	3,716	MEDA	NA
27	4,495	MEDA	NA
42	2,889	MEDA	NA
NTS 60 (YMP1)	3,727	DOE	NA
Gate 510 (YMP9)	2,748	DOE	NA
Fortymile Wash (YMP5)	3,122	DOE	NA
Knothead Gap (YMP8)	3,706	DOE	NA
Sever Wash (YMP7)	3,543	DOE	NA
Yucca Mountain (YMP2)	4,847	DOE	NA
Coyote Wash (YMP3)	4,191	DOE	NA

Table 3-103. Meteorological stations in the Mina rail alignment air quality and climate region of influence[a,b] (page 2 of 2).

Station Name	Elevation (in feet)[c]	Source	Wind data
Alice Hill (YMP4)	4,047	DOE	NA
WT-6 (YMP6)	4,313	DOE	NA

a. Sources: DIRS 165987-WRCC 2002, all; DIRS 180073-TREX 2007, all.
b. CEMP = Community Environmental Monitoring Program; DOE = DOE Environment, Safety and Health Programs Department Network; MEDA = Meteorological Data Acquisition Network; NREL = National Renewable Energy Laboratory; RAWS = Remote Automated Weather Station, NSOE = Nevada State Office of Energy; NA = not available; NTS = Nevada Test Site; WRCC = Western Regional Climate Center; YMP = Yucca Mountain Project, TREX = Tribal Environmental Exchange Network.
c. To convert feet to meters, multiply by 0.3048.

land-management agencies with a variety of efforts primarily directed at rating fire danger. The U.S. Air Force has historically operated a meteorological station from time to time on the Nevada Test and Training Range at the Tonopah Test Range and archives this data with the Air Force Combat Climatology Center.

DOE acquired data not directly available through these programs through the Western Regional Climate Center (DIRS 165987-WRCC 2002, all), which maintains historical climate databases for most of the climate stations and operational National and Military Weather Service stations throughout the western United States, including a network of stations that collect daily climate observations.

Table 3-103 lists the stations and their respective elevations in the Mina rail alignment air quality and climate region of influence. All stations collected temperature and precipitation data, and Table 3-103 also identifies those stations that collected wind speed and direction data. The range of elevations over which weather data were collected is approximately the same as the elevation range of the Mina rail alignment – from 747 meters (2,450 feet) at the Amargosa Farms Station to 1,836 meters (6,023 feet) at Tonopah.

The Mina rail alignment would cross a variety of topographic features, ranging from mountain passes to sage-covered deserts. The alignment elevations range from 1,280 meters (4,200 feet) near Schurz in Mineral County to 1,860 meters (6,090 feet) at Goldfield Summit in Esmeralda County and back down to 1,080 meters (3,540 feet) near the end of the Mina rail alignment at Yucca Mountain. These elevation changes drive a wide variation in temperature and precipitation.

From north to south, the Mina rail alignment would lie within and be exposed to the climatic conditions of Churchill, Lyon, Mineral (including the Walker River Paiute Reservation, the bulk of which lies within Mineral County), Esmeralda, and Nye Counties, as described in Sections 3.3.4.3.1 through 3.3.4.3.5. The climate discussion that follows is based on the climatic data collected from the sites listed in Table 3-103.

3.3.4.3.1 Churchill County

A small portion of the Mina rail alignment would cross through western Churchill County, at an elevation of approximately 1,200 meters (4,000 feet). Annual average temperature in this portion of Churchill County is approximately 13° Celsius (55° Fahrenheit). Because of the arid climate, it is common for strong daytime heating and rapid nighttime cooling to result in large variations in temperature, particularly during the summer. Daily temperature variations are smaller during the winter. Summertime mean maximum temperatures are approximately 33° Celsius (92° Fahrenheit), and are accompanied by low relative humidity (commonly less than 10 percent). Winter mean minimum temperatures are approximately minus 5° Celsius (23° Fahrenheit) in December and January.

Precipitation occurs about equally throughout the year although slightly more occurs during the winter (November through March). Average annual precipitation is less than 130 millimeters (5 inches), but daily precipitation levels can be as high as 25 millimeters (1 inch), and historical maximums have exceeded 50 millimeters (2 inches) per day. Occasional summer thunderstorms can produce heavy rains that can cause flash floods. From November through April, precipitation might fall as snow. Mean average total snowfall is about 150 millimeters (6 inches).

Local topography influences winds in western Churchill County along the Mina rail alignment. Wind speeds are highest in the spring and occasionally generate dust storms. Annual average wind speed is 2.8 meters per second (6.3 miles per hour), with calm conditions (wind speeds of less than 0.58 meter per second [1.3 miles per hour]) occurring about 20 percent of the time.

3.3.4.3.2 Lyon County

The Mina rail alignment would cross through Lyon County from just west of the Lahontan Dam around Silver Springs and then past Wabuska and the Fort Churchill siding. The area lies to the east of the moisture-trapping Sierra Nevada Mountains. Mina rail alignment elevations through the county would range from about 1,200 meters (3,900 feet) to about 1,300 meters (4,300 feet). This area experiences abundant hours of cloud-free days, low annual precipitation (less than 150 millimeters [6 inches] per year), and large diurnal ranges in temperature.

Within Lyon County, the mean annual temperature along the Mina rail alignment is approximately 13° Celsius (55° Fahrenheit) north of Wabuska; south of Wabuska, temperatures are moderated due to cold air drainage along the Walker River, with a mean annual air temperature of 10° Celsius (50° Fahrenheit). Because of the arid climate, it is common for strong daytime heating and rapid nighttime cooling to result in large variations in temperature, particularly during the summer. Summertime mean maximum temperatures are approximately 41° Celsius (105° Fahrenheit), while in the vicinity of the Walker River they average approximately 34° Celsius (93° Fahrenheit). Winter mean minimum temperatures are approximately minus 12° Celsius (10° Fahrenheit) north of Wabuska, while in the vicinity of the Walker River they average approximately minus 8.9° Celsius (16° Fahrenheit). Annual precipitation in Lyon County averages less than 150 millimeters (6 inches) per year, with higher amounts found at higher elevations and lower amounts at lower elevations. During the summer, occasional thunderstorms can produce heavy rains and cause flash floods. Daily precipitation levels have occasionally exceeded 25 millimeters (1 inch), but generally are much less. Precipitation from November through April might fall as snow, particularly at higher elevations. Snowfall averages are around 76 to 180 millimeters (3 to 7 inches).

Local topography in Lyon County strongly influences winds along the Mina rail alignment. Local winds are generally channeled by topography, with prevailing wind direction oriented along valley axes. Highest wind speeds occur in the spring, and occasionally generate dust storms. Annual average wind speeds are around 2.3 meters per second (5.1 miles per hour), with calm conditions occurring more than 30 percent of the time, mostly during the night.

3.3.4.3.3 Mineral County and the Walker River Paiute Reservation

The Mina rail alignment would cross through Mineral County and the Walker River Paiute Reservation from just east of the Fort Churchill siding and then around Schurz and Walker Lake to Redlich Summit. The area lies to the east of the moisture-trapping Sierra Nevada Mountains. Elevations of the alignment through the county and Reservation would range from about 1,300 meters (4,300 feet) to about 1,500 meters (5,000 feet). This area experiences abundant hours of cloud-free days, low annual precipitation (less than 250 millimeters [10 inches] per year), and large diurnal ranges in temperature.

Within Mineral County and the Walker River Paiute Reservation, the mean annual temperature along the Mina rail alignment in the vicinity of the Walker River is approximately 11° Celsius (52° Fahrenheit);

south of Walker Lake the mean air temperature is slightly warmer at 13° Celsius (55° Fahrenheit). This is due to the absence of the nighttime cold air drainage winds along the Walker River. Because of the arid climate, it is common for strong daytime heating and rapid nighttime cooling to result in large variations in temperature, particularly during the summer. Summertime mean maximum temperatures are approximately 34° Celsius (93° Fahrenheit) at northerly locations and around 36° Celsius (96° Fahrenheit) at southerly locations, and are accompanied by low relative humidity (commonly less than 10 percent). Winter mean minimum temperatures are approximately minus 8° Celsius (17° Fahrenheit) in the vicinity of Walker River and minus 6° Celsius (22° Fahrenheit) in the southern portion of the county.

Annual precipitation in Mineral County and the Walker River Paiute Reservation averages less than 130 millimeters (5 inches) per year, with higher amounts at higher elevations and lower amounts at lower elevations. During the summer, occasional thunderstorms can produce heavy rains and cause flash floods. Daily precipitation levels have occasionally exceeded 50 millimeters (2 inches), but generally are much less than 25 millimeters (1 inch) of rain. Precipitation from November through April might fall as snow, particularly at higher elevations. Snowfall averages are around 76 to 180 millimeters (3 to 7 inches).

Local topography in Mineral County and the Walker River Paiute Reservation strongly influences winds along the Mina rail alignment. Local winds are generally channeled by topography, with prevailing wind direction oriented along valley axes. Highest wind speeds occur in the spring and occasionally generate dust storms. Annual average wind speeds at the Schurz station on the Walker River Paiute Reservation, which are representative of the Mina rail alignment in the vicinity of Walker River, are around 1.7 meters per second (3.9 miles per hour); slightly more than 20 percent of the time the area experiences calm conditions. Farther south wind speeds are higher, with an annual average wind speed of 3.6 meters per second (8.1 miles per hour); slightly more than 4 percent of the time the area experiences calm conditions.

3.3.4.3.4 Esmeralda County

The Mina rail alignment would cross through Esmeralda County from Redlich Pass to Lida Junction and would be east of the highest peaks of the Sierra Nevada and White Mountain ranges. Elevations of the alignment through the county would range from about 1,300 meters (4,300 feet) to around 1,700 meters (5,500 feet). This area experiences abundant hours of cloud-free days, low annual precipitation (less than 250 millimeters [10 inches] per year), and large daily ranges in temperature.

Within Esmeralda County, the mean annual temperature along the Mina rail alignment is approximately 10° Celsius (50° Fahrenheit). Because of the arid climate, it is common for strong daytime heating and rapid nighttime cooling to result in large variations in temperature, particularly during the summer months. Summertime mean maximum temperatures are approximately 32° Celsius (90° Fahrenheit) at higher elevations and around 37° Celsius (98° Fahrenheit) at lower elevations, and are accompanied by low relative humidity (commonly less than 10 percent). Winter mean minimum temperatures are approximately minus 7° Celsius (20° Fahrenheit) in December and January.

Annual precipitation in Esmeralda County averages less than 180 millimeters (7 inches) per year, with higher amounts found at higher elevations and lower amounts at lower elevations. During the summer, occasional thunderstorms can produce heavy rains and cause flash floods. Daily precipitation levels have occasionally exceeded 50 millimeters (2 inches), but generally are less than 25 millimeters (1 inch) of rain. Precipitation from October through April might fall as snow, particularly at higher elevations. Snowfall averages are around 380 millimeters (15 inches) at higher elevations.

Local topography in Esmeralda County strongly influences winds along the Mina rail alignment. Local winds are generally channeled by topography, with prevailing wind direction oriented along valley axes. Highest wind speeds occur in the spring, and occasionally generate dust storms. Annual average wind speeds at the Goldfield station are around 2.7 meters per second (6 miles per hour); slightly more than 5 percent of the time the area experiences calm conditions.

3.3.4.3.5 Nye County

Through southern Nye County, the Mina rail alignment would lie to the east of the Grapevine and Funeral Mountains as well as the southern Sierra Nevada Mountains, a large mountain ***barrier*** that prevents much of the moist Pacific Ocean air from reaching the area. The result is that most of the area is largely desert. The Mina rail alignment through Nye County principally drops in elevation starting from approximately 1,400 meters (4,700 feet) at Stonewall Pass to 1,100 meters (3,500 feet) near the end of the Mina rail alignment at Yucca Mountain, and presents a wide variation in temperature and precipitation. In general, the climatic features can be described as abundant hours of cloud-free days, low annual precipitation (less than 250 millimeters [10 inches] per year), and large daily ranges in temperature.

In Nye County, the mean annual temperature along the Mina rail alignment ranges from approximately 16° Celsius (61° Fahrenheit) at lower elevations to approximately 13° Celsius (56° Fahrenheit) at the highest elevations. Because of the arid climate, it is common for strong daytime heating and rapid nighttime cooling to result in large variations in temperature, particularly during the summer months. Daily temperature variations are smaller during winter months, and less pronounced at higher elevations. At the lowest elevations along the Mina rail alignment, summertime maximum temperatures frequently exceed 38° Celsius (100° Fahrenheit), and are accompanied by low relative humidity (commonly less than 10 percent).

Annual precipitation averages less than 250 millimeters (10 inches) per year at all locations across southern Nye County, with most precipitation occurring during the winter months. Along the Mina rail alignment, precipitation is lowest from the Sarcobatus Flat station to the Beatty station, averaging just 76 to 100 millimeters (3 to 4 inches) per year because of the ***rain shadow*** effects from the Sierra Nevada and Amargosa Mountain Ranges. At higher elevations, a secondary peak in rainfall (associated with increased thunderstorm activity) occurs during the late summer months; at lower elevations, this precipitation often evaporates before reaching the ground. The thunderstorms occasionally produce heavy rains that can cause flash floods. Daily precipitation levels can be high, and historical maximums have reached 61 millimeters (2.4 inches) at the Sarcobatus Flat station, with a number of locations exceeding 41 millimeters (1.6 inches).

From November through April, precipitation in southern Nye County along the Mina rail alignment might fall as snow. Mean average snowfall is about 50 to 130 millimeters (2 to 5 inches).

Local topography in southern Nye County strongly influences winds along the Mina rail alignment. Local winds are generally channeled by topography, with prevailing wind direction oriented along valley axes. Wind speeds are highest in the spring, and occasionally generate dust storms at playas. The extreme highest wind speeds are along ridgetops. Winds of more than 40 meters per second (90 miles per hour) have been recorded along ridgetops at the Nevada Test Site station. Annual average wind speeds are much lower, with annual average speeds of 2.4 meters per second (5.4 miles per hour) at Sarcobatus Flat and 2.2 meters per second (4.9 miles per hour) at Beatty. Through southern Nye County, calm conditions are most frequent at Sarcobatus Flat station, and characterize wind conditions in the area about 7 percent of the time.

3.3.5 SURFACE-WATER RESOURCES

This section describes surface-water resources along the Mina rail alignment. Surface-water resources include streams, washes, playas, ponds, wetlands, floodplains, and springs. Section 3.3.5.1 describes the region of influence for surface-water resources along the Mina rail alignment; Section 3.3.5.2 is a general overview of surface-water features along the rail alignment; and Section 3.3.5.3 describes specific surface-water features for the alternative segments and common segments. Section 3.3.5.2.3 and 3.3.5.2.4 describe wetlands and floodplains, respectively, from a regulatory perspective; Section 3.3.7, Biological Resources, describes wetlands from a habitat perspective. Appendix F (Floodplain and Wetlands Assessment) addresses compliance with Executive Orders 11988, *Floodplain Management*, and 11990, *Protection of Wetlands*, in more detail.

3.3.5.1 Region of Influence

The Mina rail alignment region of influence for surface-water resources is limited in most cases to the nominal width of the construction right-of-way. Because of the types of land-disturbing activities that would take place during rail line construction, the construction right-of-way would be susceptible to erosion and changes in surface-water flow patterns. Spills (of, for example, fuel, paint, or lubricants) during railroad construction and operations could also affect this area.

In some cases, the region of influence for surface water extends beyond the construction right-of-way. In places where surface-water flow patterns (including floodwaters) could be modified or surface-water drainage could carry eroded soil, sediment, or spills downstream, the region of influence extends beyond the construction right-of-way. Within the region of influence, there could be impacts to floodwaters such that they would back up on the upstream side of the rail line, while there could be impacts to water quality if potential pollutants travel downstream during a storm event without precipitating out (soils from erosion) or becoming too dilute (petroleum-based lubricants or fuels) to detect. For purposes of analysis, DOE screened the area within 1.6 kilometers (1 mile) of the centerline of the rail alignment for surface-water resources that could be indirectly affected.

Surface-Water Terms

An **ephemeral stream** or ephemeral drainage has a channel bed above the normal water table and only flows in direct response to precipitation or snowmelt within its drainage basin.

An **intermittent stream** or intermittent drainage has a channel bed that fluctuates above or below the normal water table along its length, and might or might not have flow within it during any particular time or at any particular location. The presence of flow within the channel is determined by its channel elevation in relation to the water table, precipitation events, or snowmelt within its drainage basin.

A **wash** or drainage in the western United States generally refers to the dry streambed of an intermittent or ephemeral stream. In this Rail Alignment EIS, wash is used interchangeably with intermittent and ephemeral streams.

A **perennial stream** or perennial drainage receives groundwater into its channel and its stream bed is normally below the water table. During years with normal precipitation, a perennial stream will have constant flow.

A **playa** is normally a dry lake bed that can contain water in response to seasonally high runoff.

Evapotranspiration is a combination of processes through which water is transferred to the atmosphere from evaporation from open water and bare soil, and transpiration from vegetation.

3.3.5.2 General Environmental Setting and Characteristics

Important characteristics of hydrologic systems in the region of influence include ephemeral streams and playas. Ephemeral surface-water features can be dry over multiple seasons or even years during droughts, but can have multiple periods of flow or standing water during wet periods, as during the winter of 2004-2005. Central and southern Nevada are characterized by low precipitation and high annual ***evapotranspiration*** rates typical of desert climates, as described in Section 3.3.4, Air Quality and Climate. Because of the arid climate and the terrain (that is, north-south trending, parallel mountain ranges with broad, intervening valleys) in this area, surface water generally evaporates before it can flow out of the drainage basin. Typically, surface drainage in this area remains within its topographically defined water basin; that is, surface water generally flows to low areas such as lakes, flats, or playas.

Notable drainage channels, as referenced in the text and shown on figures in Section 3.3.5.3, were determined by choosing those channels with a stream order of 2 or greater based on Strahler's ordering system, with the National Hydrography Dataset as a base map.

Surface-water systems are typically defined in terms of watersheds (or basins). For water planning and management purposes, the State of Nevada is divided into discrete hydrologic units delineated by 14 major hydrographic regions that are subdivided into 256 hydrographic areas (DIRS 103406-Nevada Division of Water Planning 1992, all). In this Rail Alignment EIS, watersheds (or basins) are referred to as hydrographic regions. A region is defined as a geographic area drained by a single major stream or an area consisting of a drainage system comprised of streams and often natural or manmade lakes.

Overall, most surface-water features described in this section are ***ephemeral drainage*** features that intermittently contain flowing water. Walker River and some of its tributaries near the beginning of the Mina rail alignment are the exceptions, where surface-water flow is perennial. This section describes surface-water features in terms of the hydrographic regions in which they are located. Figure 3-179 shows the hydrographic basins within Nevada and the boundaries for the four hydrographic regions the Mina rail alignment would cross. Most of the existing Union Pacific Railroad Hazen Branchline would be within the Carson River Basin, while a small portion of this line, the existing Department of Defense Branchlines (North, through Schurz, and South), and a small portion of Mina common segment 1 would be within the Walker River Basin. The majority of the rail alignment (most of Mina common segment 1, the Montezuma alternative segments, Mina common segment 2, the Bonnie Claire alternative segments, and common segment 5) would be within the Central Region. The Oasis Valley alternative segments and common segment 6 would be in the Death Valley Basin.

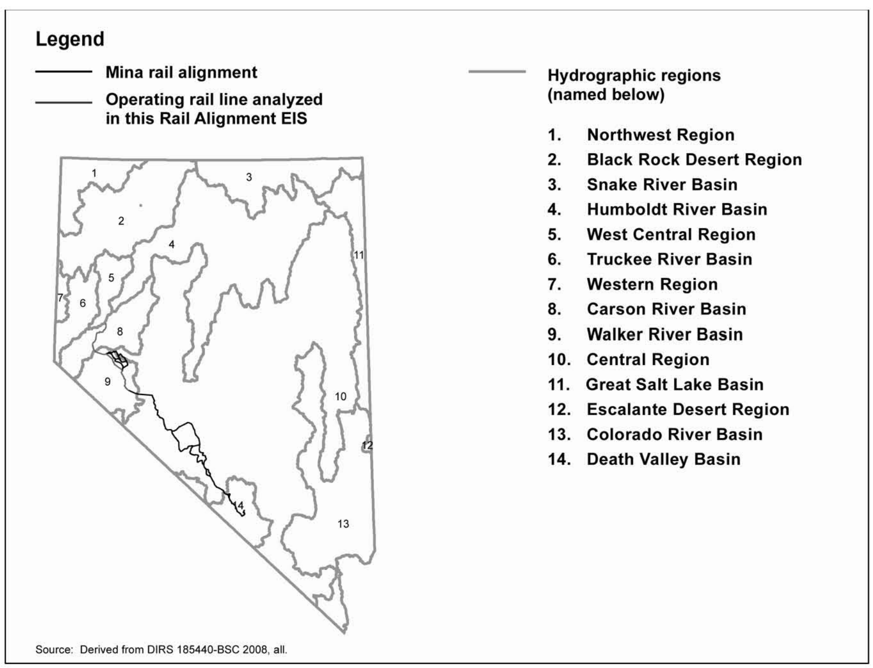


Figure 3-179. Nevada hydrographic regions the Mina rail alignment would cross.

3.3.5.2.1 Surface Drainage Features (Streams and Playas)

As described in Section 3.3.1, Physical Setting, the Mina rail alignment would pass through numerous valleys and over or around numerous mountain ranges. The need for relatively gentle curves and gradients sets physical limitations on the design of the rail line that would require the alignment to follow valley floors that go around mountain ranges, or parallel the mountain ranges in transition zones to change elevation gradually (DIRS 182824-Nevada Rail Partners 2007, Appendix B). Within the valley floors, the rail alignment could parallel predominant drainage channels and cross through or near flats and playas. Some streams within low areas are braided channels where stream flow is divided among multiple channels, which the rail alignment could cross in several locations. Near or within mountain ranges, the rail alignment typically would be perpendicular to the predominant drainage direction. Therefore, the Mina rail alignment would encounter a wide variety of surface drainage features.

Drainage features have been classified using Strahler’s stream order system (DIRS 176728-Goudie et al., ed. 1981, pp. 50 and 51), which is a method of classifying stream segments based on the number of upstream tributaries. Stream order ranks the size and potential power of streams. Orders range from small streams with no branches (1st Order) up to streams the size of the Mississippi River, which is a 10th Order stream. As two 1st Orders come together, they form a 2nd Order stream. Two 2nd Order streams converging form a 3rd Order stream. Streams of lower order joining a higher order stream do not change the order of the higher order stream.

DOE used stream order to define ***notable drainage channels*** and as a method to select the number of ***ephemeral washes*** shown on figures in Section 3.3.5.3. To improve the readability of these figures and provide a means to prioritize the drainage features, these figures depict only rivers, streams, and washes the rail alignment would cross that are 2nd Order streams or higher. Figures in Section 3.3.5.3 do not show all the washes and drainages the rail alignment would cross, but provide enough information to support the analysis of potential impacts to surface-water resources. Section 4.3.5 identifies the estimated number of drainage channels the rail alignment would cross by alternative segment and common segment.

3.3.5.2.1.1 Surface-Water Quality. Because of the ephemeral nature of surface water in the southwestern part of Nevada, water-quality data for the region of influence are limited. The State of Nevada does not formally monitor surface water in the Mina rail alignment region of influence.

Water-quality data for the state of Nevada are available through the Nevada District of the U.S. Geological Survey and the Nevada Division of Environmental Protection. Surface-water samples are collected from several major river basins in the state and then analyzed for physical and chemical parameters. The routine water-quality monitoring network includes the following river/basin systems: Walker River, Humboldt River, Colorado River, Lake Tahoe Tributaries, Snake River, Truckee River, Carson River, and Steamboat Creek. The Carson River and Walker River Basins are the only basin systems in the Nevada Division of Environmental Protection’s monitoring system relevant to the region of influence for the Mina rail alignment (DIRS 176306-NDEP 2005, all).

In accordance with federal regulations, each state is required to submit a report on overall water-quality conditions to the U.S. Environmental Protection Agency every 2 years. According to the Nevada Division of Environmental Protection report for 2005 (DIRS 176306-NDEP 2005, all), agriculture and grazing have the greatest impacts on Nevada’s waters, mainly because of ***nonpoint source pollution*** (such as irrigation, grazing, and flow-regulation practices). Flow reductions have a great impact on streams, limiting dilution of salts, minerals, and pollutants. Temperature, ***pH***, dissolved oxygen, nutrients, and suspended solids are the main pollutants of concern in the state. Agricultural sources generate large sediment and nutrient loads. Surface-water quality in Nevada varies greatly from location to location and from month to month with changes in flow. In general, concentrations of dissolved solids are higher in the southern part of the state than in the northern part, depending largely on water discharge (DIRS 176316-Bostic et al. 2004, all). Because of dilution by precipitation or snowmelt, dissolved solids concentrations are usually highest during periods of low stream flow and lowest during periods of high stream flow.

According to the Nevada Division of Environmental Protection Agency 305(b) report, the Walker River experienced improvement in pH, nitrates, and phosphates during the 2004 reporting cycle (DIRS 176306-NDEP 2005, p. 2). The report cited temperature as a continuing problem in the system and total dissolved solids as a continuing problem for the lower reach, including Walker Lake. Near Wabuska, the Walker River is listed as an impaired stream and the types of pollutants affecting the water vary throughout the stream reach. Typical pollutants consist of total phosphorus, total iron, pH, and suspended solids (DIRS 180120-NDEP 2005, Appendix A and p. A-9). Walker Lake became at-risk because of upstream agricultural diversions; upstream diversions have caused Walker Lake to decline, thereby causing the total dissolved solids concentrations to increase (DIRS 176325-USGS 2006, all). Because of its high salt content, Walker Lake is listed as an impaired waterbody (DIRS 176306-NDEP 2005, p. 99).

No site-specific water chemistry data are available for the rest of the stream channels or washes the Mina rail alignment would cross. No other streams the alignment would cross are known to be impaired. DOE previously collected and analyzed surface-water samples for chemical characteristics in the Yucca Mountain region. These analytical data are provided in the Yucca Mountain FEIS (DIRS 155970-DOE 2002, p. 3-40).

3.3.5.2.1.2 Stream Flow. The U.S. Geological Survey has stream-gaging stations (many of which have been discontinued) throughout Nevada. Stream-flow data from these monitoring stations are available through the Geological Survey Nevada District. Table 3-104 lists the range of peak discharges for typical or major streams along the Mina rail alignment. DOE cross-referenced peak discharge measurements at and near the Nevada Test Site with a Geological Survey fact sheet that discusses significant flooding events in the Amargosa River drainage basin in 1995 and 1998 (DIRS 159895-Tanko and Glancy 2001, Table 2).

Most of the drainage channels the Mina rail alignment would cross typically flow only during significant (heavy) rainfall events, which generally occur only a few times a year. In many years, most of the streams listed in Table 3-104 have little or no flow. From late spring to early fall, precipitation patterns are dominated by convective, short-duration, and high-intensity thunderstorms. From late fall to early spring, precipitation patterns are dominated by long-duration, low-intensity, general storm events with both rain and snow possible throughout the area. These two types of precipitation events result in runoff that differs between smaller watersheds (up to 520 square kilometers [200 square miles]) and larger watersheds (greater than 520 square kilometers). For smaller watersheds, the summer thunderstorm events dominate the peak runoff rates, which occur in the tributary channels and washes. However, as watershed size increases, the general storm events eventually dominate the peak rates of runoff. In addition, for all watersheds, the volume of runoff will generally be greater for the general (winter) storm events than for the thunderstorm (summer) events (DIRS 180885-Parsons Brinckerhoff 2007, p. 12).

Generally, stream discharge in Nevada is low in late summer, and then increases through the autumn and winter until the snow melts in the spring. Maximum discharge for the year normally can be expected in May and June, although rain or snow has caused floods from November through March (DIRS 176308-Stockman et. al. 2003, p. 2). As shown in Table 3-104, the more significant peak-flow scenarios relevant to the Mina rail alignment occur within the Carson River, Walker River, and Upper Amargosa hydrologic units. The highest peak flows for Nevada's hydrographic regions generally occur during late winter due to snowmelt and late summer due to intense precipitation.

The Carson River originates from the Sierra Nevada Mountains in California and flows generally northeast into Nevada where it passes through Carson City and terminates in the Carson Sink. Between Carson City and Fallon, the river is impounded by the Lahontan Dam and forms the Lahontan Reservoir, water from which is distributed throughout the Fallon area for agricultural, wildlife, and fisheries purposes (DIRS 103406-Nevada Division of Water Planning 1992, all).

Table 3-104. U.S. Geological Survey annual peak flow measurements for selected sites in streams of hydrographic basins and areas along the Mina rail alignment[a] (page 1 of 2).

Hydrologic unit (gaging station number)	Drainage area (square miles)[b]	Annual peak flow range (cubic feet per second)[c]	Typical peak flow month(s)	Years of record (number of counts)
Areas along the alignment				
Carson River Basin (existing Union Pacific Railroad Hazen Branchline and Department of Defense Branchlines North, through Schurz, and South)				
Carson River Basin near Fort Churchill (10312000)	1,300	35 to 1,090	January through June	1912-2006 (95)
Walker River Basin (Schurz alternative segments)				
Walker River near Wabuska (10301500)	2,600	39 to 3,300	May through June	1903-2005 (86)
Walker River near Mason (10300600)	2,400	325 to 2,800	May through June	1974-1984 (11)
Reese River Canyon near Schurz (10302010)	14	0 to 1,870	May through June	1963-1991 (22)
Walker River at Schurz (10302000)	2,900	60 to 2,500	May through June	1914-1933 (20)
Walker River above Weber Reservoir near Schurz (10301600)	2,700	78 to 2,010	May through June	1977-2006 (17)
Ralston-Stone Cabin Valleys (Mina common segment 2)				
Ralston Valley tributary near Tonopah (10249140)	0.2	0 to 48	July and August	1961-1981 (21)
Cactus-Sarcobatus Flats (Mina common segment 2; Mina common segment 4; common segment 5)				
Stonewall Flat tributary near Goldfield (10248970)	0.53	0 to 150	June through August	1963-1984 (20)
Areas in the Nevada Test Site				
Upper Amargosa (Oasis Valley alternative segments 1 and 3; common segment 6)				
Pah Canyon Wash above Fortymile Wash confluence (102512495)	6.3	90	February	1998 (1)
Unnamed tributary to Fortymile Wash north of Delirium Canyon (102512496)	1.1	180	February	1998 (1)
Delirium Canyon Wash above Fortymile Wash confluence (102512497)	2.4	120	February	1998 (1)
Unnamed tributary to Fortymile Wash south of Delirium Canyon (102512499)	0.81	70	February	1998 (1)
Fortymile Wash at narrows (10251250)	260	0 to 3,000	March	1982-1998 (8)
Yucca Wash near mouth (10251252)	17	0 to 940	February and March	1982-1998 (10)
Pagany Wash near the Prow (102512531)	0.47	20 to 60	February and March	1995-1998 (2)
Pagany Wash #1 near Well UZ (102512533)	0.82	0 to 17	February and March	1993-1998 (2)
Drillhole Wash above UZ (10251235)	0.68	0 to 30	March	1994-1998 (3)

Table 3-104. U.S. Geological Survey annual peak flow measurements for selected sites in streams of hydrographic basins and areas along the Mina rail alignment[a] (page 2 of 2).

Hydrologic unit (gaging station number)	Drainage area (square miles)[b]	Annual peak flow range (cubic feet per second)[c]	Typical peak flow month(s)	Years of record (number of counts)
Areas in the Nevada Test Site (continued)				
Upper Amargosa (Oasis Valley alternative segments 1 and 3; common segment 6)				
Wren Wash at Yucca Mountain (1025125356)	0.23	0 to 30	March	1994-1998 (3)
Split Wash below Quac Canyon Wash (102512537)	0.33	0 to 13	February	1994-1998 (3)
Split Wash at Antler Ridge (1025125372)	2.35	0 to 2	February	1994-1998 (3)
Drillhole Wash at mouth (10251254)	16	0 to 790	July	1982-1998 (10)
Fortymile Wash near Well J (1310251255)	304	0 to 3,000	March through July	1984-1998 (7)
Dune Wash near Busted Butte (10251256)	6.8	0 to 14	August	1982-1995 (9)
Topopah Wash at Little Skull Mountain (10251260)	105	0 to 1,500	August	1984-1998 (8)
Beatty Wash near Beatty (10251215)	95	0 to 900	July through March	1989-1998 (5)
Amargosa River at Beatty (10251217)	460	1.1 to 1,000	March through August	1994-2004 (10)
Fortymile Wash near Amargosa Valley (10251258)	320	0 to 3,300	February through July	1969-2004 (23)
Topopah Wash at Highway 95 near Amargosa Valley (10251261)	150	20	February	1998 (1)

a. Sources: DIRS 176325-USGS 2006, all; DIRS 159895-Tanko and Glancy 2001, Table 2.
b. To convert square miles to square kilometers, multiply by 2.59.
c. To convert cubic feet per second to cubic meters per second, multiply by 0.00047195.

The Walker River, with its headwaters in California, flows into Nevada through the Walker River Paiute Reservation before terminating at Walker Lake. Waters of the Walker River are predominantly used for agricultural purposes (DIRS 103406-Nevada Division of Water Planning 1992, all). Walker Lake is fed by the Walker River from the north and is a perennial, natural terminal lake. The lake became at-risk because of upstream diversions for irrigation purposes; between 1882 and 1994, upstream diversions caused Walker Lake to decline about 40 meters (140 feet) (DIRS 176325-USGS 2006, all), which has resulted in high salt concentration.

The washes that drain the Yucca Mountain Site discharge into the Amargosa River. This ephemeral drainage typically sees very low runoff rates due to minimal precipitation in its basin and, therefore, is usually dry (DIRS 159895-Tanko and Glancy 2001, p. 1). Precipitation is least along the Mina rail alignment in this area, from Sarcobatus Flat to Beatty, averaging just 75 to 100 millimeters (3.0 to 3.9 inches) per year. Most of the annual precipitation typically occurs in late spring to early fall. Fortymile Wash and Topopah Wash are significant tributaries draining the Nevada Test Site area into the Amargosa River, with maximum peak flows of 94 cubic meters (3,300 cubic feet) per second and 42 cubic meters (1,500 cubic feet) per second, respectively, during late winter to late summer (see Table 3-104). Section 3.3.5.2.4 describes two significant flooding events (March 1995 and February 1998) in the Amargosa River drainage basin on and near the Nevada Test Site.

3.3.5.2.2 Waters of the United States

> The term **waters of the United States** is defined in 33 CFR 328.3a. The U.S. Army Corps of Engineers and the Environmental Protection Agency regulate the placement of dredged or fill material into these waters. The definition incorporates channels with ephemeral and intermittent flow that exhibit specific physical features, including channel shape and surrounding vegetation, that would provide indications of an ***ordinary high water mark.***
>
> **Ordinary high water mark** means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas (33 CFR 328.3e).

Some of the surface-water features along the Mina rail alignment, such as ephemeral drainages, streams, ponds, and lakes, are considered waters of the United States, especially if there is an interstate connection to commerce. Section 404 of the Clean Water Act (33 U.S.C 1344) and implementing regulations (33 CFR Part 323) require the U.S. Army Corps of Engineers to regulate discharges of dredge or fill material into waters of the United States. Discharges of dredge or fill material essentially include all land-disturbing activities accomplished via the use of mechanized equipment. The placement of structures, such as bridge embankments, bridge piers and abutments, and culverts, would be activities potentially discharging fill materials into waters of the United States. Chapter 6 of this Rail Alignment EIS discusses compliance with Section 404 of the Clean Water Act in more detail.

DOE surveyed all drainages within 400 meters (0.25 mile) of the Mina rail alignment that are within interstate hydrologic basins to determine if those drainages could be classified as waters of the United States (DIRS 180889-PBS&J 2007, p. 1). This survey also identified and delineated wetlands along the Mina rail alignment. The alignment-specific discussions in Section 3.3.5.3 detail the results of the survey. Subsequent to DOE surveys performed along the rail alignment, the U.S. Environmental Protection Agency and U.S. Army Corps of Engineers released new guidance to be used when making determinations of waters of the United States subject to jurisdiction under the Clean Water Act. This guidance provides criteria for making these determinations for adjacent wetlands and non-navigable tributaries of waters of the United States, particularly in relation to ephemeral waters. As a result of this guidance, it is likely that many of the drainages along the rail alignment would not be considered waters of the United States (see Section 4.3.5.2.1.4 for further discussion).

The U.S. Army Corps of Engineers is ultimately responsible for determining whether drainages and wetlands along the rail alignment are regulated under Section 404; therefore, all conclusions in this analysis about the classification of washes and wetlands as waters of the United States are tentative. If DOE pursued the Mina rail alignment for construction of the proposed railroad, the Department would request that the U.S. Army Corps of Engineers determine the limits of jurisdiction under Section 404 along the alignment before beginning construction.

3.3.5.2.3 Wetlands

Generally, wetlands are lands where saturation with water is the dominant factor that determines how soil develops and the types of plant and animal communities living in the soil and on its surface (DIRS 178724-Cowardin et al. 1979, p. 11). Wetlands can support both aquatic and terrestrial species. The prolonged presence of water creates conditions that favor the growth of specially adapted plants and promote the development of characteristic wetland (***hydric***) ***soils***.

According to the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers, the regulatory definition of a Section 404 jurisdictional wetland is (33 CFR 328.3b) "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." The U.S. Department of Agriculture Natural Resources Conservation Service and U.S. Fish and Wildlife Service define wetlands somewhat differently, but all four agencies include three basic elements for identifying wetlands: ***hydrology***, soils, and vegetation. Wetland communities are recognized as providing many valuable functions that improve the human environment. Wetlands that have surface-water connections to or are adjacent to (bordering, contiguous, neighboring) other waters of the United States are regulated under Section 404 of the Clean Water Act. Wetlands that are isolated – that is, they have no permanent or temporary surface-water connections to interstate water bodies or are not considered adjacent – are not typically regulated under Section 404 unless the use of these isolated wetlands could affect interstate commerce.

Surveys in support of this Rail Alignment EIS have identified wetlands along the Mina rail alignment (DIRS 180889-PBS&J 2007, all). Tables in Section 3.3.5.3 list wetlands identified during these surveys. Appendix F discusses wetlands along the Mina rail alignment in more detail, and Section 3.3.7, Biological Resources, discusses wetlands from a habitat perspective.

3.3.5.2.4 Floodplains

The presence of floodplains in the Mina rail alignment region of influence largely depends on the meteorology and hydrology of the area. Much of the rail alignment would be in areas that are subject to intense rainfall over a short duration (1 to 3 hours), which typically occurs in late spring to early fall. Precipitation in late fall to early spring is dominated by low-intensity rainfall or snow over a long duration (2 to 4 days). In both cases, precipitation has the potential to produce flooding (DIRS 180885-Parsons Brinckerhoff 2007, pp. 12 to 14). Evapotranspiration rates throughout the region of influence are high; therefore, most of the rainfall from summer storms is lost relatively quickly unless a storm is intense enough to produce runoff, or unless there are more storms before the water evaporates (DIRS 180885-Parsons Brinckerhoff 2007, p. 18). Evapotranspiration rates are lower during the winter, and water from precipitation or melting snow has a better chance of resulting in streamflow, thereby increasing the chances of flooding. Much of the runoff quickly infiltrates into rock fractures or into the dry soils, some is carried down alluvial fans in arroyos, and some drains onto dry lakebeds where it might stand for weeks as a lake (DIRS 180885-Parsons Brinckerhoff 2007, p. 17).

Although flow in most washes is rare, the area is subject to flash flooding from intense summer thunderstorms and sustained winter precipitation. When it occurs, intense flooding can include mud and debris flows in addition to water runoff. Thunderstorms in the area can be local and intense, creating runoff in one wash while an adjacent wash receives little or no rain. In rare cases, however, storm and runoff conditions can be extensive enough to result in flow being present throughout the drainage systems. For example, conditions recorded during March 1995 and February 1998 at the Amargosa River and its tributaries indicated that the channels all flowed simultaneously along its primary stream channels to Death Valley. The 1995 event was the first documented case of this flow condition. During the 1995 event, the peak flow near the location where the existing Yucca Mountain access road crosses Fortymile Wash was approximately 100 cubic meters (3,500 cubic feet) per second (DIRS 180885-Parsons Brinckerhoff 2007, p. 18).

A majority of large flood causing events in and around the rail alignment on smaller watersheds are the result of short duration, high intensity summer thunderstorm events. These storms have caused significant flood damage to various watersheds both in and surrounding the rail line watersheds. For example, a flood event on August 1, 1968, on an Amargosa River tributary near Mercury recorded peak flood flow of 97 cubic meters (3,400 cubic feet) per second (DIRS 182755-Parsons Brinckerhoff 2005 p. 12). Historic floods in large watersheds have been caused by both short-duration, high-intensity summer thunderstorms and by long-duration, continuous winter general storms, including rail and snow events. For example, a flood event on February 24, 1969, on the Amargosa River near Beatty recorded peak flood flow of 453 cubic meters (16,000 cubic feet) per second (DIRS 182755-Parsons Brinckerhoff 2005, p. 13).

In accordance with the requirements of 10 CFR Part 1022, DOE reviewed available authoritative information to determine whether the Mina rail alignment would be located in wetlands or floodplains. The results of that effort (DIRS 180885-Parsons Brinckerhoff 2007, p. 9) indicated that the only flood map or flood studies available for the areas of the Mina rail alignment were those completed by the Federal Emergency Management Agency in the form of Flood Insurance Rate Maps. Furthermore, and consistent with the remoteness of the project area, DOE found that Federal Emergency Management Agency maps cover only about 20 percent of the rail alignment (see Appendix F, Table F-2). At present, there are no Federal Emergency Management Agency flood maps for areas northeast of Silver Springs, and the Agency has not mapped flood-prone areas east and west of where U.S. Highways 50 and 95 intersect, including a large portion of Lahontan Reservoir. Most of the mapped flood-prone areas are between Carson River and Wabuska. Federal Emergency Management Agency flood maps encompassing Department of Defense Branchline North indicate areas most prone to possible flooding correspond to emergent wetlands shown in the National Wetlands Inventory. The Federal Emergency Management Agency flood map shows no ***100-year flood***-prone areas next to the Walker River or any of its tributaries. There are limited flood-map data covering the southernmost section of Walker Lake and most of the area between Mina common segment 2 and the Yucca Mountain Site. DOE completed flood studies for several washes on the eastern slope of Yucca Mountain in support of the Yucca Mountain FEIS (DIRS 155970-DOE 2002, Figure 3-12 and pp. 3-37 to 3-39).

In accordance with 10 CFR Part 1022, DOE prepared a floodplain and wetland assessment (see Appendix F) for the Mina rail alignment. Appendix F provides a detailed discussion of the floodplains and wetlands the Mina rail alignment would cross, including figures of the relevant floodplains identified on Federal Emergency Management Agency maps and those identified near the repository site.

3.3.5.2.5 Springs

With the exception of surface-water bodies such as perennial streams and reservoirs, springs are the only other natural source of perennial surface water throughout the Mina rail alignment region of influence. Typically, these springs flow year round. The springs often infiltrate naturally into the ground or undergo evapotranspiration, or are captured near the source for local use (such as irrigation). DOE used the U.S. Geological Survey Geographic Names Information System, the National Hydrologic Dataset, and several DOE field studies completed in support of this Rail Alignment EIS to identify springs along the Mina rail alignment (DIRS 180889-PBS&J 2007, all; DIRS 180885-Parsons Brinckerhoff 2007, all). The best available data were used to identify springs along the proposed Mina rail alignment. Any additional springs would be identified and addressed during the final design phase of the railroad.

3.3.5.3 Surface-Water Features along Alternative Segments and Common Segments

DOE compiled this information using the National Wetland Inventory database, a U.S. Geological Survey dataset of hydrologic features known as the National Hydrological Dataset, a dataset from the U.S. Environmental Protection Agency Geographic Names Information System (DIRS 176979-MO0605GISGNISN.000), and DOE wetland surveys conducted in support of this Rail Alignment EIS (DIRS 180889-PBS&J 2007, all). Specific hydrologic features are divided into two categories: those within 150 meters (500 feet) of the rail alignment centerline and those between 150 meters and 1.6 kilometers (1 mile) from the rail alignment centerline. Both of these categories fall within the region of influence for surface-water resources. The first category is also within the nominal width of the rail line construction right-of-way.

Sections 3.3.5.3.1 through 3.3.5.3.12 describe surface-water resources for each Mina rail alignment alternative segment and common segment moving along the rail line from north to south (from Hazen, Nevada, to Yucca Mountain). Tables in these sections provide summaries of surface-water features identified along the Mina rail alignment region of influence. Figures in these sections show the proposed rail line location as it crosses Nevada's physiographic features. A key for these map areas is provided in Chapter 2, Figure 2-12.

3.3.5.3.1 Union Pacific Railroad Hazen Branchline (Hazen to Wabuska)

There would be no new construction and therefore no new land disturbance within or near the region of influence along this portion of the Mina rail alignment. Therefore, DOE has not characterized the surface-water features in this area.

3.3.5.3.2 Department of Defense Branchline North (Wabuska to the boundary of the Walker River Paiute Reservation)

Except for a new siding inside the existing rail line right-of-way, there would be no new construction or land disturbance along Department of Defense Branchline North within the region of influence (see Figure 3-180). Construction of this siding would not affect current drainage patterns. Therefore, DOE has not characterized surface-water features along this portion of the Mina rail alignment.

3.3.5.3.3 Department of Defense Branchline through Schurz

As part of the Mina Implementing Alternative, DOE would remove track, timber ties, and ballast, and grade the ballast section to a smooth surface along this branchline. This removal activity would not involve land disturbance outside the existing rail line right-of-way because these actions would be performed using equipment designed to move along the track. Therefore, DOE has not characterized surface-water features in this area.

3.3.5.3.4 Schurz Alternative Segments

3.3.5.3.4.1 Schurz Alternative Segment 1. From the northern end of Campbell Valley, Schurz alternative segment 1 would cross Walker River and two tributaries of the Walker River as it enters Sunshine Flat. The alternative segment would pass to the west of Painted Mesa, and east of Weber Reservoir and the northern end of the Wassuk Range before crossing U.S. Highway 95. It would then pass south of Calico Hills, enter an unnamed valley, and travel west of the Agai Pah Hills and the Gillis Range before ending near Gillis Canyon (see Table 3-105 and Figure 3-180). ***Construction camp*** 18A would be adjacent to Schurz alternative segment 1 approximately 75 meters (250 feet) east of its junction with U.S. Highway 95 (DIRS 180875-Nevada Rail Partners 2007, p. F-4). The construction camp would not overlie any surface-water features. There are no potential quarry sites along Schurz alternative segment 1.

Schurz alternative segment 1 would run northeast from Campbell Valley, where it would cross the Walker River and two tributaries to Walker River that receive their drainage from the Desert Mountains and later combine into one stream. The Walker River is a perennial stream that flows through Weber Reservoir and conveys surface water to a terminal basin called Walker Lake. Schurz alternative segment 1 would lie entirely within the Walker Hydrographic sub-basin, which has a total drainage area of approximately 2,600 square kilometers (1,000 square miles) (DIRS 180885-Parsons Brinckerhoff 2007, p. 20). The U.S. Geological Survey gaging station closest to Schurz alternative segment 1 is at the Walker River above Weber Reservoir near the community of Schurz. At this station, the river has a drainage area of

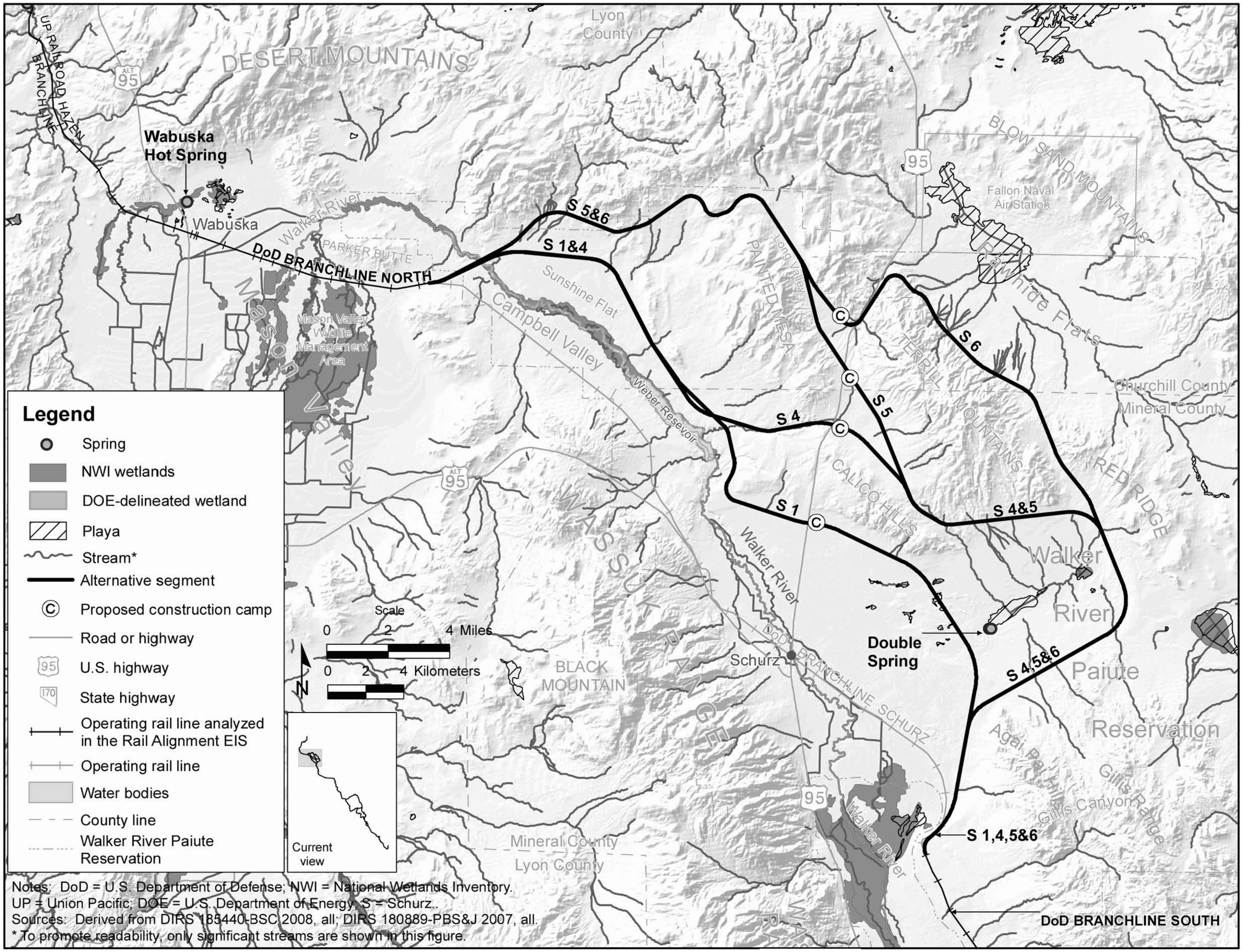


Figure 3-180. Surface drainage within map area 1.

Table 3-105. Hydrologic features potentially relevant to the Schurz alternative segments[a] (page 1 of 2).

General hydrographic features/drainage	Hydrologic features within 500 feet[b] of the centerline of the rail alignment	Hydrologic features between 500 feet and 1 mile[b] of the centerline of the rail alignment
Schurz alternative segment 1		
Drainage from the Desert Mountain Range, Painted Mesa, and Calico Hills to Sunshine Flat. Drainage from Calico Hills, Terrill Mountains, and Red Ridge into an unnamed valley. Drainage from the Agai Pah Hills into the Schurz 1 region of influence. Surface runoff would generally drain west and toward the Walker River.	Segment would cross Walker River and 20 unnamed washes (some of these washes are tributaries to Walker River). Segment would enter Sunshine Flat. Segment would cross through two unnamed playas and pass within 260 feet west of two other unnamed playas. Segment would cross over two DOE-delineated wetlands and pass within two other wetlands 360 feet north and 130 feet south of the alignment, respectively.	Weber Reservoir 0.62 mile west. Set of unnamed playas, within 0.99 mile west and 0.87 mile east of the alignment in the unnamed valley. Set of unnamed playas, west of the alignment and adjacent to Walker River (identified as wetlands in the National Wetland Inventory). Double Spring 0.93 mile east. Unnamed spring 0.88 mile east.
Schurz alternative segment 4		
Drainage from the Desert Mountain Range, Painted Mesa, and Calico Hills to Sunshine Flat. Drainage from Calico Hills, Terrill Mountains, and Red Ridge into an unnamed valley. Drainage from the Agai Pah Hills west toward Schurz 4.	Segment would cross Walker River and 41 unnamed washes (some of these washes are tributaries to Walker River). Segment would enter Sunshine Flat. Segment would cross through two unnamed playas and pass within 260 feet west of two other unnamed playas. Segment would cross over two DOE-delineated wetlands and pass within two other wetlands 360 feet north and 130 feet south of the alignment, respectively.	Weber Reservoir 0.53 mile west. Two unnamed playas, within 0.81 mile west and 0.93 mile west of the alignment in the unnamed valley. Set of unnamed playas, west of the alignment and adjacent to Walker River (identified as wetlands in the National Wetland Inventory).

Table 3-105. Hydrologic features potentially relevant to the Schurz alternative segments[a] (page 2 of 2).

General hydrographic features/drainage	Hydrologic features within 500 feet[b] of the centerline of the rail alignment	Hydrologic features between 500 feet and 1 mile[b] of the centerline of the rail alignment
Schurz alternative segment 5		
Drainage from the Desert Mountain Range, Painted Mesa, and Terrill Mountains to Long Valley. The alignment would include the entire drainage basin of Long Valley. Drainage from Calico Hills, Terrill Mountains, and Red Ridge into an unnamed valley. Drainage from the Agai Pah Hills west towards the rail alignment.	Segment would cross Walker River and 60 unnamed washes (some of these washes are tributaries to Walker River). Segment would cross over two DOE-delineated wetlands and pass within two other wetlands 23 feet north and 490 feet south of the alignment, respectively.	Two unnamed playas, within 0.81 mile west and 0.93 mile west of the alignment in the unnamed valley. Set of unnamed playas, west of the alignment and adjacent to Walker River (identified as wetlands in the National Wetland Inventory).
Schurz alternative segment 6		
Drainage from the Desert Mountain Range, Painted Mesa, and Terrill Mountains to Long Valley. The alignment would include the entire drainage basin of Long Valley. Drainage from Terrill Mountains to Rawhide Flat. Drainage from Calico Hills, Terrill Mountains, and Red Ridge into an unnamed valley. Drainage from the Agai Pah Hills west towards the rail alignment.	Segment would cross Walker River and 66 unnamed washes (some of these washes are tributaries to Walker River). Segment would enter Rawhide Flat. Segment would cross over two DOE-delineated wetlands and pass within two other wetlands 23 feet north and 490 feet south of the alignment, respectively.	Two unnamed playas, within 0.81 mile west and 0.93 mile west of the alignment in the unnamed valley. Set of unnamed playas, west of the alignment and adjacent to Walker River (identified as wetlands in the National Wetland Inventory).

a. Source: DIRS 177710-MO0607NHDWBDYD.000; DIRS 177714-MO0607NHDFLM06.000; DIRS 176979-MO0605GISGNISN.000; DIRS 176730-DeLorme 1996, pp. 51 to 53, 58, and 59.
b. To convert feet to meters, multiply by 0.3048; to convert miles to kilometers, multiply by 1.6093.

approximately 7,000 square kilometers (2,700 square miles) (see Table 3-104). Schurz alternative segment 1 would continue eastward and then head south into Sunshine Flat, which receives drainage from the Desert Mountains and Painted Mesa.

The segment would pass within 1 kilometer (0.62 mile) to the east of Weber Reservoir and cross numerous tributaries to the Walker River. There are no water-quality data available for this area; however, there are regional data for the Walker River Basin (DIRS 180064-USGS 2005, all). Schurz alternative segment 1 would then turn southeast along the southwest edge of the Calico Hills and enter an unnamed valley that receives its drainage from the Calico Hills, Terrill Mountains, Red Ridge, and Gillis Range. After passing the Calico Hills, Schurz alternative segment 1 would cross through two unnamed playas and bypass several other unnamed playas situated east and west of the segment in the unnamed valley. For most of the year, these playas and ponds would be dry; however, runoff from ephemeral washes draining the Calico Hills, Terrill Mountains, and Gillis Range would be conveyed into and toward these low-lying areas. During periods of intense precipitation, the size of the watershed and the number of ephemeral washes could provide enough runoff to create localized flooding. There is another set of playas at the southern end of Schurz alternative segment 1 adjacent to the Walker River. Additional surface runoff from ephemeral washes would drain from the Agai Pah Hills into the Schurz alternative segment 1 region of influence. Surface runoff would generally drain west toward Walker River.

The Walker River Basin is considered an interstate basin because it receives drainage from outside Nevada. During a survey of the washes along the Mina rail alignment in support of this Rail Alignment EIS, DOE identified the Walker River and three other washes that Schurz alternative segment 1 would cross as waters of the United States, as regulated under Section 404 of the Clean Water Act. There are another four washes, also classified as waters of the United States, within 0.40 kilometer (0.25 mile) of Schurz alternative segment 1, but the segment would not cross those washes (DIRS 180889-PBS&J 2007, p. 7, Table 2, and Figure 3A).

The National Wetland Inventory dataset indicates that wetlands border the Walker River. During field investigations in support of this Rail Alignment EIS, DOE confirmed the presence of these wetlands along the Walker River. Schurz alternative segment 1 would cross the Walker River and two DOE-delineated wetlands. There are two other wetlands (one north and one south of the alternative segment) adjacent to the Walker River (DIRS 180889-PBS&J 2007, Figure 4). Additionally, as the alternative segment continued south past Weber Reservoir, it would pass within approximately 1.6 kilometers (1 mile) of a small group of wetlands along the Walker River. The National Wetlands Inventory dataset identifies the playas at the southern end of Schurz alternative segment 1 and adjacent to the Walker River as wetlands; however, DOE field surveys in support of this Rail Alignment EIS confirmed that there are no wetlands in this area. Appendix F provides more information about wetlands.

The Federal Emergency Management Agency has not mapped floodplains in the area of Schurz alternative segment 1; however, the segment would cross floodplains associated with the valley floors and playas along its route. Appendix F further describes possible floodplains associated with Schurz alternative segment 1.

There are two springs within the Schurz alternative segment 1 region of influence – Double Spring and an unnamed spring. Double Spring and the unnamed spring are approximately 1.5 kilometers (0.93 mile) and 1.4 kilometers (0.88 mile) east of the alternative segment, respectively.

3.3.5.3.4.2 Schurz Alternative Segment 4. From the northern end of Campbell Valley, Schurz alternative segment 4 would cross Walker River and two tributaries of the Walker River as it enters Sunshine Flat. The alternative segment would pass to the west of Painted Mesa, and east of Weber Reservoir and the northern end of the Wassuk Range before crossing U.S. Highway 95. It would then pass south of Calico Hills, enter an unnamed valley, and travel west of the Agai Pah Hills and the Gillis Range before ending near Gillis Canyon (see Table 3-105 and Figure 3-180). Construction camp 18A would be adjacent to Schurz alternative segment 4 approximately 75 meters (250 feet) east of its junction with U.S. Highway 95 (DIRS 180875-Nevada Rail Partners 2007, p. F-4). The construction camp would not overlie any surface-water features. There are no potential quarry sites along Schurz alternative segment 4.

Schurz alternative segment 4 would run northeast from Campbell Valley, where it would cross the Walker River and two tributaries to Walker River that receive their drainage from the Desert Mountains and later combine into one stream. The Walker River is a perennial stream that flows through Weber Reservoir and conveys surface water to a terminal basin called Walker Lake. Schurz alternative segment 4 would lie entirely within the Walker Hydrographic sub-basin, which has a total drainage area of approximately 2,600 square kilometers (1,000 square miles) (DIRS 180885-Parsons Brinckerhoff 2007, p. 20). The U.S. Geological Survey gaging station closest to Schurz alternative segment 4 is at the Walker River above Weber Reservoir near the community of Schurz. At this station, the river has a drainage area of approximately 7,000 square kilometers (2,700 square miles) (see Table 3-104). Schurz alternative segment 4 would continue eastward and then head south into Sunshine Flat, which receives drainage from the Desert Mountains and Painted Mesa. The segment would pass within 0.85 kilometer (0.53 mile) to the east of Weber Reservoir and cross numerous tributaries to the Walker River. There are no water-quality data available for this area; however, there are regional data for the Walker River Basin (DIRS 180064-USGS 2005, all). Schurz alternative segment 4 would proceed east and follow along a tributary to the Walker River, crossing it several times. After passing through a valley between Painted Mesa and Calico Hills and then turning southeast, the alternative segment would turn toward the east and pass the southern edge of the Terrill Mountains and proceed into an unnamed valley that receives its drainage from the Calico Hills, Terrill Mountains, Red Ridge, and Gillis Range. In this valley, Schurz alternative segment 4 would pass two unnamed playas that would be west of the segment. For most of the year, these playas would be dry; however, runoff from unnamed ephemeral washes draining the Terrill Mountains, Red Ridge, and Gillis Range would be conveyed toward these low-lying areas. During periods of intense precipitation, the size of the watershed and the number of ephemeral washes could provide enough runoff to create localized flooding. There is another set of playas at the southern end of Schurz alternative segment 4 adjacent to the Walker River. Additional surface runoff from ephemeral washes would drain from the Agai Pah Hills into the Schurz alternative segment 4 region of influence. Surface runoff would generally drain west toward Walker River.

The Walker River Basin is considered an interstate basin because it receives drainage from outside Nevada. During a survey of the washes along the Mina rail alignment in support of this Rail Alignment EIS, DOE identified the Walker River and five washes that Schurz alternative segment 4 would cross as waters of the United States, as regulated under Section 404 of the Clean Water Act. There are another two washes, also classified as waters of the United States, within 0.40 kilometer (0.25 mile) of the Schurz alternative segment 4, but the segment would not cross those washes (DIRS 180889-PBS&J 2007, p. 3, Table 2, and Figure 3A). The National Wetland Inventory dataset indicates that emergent wetlands border the Walker River. During field investigations in support of this Rail Alignment EIS, DOE confirmed the presence of emergent wetlands along the Walker River. Schurz alternative segment 4 would cross the Walker River and two DOE-delineated wetlands. There are two other wetlands (one north and one south of the alternative segment) adjacent to the Walker River (DIRS 180889-PBS&J 2007, Figure 4). Additionally, as the alternative segment continued south past Weber Reservoir, it would pass within approximately 1.6 kilometers (1 mile) of a small group of wetlands along the Walker River. The National Wetlands Inventory dataset identifies the playas at the southern end of Schurz alternative segment 4 and adjacent to the Walker River as wetlands; however, DOE field surveys in support of this Rail Alignment EIS confirmed that there are no wetlands in this area. Appendix F provides more information about wetlands.

The Federal Emergency Management Agency has not mapped floodplains in the area of Schurz alternative segment 4; however, the segment would cross floodplains associated with the valley floors and playas along its route. Appendix F further describes possible floodplains associated with Schurz alternative segment 4.

There are no springs identified within 1.6 kilometers (1 mile) of Schurz alternative segment 4.

3.3.5.3.4.3 Schurz Alternative Segment 5. From the northern end of Campbell Valley, Schurz alternative segment 5 would cross the Walker River, travel along the southern edge of the Desert Mountains, and then travel southeast through Long Valley between Painted Mesa and the Terrill Mountains. The segment would then cross U.S. Highway 95 as it continued around the southern edge of the Terrill Mountains, past the western edge of Red Ridge, through an unnamed valley, and past the western edge of the Agai Pah Hills before ending near Gillis Canyon (see Table 3-105 and Figure 3-180). Construction camp 18C would be adjacent to Schurz alternative segment 5 approximately 295 meters (970 feet) southeast of its junction with U.S. Highway 95 (DIRS 180875-Nevada Rail Partners 2007,

p. F-4). The construction camp would not overlie any surface-water features. There are no potential quarry sites along Schurz alternative segment 5.

Schurz alternative segment 5 would run northeast from Campbell Valley, where it would cross the Walker River and several tributaries to Walker River that receive their drainage from the Desert Mountains and later combine into one stream. The Walker River is a perennial stream that flows through Weber Reservoir and conveys surface water to a terminal basin called Walker Lake. Schurz alternative segment 5 would lie entirely within the Walker Hydrographic sub-basin, which has a total drainage area of approximately 2,600 square kilometers (1,000 square miles) (DIRS 180885-Parsons Brinckerhoff 2007, p. 20). The U.S. Geological Survey gaging station closest to Schurz alternative segment 5 is at the Walker River above Weber Reservoir near the community of Schurz. At this station, the river has a drainage area of approximately 7,000 square kilometers (2,700 square miles) (see Table 3-104). As the alternative segment continued east, it would travel along the southern edge of the Desert Mountains, crossing several ephemeral washes draining the Desert Mountains and flowing toward Sunshine Flat. After rounding the northern edge of Painted Mesa, Schurz alternative segment 5 would travel southeast through Long Valley and over U.S. Highway 95. Long Valley receives its drainage from Painted Mesa, the Terrill Mountains, and Calico Hills. As the segment turned toward the east and passed the southern edge of the Terrill Mountains, it would proceed into an unnamed valley which receives its drainage from the Calico Hills, Terrill Mountains, Red Ridge, and Gillis Range. In this valley, Schurz 5 would pass two unnamed playas situated west of the rail alignment. For most of the year, these playas would be dry; however, runoff from unnamed ephemeral washes draining the Terrill Mountains, Red Ridge, and Gillis Range would be conveyed toward these low-lying areas. During periods of intense precipitation, the size of the watershed and the number of ephemeral washes could provide enough runoff to create localized flooding. There is another set of playas at the southern end of Schurz alternative segment 5 adjacent to the Walker River. Additional surface runoff from ephemeral washes would drain from the Agai Pah Hills into the Schurz alternative segment 5 region of influence. Surface runoff would generally drain west toward Walker River.

The Walker River Basin is considered an interstate basin because it receives drainage from outside Nevada. During a survey of the washes along the Mina rail alignment in support of this Rail Alignment EIS, DOE identified the Walker River as the only water of the United States, as regulated under Section 404 of the Clean Water Act, crossed by this alternative segment (DIRS 180889-PBS&J 2007, p. 3, Table 2, and Figure 3A).

The National Wetland Inventory dataset indicates that emergent wetlands border the Walker River. During field investigations in support of this Rail Alignment EIS, DOE confirmed the presence of emergent wetlands along the Walker River. Schurz alternative segment 5 would cross the Walker River and two DOE-delineated wetlands. There are two other wetlands (one north and one south of the alternative segment) adjacent to the Walker River (DIRS 180889-PBS&J 2007, Figure 4). Additionally, as the alternative segment continued south past Weber Reservoir, it would pass within approximately 1.6 kilometers (1 mile) of a small group of wetlands along the Walker River. The National Wetlands Inventory dataset identifies the playas at the southern end of Schurz alternative segment 5 and adjacent to Walker River as wetlands; however, DOE field surveys in support of this Rail Alignment EIS confirmed that there are no wetlands in this area. Appendix F provides more information about wetlands.

The Federal Emergency Management Agency has not mapped floodplains in the area of Schurz alternative segment 5; however, the segment would cross floodplains associated with the valley floors and playas along its route. Appendix F further describes possible floodplains associated with Schurz alternative segment 5.

There are no springs identified within 1.6 kilometers (1 mile) of Schurz alternative segment 5.

3.3.5.3.4.4 Schurz Alternative Segment 6. From the northern end of Campbell Valley, Schurz alternative segment 6 would cross the Walker River, travel along the southern edge of the Desert Mountains, and then travel southeast through Long Valley between Painted Mesa and the Terrill Mountains. The segment would then cross U.S. Highway 95 as it continued around the southern edge of the Terrill Mountains, past the western edge of Red Ridge, through an unnamed valley, and past the western edge of the Agai Pah Hills before ending near Gillis Canyon (see Table 3-105 and Figure 3-180). Construction camp 18D would be adjacent to Schurz alternative segment 6 approximately 640 meters (2,100 feet) west of its junction with U.S. Highway 95 (DIRS 180875-Nevada Rail Partners 2007, p. F-1). A small ephemeral stream would run through the footprint for construction camp 18D. There are no potential quarry sites along Schurz alternative segment 6.

Schurz alternative segment 6 would run northeast from Campbell Valley, where it would cross the Walker River and several tributaries to Walker River that receive their drainage from the Desert Mountains and later combine into one stream. The Walker River is a perennial stream that flows through Weber Reservoir and conveys surface water to a terminal basin called Walker Lake. Schurz alternative segment 6 would lie entirely within the Walker Hydrographic sub-basin, which has a total drainage area of approximately 2,600 square kilometers (1,000 square miles) (DIRS 180885-Parsons Brinckerhoff 2007, p. 20). The U.S. Geological Survey gaging station closest to Schurz alternative segment 6 is at the Walker River above Weber Reservoir near the community of Schurz. At this station, the river has a drainage area of approximately 7,000 square kilometers (2,700 square miles) (see Table 3-104). As the alternative segment continued east, it would travel along the southern edge of the Desert Mountains, crossing several ephemeral washes draining the Desert Mountains and flowing toward Sunshine Flat. After rounding the northern edge of Painted Mesa, Schurz 6 would travel southeast through Long Valley and over U.S. Highway 95. Long Valley receives its drainage from Painted Mesa, the Terrill Mountains, and Calico Hills. After crossing U.S. Highway 95, Schurz alternative segment 6 would turn to the northeast and pass through a gap in the Terrill Mountains, round the northern edge of the Terrill Mountains, and enter Rawhide Flats. Near the area of the alternative segment, Rawhide Flats receives its drainage from numerous ephemeral washes from the Terrill Mountains. After passing between the Terrill Mountains and Red Ridge, Schurz alternative segment 6 would enter an unnamed valley that receives its drainage from the Calico Hills, Terrill Mountains, Red Ridge, and Gillis Range. In this valley, Schurz alternative segment 6 would pass two unnamed playas west of the rail alignment. For most of the year, these playas would be dry; however, runoff from unnamed ephemeral washes draining the Terrill Mountains, Red Ridge, and Gillis Range would be conveyed toward these low-lying areas. During periods of intense precipitation, the size of the watershed and the number of ephemeral washes could provide enough runoff to create localized flooding. There is another set of playas at the southern end of Schurz alternative segment 6 adjacent to the Walker River. Additional surface runoff from ephemeral washes would drain from the Agai Pah Hills into the Schurz alternative segment 6 region of influence. Surface runoff would generally drain west toward Walker River.

The Walker River Basin is considered an interstate basin because it receives drainage from outside Nevada. During a survey of the washes along the Mina rail alignment in support of this Rail Alignment EIS, DOE identified the Walker River, which Schurz alternative segment 6 would cross, as a water of the United States, as regulated under Section 404 of the Clean Water Act (DIRS 180889-PBS&J 2007, p. 3, Table 2 and Figure 3A).

The National Wetland Inventory dataset indicates that emergent wetlands border the Walker River. During field investigations in support of this Rail Alignment EIS, DOE confirmed the presence of emergent wetlands along the Walker River. Schurz alternative segment 6 would cross the Walker River and two DOE-delineated wetlands. There are two other wetlands (one north and one south of the alternative segment) adjacent to the Walker River (DIRS 180889-PBS&J 2007, Figure 4). Additionally, as the alternative segment continued south past Weber Reservoir, it would pass within approximately 1.6

kilometers (1 mile) of a small group of wetlands along the Walker River. The National Wetlands Inventory dataset identifies the playas at the southern end of Schurz alternative segment 6 and adjacent to the Walker River as wetlands; however, DOE field surveys in support of this Rail Alignment EIS confirmed that there are no wetlands in this area. Appendix F provides more information about wetlands.

The Federal Emergency Management Agency has not mapped floodplains in the area of Schurz alternative segment 6; however, the segment would cross floodplains associated with the valley floors and playas along its route. Appendix F further describes possible floodplains associated with Schurz alternative segment 6.

There are no springs identified within 1.6 kilometers (1 mile) of Schurz alternative segment 6.

3.3.5.3.5 Department of Defense Branchline South (Boundary of Walker River Paiute Reservation to Thorne)

Except for a new siding inside the existing rail line right-of-way and construction camp 17 (which would be on the Hawthorne Army Depot), there would be no new construction along Department of Defense Branchline South. Neither the siding nor the construction camp would overlie any surface-water features. No additional road construction would be required (see Figure 3-181). Therefore, DOE has not characterized surface-water features along this portion of the Mina rail alignment.

3.3.5.3.6 Mina Common Segment 1 (Gillis Canyon to Blair Junction)

Beginning east of Thorne, Nevada, Mina common segment 1 would travel south of the Gillis Range through Walker Lake Valley and Soda Springs Valley, with the Gabbs Valley Range to the north and east and Garfield Hills to the west. This common segment would continue to travel south through Soda Springs Valley and Alkali Flat and pass to the east of Rhodes Salt Marsh between the Excelsior Mountains and Pilot Mountains. Mina common segment 1 would then travel to the east of Columbus Salt Marsh between the Candelaria Hills and the Monte Cristo Range before ending near Blair Junction. The common segment would parallel U.S. Highway 95 (see Table 3-106 and Figures 3-181 and 3-182). There are three construction camps associated with Mina common segment 1. Construction camp 16 would be adjacent to the rail alignment, 40 meters (131 feet) southeast of the junction of Mina common segment 1 with State Route 361. Two ephemeral washes that receive drainage from Gabbs Valley Range would run through the footprint for construction camp 16. Construction camp 15 would be adjacent to and west of the rail alignment, east of Tonopah Junction and Rhodes Salt Marsh. The construction camp would not overlie any surface-water features. Construction camp 14 would be adjacent to and east of the rail alignment at Blair Junction. Two ephemeral washes that receive drainage from the Monte Cristo Range would run through the footprint for construction camp 14. There are two potential quarry sites along Mina common segment 1. The first (Garfield Hills) would be approximately 2.23 kilometers (1.4 miles) south of the rail alignment near Hawthorne. Ephemeral washes draining down from the Garfield Hills would pass within 20 meters (66 feet) of the quarry. The second potential quarry site (Gabbs Range) would be approximately 0.77 kilometer (0.48 mile) east of the rail alignment, near Luning. Ephemeral washes draining down from Gabbs Valley Range into Soda Springs Valley would cross through the Gabbs Range quarry site.

Mina common segment 1 would begin in Walker Lake Valley, which receives its drainage from the Wassuk Range and Garfield Hills to the south and numerous canyons (including Ryan Canyon, Sheeps Head Canyon, and Montreal Canyon) and ephemeral washes draining Gillis Range to the north. The segment would pass to the north of a playa. As Mina common segment 1 continued through Walker Lake Valley, it would pass two playas (one of which receives drainage from Sheeps Head Canyon in the Gillis Range and ephemeral washes from Garfield Hills) and cross one playa. As the segment entered Soda Springs Valley, it would cross over a large playa that receives drainage from numerous ephemeral washes

Table 3-106. Hydrologic features potentially relevant to Mina common segment 1.[a]

General hydrographic features/drainage	Hydrologic features within 500 feet[b] of the centerline of the rail alignment	Hydrologic features between 500 feet and 1 mile[b] of the centerline of the rail alignment
Drainage from Wassuk Range, Garfield Hills, and numerous canyons (including Ryan Canyon, Sheeps Head Canyon, and Montreal Canyon) and ephemeral washes draining Gillis Range into Walker Lake Valley. Drainage from unnamed washes draining ravines and side canyons of mountainous areas into Soda Springs Valley. Drainage from Black Dyke Mountain, numerous ephemeral washes draining Gabbs Valley Range, Cinnabar Canyon, Dunlap Canyon, Mac Canyon, Water Canyon, and other washes in the Pilot Mountains, and Douglas Canyon and other washes in the Excelsior Mountains. Drainage from Long Canyon, numerous unnamed ephemeral washes from the Pilot Mountains, Candelaria Hills, and Excelsior Mountains into or towards Rhodes Salt Marsh. Drainage from Monte Cristo Range into Columbus Salt Marsh.	Segment would cross 141 unnamed washes. Segment would cross Alkali Flat. Segment would cross through two unnamed playas (one of which is identified as a wetland in the National Wetland Inventory) and pass within 490 feet of another unnamed playa (which is identified as a wetland in the National Wetland Inventory).	Alignment would pass within 1 mile of 6 unnamed playas (some of which are identified as wetlands in the National Wetland Inventory). Kinkaid Spring 0.14 mile north. Unnamed spring 0.34 mile east.

a. Source: DIRS 177710-MO0607NHDWBDYD.000; DIRS 177714-MO0607NHDFLM06.000; DIRS 176979-MO0605GISGNISN.000; DIRS 176730-DeLorme 1996, pp. 51 to 53, 58, and 59.
b. To convert feet to meters, multiply by 0.3048; to convert miles to kilometers, multiply by 1.6093.

from the Gillis Range to the north and Garfield Hills to the south and pass by a smaller playa to the north that receives drainage from Gillis Range. Intermittent surface water would flow into Soda Springs Valley from unnamed washes draining ravines and side canyons of mountainous areas bordering Mina common segment 1. Continuing south through Soda Springs Valley, the segment would pass east of two large playas in Alkali Flat. The first playa, just east of Luning, receives flow from Black Dyke Mountain to the west and numerous ephemeral washes draining Gabbs Valley Range. Drainage from Cinnabar Canyon, Dunlap Canyon, Mac Canyon, Water Canyon, and other washes in the Pilot Mountains to the east and Douglas Canyon and other washes in the Excelsior Mountains to the west flow into or toward the second playa.

As Mina common segment 1 would leave Soda Springs Valley, it would pass to the east of Rhodes Salt Marsh. This playa receives drainage from Long Canyon and numerous unnamed ephemeral washes from the Pilot Mountains to the east. Additional drainage from Candelaria Hills and the Excelsior Mountains flows toward the playa. The segment would follow a ridgeline of the Monte Cristo Range and pass east of Columbus Salt Marsh. Several ephemeral washes drain downslope from the headwaters of the Monte Cristo Range and flow west into Columbus Salt Marsh, at which point the drainages develop a braided drainage pattern. After passing around the southern end of the Monte Cristo Range, Mina common segment 1 would turn south as it crossed over U.S. Highway 95 and end at the northern edge of Big Smoky Valley. There are no streamflow or water-quality data available for the streams and washes Mina common segment 1 would cross.

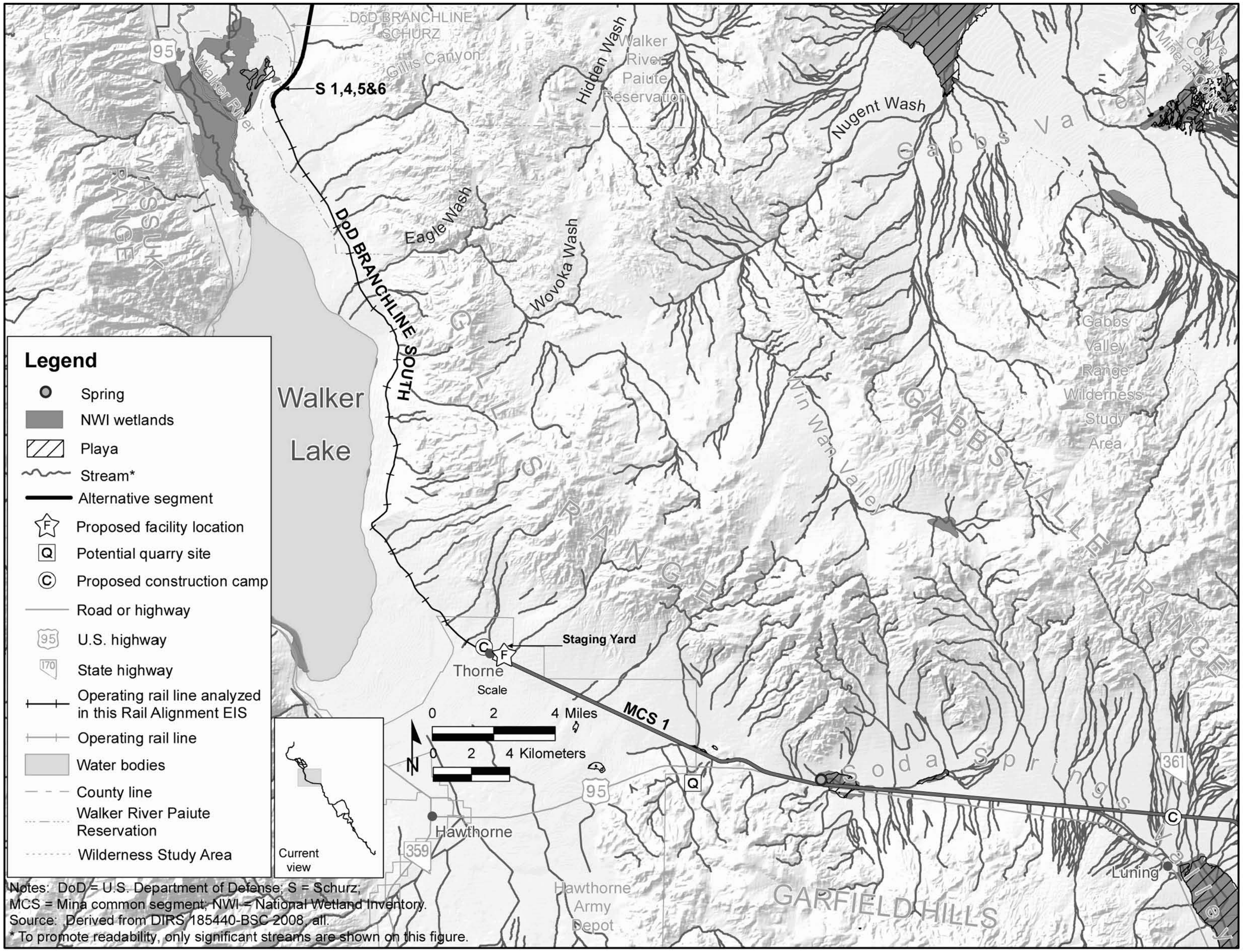


Figure 3-181. Surface drainage within map area 2.

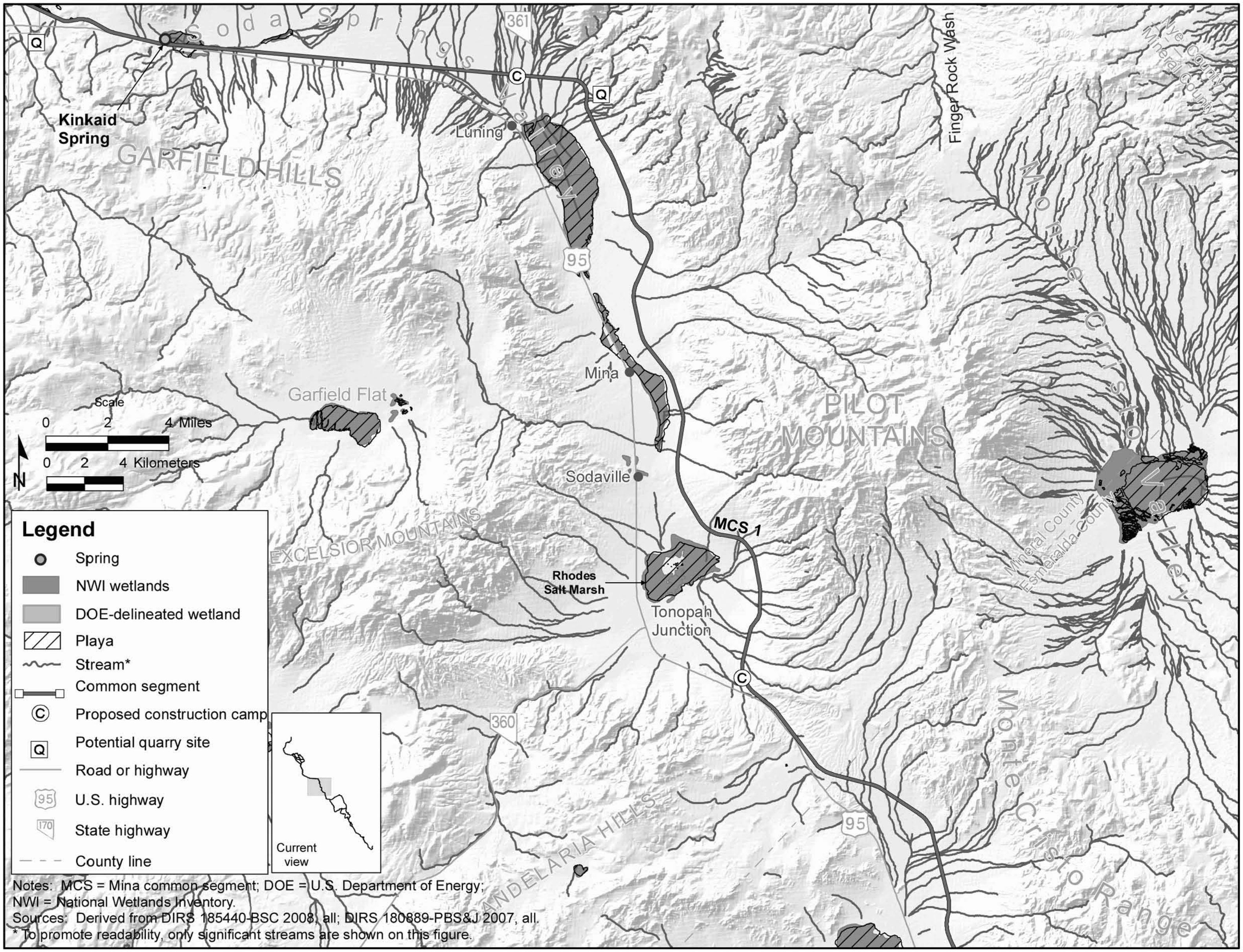


Figure 3-182. Surface drainage within map area 3.

The first approximately 15 kilometers (9 miles) of common segment 1 would be within the Walker River Basin, which is an interstate drainage system. DOE field investigations determined that none of the washes along this portion of common segment 1 have characteristics of waters of the United States. The two playas crossed in this basin have no hydrologic connection to tributaries of Walker Lake or other drainages in that basin. The remainder of Mina common segment 1 would be in the Central Hydrographic Region of Nevada, which has surface hydrology characterized by internally draining sub-areas and is considered an intrastate basin (DIRS 180889-PBS&J 2007, p. 3). Therefore, none of the washes along this portion of common segment 1 qualify as waters of the United States, as regulated under Section 404 of the Clean Water Act, because there are no connections to surface-water bodies with a connection to interstate water (DIRS 180889-PBS&J 2007, all).

The National Wetland Inventory dataset identifies the playas in Soda Springs Valley and Alkali Flat as wetlands; however, DOE field studies in support of this Rail Alignment EIS confirmed no wetlands in these areas (DIRS 180889-PBS&J 2007, Figure 5B). Appendix F provides more information about wetlands.

The Federal Emergency Management Agency has not mapped floodplains in the area of Mina common segment 1; however, the rail alignment would cross floodplains associated with the valley floors and playas along its route. Appendix F further describes possible floodplains associated with the rail alignment.

There are two springs within the Mina common segment 1 region of influence – Kinkaid Spring and an unnamed spring. Kinkaid Spring is approximately 0.23 kilometer (0.14 mile) north of the common segment just west of the large playa in Soda Springs Valley (DIRS 180889-PBS&J 2007, p. 9). The unnamed spring is approximately 0.54 kilometer (0.34 mile) east of the common segment in the foothills of the Monte Cristo Range.

3.3.5.3.7 Montezuma Alternative Segments

3.3.5.3.7.1 Montezuma Alternative Segment 1. Montezuma alternative segment 1 would parallel State Route 265 as it traveled south from Big Smoky Valley past the Silver Peak Range and Mineral Ridge to the west and the Weepah Hills to the east. After entering Clayton Valley, the alternative segment would travel past Angel Island, Paymaster Ridge, Clayton Ridge, the Montezuma Range, Goldfield Hills, Cuprite Hills, Stonewall Flat, and Stonewall Mountain before ending near Lida Junction (see Table 3-107 and Figures 3-183 and 3-184). Construction camp 13A would be adjacent to Montezuma 1 just south of the community of Silver Peak. The construction camp would not overlie any surface-water features. Construction camp 9A would be adjacent to Montezuma alternative segment 1 approximately 290 meters (950 feet) northwest of where the rail segment would cross U.S. Highway 95. A small ephemeral wash draining downslope of Garfield Hills would run through the extreme southwest corner of the footprint for this construction camp (DIRS 180875-Nevada Rail Partners 2007, p. F-11). A potential quarry site, North Clayton, would be located along Montezuma alternative segment 1 near the Montezuma Range. The quarry would not overlie any surface-water features.

From Big Smoky Valley, Montezuma alternative segment 1 would travel south, paralleling State Route 265 to Silver Peak, and along the way, cross over numerous ephemeral washes flowing into Big Smoky Valley. Big Smoky Valley receives drainage from numerous ephemeral washes flowing downslope of the Monte Cristo Range to the north to join drainage from the Silver Peak Range and Mineral Ridge to the west and south via Black Canyon, Eagle Nest Canyon, New York Canyon, Echo Canyon, Eagle Canyon, Custer Gulch, Great Gulch, and unnamed washes, and drainage from Weepah Hills to the east. Although Big Smoky Valley is an extensive topographic feature, Montezuma alternative segment 1 would only cross through the extreme western part. Once past Silver Peak, Montezuma alternative segment 1 would enter Clayton Valley, which receives drainage from the Silver Peak Range, Mineral Ridge, Palmetto

Table 3-107. Hydrologic features potentially relevant to the Montezuma alternative segments.[a]

General hydrographic features/drainage	Hydrologic features within 500 feet[b] of the centerline of the rail alignment	Hydrologic features between 500 feet and 1 mile[b] of the centerline of the rail alignment
Montezuma alternative segment 1		
Drainage from Monte Cristo Range, Silver Peak Range, Mineral Ridge, and Weepah Hills via Black Canyon, Eagle Nest Canyon, New York Canyon, Echo Canyon, Eagle Canyon, Custer Gulch, Great Gulch, and unnamed washes to Big Smoky Valley. Drainage from Silver Peak Range, Mineral Ridge, Palmetto Mountains, Clayton Ridge, Paymaster Range, and Weepah Hills via Lida Wash and unnamed washes into Clayton Valley. Drainage from Paymaster Ridge, Clayton Ridge, and Montezuma Range via Nevada Canyon and unnamed washes. Drainage from numerous ephemeral washes flows downslope of the Montezuma Range and Goldfield Hills into an unnamed valley.	Segment would cross Jackson Wash, China Wash, and 185 unnamed washes.	Hot Spring 0.33 mile west.
Montezuma alternative segment 2		
Drainage from Monte Cristo Range, Silver Peak Range, Mineral Ridge, and Weepah Hills via Black Canyon, Eagle Nest Canyon, New York Canyon, Echo Canyon, Eagle Canyon, Custer Gulch, Great Gulch, and unnamed washes to Big Smoky Valley. Drainage from Lone Mountain, General Thomas Hills, and San Antonio Mountains flows into Montezuma Valley. Drainage from Malpais Mesa, Goldfield Hills, Montezuma Range, and Chispa Hills flow into Alkali Lake Playa and Stonewall Flat.	Segment would cross Big Wash and 84 unnamed washes. Segment would cross Stonewall Flat.	Slaughterhouse Spring 0.57 mile west. Rabbit Spring 0.12 mile west. Three unnamed springs within 0.12 mile west.
Montezuma alternative segment 3		
Drainage from Monte Cristo Range, Silver Peak Range, Mineral Ridge, and Weepah Hills via Black Canyon, Eagle Nest Canyon, New York Canyon, Echo Canyon, Eagle Canyon, Custer Gulch, Great Gulch, and unnamed washes to Big Smoky Valley. Drainage from Lone Mountain, General Thomas Hills, and San Antonio Mountains flows into Montezuma Valley. Drainage from numerous ephemeral washes flows down slope of the Montezuma Range and the Goldfield Hills into an unnamed valley.	Segment would cross Big Wash and 147 unnamed washes.	

a. Source: DIRS 177710-MO0607NHDWBDYD.000; DIRS 177714-MO0607NHDFLM06.000; DIRS 176979-MO0605GISGNISN.000; DIRS 176730-DeLorme 1996, pp. 52, 53, 58, and 59.
b. To convert feet to meters, multiply by 0.3048; to convert kilometers to miles, multiply by 1.6093.

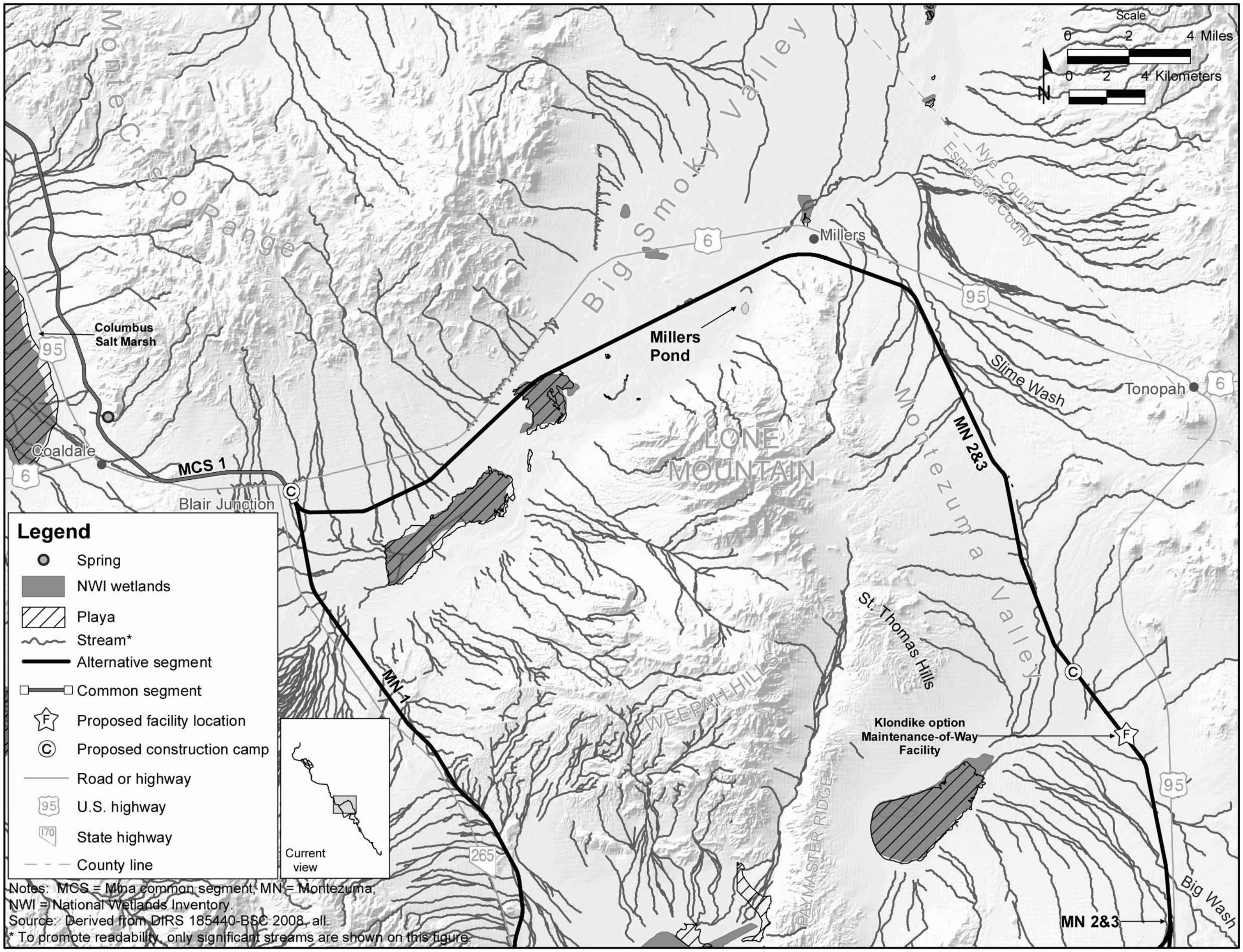


Figure 3-183. Surface drainage within map area 4.

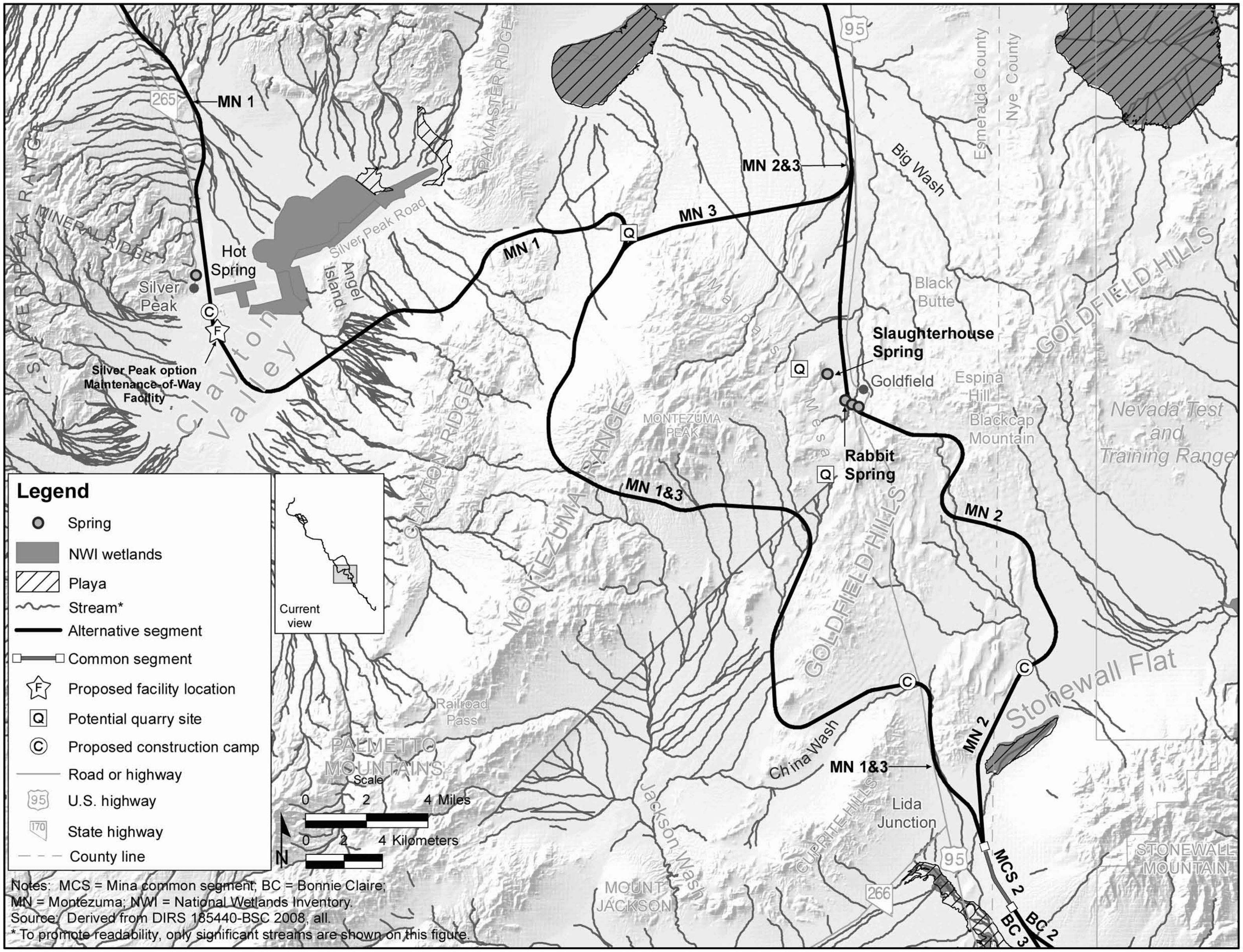


Figure 3-184. Surface drainage within map area 5.

Mountains, Clayton Ridge, Paymaster Range, and Weepah Hills via Lida Wash and unnamed washes. In Clayton Valley, the alternative segment would pass between Angel Island and Clayton Ridge, where it would cross numerous ephemeral washes flowing down from Clayton Ridge. As Montezuma alternative segment 1 passed through the gap between Paymaster Ridge and Clayton Ridge and rounded the southern portion of Clayton Ridge, it would cross over ephemeral washes flowing down from Paymaster Ridge, Clayton Ridge, and the Montezuma Range via Nevada Canyon and unnamed washes. After passing through a gap in the Montezuma Range, the segment would cross over Jackson Wash into an unnamed valley. Drainage from numerous ephemeral washes flows downslope of the Montezuma Range and the Goldfield Hills into this valley. Montezuma alternative segment 1 would skirt the western foothills of the Goldfield Hills, round the southern edge, cross over China Wash, and pass between the Goldfield Hills and the Cuprite Hills, crossing over several washes flowing down from both hills. Montezuma alternative segment 1 would pass between a gap in the Cuprite Hills and end near Lida Junction. There are no streamflow or water-quality data available for the streams and washes Montezuma alternative segment 1 would cross.

Montezuma alternative segment 1 would be in the Central Hydrographic Region of Nevada, which has surface hydrology characterized by internally draining sub-areas and is considered an intrastate basin (DIRS 180889-PBS&J 2007, p. 3). Therefore, none of the washes along Montezuma 1 qualify as waters of the United States, as regulated under Section 404 of the Clean Water Act, because there are no connections to surface-water bodies with a connection to interstate water.

The National Wetland Inventory dataset identifies a pond in the private, diked area near Silver Peak as a wetland; however, DOE field studies in support of this Rail Alignment EIS confirmed no wetlands in these areas (DIRS 180889-PBS&J 2007, all). Appendix F provides more information about wetlands.

The Federal Emergency Management Agency has not mapped floodplains in the area of Montezuma 1; however, the rail alignment would cross floodplains associated with the valley floors and playas along its route. Appendix F further describes possible floodplains associated with the rail alignment.

Hot Spring is within the region of influence for Montezuma alternative segment 1, approximately 0.53 kilometer (0.33 mile) west of the alternative segment near the Silver Peak.

3.3.5.3.7.2 Montezuma Alternative Segment 2. Montezuma alternative segment 2 would parallel U.S. Highway 95 as it traveled east from Big Smoky Valley past Lone Mountain. After passing Millers, the segment would head south and enter Montezuma Valley. It would pass Tonopah, General Thomas Hills, and Klondike and parallel U.S. Highway 95 for a short time before crossing it near Malpais Mesa, Goldfield Hills, and Goldfield. Montezuma alternative segment 2 would end near Stonewall Flat (see Table 3-107 and Figures 3-183 and 3-184). Construction camp 9 would be adjacent to Montezuma alternative segment 2 just north of Stonewall Flat. The construction camp would not overlie any surface-water features. Construction camp 13B would be adjacent to Montezuma alternative segment 1 in Montezuma Valley. A small ephemeral wash draining hills near Hasbrouck Peak into Montezuma Valley would run through the footprint for the construction camp (DIRS 180875-Nevada Rail Partners 2007, p. F-10). Two potential quarry sites, ES-7 and Malpais Mesa, would be along the Montezuma alternative segment 2 in Malpais Mesa near Goldfield. Neither quarry would overlie any surface-water features.

Montezuma alternative segment 2 would parallel State Route 6 as it traveled east along the southern edge of the Monte Cristo Range and into Big Smoky Valley. Big Smoky Valley receives drainage from numerous ephemeral washes flowing downslope of the Monte Cristo Range to the north to join drainage from the Silver Peak Range and Mineral Ridge to the west and south via Black Canyon, Eagle Nest Canyon, New York Canyon, Echo Canyon, Eagle Canyon, Custer Gulch, Great Gulch, and unnamed washes, and drainage from Weepah Hills to the east. Montezuma alternative segment 2 would cross several ephemeral washes flowing down from the Monte Cristo Range, pass a few small playas, and cross a large playa twice. These playas are actually part of a larger playa in Big Smoky Valley. The segment would pass within 0.42 kilometer (0.26 mile) of a smaller playa in Big Smoky Valley. After crossing private property known as Millers, the segment would pass approximately 1.3 kilometers (0.81 mile) north of a tailings pond located on the same property. The pond, approximately 0.17 square kilometer (0.07 square mile) in size, appears to receive a portion of its hydrology as seasonal runoff from Lone Mountain. No water-quality data are available for Millers tailings pond.

In the Millers area, there is a small playa identified as a dry lake, which would be approximately 1.5 kilometers (0.93 mile) north of Montezuma alternative segment 2. As the segment passed Millers, it would turn south, proceed past Slime Wash to the east, and enter Montezuma Valley. Montezuma Valley receives drainage from numerous ephemeral washes flowing downslope of Lone Mountain and General Thomas Hills to the west and San Antonio Mountains to the east. As the Montezuma alternative segment 2 continued south through Montezuma Valley, it would pass to the west of a set of three small playas. A few small ephemeral washes originating near Mt. Butte to the east and Lone Mountain to the west might convey seasonal waters toward these playas. Just north of Goldfield, the Montezuma alternative segment 2 would cross Big Wash. Once in Goldfield, the rail segment would pass to the west of a number of small playas that receive drainage from Goldfield Hills to the south. At the extreme southern end of the Montezuma alternative segment 2, near Ralston, the segment would pass to the west of a large playa named Stonewall Flat, which is northwest of Stonewall Mountain. Runoff from Stonewall Flat drains downslope into Lida Valley where it might remain as surface water for brief periods. The estimated runoff entering Stonewall Flat is 490,000 cubic meters (17.3 million cubic feet) per year (DIRS 101811-DOE 1996, Section 4.2.5.1). It is likely that ephemeral washes would convey seasonal runoff from Stonewall Mountain into the playa. Montezuma alternative segment 2 would end shortly after passing Stonewall Flat. There are no streamflow or water-quality data available for the streams and washes Montezuma 2 would cross.

Montezuma alternative segment 2 would be in the Central Hydrographic Region of Nevada, which has surface hydrology characterized by internally draining sub-areas and is considered an intrastate basin (DIRS 180889-PBS&J 2007, p. 3). Therefore, none of the washes along Montezuma 2 qualify as waters of the United States, as regulated under Section 404 of the Clean Water Act, because there are no connections to surface-water bodies with a connection to interstate water.

The National Wetland Inventory dataset identifies the large playas in Big Smoky Valley and Stonewall Flat as wetlands; however, DOE field studies in support of this Rail Alignment EIS confirmed no wetlands in this area (DIRS 180889-PBS&J 2007, all). Appendix F provides more information about wetlands.

The Federal Emergency Management Agency has not mapped floodplains in the area of Montezuma alternative segment 2; however, the segment would cross floodplains associated with the valley floors and playas along its route. Appendix F further describes possible floodplains associated with the rail alignment.

Slaughterhouse Spring and Rabbit Spring are located approximately 0.92 kilometer (0.57 mile) and 0.20 kilometer (0.12 mile), respectively, west of the rail alignment near the town of Goldfield. Three unnamed springs are also within the Mina rail alignment region of influence but would be outside the construction right-of-way.

3.3.5.3.7.3 Montezuma Alternative Segment 3. Montezuma alternative segment 3 would parallel State Route 6 as it traveled east from Big Smoky Valley past Lone Mountain. After passing Millers, the segment would head south and enter Montezuma Valley. It would pass Tonopah, General Thomas Hills, and Klondike and parallel U.S. Highway 95 for a short time before turning west at the Montezuma Range, just north of Malpais Mesa. The segment would travel past Clayton Ridge, the Montezuma Range, Goldfield Hills, Cuprite Hills, Stonewall Flat, and Stonewall Mountain before ending near Lida Junction (see Table 3-107 and Figures 3-183 and 3-184). Construction camp 13B would be adjacent to Montezuma alternative segment 3 in Montezuma Valley. A small ephemeral wash draining hills near Hasbrouck Peak into Montezuma Valley would run through the footprint for the construction camp (DIRS 180875-Nevada Rail Partners 2007, p. F-10). Construction camp 9A would be adjacent to Montezuma 3 approximately 280 meters (920 feet) west of where the rail alignment would cross U.S. Highway 95 (DIRS 180875-Nevada Rail Partners 2007, p. F-11). A small ephemeral wash draining downslope of Garfield Hills would run through the extreme southwest corner of the construction camp. There are no potential quarry sites along Montezuma 3.

Montezuma alternative segment 3 would parallel State Route 6 as it traveled east along the southern edge of the Monte Cristo Range and into Big Smoky Valley. Big Smoky Valley receives drainage from numerous ephemeral washes flowing downslope of the Monte Cristo Range to the north to join drainage from the Silver Peak Range and Mineral Ridge to the west and south via Black Canyon, Eagle Nest Canyon, New York Canyon, Echo Canyon, Eagle Canyon, Custer Gulch, Great Gulch, and unnamed washes, and drainage from Weepah Hills to the east. The segment would cross several ephemeral washes flowing down from the Monte Cristo Range, pass a few small playas, and cross a large playa twice. These playas are actually part of a larger playa in Big Smoky Valley. Montezuma alternative segment 3 would pass within 0.42 kilometer (0.26 mile) of a smaller playa in Big Smoky Valley. After reaching Millers, the segment would pass approximately 1.3 kilometers (0.81 mile) north of Millers Pond. The pond, approximately 0.17 square kilometer (0.07 square mile) in size, appears to receive a portion of its hydrology as seasonal runoff from Lone Mountain. No streamflow or water-quality data are available for Millers Pond. In Millers, there is a small playa identified as a dry lake, which would be approximately 1.5 kilometers (0.93 mile) north of Montezuma 3. As Montezuma alternative segment 3 passed Millers, it would turn south, proceed past Slime Wash to the east, and enter Montezuma Valley. Montezuma Valley receives drainage from numerous ephemeral washes flowing downslope of Lone Mountain and General Thomas Hills to the west and San Antonio Mountains to the east. As the segment continued south through Montezuma Valley, it would pass a set of three small playas to the east. A few small ephemeral washes originating near Mt. Butte to the east and Lone Mountain to the west might convey seasonal waters toward these playas. As Montezuma alternative segment 3 passed around the northern end of the Montezuma Range, it would cross over ephemeral washes flowing down from Paymaster Ridge, Clayton Ridge, and the Montezuma Range via Nevada Canyon and unnamed washes. After passing through a gap in the Montezuma Range, the Montezuma alternative segment 3 would cross Jackson Wash into an unnamed valley. Drainage from numerous ephemeral washes flows downslope of the Montezuma Range and the Goldfield Hills into this valley. Montezuma alternative segment 3 would skirt the western foothills of the Goldfield Hills, round the southern edge, and pass between the Goldfield Hills and Cuprite Hills, crossing over several washes flowing down from both hills. Montezuma 3 would pass between a gap in the Cuprite Hills and end near Lida Junction. There are no streamflow or water-quality data available for the streams and washes Montezuma alternative segment 3 would cross.

Montezuma alternative segment 3 would be in the Central Hydrographic Region of Nevada, which has surface hydrology characterized by internally draining sub-areas and is considered an intrastate basin (DIRS 180889-PBS&J 2007, p. 3). Therefore, none of the washes along Montezuma alternative segment 3 qualify as waters of the United States, as regulated under Section 404 of the Clean Water Act, because there are no connections to surface-water bodies with a connection to interstate water.

The National Wetland Inventory dataset identifies the large playa in Big Smoky Valley as a wetland; however, DOE field studies in support of this Rail Alignment EIS confirmed no wetlands in these areas (DIRS 180889-PBS&J 2007, all). Appendix F provides more information about wetlands.

The Federal Emergency Management Agency has not mapped floodplains in the area of Montezuma alternative segment 3; however, the rail alignment would cross floodplains associated with the valley floors and playas along its route. Appendix F further describes possible floodplains associated with the rail alignment.

There are no springs identified within 1.6 kilometers (1 mile) of Montezuma alternative segment 3.

3.3.5.3.8 Mina Common Segment 2

Mina common segment 2 would begin just east of Lida Junction and would cross Alkali Flat (within the Lida Valley) and end near the foot of Stonewall Mountain (see Table 3-108 and Figure 3-185). There are no proposed construction camps or potential quarry sites along Mina common segment 2.

Table 3-108. Hydrologic features potentially relevant to Mina common segment 2.[a]

General hydrographic features/drainage	Hydrologic features within 500 feet[b] of the centerline of the rail alignment	Hydrologic features between 500 feet and 1 mile[b] of the centerline of the rail alignment
Drainage from northwest side of Stonewall Mountain and the Cuprite Hills would drain into Lida Valley and Alkali Flat Playa.	Jackson Wash, China Wash. Segment would cross three washes.	Alkali Flat/Lida Valley Playa.

a. Source: DIRS 177710-MO0607NHDWBDYD.000; DIRS 177714-MO0607NHDFLM06.000; DIRS 176979-MO0605GISGNISN.000; DIRS 176730-DeLorme 1996, p. 59.
b. To convert feet to meters, multiply by 0.3048; to convert miles to kilometers, multiply by 1.6093.

Mina common segment 2 would begin in Lida Valley, south of Stonewall Flat, and cross over Alkali Flat. Runoff from Stonewall Flat drains downslope into Lida Valley where it might remain as surface water for brief periods. The estimated runoff entering Stonewall Flat is 490,000 cubic meters (17.3 million cubic feet) per year (DIRS 101811-DOE 1996, Section 4.2.5.1). Jackson Wash appears to be a notable drainage that contributes seasonal water to Lida Valley.

There are no perennial streams in any of the surrounding basins; rather, the many washes that drain the upland areas convey ephemeral flow that ponds on the playas during periods of intense precipitation. No streamflow or water-quality data are available for the streams and washes Mina common segment 2 would cross.

Mina common segment 2 would be in the Central Hydrographic Region of Nevada, which has surface hydrology characterized by internally draining sub-areas and is considered an intrastate basin (DIRS 180889-PBS&J 2007, p. 3). Therefore, none of the washes along Mina common segment 2 qualify as waters of the United States, as regulated under Section 404 of the Clean Water Act, because there are no connections to surface-water bodies with a connection to interstate water.

There are no wetlands within the Mina common segment 2 region of influence.

Federal Emergency Management Agency flood maps provide coverage for the entire length of Mina common segment 2; however, the common segment would not cross any floodplains. Because Mina common segment 2 follows valley floors and crosses unnamed ephemeral washes and playas, it is feasible that a floodplain could exist in low-lying areas along this segment. Appendix F further describes possible floodplains associated with the rail alignment.

There are no springs identified within 1.6 kilometers (1 mile) of Mina common segment 2.

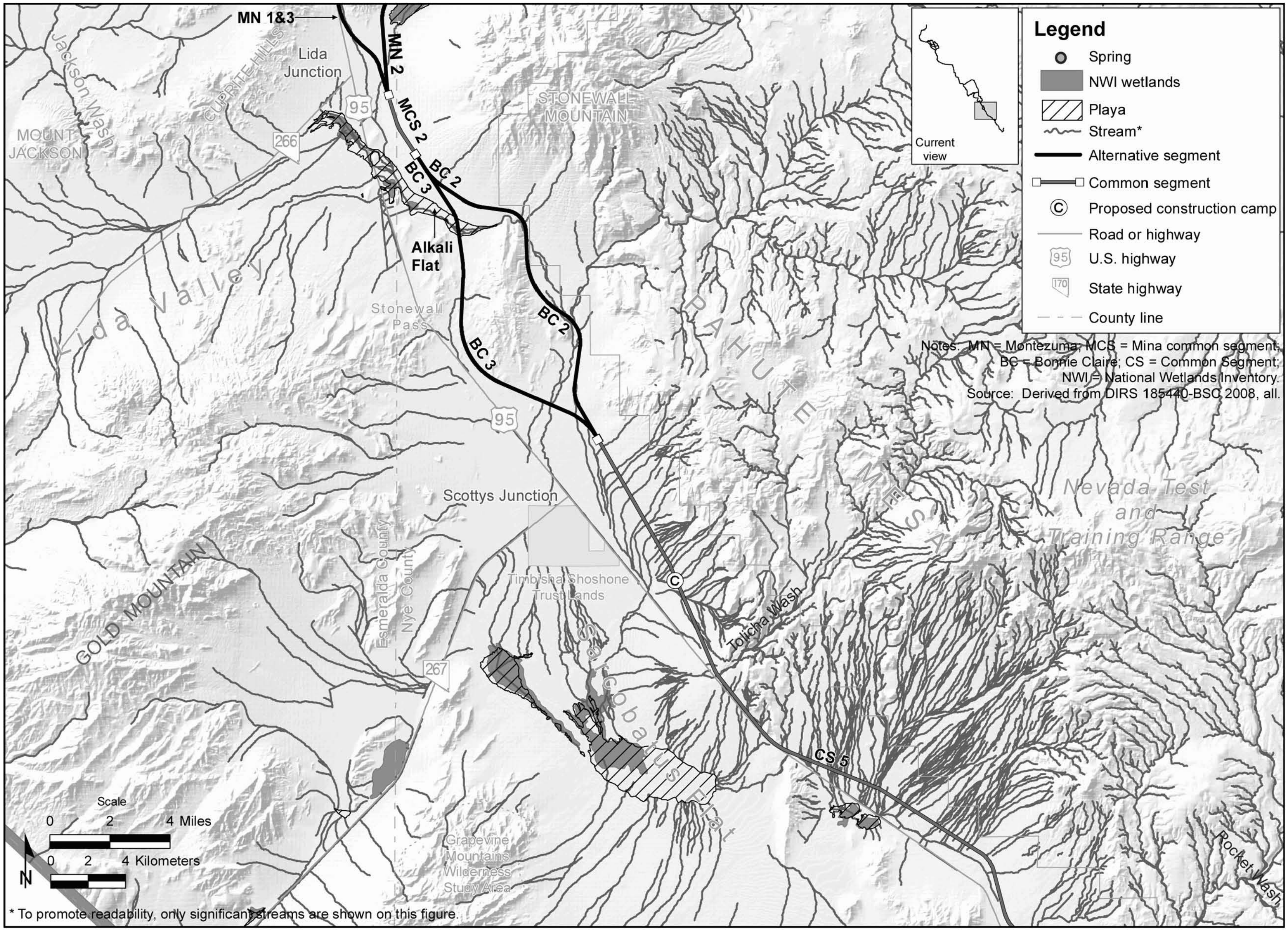


Figure 3-185. Surface drainage within map area 6.

3.3.5.3.9 Bonnie Claire Alternative Segments

Bonnie Claire alternative segment 2 would begin south of Stonewall Flat, exit Lida Valley, and turn to the east, entering Sarcobatus Flat, a large playa. Sarcobatus Flat is bounded by Pahute Mesa on the east and Gold Mountain to the west (see Table 3-109 and Figure 3-185). There are no construction camps or quarries proposed for Bonnie Claire 2.

Table 3-109. Hydrologic features potentially relevant to the Bonnie Claire alternative segments.[a]

General hydrographic features/drainage	Hydrologic features within 500 feet[b] of the centerline of the rail alignment	Hydrologic features between 500 feet and 1 mile[c] of the centerline of the rail alignment
Bonnie Claire alternative segment 2		
Drainage from Stonewall Mountain, the foothills of Gold Mountain, Stonewall Pass, and Northern Pahute Mesa to Lida Valley, Alkali Flat, and Bonnie Claire area within Sarcobatus Flat.	Segment would cross 31 washes, including an unnamed braided wash.	Alkali Flat/Lida Valley Playa.
Bonnie Claire alternative segment 3		
Drainage from the foothills of Gold Mountain, Stonewall Mountain, Stonewall Pass, and Northern Pahute Mesa to Lida Valley, Alkali Flat, and Bonnie Claire area within Sarcobatus Flat.	Segment would cross Alkali Flat/Lida Valley Playa. Segment would cross 23 washes.	None.

a. Source: DIRS 177710-MO0607NHDWBDYD.000; DIRS 177714-MO06007NHDFLM06.000; DIRS 176979-MO0605GISGNISN.000; DIRS 176730-DeLorme 1996, pp. 59, 60, and 68.
b. To convert feet to meters, multiply by 0.3048.
c. To convert miles to kilometers, multiply by 1.6093.

Bonnie Claire alternative segment 2 would be in an area that receives drainage from Stonewall Mountain, the foothills of Gold Mountain, and the Northern Pahute Mesa, which flows toward Lida Valley, Alkali Flat, and the Bonnie Claire area of Sarcobatus Flat. Unnamed washes run northeast to southwest, providing a path for overland flow from Pahute Mesa, including the south and southeast sides of Stonewall Mountain to Sarcobatus Flat. Bonnie Claire 2 would cross a notable braided wash at the north end of Sarcobatus Flat before running adjacent to the same wash for several kilometers. This braided wash flows from Stonewall Pass to the Bonnie Claire area of Sarcobatus Flat. There are no streamflow or water-quality data available for the streams and washes Bonnie Claire 2 would cross.

Bonnie Claire 2 would be in the Central Hydrographic Region of Nevada, which has surface hydrology characterized by internally draining sub-areas and is considered an intrastate basin (DIRS 180889-PBS&J 2007, p. 3). Therefore, none of the washes along Bonnie Claire 2 qualify as waters of the United States, as regulated under Section 404 of the Clean Water Act, because there are no connections to surface-water bodies with a connection to interstate water.
There are no wetlands within the region of influence for Bonnie Claire 2.

Federal Emergency Management Agency flood maps cover most of Bonnie Claire 2, but do not include a portion of the land on the eastern side of the alternative segment, which is shown on the maps as an old boundary of the Nevada Test and Training Range. Flood mapping does not extend east of this boundary. The flood maps also show a floodplain for an unnamed drainage feature from Pahute Mesa. The floodplain ends just south of Bonnie Claire 2 near one of the old Nevada Test and Training Range boundaries. It is possible that this floodplain would extend far enough to the northeast to be encountered by Bonnie Claire 2; however, the distance is too far to support such an assumption. In addition, Bonnie

Claire 2 would run farther up in the foothill area where the wash would involve few tributaries. Appendix F provides additional information on this floodplain.

There are no springs identified within 1.6 kilometers (1 mile) of Bonnie Claire 2.

Bonnie Claire alternative segment 3 would begin south of Stonewall Flat, exit Lida Valley, and continue south into Sarcobatus Flat, a large playa. Sarcobatus Flat is bounded by Pahute Mesa on the east and Gold Mountain on the west (Table 3-109 and Figure 3-185). There are no potential quarry sites or proposed construction camps along Bonnie Claire alternative segment 3.

Bonnie Claire alternative segment 3 would be in an area that receives drainage from Stonewall Mountain, the foothills of Gold Mountain, and the Northern Pahute Mesa, which flows toward Lida Valley, Alkali Flat, and the Bonnie Claire area of Sarcobatus Flat. Unnamed washes run northeast to southwest, providing a path for overland flow from Pahute Mesa, including the south and southeast sides of Stonewall Mountain to Sarcobatus Flat. Bonnie Claire 3 would pass through Alkali Flat Playa, a major playa shown in Figure 3-185 and cross a notable braided wash in Sarcobatus Flat. This braided wash flows from Stonewall Pass to the Bonnie Claire area of Sarcobatus Flat. There are no streamflow or water-quality data available for the streams and washes Bonnie Claire 3 would cross.

Bonnie Claire alternative segment 3 would be in the Central Hydrographic Region of Nevada, which has surface hydrology characterized by internally draining sub-areas and is considered an intrastate basin (DIRS 180889-PBS&J 2007, p. 3). Therefore, none of the washes along Bonnie Claire alternative segment 3 qualify as waters of the United States, as regulated under Section 404 of the Clean Water Act, because there are no connections to surface-water bodies with a connection to interstate water.

There are no wetlands within the region of influence for Bonnie Claire alternative segment 3.

Federal Emergency Management Agency flood maps cover most of Bonnie Claire alternative segment 3, but do not include a portion of the land on the eastern side of the segment, which is shown on the maps as an old boundary of the Nevada Test and Training Range. Flood mapping does not extend east of this boundary. Bonnie Claire alternative segment 3 would cross a 100-year floodplain associated with Alkali Flat Playa. The flood maps also show a floodplain for an unnamed drainage feature from Pahute Mesa. The floodplain ends just south of Bonnie Claire alternative segment 3 at one of the old Nevada Test and Training Range boundaries. The floodplain is close enough to Bonnie Claire alternative segment 3 that it is reasonable to assume it would be at a similar width if it extended farther up the wash to where Bonnie Claire alternative segment 3 would cross. Appendix F provides additional information on this floodplain.

There are no springs identified within 1.6 kilometers (1 mile) of Bonnie Claire alternative segment 3.

3.3.5.3.10 Common Segment 5 (Sarcobatus Flat Area)

Common segment 5 would begin approximately 3.1 kilometers (1.9 miles) east of U.S. Highway 95 and trend generally southeast, through the Sarcobatus Flat Area, and along the east side of U.S. Highway 95 (Table 3-110 and Figures 3-185 and 3-186). Common segment 5 would end approximately 6.4 kilometers (4 miles) north of Springdale. Construction camp 10 would be adjacent to the rail alignment and east of U.S. Highway 95. Numerous ephemeral wash draining downslope of Pahute Mesa would run through the construction camp. There are no potential quarry sites along common segment 5 (DIRS 180875-Nevada Rail Partners 2007, p. 3-5).

Common segment 5 would cross washes that drain the Tolicha Peak area of Pahute Mesa. Drainage from the Pahute Mesa flows from the east into Sarcobatus Flat. The alluvial flat terrain between Tolicha Peak and U.S. Highway 95 is characterized by numerous braided washes. Although Sarcobatus Flat is an

Table 3-110. Hydrologic features potentially relevant to common segment 5.[a]

General hydrographic features/drainage	Hydrologic features within 500 feet of the centerline of the rail alignment[b]	Hydrologic features between 500 feet and 1 mile[c] of the centerline of the rail alignment
Drainage from Pahute Mesa and Bullfrog Hills flows to playas within Sarcobatus Flat and Bonnie Claire Lake within Sarcobatus Flat.	Segment would cross Tolicha Wash and 123 other washes. The alluvial flat terrain between Tolicha Peak and U.S. Highway 95 is characterized by numerous braided washes. Washes within this type of soil and terrain can shift in number and geography with a variation of precipitation intensity.	Dry lake bed 0.31 mile south.

a. Source: DIRS 177710-MO0607NHDWBDYD.000; DIRS 177714-MO0607NHDFLM06.000; DIRS 176979-MO0605GISGNISN.000; DIRS 176730-DeLorme 1996, pp. 59, 60, 64, and 68.
b. To convert feet to meters, multiply by 0.3048.
c. To convert miles to kilometers, multiply by 1.6093.

extensive topographic feature, there is only one portion designated as a minor playa that would be close to the rail alignment. The northern edge of this small playa is adjacent to U.S. Highway 95, and would be

approximately 1.7 kilometers (1.1 miles) south of common segment 5 to the southeast of the point where Tolicha Wash crosses Interstate Highway 95. The segment would then cross surface drainage originating from Tolicha Peak and Springdale Mountain. There are no streamflow or water-quality data available for the streams and washes common segment 5 would cross.

Common segment 5 would be in the Central Hydrographic Region of Nevada, which has surface hydrology characterized by internally draining sub-areas and is considered an intrastate basin (DIRS 180889-PBS&J 2007, p. 3). Therefore, none of the washes along common segment 5 qualify as waters of the United States, as regulated under Section 404 of the Clean Water Act, because there are no connections to surface-water bodies with a connection to interstate water.

The National Wetlands Inventory map identifies the playas associated with Sarcobatus Flat as wetlands; however, field studies conducted in support of this Rail Alignment EIS confirmed that there are no hydric soils, plant species indicative of wetlands, or other indicators of wetlands on or adjacent to the playa near the rail alignment (DIRS 180696-Potomac Hudson Engineering 2007, p. 6). Appendix F provides more information about wetlands in this area.

Federal Emergency Management Agency flood maps provide coverage for almost all of common segment 5. The maps show that the segment would cross a 100-year floodplain associated with Tolicha Wash where it drains toward Sarcobatus Flat. Appendix F provides more information on this floodplain.

There are no springs identified within 1.6 kilometers (1 mile) of common segment 5.

3.3.5.3.11 Oasis Valley Alternative Segments

Oasis Valley alternative segment 1 would begin north of Oasis Mountain and would run southeast for approximately 9.8 kilometers (6.1 miles) before converging with common segment 6 (Table 3-111 and Figure 3-186). Construction camp 11 would be along the west side of Oasis Valley alternative segment 1

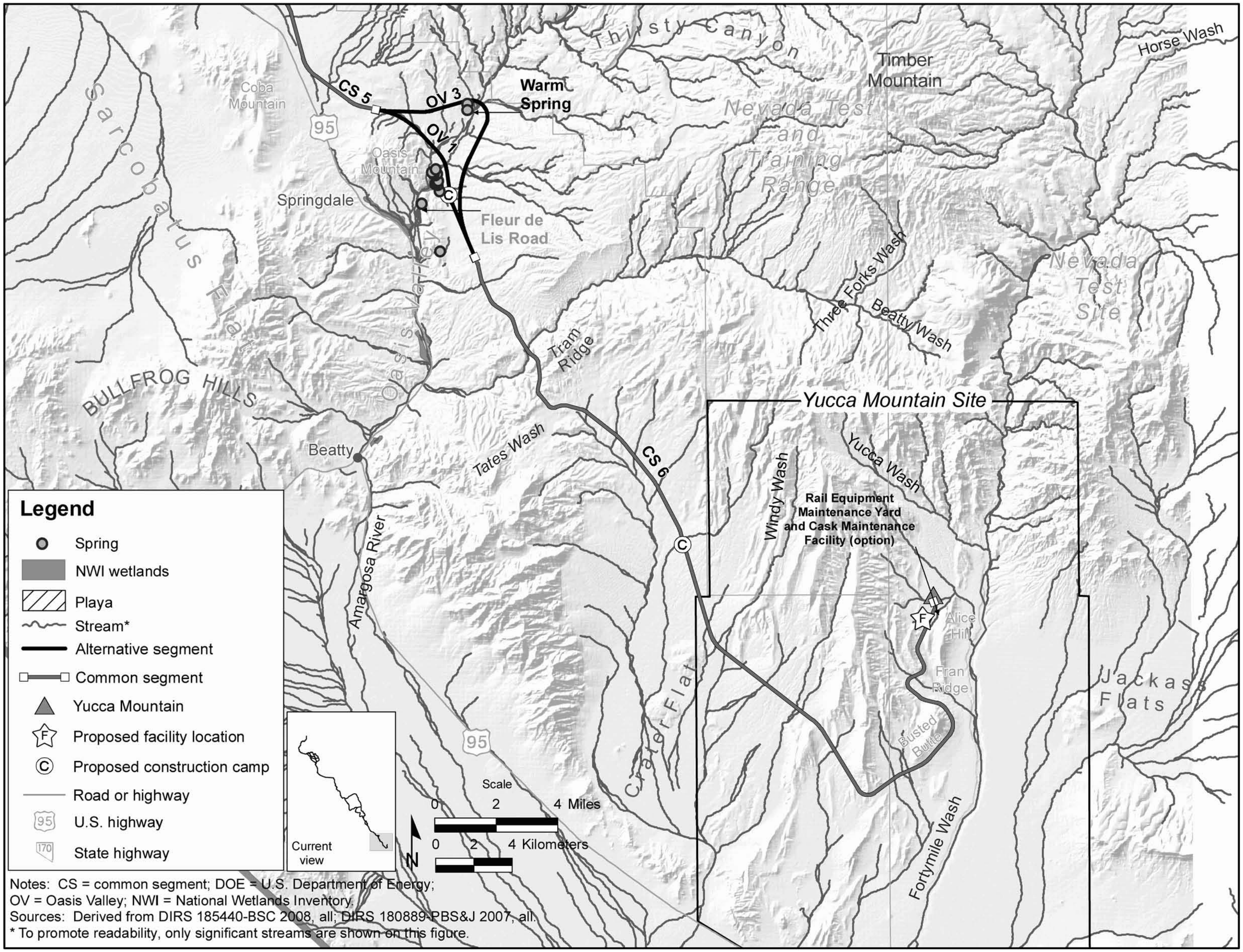


Figure 3-186. Surface drainage within map area 7.

approximately 3.1 kilometers (1.9 miles) north of its junction with common segment 6. Several ephemeral washes flowing downslope from Bullfrog Hills and mountains to the east would run through the construction camp. There are no potential quarry sites along Oasis Valley alternative segment 1 (DIRS 180875-Nevada Rail Partners 2007, pp. 3-5).

Oasis Valley alternative segment 1 would cross the Amargosa River and its tributaries. Although referred to as a river, the Amargosa River and tributary branches and washes receive ephemeral flows from winter and summer storms, and perennial flows near springs and seeps. For most of the year, the tributaries carry no water. The Amargosa River has approximately 20 branches and 40 tributary washes in Oasis Valley. The main branch enters the valley from the north through Thirsty Canyon. Most of the drainage into Oasis Valley is from Pahute Mesa (including Oasis and Springdale Mountains to the north) and the Bullfrog Hills to the southwest. There are no streamflow or water-quality data available for this area; however, there is regional data for the Death Valley Basin (DIRS 176325-USGS 2006, all).

The Amargosa River interstate drainage system flows to Death Valley in California. A survey of the washes along the Mina rail alignment identified the Amargosa River and one tributary that Oasis Valley alternative segment 1 would cross as waters of the United States, as regulated under Section 404 of the Clean Water Act (DIRS 180889-PBS&J 2007, Figure 3B).

There are no wetlands identified within the region of influence for Oasis Valley alternative segment 1.

Federal Emergency Management Agency flood maps provide complete coverage for Oasis Valley 1. The maps show that the segment would cross a 100-year floodplain associated with the Amargosa River. Appendix F provides more information about this floodplain.

There are numerous springs in Oasis Valley and Thirsty Canyon near where Oasis Valley alternative segment 1 would cross. Oasis Valley 1 would pass within 0.48 kilometer (0.30 mile) of several springs identified as the upper Oasis Valley Ranch Springs (DIRS 169384-Reiner et al. 2002, Figure 3). These springs are near the narrows through which the Amargosa River leaves Oasis Valley. Table 3-111 lists these springs.

Oasis Valley alternative segment 3 would begin north of Oasis Mountain, generally run east and then south for approximately 14 kilometers (8.8 miles) and would cross Oasis Valley approximately 0.52 kilometer (0.32 mile) northeast of Colson Pond before converging with common segment 6 (Table 3-111 and Figure 3-186). There are no potential quarry sites or proposed construction camps along Oasis Valley 3.

Oasis Valley alternative segment 3 would cross the Amargosa River and its tributaries, as described above for Oasis Valley alternative segment 1.

A survey of washes performed along the Mina rail alignment identified the Amargosa River, which Oasis Valley alternative segment 3 would cross, as a water of the United States, as regulated under Section 404 of the Clean Water Act (DIRS 183595-PBS&J 2006, Figure 3B).

DOE field studies identified a small wetland associated with an unnamed seep approximately 0.5 kilometer (0.31 mile) from Colson Pond (DIRS 183595-PBS&J 2006, Figure 4T). Appendix F provides more information about this wetland.

Federal Emergency Management Agency flood maps provide complete coverage for Oasis Valley 3. The maps show that the segment would cross a 100-year floodplain associated with the Amargosa River. Appendix F provides more information about this floodplain.

Table 3-111. Hydrologic features potentially relevant to the Oasis Valley alternative segments.[a]

General hydrographic features/drainage	Hydrologic features within 500 feet[b] of the centerline of the rail alignment	Hydrologic features between 500 feet and 1 mile[c] of the centerline of the rail alignment
Oasis Valley alternative segment 1		
Drainage from Bull Frog Hills and the Pahute Mesa, including the Amargosa River and Amargosa River tributaries.	Segment would cross the Amargosa River and 23 unnamed washes.	Unnamed springs: 0.30 mile west 0.30 mile west 0.34 mile west 0.34 mile west 0.37 mile west 0.38 mile west 0.42 mile west 0.43 mile west 0.47 mile west 0.30 mile west 0.93 mile west 0.95 mile west
Oasis Valley alternative segment 3		
Drainage from Bull Frog Hills and the Pahute Mesa, including the Amargosa River and Amargosa River tributaries.	Segment would cross the Amargosa River, and 27 washes/tributaries to the Amargosa River.	Colson Pond (spring fed) 0.32 mile southwest. Small wetland 0.31 mile from Colson Pond. Unnamed springs: 0.12 mile west 0.65 mile west 0.73 mile west 0.74 mile west 0.80 mile west 0.80 mile west 0.83 mile west 0.86 mile west 0.89 mile west 0.94 mile west 0.95 mile west 0.99 mile west

a. Source: DIRS 177710-MO0607NHDWBDYD.000; DIRS 177714-MO0607NHDFLM06.000; DIRS 176979-MO0605GISGNISN.000; DIRS 176730-DeLorme 1996, p. 64.
b. To convert feet to meters, multiply by 0.3048.
c. To convert miles to kilometers, multiply by 1.6093.

There are numerous springs in Oasis Valley and Thirsty Canyon near where Oasis Valley alternative segment 3 would cross (see Table 3-111). Colson Pond is spring fed and would be within 0.52 kilometer (0.32 mile) of the alternative segment. This spring is commonly known as Colson Pond Spring (DIRS 169384-Reiner et al. 2002, Plate 2), but is also referred to as Warm Spring.

3.3.5.3.12 Common Segment 6 (Yucca Mountain Approach)

Common segment 6 would begin at the south juncture of the end of the Oasis Valley alternative segments and proceed to the southeast toward Yucca Mountain (Table 3-112 and Figure 3-186).

Table 3-112. Hydrologic features potentially relevant to common segment 6.[a]

General hydrographic features/drainage	Hydrologic features within 500 feet[b] of the centerline of the rail alignment	Hydrologic features between 500 feet to 1 mile[c] of the centerline of the rail alignment
Drainage from northern Yucca Mountain Range, including Tram Ridge, and Timber Mountain. Drainage from Yucca Mountain Range to Crater Flat and Amargosa Valley.	Segment would cross Beatty Wash, Tates Wash, Windy Wash, Busted Butte Wash, and 39 unnamed washes.	Fortymile Wash. Midway Valley Wash.

a. Source: DIRS 177710-MO0607NHDWBDYD.000; DIRS 177714-MO0607NHDFLM06.000; DIRS 176979-MO0605GISGNISN.000, all; DIRS 176730-DeLorme 1996, pp. 64 and 65.
b. To convert feet to meters, multiply by 0.3048.
c. To convert miles to kilometers, multiply by 1.6093.

The proposed location for construction camp 12 is adjacent to the rail line approximately 9.7 kilometers (6 miles) south of the ***geologic repository*** operations area. There are no potential quarry sites along common segment 6 (DIRS 180875-Nevada Rail Partners 2007, p. 3-5).

Common segment 6 would cross terrain that drains from the southern end of Pahute Mesa and the Yucca Mountain Range to Crater Flat and the Amargosa River. The first significant tributary common segment 6 would cross is Beatty Wash and its tributaries, which provide drainage from Timber Mountain and Tram Ridge at the northern reaches of Yucca Mountain, to Oasis Valley and the Amargosa River at a point approximately 4.8 kilometers (3 miles) northeast of the community of Beatty. Beatty Wash is one of the largest tributaries of the Amargosa River. Common segment 6 would cross Beatty Wash at the north end of the Yucca Mountain Range, approximately 5.4 kilometers (3.4 miles) southeast of Oasis Valley. After crossing Beatty Wash, common segment 6 would proceed to the southeast toward Yucca Mountain, where it would cross several tributaries of Tates Wash. Approximately 26 kilometers (16 miles) from the start of common segment 6, the segment would cross Windy Wash and unnamed washes carrying drainage from the eastern side of Yucca Mountain. The segment would then continue around the southern tip of the Yucca Mountain Range before turning northeast, skirting the eastern edge of Busted Butte and continuing between Bow and Fran Ridges.

Near the Yucca Mountain Site, Fortymile Wash, a major wash that flows to the Amargosa River, drains the eastern side of Yucca Mountain (DIRS 169734-BSC 2004, p. 7.1-3). The tributaries draining into Fortymile Wash at Yucca Mountain include Yucca Wash to the north; Drill Hole Wash, which, together with a tributary in Midway Valley, drains most of the repository site; and Busted Butte Wash (also known as Dune Wash) to the south. Common segment 6 would cross Busted Butte Wash, some of its unnamed tributaries, and unnamed tributaries of Drill Hole Wash. Common segment 6 would not actually cross Drill Hole Wash, but the wash would be within the common segment 6 region of influence. Fortymile Wash runs parallel to the end of common segment 6 at the Yucca Mountain Site, but common segment 6 would not cross the wash. Fortymile Wash is the most prominent drainage through Jackass Flats to the Amargosa River (DIRS 155970-DOE 2002, p. 3-36, Figure 3-11).

All of common segment 6 is within the Amargosa River interstate drainage system. Of the numerous washes along common segment 6, 14 were identified as waters of the United States, as regulated under Section 404 of the Clean Water Act (DIRS 180889-PBS&J 2007, Figures 3B and 3C). The Rail Equipment Maintenance Yard would be where the proposed rail line ends at Yucca Mountain. There are no perennial streams, natural bodies of water, or naturally occurring wetlands at Yucca Mountain (DIRS 155970-DOE 2002, p. 3-35). The facility would overlie an ephemeral stream but would not cross any waters of the United States.

Slightly more than half of common segment 6 has coverage on Federal Emergency Management Agency flood maps. These maps show that common segment 6 would cross a short span of the 100-year floodplain associated with Beatty Wash. Although the flood maps do not provide coverage for the area of the repository on the eastern side of Yucca Mountain, DOE has performed flood studies on several washes in that area, as addressed in the Yucca Mountain FEIS. An overlay of the Mina rail alignment with Yucca Mountain FEIS Figure 3-12 indicates that common segment 6 would cross short stretches of 100-year floodplains associated with Busted Butte Wash and Drill Hole Wash. The rail line would terminate just before reaching a floodplain associated with Midway Valley Wash (also known as Sever Wash) (DIRS 155970-DOE 2002, pp. 3-38 and 3-39, and Figure 3-12). Appendix F further describes the floodplains associated with common segment 6.

There are no springs identified within 1.6 kilometers (1 mile) of common segment 6. Ute Springs, 270 meters (890 feet) west of U.S. Highway 95 in Oasis Valley, would be within about 0.6 to 0.88 kilometer (0.37 to 0.55 mile) of potential alternative well sites OV9 through OV12 near U.S. Highway 95 (DIRS 169384-Reiner et al. 2002, Plate 2).

3.3.6 GROUNDWATER RESOURCES

This section describes groundwater resources along the Mina rail alignment. Section 3.3.6.1 describes the region of influence for groundwater resources; Section 3.3.6.2 is a general overview of groundwater features along the Mina rail alignment; and Section 3.3.6.3 describes more specific features for each of the Mina rail alignment alternative segments and common segments.

3.3.6.1 Region of Influence

The region of influence for groundwater resources along the Mina rail alignment includes aquifers that would underlie areas of the proposed railroad construction and operations, portions of groundwater aquifers DOE would use to obtain water for construction and operations support and that would be affected by these groundwater withdrawals, and nearby springs, seeps, or other surface-water-right locations that might be affected by such groundwater withdrawals. The horizontal extent of the region of influence varies depending on the particular aspects of the specific project activity, as follows:

- DOE used the nominal width of the rail line construction right-of-way and the footprints of the railroad construction and operations support facilities to define where there would be construction or other land disturbances. These areas could be susceptible to changes in groundwater ***infiltration***, discharge (for example, spring discharge), or quality. There could also be damage to, or loss of use of, an existing well (including potential need for well abandonment), if that well fell within the rail ***roadbed*** or was disturbed during railroad construction activities. Review of the available information on the locations of existing wells indicates that rail roadbed construction would not disturb any existing wells. However, the precise locations for existing wells have not been field-verified and actual well locations might vary from the coordinates identified and cataloged for the wells in State of Nevada and U.S. Geological Survey well databases (see Section 3.3.6.2.1).
- DOE used an initial screening-level distance of 1.6 kilometers (1 mile) on either side of the centerline of the rail alignment and an initial radius of 1 mile surrounding each proposed new well if that well would be outside of the nominal width of the construction right-of-way to define areas in the general vicinity of the rail alignment and proposed well locations that could also be affected by changes in groundwater discharge or quality at existing wells, springs, seeps, and other surface-water-right locations.
- DOE used a distance criterion of 150 meters (500 feet) on either side of the proposed rail alignment centerline to define areas in which there could be damage to, or loss of use of, an existing well if that well fell within the rail roadbed or was disturbed during rail construction activities.
- DOE considered both the individual groundwater basins (hydrographic areas) that underlie the Mina rail alignment and the railroad construction and operations support facilities and adjacent hydrographic areas for evaluating areas that might be affected by proposed groundwater withdrawals for construction or operations support. This would include areas that could be susceptible to changes in groundwater discharge or flow to an adjacent groundwater basin.

3.3.6.2 General Hydrogeologic Setting and Characteristics

This section is an overview of the general hydrogeologic setting and characteristics of groundwater underlying the area along the Mina rail alignment. Water-resource features, primarily those associated with groundwater, are described in relation to the hydrographic areas in which they lie.

Groundwater ***recharge*** in central and southern Nevada is affected by low precipitation and high annual evaporation rates typical of desert climates. Most recharge to aquifers in the region of influence is derived from precipitation falling in the higher parts of the inter-basin mountain ranges (DIRS 103136-Prudic, Harrill, and Burbey 1993, pp. 2, 58, 84, and 88).

3.3.6.2.1 Groundwater Hydrographic Areas and Groundwater Use in Nevada

To classify hydrographic regions and hydrographic areas and facilitate the management of groundwater resources within the State of Nevada, the state has been divided into a series of groundwater basins (designated as hydrographic areas) (DIRS 177741-State of Nevada 2005, all; DIRS 106094-Harrill, Gates, and Thomas 1988, all).

A total of 260 hydrographic areas are recognized within the Great Basin; all or parts of 232 hydrographic areas fall within Nevada (DIRS 106094-Harrill, Gates, and Thomas 1988, all; DIRS 177741-State of Nevada 2005, all).

Three types of aquifers are the principal sources of groundwater found in central and southern Nevada, as follows (DIRS 172905-USGS 1995, all):

- Alluvial valley fill: Composed primarily of unconsolidated alluvial sand and gravel. The distribution of sediment size is directly associated with distance from the mountains. In general, the coarsest materials (for example, gravel and boulders) were deposited near the mountains, and the finer materials (for example, sand, silt, and clay) were deposited in the central parts of the basins or in the lakes and playas. Alluvial fans are important hydrologic features within the hydrographic basins, sometimes serving as targets for groundwater development, and with alluvial valley-fill portions of the basins receiving some of their recharge through the coarse sediment deposits in the alluvial fans. Alluvial deposits consisting of alluvial sand and gravel are present along the courses of modern ephemeral and intermittent streams or ancestral streams that generally parallel the long axes of the basins. Alluvial deposits underlie most of the Mina rail alignment. Groundwater in the alluvial valley-fill aquifers generally flows from recharge areas in the surrounding mountains toward the axial centers of the alluvial basins. Groundwater flow characteristics can vary with location depending on the geometry, composition, and hydraulic properties of the alluvial deposits comprising the alluvial aquifer and the degree of hydraulic connection to adjacent aquifers. For example, groundwater flow could be relatively uniform and roughly horizontal in shallow aquifers with the groundwater flow pattern generally following the local topography, or flow behavior could be controlled in deeper alluvial flow systems if horizontal confining units or confining layers or lateral flow boundaries are present. Sand-and gravel-rich alluvial aquifers can yield water readily to wells and are the aquifers most commonly developed.
- Volcanic rock aquifers: Composed primarily of tuffs (ash flows, ash falls), rhyolite, or basalt. Groundwater movement in these materials is often controlled by the number and degree of joint interconnections, ***fractures*** or faults, or vesicle (void space) interconnection in lavas.
- Carbonate rock aquifers: Composed primarily of limestones and dolomites. The carbonate rocks are commonly highly fractured and are locally fragmented. Groundwater flow in the carbonate rock aquifers is controlled by interconnected fractures.

Tectonic forces superimposed faulting on existing groundwater-bearing formations (aquifers) in this region. As a result, several aquifer units underlying the Mina rail alignment are fractured and faulted in some locations. These faults and fractures locally can influence groundwater flow patterns within the affected aquifer areas, with these features capable of acting as either barriers to, or conduits for, groundwater flow (see Appendix G).

Within the Basin and Range Province, any or all of the three basic aquifer types discussed above might be present within a particular area and might constitute three separate, hydraulically distinct, sources of water. Alternatively, any or all of the three aquifer types might underlie an area but might be hydraulically connected to form a single groundwater source.

Groundwater levels fluctuate seasonally and annually in response to changes in withdrawal (consumptive use) and climatic conditions, with levels generally rising from late winter to early summer and generally declining from summer to early winter (DIRS 172904-Berris et al. 2003, p. 6). In 2000, an estimated 1.75 billion cubic meters (1.42 million ***acre-feet***) of groundwater were pumped in Nevada (DIRS 175964-Lopes and Evetts 2004, p. 7). Irrigation and stock watering was the primary groundwater use, accounting for approximately 46 percent of the total groundwater withdrawal, followed by mining (approximately 26 percent), drinking-water systems (approximately 14 percent), geothermal production (approximately 8 percent), self-supplied domestic (approximately 5 percent), and miscellaneous (1 percent) (DIRS 175964-Lopes and Evetts 2004, p. 7) (see Figure 3-187). Virtually all major groundwater development in Nevada has been in the alluvial valley fill, with withdrawals from approximately the upper 460 meters (1,500 feet) of these aquifers. The carbonate rock aquifers in eastern and southern Nevada supply water to numerous springs (DIRS 106094-Harrill, Gates, and Thomas 1988, all).

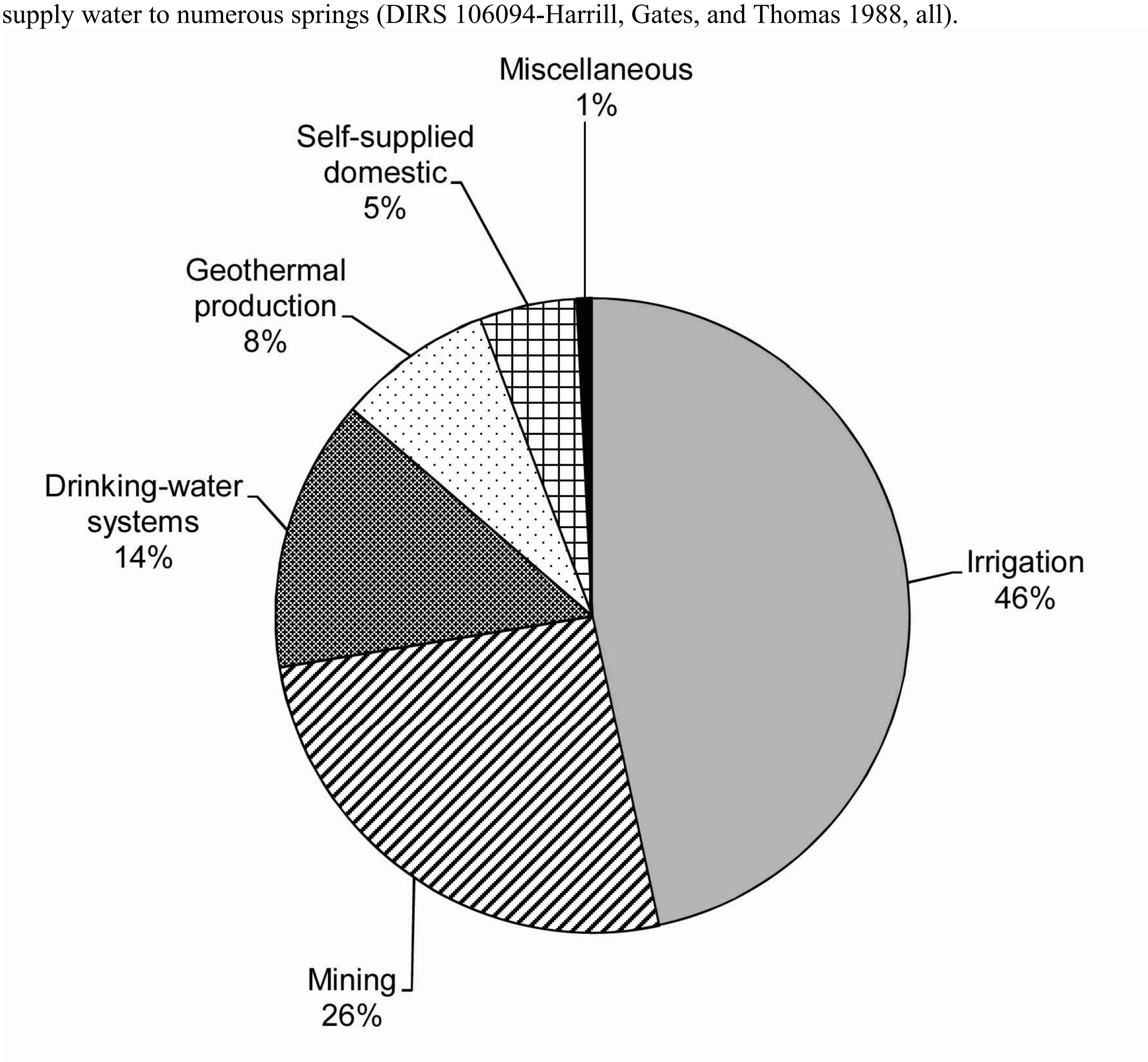


Figure 3-187. Groundwater usage in Nevada in 2000. (Source: DIRS 175964-Lopes and Evetts 2004, p. 7.)

Figure 3-188 shows generalized regional groundwater flow patterns in the vicinity of the Mina rail alignment. Available information regarding groundwater "interbasin" inflow and outflow (groundwater flow across hydrographic area boundaries) characteristics for hydrographic areas (groundwater basins) within central Nevada (DIRS 177524-Anning and Konieczki 2005, pp. 10 and 11, and Plate 1) indicates that interbasin groundwater outflow or groundwater inflow through alluvial valley-fill aquifer materials or through consolidated rock aquifers (lithified or cemented rock aquifers such as carbonate rock units, or clastic, metamorphic, igneous, or volcanic rock aquifers) appears to occur at some locations; at other locations, there appears to be no substantial interbasin groundwater flow occurring through either or both of these types of aquifer units. The figure depicts generalized flow directions within alluvial valley-fill units and within consolidated rock aquifers, in areas where such flow is inferred to be occurring across hydrographic area boundaries.

Acre-foot is a unit commonly used to measure water volume. It is the quantity of water required to cover 4,047 square meters (1 acre) to a depth of 0.3048 meter (1 foot), and is equal to 1,233.5 cubic meters (325,851 gallons). Sections 3.3.6 and 4.3.6 list perennial yields, committed groundwater resources, and consumptive use in acre-feet because it is the common unit used by industry and government agencies.

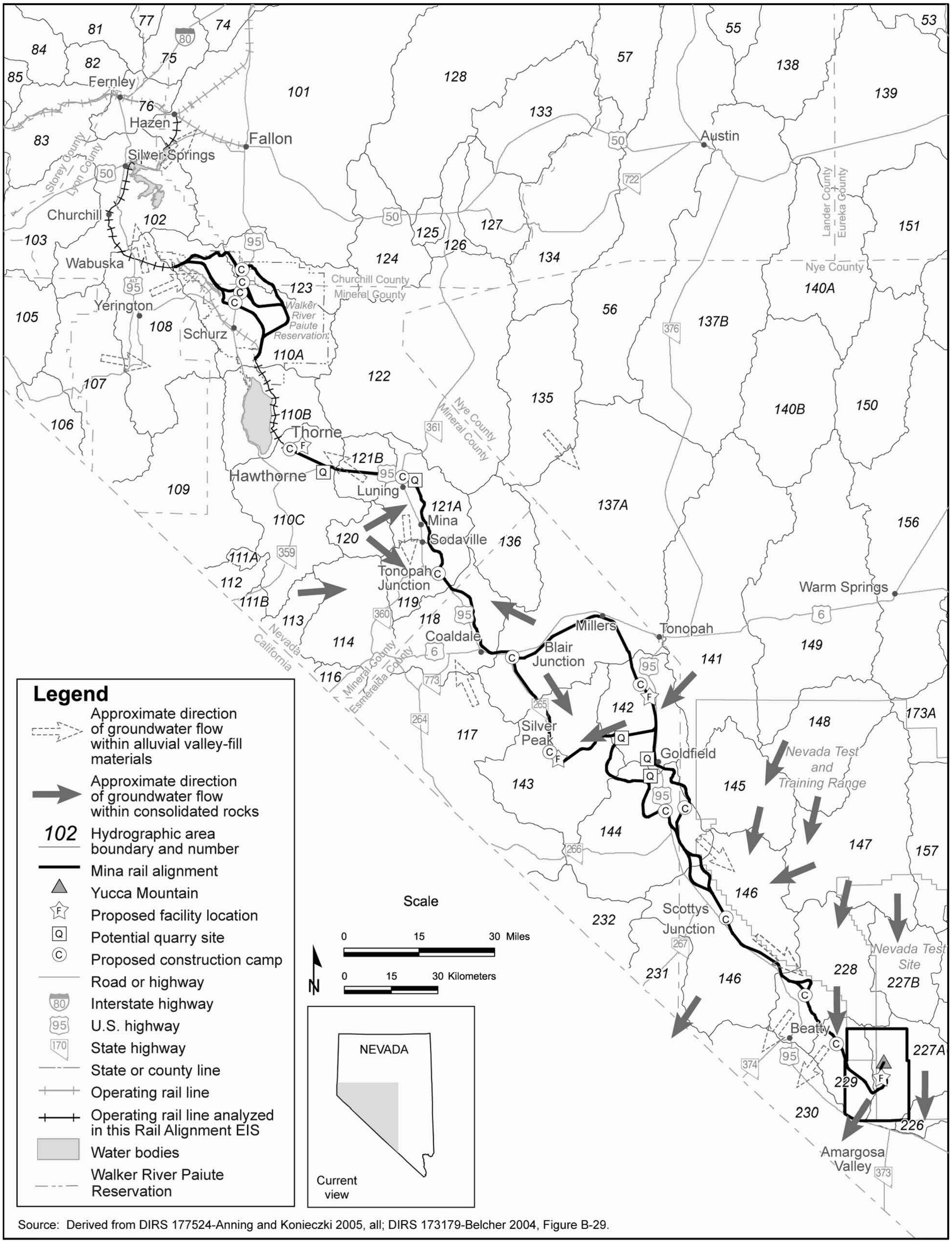
This section describes groundwater resources in relation to hydrographic areas. Figure 3-189 shows the 18 hydrographic areas the Mina rail alignment would cross, depending on alternative segments selected. Table 3-113 lists the estimated annual ***perennial yields*** for the 18 hydrographic areas, and identifies which are State of Nevada-***designated groundwater basins***. The hydrographic areas are presented in the order the Mina rail alignment would cross them, beginning near Wabuska, moving southeast across Nevada toward Yucca Mountain.

There are a number of published estimates of perennial yield for many of the hydrographic areas in Nevada, and those estimates often differ by large amounts. The perennial-yield values listed in Table 3-113 predominantly come from a single source, the Nevada Division of Water Planning (DIRS 103406-Nevada Division of Water Planning 1992, for Hydrographic Regions 10, 13, and 14); therefore, the table does not show a range of values for each hydrographic area.

In the Yucca Mountain area, the Nevada Division of Water Planning identifies a combined perennial yield for hydrographic areas 225 through 230. DOE obtained perennial yields from *Data Assessment & Water Rights/Resource Analysis of: Hydrographic Region #14 Death Valley Basin* (DIRS 147766-Thiel Engineering Consultants 1999, pp. 6 to 12) to provide estimates for hydrographic areas the Mina rail alignment would cross: hydrographic areas 227A, 228, and 229. That 1999 document presents perennial-yield estimates from several sources. Table 3-113 lists the lowest (that is, the most conservative) values cited in that document, which is consistent with the approach DOE used in the Yucca Mountain FEIS (DIRS 155970-DOE 2002, pp. 3 to 136).

Table 3-113 also summarizes existing annual ***committed groundwater resources*** for each hydrographic area along the Mina rail alignment. However, all committed groundwater resources within a hydrographic area might not be in use at the same time. Table 3-113 also includes information on pending annual duties within each of these hydrographic areas. A ***pending annual duty*** represents the amount of water for which an appropriation application has been submitted to the State Engineer for consideration and that the State Engineer has classified as a pending annual ***duty*** value within a hydrographic area, in accordance with applicable state statutes. Unless otherwise noted, the source of data for pending annual duties in the hydrographic areas the alignment would cross is DIRS 182759-Converse Consultants 2007, all; DIRS 182900-NDWR 2007, all; and DIRS 183991-Luellen 2007, all.

These data were acquired on March 31, 2007: NDWR Data Update (DIRS 182759-Converse Consultants 2007, all) and either April 18, 2007: NDWR Water Rights Data Hydrographic Area 110B (DIRS 182900-NDWR 2007, all) or May 30, 2007: DIRS 183991-Luellen 2007, all.



Source: Derived from DIRS 177524-Anning and Konieczki 2005, all; DIRS 173179-Belcher 2004, Figure B-29.

Figure 3-188. Generalized groundwater flow direction through alluvial valley-fill and consolidated rock aquifers in the vicinity of the Mina rail alignment.

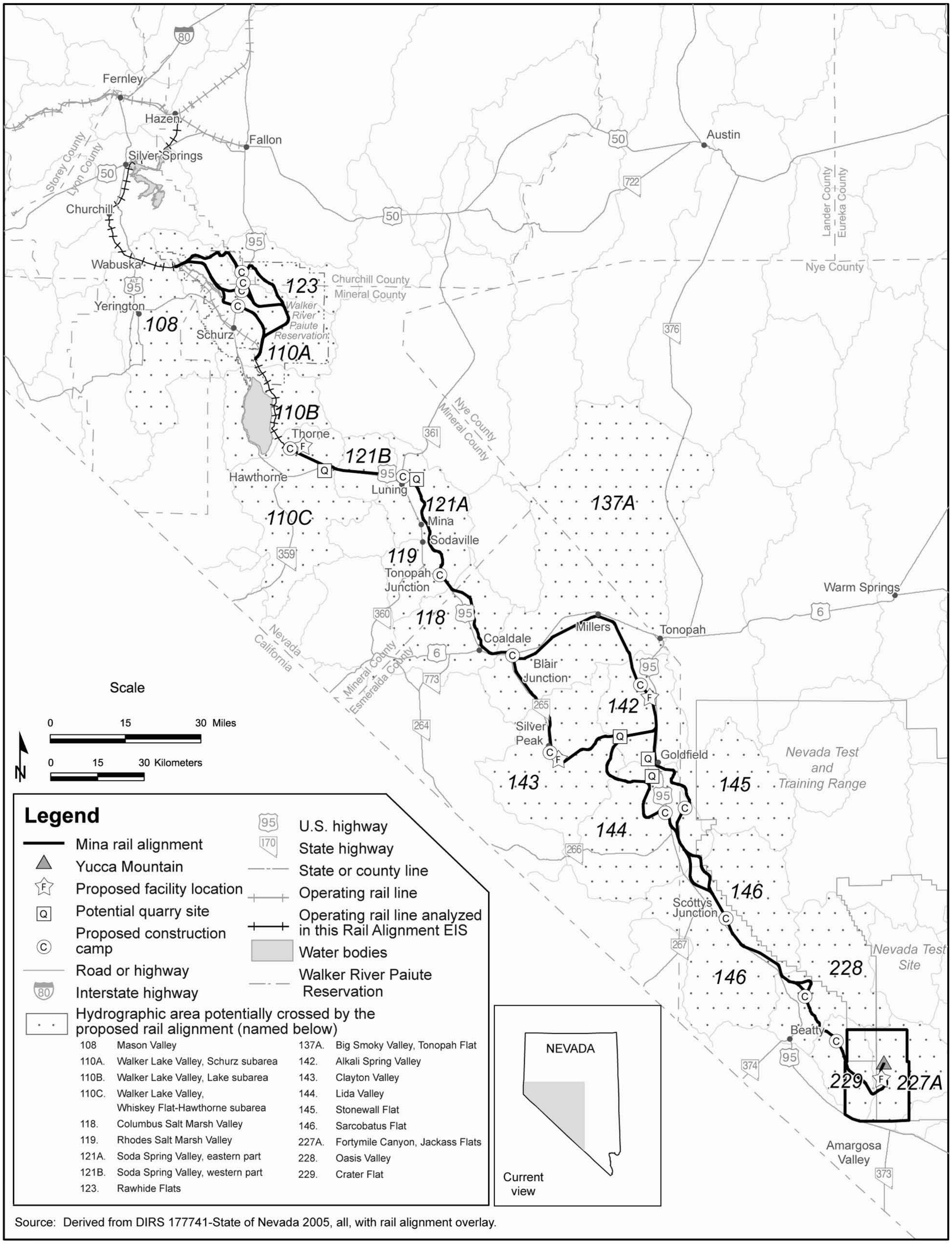


Figure 3-189. Hydrographic areas the Mina rail alignment would cross.

Table 3-113. Perennial yield and annual committed groundwater resources of hydrographic areas the Mina rail alignment would cross (page 1 of 2).

Rail line segment	Hydrographic area[a] number	Hydrographic area name	Perennial yield (acre-feet)[b,c]	Annual committed groundwater resources/pending annual groundwater duties (acre-feet)[d]	Designated groundwater basin[e,f]
Department of Defense Branchline North	108	Mason Valley	25,000	179,696/25,269	Yes
Schurz alternative segment 1, Department of Defense Branchline South	110A	Walker Lake Valley (Schurz subarea)	1,500	637/2	No
Schurz alternative segment 4, Department of Defense Branchline South					
Schurz alternative segment 5, Department of Defense Branchline South					
Schurz alternative segment 6, Department of Defense Branchline South					
Schurz alternative segment 5	123	Rawhide Flats	500	116/0	No
Schurz alternative segment 6					
Department of Defense Branchline South	110B	Walker Lake Valley (Lake subarea)	700	2,093/0	No
Department of Defense Branchline South, Mina common segment 1	110C	Walker Lake Valley (Whiskey Flat-Hawthorne subarea)	5,000	12,709/0	Yes
Mina common segment 1	121 B	Soda Spring Valley (western part)	200	354/0	Yes
Mina common segment 1	121 A	Soda Spring Valley (eastern part)	6,000	3,168/0	Yes
Mina common segment 1	119	Rhodes Salt Marsh Valley	1,000	49/0	No
Mina common segment 1	118	Columbus Salt Marsh Valley	4,000	1,764/0	No
Mina common segment 1, Montezuma alternative segment 1	137A	Big Smoky Valley (Tonopah Flat)	6,000	19,638/0	Yes
Mina common segment 1, Montezuma alternative segment 2					
Montezuma alternative segment 1	143	Clayton Valley	20,000	23,882/0	No

Table 3-113. Perennial yield and annual committed groundwater resources of hydrographic areas the Mina rail alignment would cross (page 2 of 2).

Rail line segment	Hydrographic area[a] number	Hydrographic area name	Perennial yield (acre-feet)[b,c]	Annual committed groundwater resources/pending annual groundwater duties (acre-feet)[d]	Designated groundwater basin[e,f]
Montezuma alternative segment 1	142	Alkali Spring Valley	3,000	2,596/0	No
Montezuma alternative segment 2					
Montezuma alternative segments 1, 2, and 3					
Montezuma alternative segment 1, Mina common segment 2, Bonnie Claire alternative segment 2	144	Lida Valley	350	72/0	No
Montezuma alternative segment 1, Mina common segment 2, Bonnie Claire alternative segment 3					
Montezuma alternative segment 2	145	Stonewall Flat	100	12/0	No
Bonnie Claire alternative segment 2, common segment 5	146	Sarcobatus Flat	3,000	3,591/0	Yes
Bonnie Claire alternative segment 3, common segment 5					
Common segment 5, Oasis Valley alternative segment 1, common segment 6	228	Oasis Valley	1,000	1,299/0	Yes
Common segment 5, Oasis Valley alternative segment 3, common segment 6					
Common segment 6	229	Crater Flat	220	1,147/82	No
Common segment 6	227A	Fortymile Canyon/Jackass Flats	880[f]	58[f]/5	No

a. Source: DIRS 106094-Harrill, Gates, and Thomas 1988, Summary, Figure 3, with the proposed rail alignment map overlay.
b. Source: DIRS 103406-Nevada Division of Water Planning 1992, Regions 10, 13, and 14, except hydrographic areas 227A, 228, and 229, for which the source is DIRS 147766-Thiel 1999, pp. 6 to 12.
c. To convert acre-feet to cubic meters, multiply by 1,233.49; to convert acre-feet to gallons, multiply by 3.259×10^5.
d. Data for committed groundwater and pending annual duties are current as of March 31, 2007 (all hydrographic areas except areas 110B and areas 142, 144, 145, 146, 228, 229, and 227A) (DIRS 182759-Converse Consultants 2007, all); April 18, 2007 (hydrographic area 110B) (DIRS 182900-NDWR 2007, all); and May 30, 2007 (hydrographic areas 142, 144, 145, 146, 228, 229, and 227A) (DIRS 183991-Luellen 2007, all). Data for pending annual duties include underground duties but do not include duties for streams or springs. All values have been rounded to the nearest acre-foot.
e. Sources: DIRS 176488-State of Nevada 2006, Regions 10, 13, and 14; DIRS 177741-State of Nevada 2005, all.
f. Based on a 1979 Designation Order by the State Engineer; there are no committed resources in hydrographic area 227A. However, water-rights information from the Nevada Department of Water Resources indicates there are 58 acre-feet in committed resources for this area. The discrepancy appears to be related to the location of the boundary between areas 227A and 230 (Amargosa Desert) (DIRS 182821-Converse Consultants 2005, p. 29 and Tables 4 through 45). The perennial-yield value shown for hydrographic area 227A is the lowest estimated value presented in *Data Assessment & Water Rights/Resource Analysis of: Hydrographic Region #14 Death Valley Basin* (DIRS 147766-Thiel 1999, p. 8), for the western two-thirds of hydrographic area 227A. The perennial yield estimate for area 277A is broken down into 300 acre-feet for the eastern third of the area and 580 acre-feet for the western two-thirds of the area.

As part of an effort to assess water resources in the vicinity of the Mina rail alignment, DOE performed studies to identify groundwater conditions, the locations of springs, seeps, and other surface-water-right locations, and the locations, use, and water-rights status of groundwater-supply wells within 32 kilometers (20 miles) of either side of the centerline of the rail alignment. Information on groundwater characteristics in hydrographic areas that the rail alignment would cross and identified groundwater uses and use types within the 64-kilometer (40-mile) search area are compiled in the *Water Resources Assessment Report, Mina Rail Corridor* (DIRS 180887-Converse Consultants 2007, all). DOE reviewed several other published reports and maps providing information regarding hydrogeologic and groundwater characteristics in hydrographic areas the rail alignment would cross to obtain information to support the groundwater resources impacts assessment.

Perennial yield is the amount of useable water from a groundwater aquifer that can be economically withdrawn and consumed each year for an indefinite period. It cannot exceed the natural recharge to that aquifer and ultimately is limited to the maximum amount of discharge that can be utilized for beneficial use.

The State of Nevada may identify a hydrographic area as a **designated groundwater basin** where permitted groundwater rights approach or exceed the estimated average annual recharge and the water resources are being depleted or require additional administration, including a state declaration of preferred uses (for example, municipal and industrial, domestic supply, etc.) (DIRS 103406-Nevada Division of Water Planning 1992, p. 18). Designated groundwater basins are also referred to as administered groundwater basins.

DOE reviewed several well, water-rights, and spring databases, including Nevada Division of Water Resources (NDWR) and U.S. Geological Survey National Water Information System (USGS NWIS) databases to identify existing wells with certificated water rights, domestic wells, springs, seeps, and other surface-water-right locations within the potential region of influence of proposed new groundwater withdrawal wells. Unless noted otherwise, the sources for the spring, seep, other surface-water-right location, and well data in this section are as follows: DIRS 182821-Converse Consultants 2005, all; DIRS 176979-MO0605GISGNISN.000, all; DIRS 177294-MO0607USGSWNVD.000, all; DIRS 176325-USGS 2006, all; DIRS 183991-Luellen 2007, all; DIRS 182759-Converse Consultants 2007, all; DIRS 183990-Luellen 2007, all; DIRS 180887-Converse Consultants 2007, all; DIRS 185060-Converse Consultants 2008, all; DIRS 177712-MO0607NHDPOINT.000, all; DIRS 177710-MO0607NHDWBDYD.000, all; DIRS 183990-Luellen 2007, all; DIRS 183991-Luellen 2007, all; and DIRS 182900-NDWR 2007, all. An initial screening process identified existing wells within 1.6 kilometers (1 mile) of the centerlines of the respective alternative segments, or within 1.6 kilometers of DOE-proposed new water-supply wells. As described later in this section, before analyzing potential impacts to groundwater resources, DOE extended the search radius for identifying existing beneficial-use wells, springs, seeps, or other surface-water-right locations up to 2.8 kilometers (1.75 miles) away from a proposed new well if the initial search for such wells or springs within 1.6 kilometers (1 mile) did not reveal the presence of any such wells, springs, seeps, or other surface-water-right locations. Well locations identified for consideration also included permitted (PER) wells. DOE also considered potential future cumulative impacts associated with proposed future water-rights locations (proposed well locations) for which water-rights applications had been submitted to the State Engineer and that had been assigned a status of “Ready for Action (RFA)” or “Ready for Action, Protested (RFP)” by the State Engineer at the time the data were acquired (Section 5.2.1.3.2). Additionally, on a case-by-case basis (see Section 4.3.6 and Appendix G) for a selected set of new groundwater withdrawal wells specifically targeted for installation within a fault zone or an extensive fracture zone, DOE identified the locations of existing wells, springs, seeps, or other surface-water-right locations up to 9.7 kilometers (6 miles) away from each such proposed well (to address the possibility of fault zones or extensive fracture zones acting as conduits for groundwater flow).

Information for completing this compilation included well-log data and water-rights information obtained from the NDWR. NDWR well-log database entries and water-rights database information include a general and legal description of the location of existing wells, along with ***borehole*** and well completion information, well testing data (if available), and information on the appropriated water right (diversion rate and/or annual duty). The NDWR water-rights database includes data on the locations, manner of use, and appropriations status of wells having appropriated water rights in Nevada. The USGS website generally includes site information (for example, well location coordinates, elevation, depth) and water-level data. DOE eliminated from consideration in the impacts analysis wells in the NDWR well-log database and the NDWR water-rights database that did not have appropriated water rights or were not domestic wells (such as abandoned or plugged wells, monitoring wells, thermal gradient test wells, oil or gas exploration wells, or groundwater investigation wells). DOE considered all USGS-identified wells.

The compiled well locations had varying levels of accuracy. For example, well locations recorded in the NDWR water-rights database are generally considered to be at the center of each 0.16-square-kilometer (40-acre) parcel representing each quarter-quarter section. Additionally, the well driller might have mapped the well incorrectly, or a well might have been inadvertently recorded in the NDWR water-rights database in the wrong hydrographic area (for example, for wells very near a hydrographic area boundary). Figures 3-190 through 3-196 identify well locations within 1.6 kilometers (1 mile) of the centerline of the Mina rail alignment or proposed wells. As a result of the characteristics of the well location specifications, there might be more than one existing well at some locations on these figures. Table 3-114 lists hydrographic areas the Mina rail alignment would cross (or for which a small portion of the hydrographic area would lie within the region of influence of the alignment) and the corresponding number of wells within 1.6 kilometers (1 mile) of the centerline of the rail alignment.

Table 3-114 identifies the associated proposed-use category of the NDWR-cataloged wells (as defined in the State of Nevada well-log database). The USGS NWIS database does not categorize wells according to their use.

The distance of 1.6 kilometers (1 mile) reflects the first two of three aspects considered in establishing the groundwater region of influence, as described in Section 3.3.6.1. The wells identified in these figures were compiled from information provided in the *Water Resources Assessment Report, Mina Rail Corridor* and an NDWR Data Update Technical Memorandum (DIRS 180887-Converse Consultants 2007, all; DIRS 182759-Converse Consultants 2007, all) and databases administered by the NDWR and the USGS NWIS. DOE would field-verify the locations of wells that could be affected during rail line construction before starting construction activities.

DOE-compiled well data include data on well locations for well records coded as “new” or “replacement” wells in the Nevada well-log database. Because each entry in the well-log database represents an event at a well site (for example, installation, redrilling, abandonment), there is a possibility that there is more than one record to represent a particular well. To preclude duplication, DOE summarized only records that identified wells as new or replacement. As a result of the characteristics of the well location specifications, there might be more than one existing well that plot at the same location on these figures.

Table 3-114 lists hydrographic areas the Mina rail alignment would cross and the corresponding number of NDWR wells with water rights and USGS wells within 1.6 kilometers (1 mile) of the centerline of the rail alignment, or within a 1.6-kilometer radius of any proposed new water well that would be outside the rail line construction right-of-way. Table 3-114 identifies the associated proposed-use category of the NDWR-cataloged wells with water rights (as defined in the State of Nevada well-log and water-rights databases). The USGS NWIS database does not categorize wells according to their use. For this reason, the existing USGS wells that are included on Figures 3-190 through 3-196 are not included in the well use categorization presented in Table 3-114.

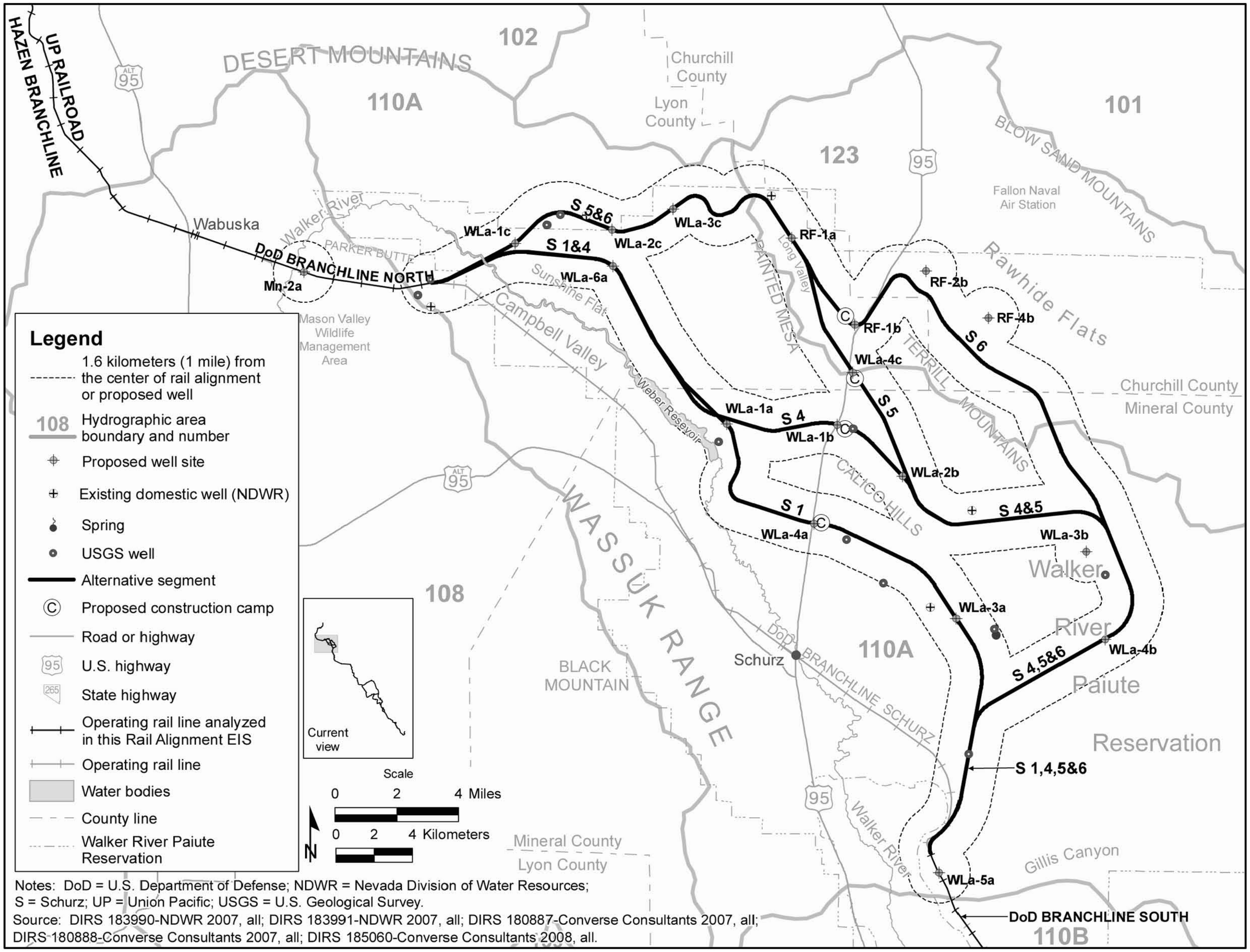
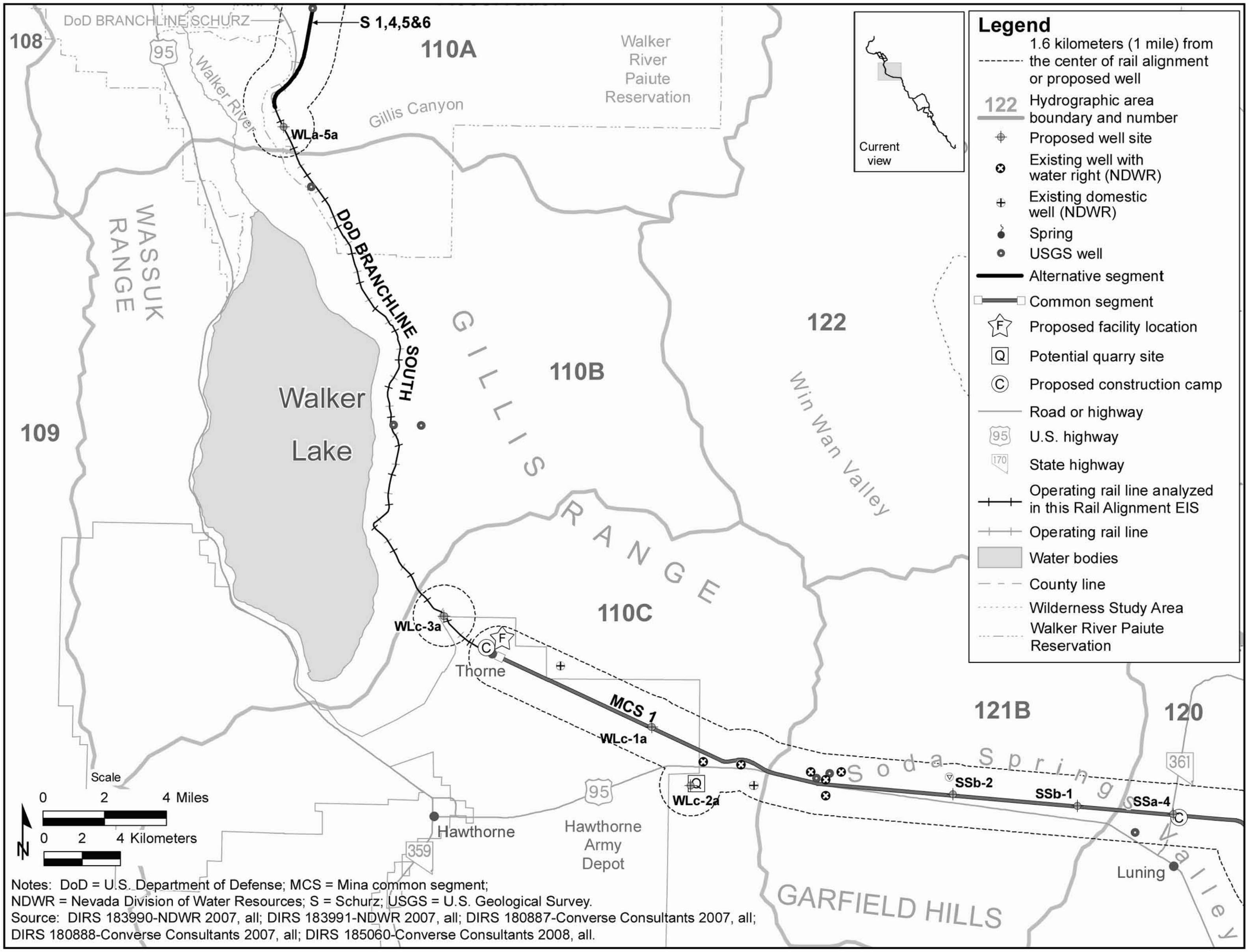


Figure 3-190. Proposed wells and existing USGS and NDWR wells and springs within map area 1.



Notes: DoD = U.S. Department of Defense; MCS = Mina common segment;
NDWR = Nevada Division of Water Resources; S = Schurz; USGS = U.S. Geological Survey.
Source: DIRS 183990-NDWR 2007, all; DIRS 183991-NDWR 2007, all; DIRS 180887-Converse Consultants 2007, all;
DIRS 180888-Converse Consultants 2007, all; DIRS 185060-Converse Consultants 2008, all.

Figure 3-191. Proposed wells and existing USGS and NDWR wells and springs within map area 2.

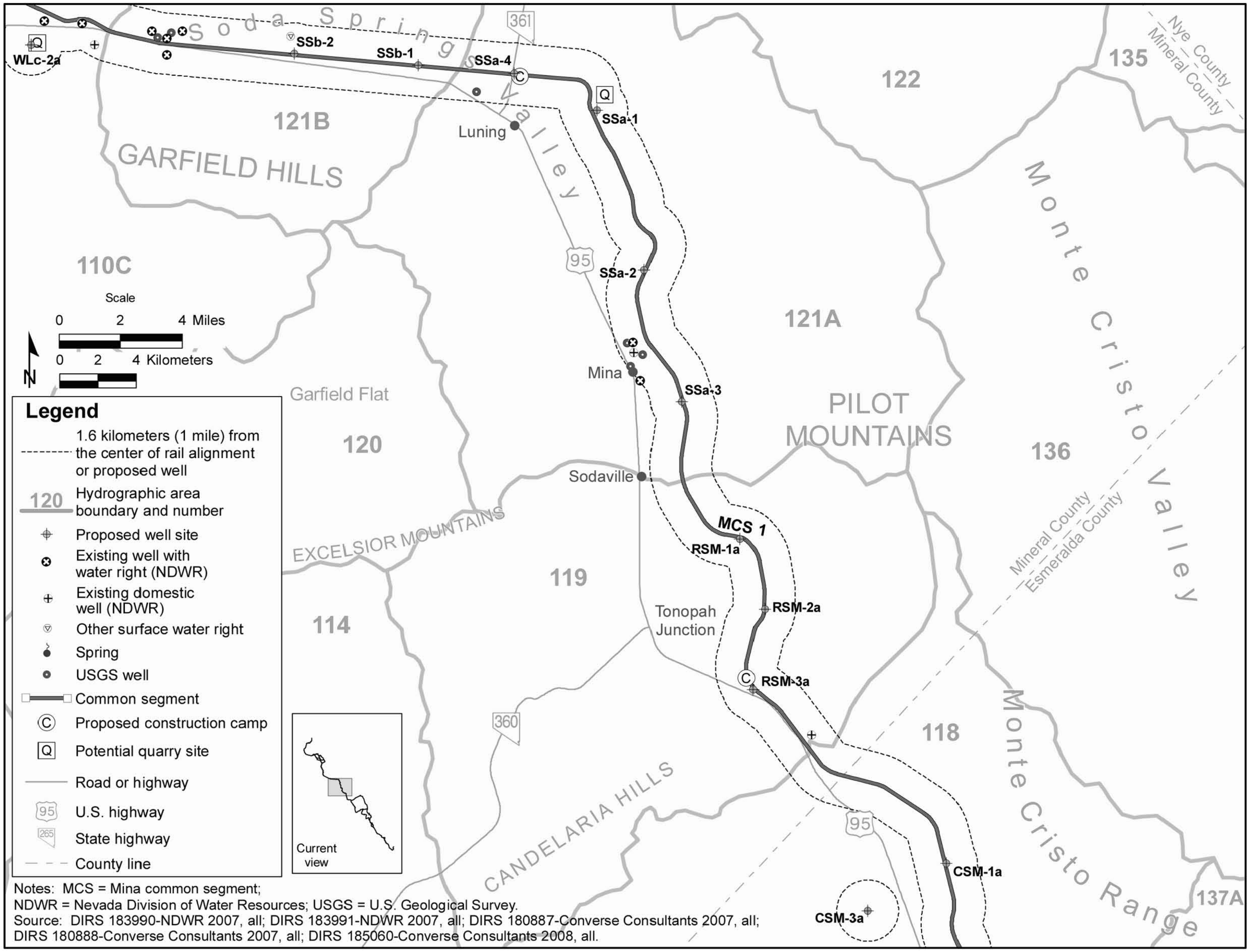


Figure 3-192. Proposed wells and existing USGS and NDWR wells and springs within map area 3.

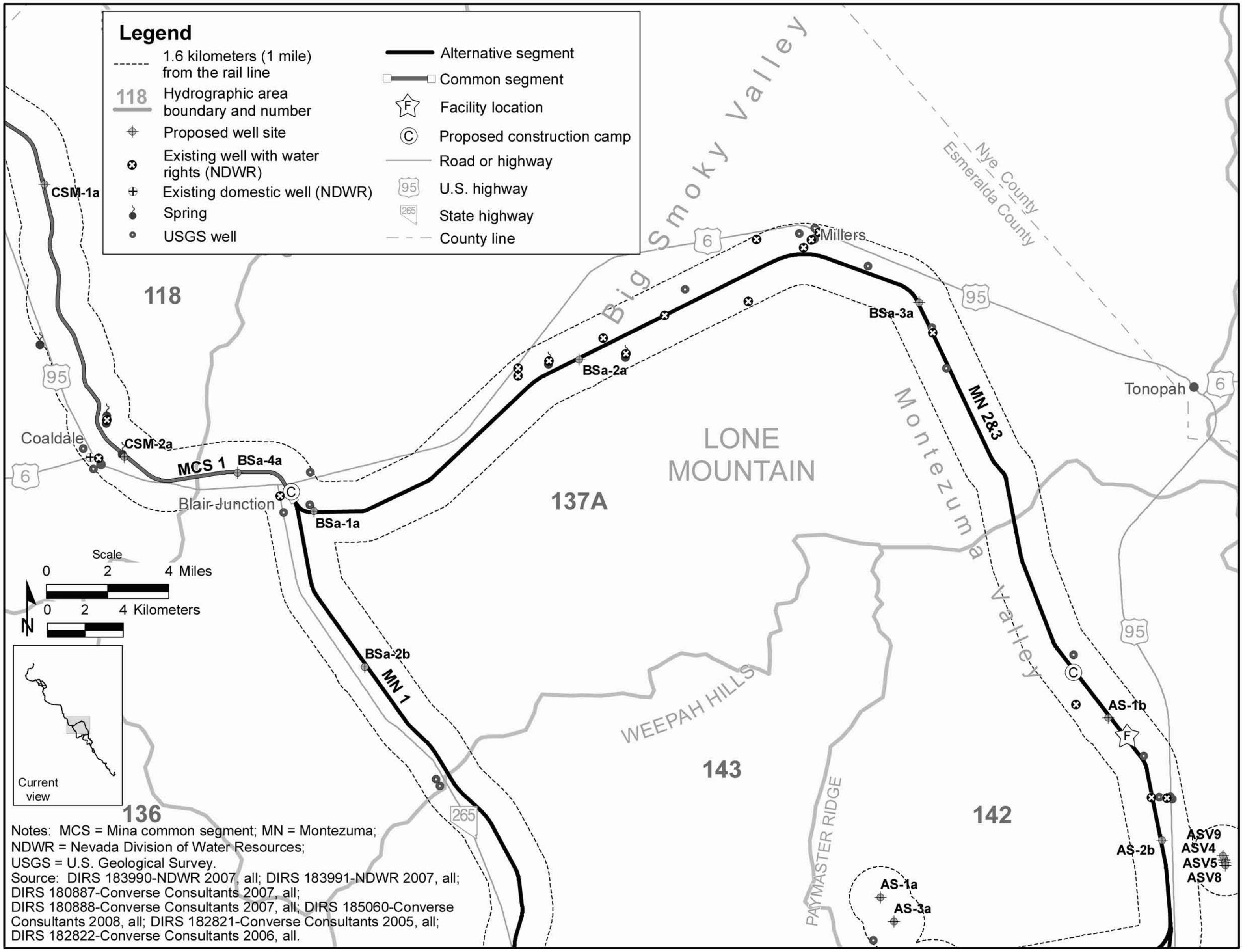


Figure 3-193. Proposed wells and existing USGS and NDWR wells and springs within map area 4.

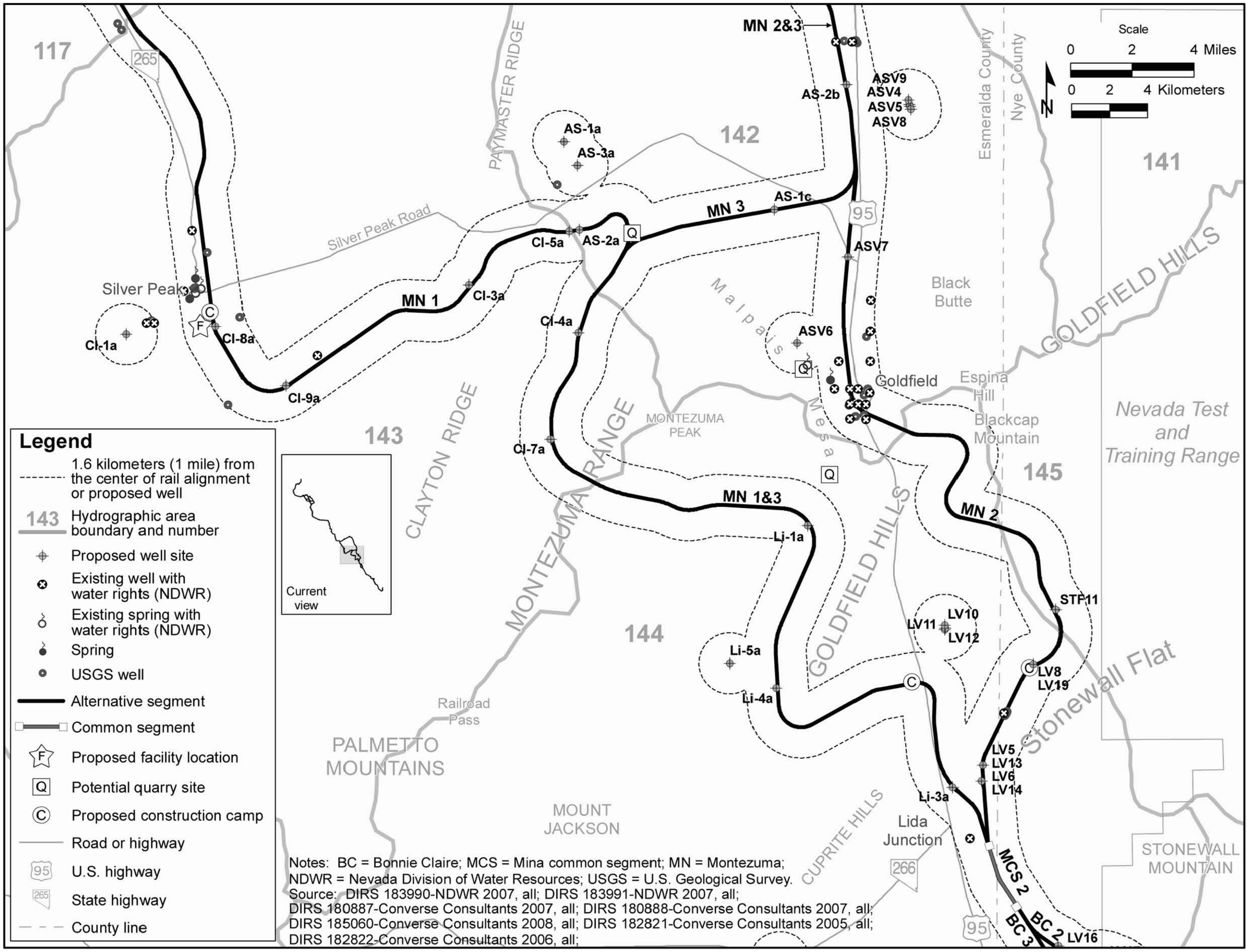


Figure 3-194. Proposed wells and existing USGS and NDWR wells and springs within map area 5.

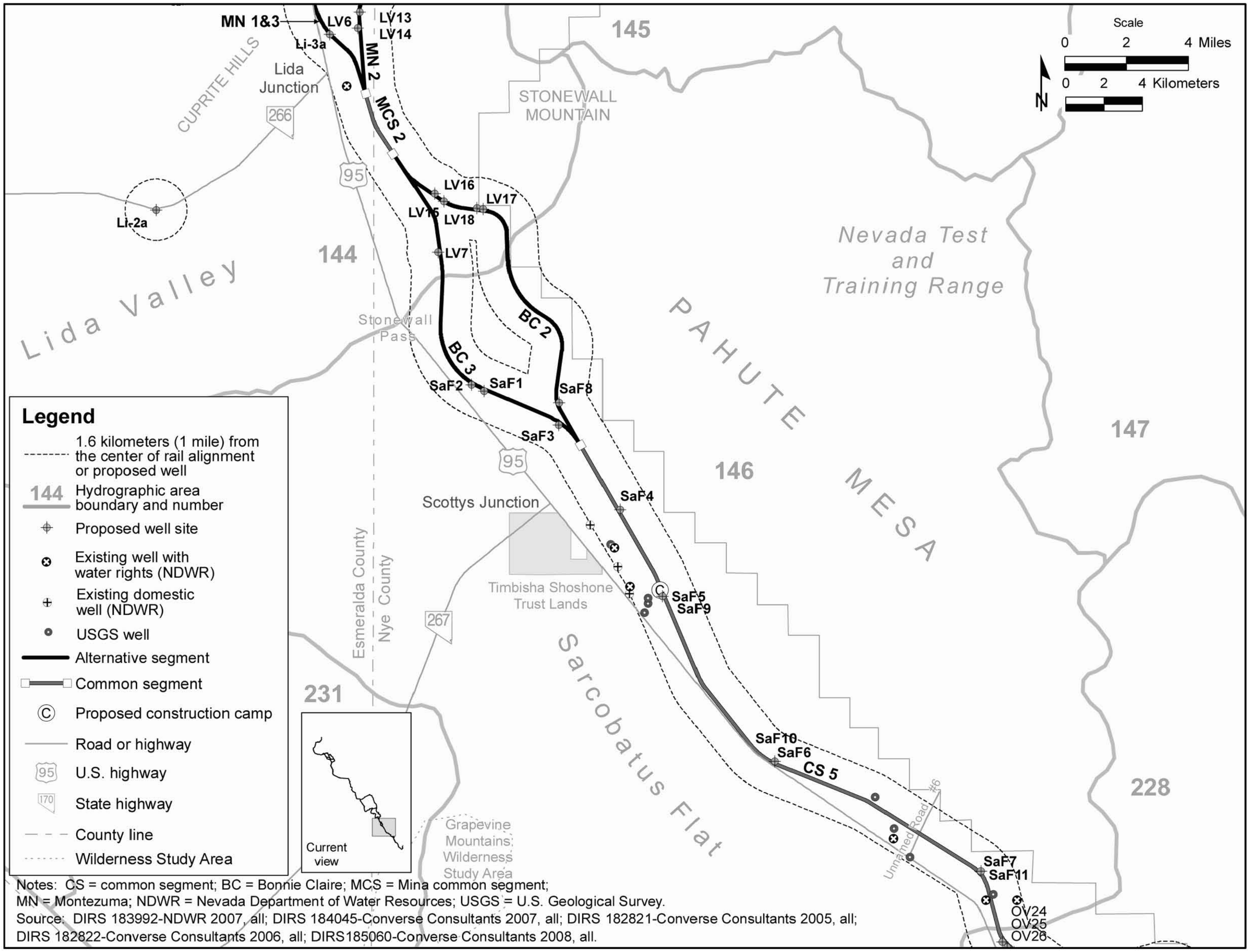


Figure 3-195. Proposed wells and existing USGS and NDWR wells and springs within map area 6.

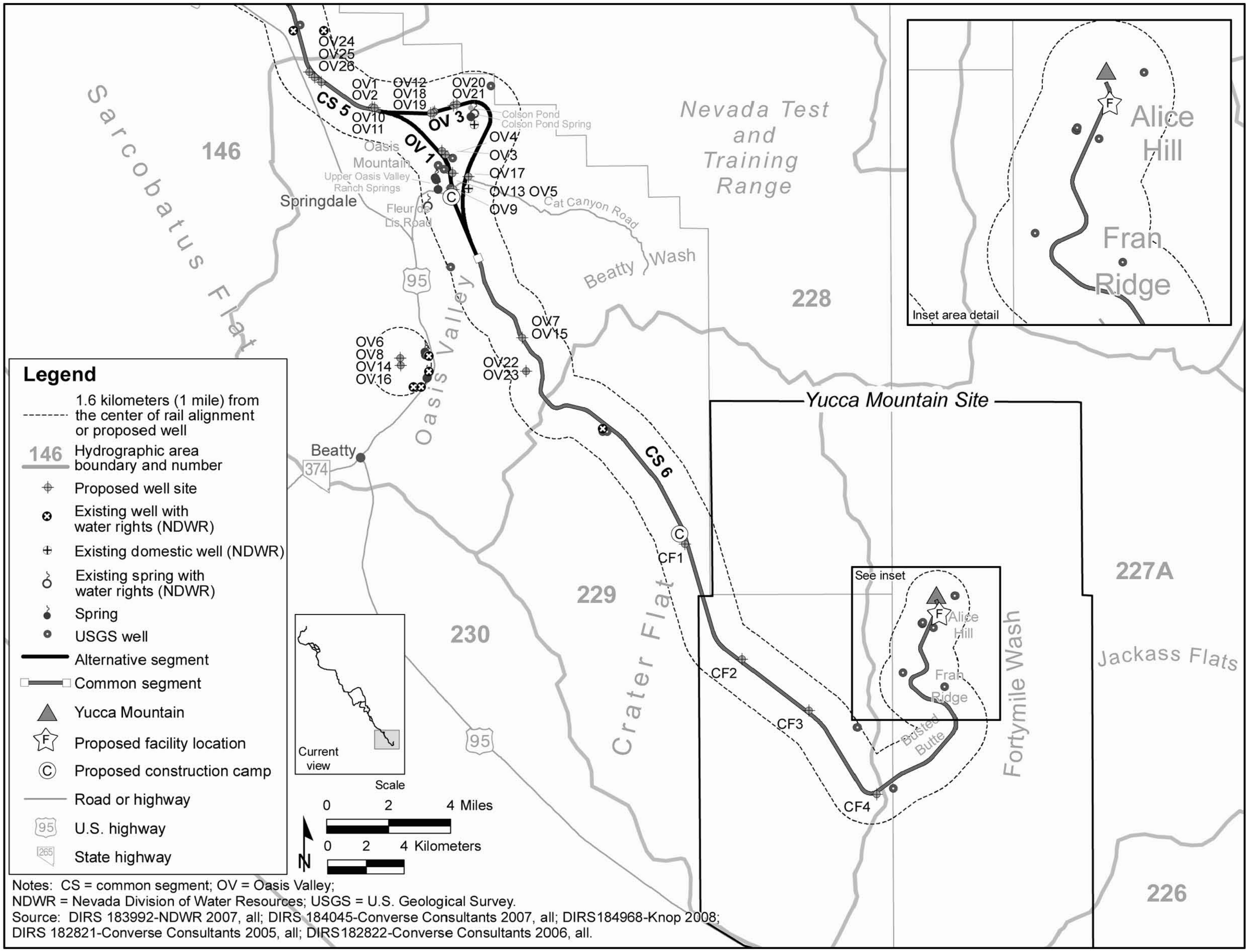


Figure 3-196. Proposed wells and existing USGS and NDWR wells and springs within map area 7.

Table 3-114. Existing wells within 1 mile[a] of the centerline of the Mina rail alignment by hydrographic area and/or within 1 mile of proposed new wells outside the rail line construction right-of-way[b].

Hydrographic area		Total number of wells and number of NDWR[c] wells by proposed-use category[d,e]										
Name	Area number	Number of wells[f,g]	C	G	H	I	K	N	P	S	X	Z
Mason Valley	108	1	0	0	1	0	0	0	0	0	0	0
Walker Lake Valley (Schurz subarea)	110A	35	0	0	3	0	0	0	0	0	0	0
Walker Lake Valley (Lake subarea)	110B	4	0	0	0	0	0	0	0	0	0	0
Walker Lake Valley (Whiskey Flat-Hawthorne subarea)	110C	3	2	0	1	0	0	0	0	0	0	0
Rawhide Flats	123	1	0	0	0	0	0	0	0	0	0	0
Soda Springs Valley (western part)	121B	7	0	0	0	0	4	0	0	1	0	0
Soda Springs Valley (eastern part)	121A	9	0	0	1	0	2	0	0	0	0	0
Rhodes Salt Marsh Valley	119	0	0	0	0	0	0	0	0	0	0	0
Columbus Salt Marsh Valley	118	5	0	0	1	0	0	0	1	0	0	0
Big Smoky Valley	137A	26	0	0	0	0	2	0	1	10	0	0
Clayton Valley	143	14	0	0	1	0	2	0	3	1	0	0
Alkali Spring Valley	142	21	0	0	0	0	2	0	6	2	0	0
Lida Valley	144	2	0	0	0	0	0	0	0	0	0	0
Stonewall Flat	145	0	0	0	0	0	0	0	0	0	0	0
Sarcobatus Flat	146	17	0	0	3	1	0	0	1	4	0	0
Oasis Valley	228	14	0	0	3	0	1	0	0	0	0	0
Crater Flat	229	7	0	0	0	0	4	0	0	0	0	0
Fortymile Canyon, Jackass Flats	227A	14	0	0	0	0	0	0	0	0	0	0
Totals		180	2	0	14	1	17	0	12	18	0	0

a. To convert miles to kilometers, multiply by 1.6093.
b. Includes existing wells listed as USGS NWIS wells, Nevada Division of Water Resources (NDWR) wells with water rights, and NDWR domestic wells.
c. NDWR = Nevada Division of Water Resources.
d. C = commercial; G = monitoring wells; H = domestic; I = irrigation; K = mining and milling; N = industrial (includes those designated in the database as N for "industrial" and as J for "industrial-cooling"); P = municipal or quasi-municipal; S = stock; X = test wells; Z = other (includes those designated in the database as R for "recreation," U for "unused," and other use categories not already listed in this table).
e. Proposed-use categories are tabulated only for wells (64 of the 180 wells) listed as NDWR wells with water rights, NDWR domestic wells, or NDWR wells with an associated water-rights application number.
f. Includes total number of NDWR-documented existing wells with water rights, plus NDWR domestic wells, plus U.S. Geological Survey National Water Information System-listed wells within 1 mile from the centerline of the rail alignment or within 1 mile of any DOE-proposed new groundwater-supply well. Note that the number of NDWR wells listed by proposed use category applies only to NDWR wells with water rights and NDWR domestic wells. U.S. Geological Survey wells are not included in the well counts for the NDWR-listed wells (according to use category) because the Geological Survey NWIS database does not provide information regarding well use category.
g. Well locations have not been field-verified. Therefore, some of the identified wells might be farther than 1 mile from the centerline of the rail alignment or proposed new groundwater-supply wells.

As shown in Table 3-114, there are 180 NDWR wells with water rights and USGS NWIS wells within 1.6 kilometers (1 mile) of the centerlines of all of the Mina rail alignment segments (combined) and/or within 1 mile of proposed new groundwater-supply wells. For those hydrographic areas containing multiple (alternative) segments, the actual number of existing wells falling within 1.6 kilometers of the completed rail line within that hydrographic area would be less than the number listed in Table 3-114, since only one alternative segment or unique set of alignment segments would be constructed in that hydrographic area.

As part of the Proposed Action, DOE proposes to install a series of new wells within the nominal width of the rail line construction right-of-way to acquire water needed to support railroad construction and operation. In addition to these wells, DOE might install additional wells at selected locations outside this construction right-of-way to serve as alternative-use water wells, supplemental wells to be used in combination with other water wells installed within the construction right-of-way, or to support proposed quarry operations. The need for installing alternative-use or supplemental wells would be based on wells installed at or very near a certain water ***demand*** location within the construction right-of-way not being adequate for meeting construction or operations needs. The locations of the proposed new wells are depicted on Figures 3-190 through 3-196.

There are numerous existing wells in hydrographic area 108 that are not reflected in Table 3-114; however, except for construction of a new siding in this area, with installation of one associated new small-production rate well, there is no new construction planned along this portion of the Mina alignment (see Section 3.3.6.3.1). There are no existing wells with water rights, no USGS NWIS wells, and no springs, seeps, or other surface-water-right locations within a 1.6-kilometer (1-mile) radius of this proposed new well. Most of the existing wells near the remaining alignment segments are in areas 110A, 142 and 137A. Table 3-114 lists domestic wells (14 wells total; no formal water rights associated with these wells), public supply-municipal (12 out of 50 NDWR-listed wells with water rights), stock-watering (18 of 50 NDWR-listed wells with water rights), and mining and milling (17 of 50 NDWR-listed wells with water rights) as the predominant use categories for those NDWR-listed wells with water rights that are within the 1-mile distance from the Mina rail alignment and/or within 1 mile of any proposed new groundwater-supply well location along the Mina alignment.

3.3.6.2.2 Groundwater-Quality Characteristics

Water quality in aquifers in Nevada varies with location (DIRS 106094-Harrill, Gates, and Thomas 1988, all). In the Basin and Range, total dissolved solids concentrations can range from less than 500 to more than 10,000 parts per million (ppm) (DIRS 172905-USGS 1995, all). In general, at hydrographic area margins and on the slopes of alluvial fans, groundwater quality is good. In discharge areas (such as playas) and other selected areas, groundwater quality can be brackish. However, groundwater in deeper alluvial valley-fill units underlying some playa areas can be of better quality (DIRS 172905-USGS 1995, all). Groundwater quality in the carbonate aquifers in southern and central Nevada, including total dissolved solids concentrations, is generally more uniform in character and with depth within the aquifer (DIRS 101167-Winograd and Thordarson 1975, p. C103). Total dissolved solids concentrations in alluvial valley fill underlying the Mina rail alignment range from less than 500 to more than 10,000 milligrams per liter (mg/L), or approximately 500 to 10,000 ppm (DIRS 172905-USGS 1995, Figure 70, with overlay of hydrographic area boundaries). The U.S. Environmental Protection Agency has set an aesthetic standard of 500 mg/L (approximately 500 ppm) of total dissolved solids for drinking water (40 CFR Part 143). Water with a total dissolved solids concentration of 500 ppm or less is regarded as acceptable and pleasing for general consumption. A secondary preferred drinking water standard for total dissolved solids concentrations of 500 ppm for public water supplies has been adopted for Nevada. If water supplies that meet the preferred standard are not available, the Maximum Contaminant Level of 1,000 ppm is enforceable by the State of Nevada. At higher concentrations, general consumption issues (pertaining to hardness, deposits, color, staining, and salty taste) could develop, but the water could be used for other purposes (for example, agriculture or earthwork compaction as part of embankment construction). Another parameter of interest for gauging the quality of groundwater in Nevada is arsenic. A revised drinking water standard for arsenic (for water systems meeting certain specified criteria) of 0.010 ppm became enforceable in January 2006 (40 CFR 141.23).

3.3.6.3 Hydrogeologic Setting and Characteristics along Alternative Segments and Common Segments

3.3.6.3.1 Department of Defense Branchline North

The Mina rail alignment would commence with Department of Defense Branchline North, beginning near Fort Churchill, Nevada. The beginning of Department of Defense Branchline North would overlie a portion of Mason Valley (hydrographic area 108). Department of Defense Branchline North would then proceed eastward where it would cross into a small portion of the Walker Lake Valley-Schurz subarea (hydrographic area 110A) (Figure 3-190). Department of Defense Branchline North would predominately overlie alluvial valley fill (DIRS 180887-Converse Consultants 2007, pp. 89 and 101, and Plates 4-10 and 4-12).

Hydrographic area 108, Mason Valley, is a designated groundwater basin (see Table 3-113). Committed groundwater resources exceed estimated perennial yield of 30.8 million cubic meters (25,000 acre-feet). However, all committed resources within a hydrographic area might not be in use at the same time. There could be approximately 3.57 billion cubic meters (2.9 million acre-feet) of recoverable groundwater in the upper 30 meters (100 feet) of saturated aquifer materials within area 108 (DIRS 180754-Rush et al. 1971, all). NDWR data indicate that there are approximately 31.2 million cubic meters (25,269 acre-feet) of documented pending annual duties (see Table 3-113) in area 108 (DIRS 182759-Converse Consultants 2007; data acquired on March 31, 2007).

Table 3-115 summarizes general groundwater-quality and aquifer characteristics in hydrographic area 108. The depth at which groundwater occurs varies from approximately 3 meters (10 feet) to approximately 30 meters (100 feet) below ground along the portion of Department of Defense Branchline North that would lie within hydrographic area 108. Groundwater is primarily produced from the valley-fill sediments (DIRS 180697-Huxel and Harris 1969, p. 11). Geologic units in the Mason Valley area include alluvial sediments, altered sediments, altered volcanic rocks, and granitic rocks.

One new well (Mn-2a) is proposed along Department of Defense Branchline North in hydrographic area 108 (Figure 3-190). This well would be a small-production rate (less than 3.8 liters [1 gallon] per minute) well, and would supply water to support operation of a proposed rail siding. DOE determined that there are no existing NDWR wells with water rights, one domestic well, and no USGS NWIS wells within a 1.6-kilometer (1-mile) radius of this proposed well location (DIRS 180888-Converse Consultants 2007, Appendix B and Plate 4-12).

Hydrographic area 110A, Walker Lake Valley-Schurz subarea, is not a designated groundwater basin (see Table 3-113). Committed groundwater resources do not exceed estimated perennial yield of 1.85 million cubic meters (1,500 acre-feet). There could be approximately 1.85 billion cubic meters (1.5 million acre-feet) of recoverable groundwater in the upper 30 meters (100 feet) of saturated aquifer materials within area 110A (DIRS 180754-Rush et al. 1971, all). NDWR data indicate that there are approximately 2,500 cubic meters (2 acre-feet) of documented pending annual duties (see Table 3-113) in area 110A.

Table 3-115 summarizes general groundwater-quality and aquifer characteristics in hydrographic area 110A. The depth at which groundwater occurs throughout hydrographic area 110A could vary from as shallow as 0 meter (0 foot) to approximately 150 meters (460 feet), with most groundwater being less

Table 3-115. General groundwater-quality and aquifer characteristics – Department of Defense Branchline North.

Hydrographic area number and name	Aquifer geologic characteristics[a]	Depth to groundwater (feet)[b,c]	Estimated recoverable groundwater (acre-feet)[d]	Groundwater quality[e]
108 Mason Valley	Alluvial sediments, altered sediments, altered volcanic rocks, and granitic rocks	10 to 100	2.9 million[f]	Total dissolved solids: Less than 500 to 97,100 ppm[g] Fluoride: 7.7 ppm (north of Wabuska)[g]
110A Walker Lake Valley (Schurz subarea)	Alluvial valley fill, granitic rocks, volcanics, altered volcanic rocks	0 to 460	1.5 million[f]	Total dissolved solids: 500 to 1,800 ppm[g] Fluoride: 9.3 ppm[g]

a. Source: DIRS 180887-Converse Consultants 2007, pp. 102 and 89.
b. To convert feet to meters, multiply by 0.3048.
c. Source: DIRS 180887-Converse Consultants 2007, Plates 4-11 and 4-12. The listed depth ranges generally apply to areas underlying the alignment segments; groundwater may be deeper in the southern part of hydrographic area 108 (DIRS 180887-Converse Consultants 2007,p. 89).
d. To convert from acre-feet to cubic meters, multiply by 1,233.49; unless otherwise specified, the groundwater quality refers to the upper 100 feet of the saturated alluvial valley-fill material in the hydrographic area.
e. Many reference sources list a concentration value in mg/L (milligrams per liter), which, for materials or contaminants in most groundwaters, is approximately equivalent to parts per million (ppm).
f. Source: DIRS 180754-Rush et al. 1971, all.
g. Source: DIRS 180887-Converse Consultants 2007, pp. 90 and 102.

than 30 meters (100 feet) below ground (DIRS 180887-Converse Consultants 2007, p. 89). However, groundwater contour maps (DIRS 180887-Converse Consultants 2007, Plates 4-10 and 4-12) developed for hydrographic areas 108 and 110A do not indicate any areas underlying the proposed Department of Defense Branchline North segment where groundwater depths less than 3 meters (10 feet) or more would be anticipated to occur. Depth to groundwater is generally 15 meters (50 feet) along the segments of Department of Defense Branchline North that would lie within and along hydrographic area 110A (DIRS 180887-Converse Consultants 2007, p. 89 and Plate 4-11). Groundwater is primarily produced from the valley-fill sediments. Geologic units in hydrographic area 110A include alluvial sediments, volcanic and altered volcanic rocks, and granitic rocks.

There are no springs, seeps, or other surface-water-right locations and no existing NDWR wells with water rights, and there is one USGS NWIS well within 1.6 kilometers (1 mile) of the centerline of Department of Defense Branchline North in hydrographic area 110A (see Figure 3-190). The land crossed by the short portion of Department of Defense Branchline North (and by the Schurz alternative segments [Section 3.3.6.3.2]) is part of the Walker River Paiute Reservation. There are existing wells on the Reservation rangeland for which there is currently no documentation or information on the wells on file at the Nevada Division of Water Resources. The Nevada Division of Water Resources Well Log and Water Rights Databases are therefore incomplete regarding existing wells present in hydrographic 110A (and in hydrographic area 123 [Section 3.3.6.3.2]). Therefore, DOE does not have a complete record of groundwater usage on the Reservation.

3.3.6.3.2 Schurz Alternative Segments

The Schurz alternative segments would overlie hydrographic area 110A and/or the western part of hydrographic area 123 (Rawhide Flats) as shown on Figure 3-190. These alternative segments would overlie various geologic materials, depending on the specific combination of alternative segments constructed, including alluvial valley-fill materials, volcanic rocks, altered volcanic rocks, and/or granitic rocks (DIRS 180887-Converse Consultants 2007, pp. 89 and 95 and Plates 4-10 and 4-11).

Section 3.3.6.3.1 describes the hydrogeologic characteristics of hydrographic area 110A, including groundwater-quality and aquifer characteristics, as well as information regarding existing wells, springs, seeps, and other surface-water-right locations in the vicinity of the Schurz alternative segments. Table 3-115 summarizes general groundwater-quality and aquifer characteristics in hydrographic area 110A. Groundwater contour maps (DIRS 180887-Converse Consultants 2007, Plates 4-10 and 4-11) developed for hydrographic area 110A suggest that one or more areas might underlie the proposed Schurz alternative segments where groundwater depths of 3 meters (10 feet), or possibly less, might be anticipated to occur. There are a total of five existing NDWR wells with water rights and USGS NWIS wells in hydrographic area 110A within 1.6 kilometers (1 mile) of the centerlines of the Schurz alternative segments and/or within 1 mile of any proposed new well locations along these alignment segments (see Table 3-114).

Area 123 is not a designated groundwater basin. Committed groundwater resources do not exceed estimated perennial yield of 617,000 cubic meters (500 acre-feet) (see Table 3-113). There could be between approximately 74 and 666 million cubic meters (60,000 and 540,000 acre-feet) of recoverable groundwater in the upper 30 meters (100 feet) of saturated aquifer materials within area 123 (DIRS 180754-Rush et al. 1971, all; DIRS 181394-Everett and Rush 1967, Table 6). NDWR data indicate that there are no documented pending annual duties (see Table 3-113) in area 123. Table 3-116 summarizes general groundwater-quality and aquifer characteristics in hydrographic area 123. The depth at which groundwater occurs in hydrographic area 123 varies from less than 15 to greater than 30 meters (less than 50 to 100 feet).

Table 3-116. General groundwater-quality and aquifer characteristics – Schurz alternative segments.

Hydrographic area number and name	Aquifer geologic characteristics[a]	Depth to groundwater (feet)[b,c]	Estimated recoverable groundwater (acre-feet)[d]	Groundwater quality[e]
110A Walker Lake Valley (Schurz subarea)	Alluvial valley fill, granitic rocks, volcanic rocks, altered volcanic rocks	Less than 10 to 460	1.5 million[f]	Total dissolved solids: 500 to 1,800 ppm[g] Fluoride: 9.3 ppm[g]
123 Rawhide Flats	Alluvial valley fill and volcanic rocks	50 to 100	Both aquifer types: 60,000 to 540,000[f,h]	Total dissolved solids: 300 to 1,660 ppm[g] Sulfate: 52 ppm[g] Fluoride: 7.9 ppm[g]

a. Source: DIRS 180887-Converse Consultants 2007, pp. 90 and 96.
b. The listed depth ranges generally apply to areas underlying the alternative segments (DIRS 180887-Converse Consultants 2007, Plates 4-10 and 4-11); groundwater can vary over a wide range of depth depending on location in each hydrographic area (DIRS 180887-Converse Consultants 2007, p. 89 and 90).
c. To convert feet to meters, multiply by 0.3048.
d. To convert acre-feet to cubic meters, multiply by 1,233.49; unless otherwise specified, the groundwater quality refers to the upper 100 feet of the saturated alluvial valley-fill material in the hydrographic area.
e. Many reference sources list a concentration value in mg/L (milligrams per liter), which, for materials or contaminants in most groundwaters, is approximately equivalent to parts per million (ppm).
f. Source: DIRS 180754-Rush et al. 1971, all.
g. Source: DIRS 180887-Converse Consultants 2007, pp. 90 and 96.
h. Source: DIRS 181394-Everett and Rush 1967, Table 6.

The NDWR Water Rights database (DIRS 183991-Luellen 2007, all) does not include any wells for hydrographic area 123 (DIRS 180887-Converse Consultants 2007, p. 97). According to the NDWR records, there are a total of approximately 2,500 cubic meters (2 acre-feet) in pending annual duties assigned to hydrographic area 110A and no pending annual duties assigned to hydrographic area 123 (see Table 3-113). Similar to the case for hydrographic area 110A as discussed in Section 3.3.6.3.1, land across which the Schurz alternative segments would cross in hydrographic area 123 is part of the Walker River Paiute Reservation and therefore the NDWR Well Log and Water Rights Database is incomplete with respect to existing wells in hydrographic area 123. For example, the NDWR Well Log Database has no record of any existing wells in hydrographic area 123, whereas information in a published historical report (DIRS 181394-Everett and Rush 1967, Table 4-9) provide data on two wells in that area (DIRS 180887-Converse Consultants 2007, Table 4-44).

Three wells (RF-2b, RF-4b, and WLa-3b) could be installed in hydrographic area 123 at locations outside of the construction rights-of-way for the various alternative segments (Figure 3-190). Geologic materials underlying these potential well locations are comprised of alluvial slope and alluvial valley-fill materials (DIRS 180888-Converse Consultants 2007, Appendix B and Plate 4-11).

3.3.6.3.3 Department of Defense Branchline South (Walker Lake Valley Area)

Department of Defense Branchline South would overlie the southern part of hydrographic area 110A, continue southward across hydrographic area 110B (Walker Lake Valley – Lake subarea), and cross over a small portion of the northwestern part of hydrographic area 110C (Walker Lake Valley, Whiskey Flat-Hawthorne subarea).

Section 3.3.6.3.1 describes the hydrogeologic characteristics of hydrographic area 110A, including groundwater-quality and aquifer characteristics, as well as information regarding existing wells, springs, seeps, and other surface-water-right locations in the vicinity of the proposed alignment segments. Table 3-115 summarizes general groundwater-quality and aquifer characteristics in hydrographic area 110A. Groundwater contour maps (DIRS 180887-Converse Consultants 2007, Plates 4-9 and 4-10) developed for hydrographic area 110A do not indicate any areas underlying the proposed Department of Defense Branchline South segment where groundwater depths less than 3 meters (10 feet) would be anticipated to occur.

Area 110B is not a designated groundwater basin. Committed groundwater resources exceed the estimated perennial yield of 860,000 cubic meters (700 acre-feet) (see Table 3-113). However, as noted previously, all committed resources within a hydrographic area might not be in use at the same time. There could be approximately 123 million cubic meters (100,000 acre-feet) of recoverable groundwater in the upper 30 meters (100 feet) of saturated aquifer materials within area 110B. NDWR data indicate that there no documented pending annual duties (see Table 3-113) in area 110B.

Department of Defense Branchline South would cross alluvial valley fill in hydrographic area 110B. Adjacent mountain ranges in hydrographic area 110B are comprised primarily of volcanic rocks.

Groundwater quality within hydrographic area 110B varies according to location within the area (DIRS 180887-Converse Consultants 2007, Plate 4-10). Table 3-117 summarizes general groundwater-quality and aquifer characteristics in hydrographic area 110B.

Groundwater depth underlying the alignment in hydrographic area 110B (see Table 3-117) is 15 meters (50 feet). Groundwater depths reported in three wells in hydrographic area 110C, between 4.5 and 8.9 kilometers (2.8 and 5.5 miles) south of the southern boundary of subarea 110B, range from 15 to 31 meters (50 to 103 feet). There are a total of four existing NDWR wells with water rights, domestic wells, and USGS NWIS wells in hydrographic area 110B within 1.6 kilometers (1 mile) of the centerline of Mina common segment 1 and/or within 1 mile of any proposed new well locations along this alignment segment (see Table 3-114).

Hydrographic area 110C, Walker Lake Valley (Whiskey Flat-Hawthorne subarea), is a designated groundwater basin. Committed groundwater resources do not exceed its estimated perennial yield of 6.17 million cubic meters (5,000 acre-feet) (see Table 3-113). There could be approximately 1.11 billion cubic meters (900,000 acre-feet) of recoverable groundwater in the upper 30 meters (100 feet) of

Table 3-117. General groundwater-quality and aquifer characteristics – Department of Defense Branchline South.

Hydrographic area number and name	Aquifer geologic characteristics[a]	Depth to groundwater (feet)[b,c]	Estimated recoverable groundwater (acre-feet)[d]	Groundwater quality[e]
110A Walker Lake Valley (Schurz subarea)	Alluvial valley fill, granitic rocks, volcanic rocks, altered volcanic rocks	10 to 460	1.5 million[f]	Total dissolved solids: 500 to 1,800 ppm[g] Fluoride: 9.3 ppm[g]
110B Walker Lake Valley (Lake subarea)	Alluvial valley fill and volcanic rocks[h]	50	Both aquifer types: 100,000[f]	Total dissolved solids: 742 ppm[i] Sulfate: 92 to 383 ppm[i] Fluoride: 0 to 1.6 ppm[i]
110C Walker Lake Valley (Whiskey Flat-Hawthorne subarea)	Alluvial valley fill, granitic rocks, volcanic rocks, altered volcanic rocks, chert	50 to 300	900,000[f]	Total dissolved solids: 191 to 1,033 ppm[g] Sulfate: 19 to 502 ppm[g] Fluoride: 6.8 ppm[g]

a. Source: DIRS 180887-Converse Consultants 2007, pp. 82 and 90.
b. Estimated depth to groundwater obtained from DIRS 180887-Converse Consultants 2007, pp. 89 and 90 and Plates 4-9 and 4-10, and based on water depths in three wells in adjacent hydrographic area 110C (DIRS 181394-Everett and Rush 1967, Table 9 and Plate 1). The listed depth range for hydrographic area 110B generally applies to valley floor areas underlying the general vicinity of the proposed alignment segment; groundwater depths in other portions of hydrographic area 110B might be substantially different. Groundwater depth ranges for all the basins in the table are for areas underlying the general vicinity of the alignment; groundwater depths in other portions of the basins may be different.
c. To convert feet to meters, multiply by 0.3048.
d. To convert acre-feet to cubic meters, multiply by 1,233.49; unless otherwise specified, the groundwater quality refers to the upper 100 feet of the saturated alluvial valley-fill material in the hydrographic area.
e. Many reference sources list a concentration value in mg/L (milligrams per liter), which, for materials or contaminants in most groundwaters, is approximately equivalent to parts per million (ppm).
f. Source: DIRS 180754-Rush et al. 1971, all.
g. Source: DIRS 180887-Converse Consultants 2007, p. 90.
h. Source: DIRS 182289-Ross 1961, Plate 2.
i. Source: DIRS 181394-Everett and Rush 1967, Table 8 and Plate 1; data are for a spring in hydrographic area 110A about 1.2 kilometers (0.75 mile) north of the subarea 110B boundary and a well 4.4 kilometers (2.75 miles) south of the subarea 110B boundary.

saturated aquifer materials within area 110C. NDWR data indicate that there are no documented pending annual duties (see Table 3-113) in area 110C.

Geologic units in the Walker Lake Valley (Whiskey Flat-Hawthorne subarea) area include alluvial valley fill, granitic rock, volcanics, altered volcanics, and chert (see Table 3-117). The depth to groundwater in Walker Lake Valley (Whiskey Flat-Hawthorne subarea) near the proposed rail line is 15 to 90 meters (50 to 300 feet) (see Table 3-117). The primary source of groundwater in 110C is from unconfined aquifers of alluvial valley fill. Table 3-117 summarizes general groundwater-quality and aquifer characteristics in hydrographic area 110C.

Most groundwater in hydrographic area 110C is a sodium-sulfate type (DIRS 181394-Everett and Rush 1967, p. 32). The Hawthorne Army Depot property covers most of the Whiskey Flat-Hawthorne area. Contaminants have been reported in some groundwater monitoring wells underlying the Hawthorne Army Depot property, including explosives, volatile organic compounds, and inorganic nitrogen compounds. Areas of known impacted groundwater underlying the Hawthorne Army Depot property are approximately 4.5 kilometers (2.8 miles) to the west and southwest of the centerline of Department of Defense Branchline South and approximately 3.2 kilometers (2 miles) to the west and southwest of the centerline of Mina common segment 1 (DIRS 182749-Tetra Tech EM 2007, Figure 5).

Available information indicates that the groundwater flow direction in the areas of identified ***contamination*** and underlying the land surface between these areas and adjacent to Department of Defense Branchline South and Mina common segment 1 is westward to southwestward (DIRS 182749-Tetra Tech EM 2007, Figures 4A and 4B). On the basis of the groundwater flow directions underlying these areas and the distances to the proposed alignment and the impacted wells on the Hawthorne Army Depot property, it is extremely improbable that new wells installed within the rail alignment construction right-of-way to support construction of the proposed railroad (for example, well WLc-3a on Figure 3-191) would encounter the identified contaminated groundwater.

One new well (location WLa-5a) is proposed within hydrographic area 110A to support water needs associated with railroad construction and operation of a new rail siding. Figures 3-190 and 3-191 show the approximate location of this proposed new water well.

Available information indicates that there are no springs, seeps, or other surface-water-right locations, no existing NDWR wells with water rights, and no USGS NWIS wells within 1.6 kilometers (1 mile) of the centerline of Department of Defense Branchline South or within 1.6 kilometers of the proposed new well location in hydrographic area 110A (see Figures 3-190 and 3-191).

However, as discussed previously, the NDWR Well Log and Water Rights Databases are incomplete with respect to existing wells that might exist on the Walker River Paiute Reservation for this hydrographic area.

3.3.6.3.4 Mina Common Segment 1

Crossing from north to southeast, Mina common segment 1 would overlie hydrographic areas 110C (Walker Lake Valley, Whiskey Flat-Hawthorne subarea), 121B (Soda Spring Valley, western part), 121A (Soda Spring, eastern part), 119 (Rhodes Salt Marsh Valley), 118 (Columbus Salt Marsh Valley), and a small portion of hydrographic area 137A (Big Smoky Valley) (Figures 3-191 through 3-193). Mina common segment 1 would predominantly cross alluvial deposits. The depth to groundwater and groundwater-quality characteristics underlying Mina common segment 1 vary according to location within the hydrographic areas the rail line would cross. Table 3-118 summarizes the groundwater-quality and aquifer characteristics in the hydrographic areas Mina common segment 1 would cross.

Section 3.3.6.3.3 describes the hydrogeologic characteristics of hydrographic area 110C, including groundwater-quality and aquifer characteristics, as well as information regarding existing wells, springs, seeps, and other surface-water-right location in the vicinity of the proposed common segment. Tables 3-117 and 3-118 summarize general groundwater-quality and aquifer characteristics in hydrographic area 110C.

Two potential quarry sites have been identified along Mina common segment 1 (Figures 3-191 and 3-192). A new well is proposed at each potential quarry location. The first potential quarry site is in the northeast part of hydrographic area 110C (Walker Lake Valley, Whiskey Flat-Hawthorne subarea), approximately 2.1 kilometers (1.3 miles) south of the centerline of Mina common segment 1. Proposed well WLc-2a would be installed adjacent to this quarry location. Geologic conditions found at this location include primarily volcanic rocks (DIRS 183636-Shannon & Wilson 2007, p. 28). The quarry and the quarry well would be located partially on grazing land and partially on the Hawthorne Army Depot (Section 4.3.2).

There are a total of three existing NDWR wells with water rights, domestic wells, and USGS NWIS wells in hydrographic area 110C within 1.6 kilometers (1 mile) of the centerline of Mina common segment 1 and/or within 1.6 kilometers of any proposed new well locations along this common segment (see Table 3-114). One of these two wells is also within 1.6 kilometers of a proposed new well location (Figures 3-191 and 3-192). Figure 3-190 shows the locations of these wells. There are no springs, seeps, or other

Table 3-118. General groundwater-quality and aquifer characteristics – Mina common segment 1.

Hydrographic area number and name	Aquifer geologic characteristics[a]	Depth to groundwater (feet)[b,c]	Estimated recoverable groundwater (acre-feet)[d]	Groundwater quality[e]
110C Walker Lake Valley (Whiskey Flat-Hawthorne subarea)	Alluvial valley fill, granitic rocks, volcanic rocks, altered volcanic rocks, chert	50 to 300	900,000[f]	Total dissolved solids: 191 to 1,033 ppm[g] Sulfate: 19 to 502 ppm[g] Fluoride: 6.8 ppm[g]
121B Soda Spring Valley (western part)	Alluvial valley fill, intrusive and metamorphic rock, minor clastic sandstones	15	Both aquifer types: 280,000[f]	Total dissolved solids: Generally less than 500 to 1,170 ppm[g] 6,500 ppm (valley center discharge locations)[g] Sulfate: 350 to 372 ppm[g]
121A Soda Spring Valley (eastern part)	Alluvial valley fill, intrusive and metamorphic bedrock units, and clastic sandstone	50 to 100	430,000[f]	Total dissolved solids: 200 to 1,250 ppm[g] 6,500 ppm (valley center discharge locations) [g] Sulfate: 82 to 744 ppm[g]
119 Rhodes Salt Marsh Valley	Alluvial valley-fill deposits, altered volcanic rocks, chert, limestone, dolomite with interbedded zones of sandstone and conglomerates	50 to 100	340,000[f]	Total dissolved solids: 2,370 ppm[g] Sulfate: 250 to 1,830 ppm[g]
118 Columbus Salt Marsh Valley	Alluvial sediments, volcanic rocks, and clastic rocks	50 to 100	530,000[f]	Total dissolved solids: 5,556 ppm[g] Sulfate: 250 to 2,600 ppm[g]
137A Big Smoky Valley	Alluvial valley fill, volcanic rocks, intrusive and metamorphic rocks, clastic rocks	Less than 10 to more than 100	7 million[f]	Total dissolved solids: 300 to 4,000 ppm[g] 6,500 ppm (valley center discharge locations)[g]

a. Source: DIRS 180887-Converse Consultants 2007, pp. 51, 56, 62, 68, 75 and 81.
b. Estimated depth to groundwater obtained from DIRS 180887-Converse Consultants 2007, Plates 4-4 to 4-10, and pp. 51 and 52. Groundwater depths are for those areas underlying the general vicinity of the alignment; groundwater depths in other areas of the basins could be different.
c. To convert feet to meters, multiply by 0.3048.
d. To convert acre-feet to cubic meters, multiply by 1,233.49; unless otherwise specified, the groundwater quality refers to the upper 100 feet of the saturated alluvial valley-fill material in the hydrographic area.
e. Many reference sources list a concentration value in mg/L (milligrams per liter), which, for materials or contaminants in most groundwaters, is approximately equivalent to parts per million (ppm).
f. Source: DIRS 180754-Rush et al. 1971, all.
g. Source: DIRS 180887-Converse Consultants 2007, pp. 52, 57, 58, 63, 70, 76, and 83.

surface-water-right locations within 1.6 kilometers of the centerline of Mina common segment 1 in hydrographic area 110C.

Hydrographic area 121B, Soda Spring Valley (western part), is a designated groundwater basin. Committed groundwater resources exceed its estimated perennial yield of 246,000 cubic meters (200 acre-feet) (see Table 3-113). However, as previously noted, all committed resources within a hydrographic area might not be in use at the same time. There could be approximately 345 million cubic meters (280,000 acre-feet) of recoverable groundwater in the upper 30 meters (100 feet) of saturated aquifer materials within area 121B. NDWR data indicate that there are no documented pending annual duties (see Table 3-113) in the area.

The depth to groundwater in most parts of Soda Spring Valley (western part) ranges from approximately less than 15 to more than 90 meters (less than 50 to more than 300 feet) (DIRS 180887-Converse Consultants 2007, p. 76). Depth to groundwater underlying the rail alignment in hydrographic area 121B is generally 15 meters (50 feet) (see Table 3-118) (DIRS 180887-Converse Consultants 2007, Plate 4-8). Groundwater is generally low in dissolved solids with dominant ions of calcium and bicarbonate. The main use of groundwater in hydrographic area 121B is for mining (DIRS 180887-Converse Consultants 2007, p. 77). The primary source of groundwater in Soda Spring Valley (western part) is inferred to be interbasin flow from the Soda Spring Valley-East Basin. Table 3-118 summarizes general groundwater-quality and aquifer characteristics in hydrographic area 121B.

Geologic units in the Soda Spring Valley (western part) area include alluvial valley fill, metamorphic rocks, and clastic rocks. Alluvial valley fill comprises the best aquifers in hydrographic area 121B. There is an estimated 345 million cubic meters (280,000 acre-feet) of recoverable groundwater in the saturated aquifer material within this basin (see Table 3-118). There are a total of seven existing NDWR wells with water rights and USGS NWIS wells in hydrographic area 121B within 1.6 kilometers (1 mile) of the centerline of Mina common segment 1 and/or within 1 mile of any proposed new well locations along this alignment segment (see Table 3-114). Figures 3-191 and 3-192 identify the locations of these wells. There are no springs or seeps within 1 mile of the centerline of Mina common segment 1 and/or within 1 mile of any proposed new well locations outside of the segment construction right-of-way. There is one (vested) surface-water-right location approximately 0.6 mile from proposed new well location SSb-2 in hydrographic area 121B (DIRS 183991-Luellen 2007, all).

Hydrographic area 121A, Soda Spring Valley (eastern part), is a designated groundwater basin. Committed groundwater resources do not exceed its estimated perennial yield of 7.4 million cubic meters (6,000 acre-feet) (see Table 3-113). There could be approximately 530 million cubic meters (430,000 acre-feet) of recoverable groundwater in the upper 30 meters (100 feet) of saturated aquifer materials within area 121A. NDWR data indicate that there are no documented pending annual duties (see Table 3-113) in area 121A.

Geologic units underlying the Soda Spring Valley (eastern part) hydrographic area include alluvial valley fill, intrusive and metamorphic bedrock units, and clastic sandstone (see Table 3-118). Mina common segment 1 would primarily overlie alluvial valley (alluvial valley floor and alluvial slope) deposits. Table 3-118 summarizes general groundwater-quality and aquifer characteristics in hydrographic area 121A.

Faulting is mapped predominantly on the alluvial aprons in hydrographic area 121A. Mapped fault traces (for example, part of the Benson Springs fault system) in alluvial valley fill to the south of one proposed new well site (SSa-3, see Figure 3-192) could project northeastward past the well location to the east; faults are also identified along the alluvial apron at the bedrock contact to the east (base of the Pilot Mountains), about 1.6 kilometers (1 mile) east of this proposed well location (DIRS 180888-Converse Consultants 2007, Appendix B; DIRS 180975-Stewart, Carlson, and Johannessen 1982, all). The possible effects of such faults on groundwater flow in hydrographic area 121A in the vicinity of proposed well location SSa-3 (DIRS 180888-Converse Consultants 2007, Appendix B) were evaluated in hydrogeologic impact analyses (Appendix G).

The depth to groundwater beneath Soda Spring Valley (eastern part) is generally between 15 to 30 meters (50 to 100 feet) (see Table 3-118). Available data regarding characteristics of the valley-fill aquifer underlying hydrographic area 121A indicate that approximately 530 million cubic meters (430,000 acre-feet) of recoverable groundwater might exist within saturated aquifer material within this basin (see Table 3-118).

A second potential quarry location is in the Gabbs Valley Range northeast of Luning along the northeastern side of Mina common segment 1. Proposed well location SSa-1 is adjacent to this potential quarry site. The geology in this area consists of sedimentary and plutonic rocks (DIRS 180881-Shannon & Wilson 2007, p. 28*)*. The quarry and the quarry well would be located on grazing land (Section 4.3.2).

There are a total of 9 existing NDWR wells with water rights, domestic wells, and USGS NWIS wells in hydrographic area 121A within 1.6 kilometers (1 mile) of either the centerline of Mina common segment 1 and/or within 1 mile of any proposed new well outside of the segment construction right-of-way (see Table 3-114). There are no springs, seeps, or other surface-water-right locations in hydrographic area 121A within 1.6 kilometers of the centerline of Mina common segment 1 or any proposed new well outside of the segment construction right-of-way.

Hydrographic area 119, Rhodes Salt Marsh Valley, is not a designated groundwater basin. Committed groundwater resources do not exceed its estimated perennial yield of 1.23 million cubic meters (1,000 acre-feet) (see Table 3-113). There could be approximately 420 million cubic meters (340,000 acre-feet) of recoverable groundwater in the upper 30 meters (100 feet) of saturated aquifer materials within area 119. NDWR data indicate that that there are no documented pending annual duties (see Table 3-113) in hydrographic area 119.

In the portion of hydrographic area 119 the rail line would cross, groundwater is approximately 15 meters (50 feet) to less than 30 meters (100 feet) below ground surface (see Table 3-118). Groundwater chemistry within hydrographic area 119 is highly variable. Groundwater is primarily obtained from the alluvial valley-fill aquifer. The primary geologic units comprising Rhodes Salt Marsh Valley include alluvial valley fill, volcanic rocks, and older carbonate and clastic rocks. There are no NDWR wells with water rights, no domestic wells, and no other USGS NWIS wells within 1.6 kilometers (1 mile) of the centerline of Mina common segment 1 and/or within 1 mile of any proposed new well locations outside of the centerline (see Table 3-114). There are no springs, seeps, or other surface-water-right locations in hydrographic area 119 within 1 mile of the centerline of Mina common segment 1 or within 1 mile of any proposed new well locations outside of the centerline (Figure 3-192). There are two existing springs in Sodaville, just north of hydrographic area 119 (Figure 3-192). These springs have documented discharge rates of approximately 280 liters (75 gallons) per minute but are more than 3.2 kilometers (2 miles) from the centerline of Mina common segment 1 (DIRS 180759-Van Denburgh and Clancy 1970, p. 28 and Plate 1). Table 3-118 summarizes general groundwater-quality and aquifer characteristics in hydrographic area 119.

Hydrographic area 118, Columbus Salt Marsh Valley, is not a designated groundwater basin. Committed groundwater resources do not exceed its estimated perennial yield of 4.9 million cubic meters (4,000 acre-feet) (see Table 3-113). There could be approximately 650 million cubic meters (530,000 acre-feet) of recoverable groundwater in the upper 30 meters (100 feet) of saturated aquifer materials within area 118. NDWR data indicate that there are no documented pending annual duties (see Table 3-113) in area 118.

Groundwater derived within area 118 is primarily obtained from alluvial valley fill. Table 3-118 summarizes general groundwater-quality and aquifer characteristics in hydrographic area 118.

The primary geologic units comprising Columbus Salt Marsh Valley are alluvial sediments, volcanic rock, and clastic rocks (see Table 3-118). Depth to groundwater in hydrographic area 118 varies from approximately 0 to 34 meters (0 to 111 feet) below ground surface (DIRS 180887-Converse Consultants 2007, p. 57). Available data indicate that depth to groundwater beneath Mina common segment 1 in hydrographic area 118 could vary from about 15 to 30.5 meters (50 to 100 feet) (see Table 3-118).

There are two NDWR wells with water rights, three USGS NWIS wells, and three springs in hydrographic area 118 within 1.6 kilometers (1 mile) of the centerline of Mina common segment 1 and/or within 1 mile of proposed pumping well locations for this alignment segment. Figure 3-192 shows the locations of the wells.

Big Smoky Valley (hydrographic area 137A) is a designated groundwater basin, and the committed groundwater resources exceed the perennial yield of 7.4 million cubic meters (6,000 acre-feet). There could be approximately 8.63 billion cubic meters (7 million acre-feet) of recoverable groundwater in the upper 30 meters (100 feet) of saturated aquifer materials within area 137A. NDWR data indicate that there are no documented pending annual duties (see Table 3-113) in area 137A. Geologic units in this hydrographic area include primarily alluvial valley fill, volcanic rocks, intrusive and metamorphic rocks, and clastic rocks (see Table 3-118). The alluvial valley-fill materials include sands and gravels along alluvial fans and washes, and silts and clays along the valley floor; most of the available groundwater in Big Smoky Valley is found in unconfined and semi-unconfined aquifers comprised of these valley-fill sediments.

Depth to groundwater underlying the alignment in hydrographic area 137A typically varies from less than 3 to greater than about 30 meters (10 to 100 feet) below ground surface (see Table 3-118). Depth to groundwater in hydrographic area 137A could vary from less than 1 meter (2 feet) to as deep as 220 meters (720 feet) below ground surface reported for some locations in the alluvial apron (DIRS 180887-Converse Consultants 2007, pp. 51 and 52). Groundwater in hydrographic area 137A contains dominant ions of calcium and bicarbonate, and groundwater at higher elevations has total dissolved solids concentrations that are relatively low (500 ppm or less), although discharge areas in the center of the valley may have higher concentrations (see Table 3-118) (DIRS 180887-Converse Consultants 2007, p. 52).

Groundwater in Big Smoky Valley is mainly used for irrigation and mining purposes (DIRS 180887-Converse Consultants 2007, p. 53). Besides groundwater pumping and evapotranspiration, groundwater in the basin flows out of the area as subsurface outflow to Clayton Valley and Columbus Salt Marsh.

There are a total of 26 existing wells in hydrographic area 137A within 1.6 kilometers (1 mile) of the centerlines of alternative segments passing through this basin and/or within 1 mile of proposed pumping well locations for alternative segments. Thirteen of these wells are USGS wells and 13 are NDWR wells with active water rights. There are no springs, seeps, or other surface-water-right locations within 1.6 kilometers of the centerline of the rail alignment and/or proposed pumping well locations. There are no proposed groundwater supply-well locations in Big Smoky Valley for Mina common segment 1 that are outside of the construction right-of-way (Figure 3-193).

3.3.6.3.5 Montezuma Alternative Segment 1

Starting near Blair Junction, Montezuma alternative segment 1 would proceed southeastward towards Silver Peak, then continue eastward and southward in a sinuous fashion on its way to a point where the segment would connect to the beginning of Mina common segment 2, southeast of the Cuprite Hills. Montezuma alternative segment 1 would cross the following hydrographic areas: 137A (Big Smoky Valley), 143 (Clayton Valley), 142 (Alkali Spring Valley), and 144 (Lida Valley). Figures 3-193 and 3-194 depict the proposed Montezuma alternative segment 1 configuration. Aquifer characteristics, such as aquifer type(s), groundwater quality, and depth to groundwater underlying Montezuma alternative segment 1 vary according to the locations within the hydrographic areas that the rail line would cross. Table 3-119 summarizes the groundwater-quality and aquifer characteristics for each hydrographic area Montezuma alternative segment 1 would cross.

Table 3-119. General groundwater-quality and aquifer characteristics – Montezuma alternative segment 1.

Hydrographic area number and name	Aquifer geologic characteristics[a]	Depth to groundwater (feet)[b,c]	Estimated recoverable groundwater (acre-feet)[d]	Groundwater quality[e]
137A Big Smoky Valley	Alluvial valley fill, volcanic rocks, intrusive and metamorphic rocks, clastic rocks	Less than 10 to more than 100	7 million[f]	Total dissolved solids: 300 to 4,000 ppm[g] 6,500 ppm (valley center discharge locations)[f]
143 Clayton Valley	Alluvial valley fill, carbonate and clastic rocks, volcanic rocks	Less than 10 to 50	1.3 million[f]	Total dissolved solids: Up to 1,700 ppm[g] (more than 10,000 ppm lower parts of the basin)[g]
142 Alkali Spring Valley (Esmeralda)	Alluvial valley fill, clastic and subordinate carbonate rocks, rhyolite dikes, volcanic rocks	90	1.3 million[f]	Total dissolved solids: Less than 1,000 ppm[g] 1,000 to 3,000 ppm (in playa area)[g]
144 Lida Valley	Alluvial valley fill, volcanic sediments, and older rock units including hornfels, phyllite, quartzite, limestone, and dolomite	140 to 280	1.5 million[f]	Total dissolved solids: 400 to 1,100 ppm[g] Sulfate: 61 to 284 ppm[g]

a. Source: DIRS 180887-Converse Consultants 2007, pp. 32, 39, 46, and 52.
b. Estimated depth to groundwater obtained from DIRS 180887-Converse Consultants 2007, Plates 4-1 to 4-4, and p. 52; DIRS 182821-Converse Consultants 2005, Plates 4-3 and 4-5. Groundwater depths are for those areas underlying the general vicinity of the alignment; groundwater depths in other areas of the basins could be different.
c. To convert feet to meters, multiply by 0.3048.
d. To convert from acre-feet to cubic meters, multiply by 1,233.49; unless otherwise specified, the groundwater quality refers to the upper 100 feet of the saturated alluvial valley-fill material in the hydrographic area.
e. Many reference sources list a concentration value in mg/L (milligrams per liter), which, for materials or contaminants in most groundwaters, is approximately equivalent to parts per million (ppm).
f. Source: DIRS 180754-Rush et al. 1971, all.
g. Source: DIRS 180887-Converse Consultants 2007, pp. 34, 40, 46, and 52.

Section 3.3.6.3.4 describes the hydrogeologic characteristics of hydrographic area 137A, including groundwater-quality and aquifer characteristics, as well as information regarding existing wells and springs, seeps, or other surface-water-right locations in the vicinity of the proposed rail alignment segments. Table 3-119 summarizes general groundwater-quality and aquifer characteristics in hydrographic area 137A.

Clayton Valley (hydrographic area 143) is a designated groundwater basin, and the total active annual duties for the basin exceed the perennial yield of 24.6 million cubic meters (20,000 acre-feet) (see Table 3-113). There could be approximately 1.6 million cubic meters (1.3 million acre-feet) of recoverable groundwater in the upper 30 meters (100 feet) of saturated aquifer materials within area 143 (DIRS 180754-Rush et al. 1971, all). NDWR data indicate that there are no documented pending underground annual duties in hydrographic area 143 (see Table 3-113).

Alluvial valley deposits consisting of silts and clays comprise the center of the valley and are hundreds of feet thick. Alluvial valley-fill materials, volcanic rocks, and carbonate and clastic rocks are the major geologic units encountered (see Table 3-119). Most of the available groundwater in Clayton Valley is found in alluvial valley-fill materials, with some groundwater contained in fractured rock of the surrounding mountains. Subsurface inflow from Big Smoky Valley and Alkali Spring Valley contributes most of the recharge to groundwater in Clayton Valley. The majority of groundwater leaves this basin as evapotranspiration or through pumping wells (DIRS 180887-Converse Consultants 2007, p. 47).

Depth to groundwater throughout hydrographic area 143 varies from approximately less than 1 meter to 237 meters below ground surface (2 feet to 778 feet) (DIRS 180887-Converse Consultants 2007, p. 45). Depth to groundwater underlying the alignment in hydrographic area 143 ranges from about 3 to 15 meters below ground surface (less than 10 to 50 feet) below ground surface (see Table 3-119). Groundwater in Clayton Valley is highly mineralized (brackish) with elevated sodium and chloride concentrations, and total dissolved solids as high as 10,000 ppm in lower parts of the basin (see Table 3-119) (DIRS 180760-Albers and Stewart 1981, p. 2; DIRS 180887-Converse Consultants 2007, p. 46).

The dominant use for groundwater in Clayton Valley is solution-mining of lithium from brines in the playa area (DIRS 180887-Converse Consultants 2007, p. 47). There are a total of 14 existing wells in hydrographic area 143 within 1.6 kilometers (1 mile) of the centerline of Montezuma alternative segment 1 passing through this basin and/or within 1 mile of proposed pumping well locations for this alternative segment (see Table 3-114). Seven of these wells are USGS wells, six are NDWR wells with active water rights, and there is one domestic well. There are six springs within 1.6 kilometers of the centerline of Montezuma alternative segment 1 and/or the proposed pumping well locations.

Proposed groundwater supply-well location Cl-1a is the only proposed well location for Montezuma alternative segment 1 that is outside the construction right-of-way in Clayton Valley (Figure 3-194). It is located on an alluvial fan, about 5.6 kilometers (3.5 miles) west of Montezuma alternative segment 1 (DIRS 180888-Converse Consultants 2007, Appendices A and B).

Alkali Spring Valley (hydrographic area 142) is not a designated groundwater basin, and the total active annual duties for the basin do not exceed the perennial yield of 3.7 million cubic meters (3,000 acre-feet) (see Table 3-113). There could be approximately 1.6 billion cubic meters (1.3 million acre-feet) of recoverable groundwater in the upper 30 meters (100 feet) of saturated aquifer materials within area 142 (DIRS 180754-Rush et al. 1971, all). NDWR data indicate that there are no documented pending underground annual duties in hydrographic area 142 (see Table 3-113).

Geologic units in this hydrographic area include primarily alluvial valley fill, volcanic rocks, rhyolite, and clastic and carbonate rocks (see Table 3-119). The alluvial valley deposits of Alkali Spring Valley contain most of the available groundwater, and groundwater production comes mainly from valley-fill wells. However, fractured rock is the source of groundwater discharging from small springs on the south side of the basin. Most aquifer recharge is from subsurface inflow from Ralston Valley, and groundwater in Alkali Spring Valley flows to the southwest, with the majority of groundwater leaving as outflow to Clayton Valley (DIRS 180887-Converse Consultants 2007, pp. 40 and 41).

Depth to groundwater in hydrographic area 142 varies from approximately 2 to 150 meters (7 to 480 feet) below ground surface (DIRS 180887-Converse Consultants 2007, p. 39). Depth to groundwater underlying the rail alignment in Alkali Spring Valley is approximately 27 meters (90 feet) (see Table 3-119). Groundwater quality in Alkali Spring Valley varies throughout the basin. The northeastern part has the best water quality, with lower total dissolved solids; while the playa area and the vicinity of Alkali Hot Spring has groundwater that is high in sodium sulfate and total dissolved solids (see Table 3-119).

The dominant uses for groundwater in Alkali Spring Valley are for mining and municipal water supply. There are a total of 21 existing wells in hydrographic area 142 within 1.6 kilometers (1 mile) of the centerline of alternative segments passing through this basin and/or within 1 mile of proposed pumping well locations for the alternative segments. Eleven of these wells are USGS wells, and ten are NDWR wells with active water rights. There are two springs within 1.6 kilometer of the centerline of the alternative segments.

Lida Valley (hydrographic area 144) is not a designated groundwater basin, and the committed groundwater resources are less than the perennial yield of 430,000 cubic meters (350 acre-feet). There could be approximately 1.9 billion cubic meters (1.5 million acre-feet) of recoverable groundwater in the upper 30 meters (100 feet) of saturated aquifer materials within area 144. NDWR data indicate that there are no documented pending underground annual duties in hydrographic area 144 (see Table 3-113).

Geologic units in hydrographic area 144 include primarily alluvial valley fill, volcanic rocks, limestone and dolomite, hornfels, phyllite, and quartzite (see Table 3-119). Groundwater is mostly found in unconfined aquifers of the alluvial valley-fill materials. Most aquifer recharge is derived from precipitation and subsurface inflow from Stonewall Basin, and groundwater exits the basin in the form of outflow to Sarcobatus Flat (DIRS 180887-Converse Consultants 2007, pp. 34 and 35).

Depth to groundwater in hydrographic area 144 varies from approximately 8 to 110 meters (140 to 280 feet) below ground surface. Depth to groundwater underlying the rail alignment in Lida Valley ranges from 50 to 61 meters (160 to 200 feet). Groundwater quality is reflected in the total dissolved solids (see Table 3-119).

The dominant uses for groundwater in hydrographic area 144 (Lida Valley) include mining, stockwatering, and municipal water supply. There are a total of two existing wells in hydrographic area 144 within 1.6 kilometers (1 mile) of the centerlines of the alternative segments passing through this basin and/or within 1 mile of proposed pumping well locations for the alternative segments. These two wells are USGS wells. There are no wells with water rights, no domestic wells, and no springs, seeps, or other surface-water-right locations within 1 mile of the centerlines of the alternative segments or within 1 mile of proposed pumping well locations for these alternative segments.

Proposed groundwater-supply wells for Montezuma alternative segment 1 in the Alkali Spring Valley and Lida Valley hydrographic areas that might be required outside the construction right-of-way (Figure 3-194) and which are not related to water-supply requirements for potential quarries include AS-1a and AS-3a and LV10/LV11/LV12 in hydrographic area 144. The AS-1a and AS-3a proposed well locations lie about 4.8 kilometers (3 miles) and 3.7 kilometers (2.3 miles) north, respectively, of the centerline of Montezuma alternative segment 1, on an alluvial valley-fill slope in an area without a history of much groundwater production. These two proposed well locations would be located on grazing land (Section 4.3.2). For both locations, there are north-northeast striking faults in bedrock to the southwest of these proposed well locations, which could impact groundwater flow and pumping conditions in the area (DIRS 180888-Converse Consultants 2007, Appendix B).

Another proposed groundwater supply-well location (Li-5a) that is in hydrographic area 144 for Montezuma alternative segment 1 that is outside of the construction right-of-way (Figure 3-194) is a proposed alternate quarry water-supply well in the central part of an alluvial fan, about 2.4 kilometers (1.5 miles) west of Montezuma alternative segment 1. This well site might be used in lieu of another proposed new well (Li-1a) located within the Montezuma alternative segment 1 construction right-of-way due to the possibility of encountering a sufficient thickness of alluvial valley-fill materials and a thicker ***saturated zone*** at location Li-5a than at location Li-1a (DIRS 180888-Converse Consultants 2007, Appendix B and Plate 4-1). This proposed alternate quarry well would be located on grazing land (Section 4.3.2).

3.3.6.3.6 Montezuma Alternative Segment 2

Montezuma alternative segment 2 would begin near Blair Junction and proceed from west to east through hydrographic area 137A (Big Smoky Valley), then proceed generally southward or southeastward through hydrographic areas 142 (Alkali Spring Valley), 145 (Stonewall Valley), and 144 (Lida Valley), passing west of the community of Goldfield (Figures 3-193 through 3-195). Aquifer characteristics, such as aquifer type(s), groundwater quality, and depth to groundwater underlying Montezuma alternative segment 2, vary according to the locations within the hydrographic areas that the rail line would cross. Table 3-120 summarizes the groundwater-quality and aquifer characteristics for each hydrographic area through which the alternative segment would pass.

Section 3.3.6.3.4 describes the hydrogeologic characteristics of hydrographic area 137A, including groundwater-quality and aquifer characteristics, as well as information regarding existing wells, springs, seeps, and other surface-water-right locations in the vicinity of the proposed rail alignment segments. This information is again presented here for convenience.

Big Smoky Valley (hydrographic area 137A) is a designated groundwater basin, and the committed groundwater resources exceed the perennial yield of 7.4 million cubic meters (6,000 acre-feet) (see Table 3-113). As described previously in Section 3.3.6.3.4, there are no documented pending underground annual duties in area 137A. Geologic units in this hydrographic area include primarily alluvial valley fill, volcanic rocks, intrusive and metamorphic rocks, and clastic rocks (see Table 3-120). The alluvial valley-fill materials include sands and gravels along alluvial fans and washes, and silts and clays along the valley floor; most of the available groundwater in Big Smoky Valley is found in unconfined and semi-unconfined aquifers comprised of these valley-fill sediments (DIRS 180887-Converse Consultants 2007, p. 51). Depth to groundwater in hydrographic area 137A typically varies from less than 3 to more than about 30 meters (10 to 100 feet) below ground surface (see Table 3-120), with values as deep as 220 meters (720 feet) below ground surface reported for some locations in the alluvial apron. Groundwater in hydrographic area 137A contains dominant ions of calcium and bicarbonate, and total dissolved solids are generally relatively low, but can vary from approximately 300 to 4,000 ppm, with higher concentrations possible underlying discharge areas in the center of the valley (see Table 3-121).

Section 3.3.6.3.5 describes the hydrogeologic characteristics of hydrographic areas 142 and 144, including groundwater-quality and aquifer characteristics, as well as information regarding existing wells, springs, seeps, and other surface-water-right locations in the vicinity of the proposed alternative segments. This information is again presented here for convenience.

Alkali Spring Valley (hydrographic area 142) is not a designated groundwater basin, and the total active annual duties for the basin do not exceed the perennial yield of 3.7 million cubic meters (3,000 acre-feet) (see Table 3-113). As described previously in Section 3.3.6.3.5, there are no documented pending underground annual duties in area 142. Geologic units in hydrographic area 142 include primarily alluvial valley fill, volcanic rocks, rhyolite, and clastic and carbonate rocks (see Table 3-120).

The alluvial valley deposits of Alkali Spring Valley contain most of the available groundwater, and groundwater production comes mainly from valley-fill wells. However, fractured rock is the source of groundwater discharging from small springs on the south side of the basin. Most aquifer recharge is from subsurface inflow from Ralston Valley, and groundwater in Alkali Spring Valley flows to the southwest, with the majority of groundwater leaving as outflow to Clayton Valley (DIRS 180887-Converse Consultants 2007, pp. 40 and 41).

Table 3-120. General groundwater-quality and aquifer characteristics – Montezuma alternative segment 2.

Hydrographic area number and name	Aquifer geologic characteristics[a]	Depth to groundwater (feet)[b,c]	Estimated recoverable groundwater (acre-feet)[d]	Groundwater quality[e]
137A Big Smoky Valley	Alluvial valley fill, volcanic rocks, intrusive and metamorphic rocks, clastic rocks	Less than 10 to more than 100	7 million[f]	Total dissolved solids: 300 to 4,000 ppm[g] 6,500 ppm (valley center discharge locations)[g]
142 Alkali Spring Valley (Esmeralda)	Alluvial valley fill, clastic and subordinate carbonate rocks, rhyolite dikes, volcanic rocks	90 to 200	1.3 million[f]	Total dissolved solids: Less than 1,000 ppm[g] 1,000 to 3,000 ppm (in playa area)[g]
145 Stonewall Flat	Alluvial valley-fill deposits, volcanic rocks, older sedimentary rocks[h]	120 to 200	820,000[f]	Total dissolved solids: Less than 300 ppm[i]
144 Lida Valley	Alluvial valley fill, rhyolite volcanic sediments (including tuffs of the stonewall flat and tuffs of the Thirty Canyon Group), older rock units including claystone, siltstone, and limestone	240 to 280	1.5 million[f]	Total dissolved solids: 400 to 1,100 ppm[g] Sulfate: 61 to 284 ppm[g]

a. Sources: DIRS 180887-Converse Consultants 2007, pp. 32, 39, and 52; DIRS 183639-Shannon & Wilson 2007, pp. 22 to 35.
b. Estimated depth to groundwater obtained from DIRS 180887-Converse Consultants 2007, Plates 4-1 through 4-4, and p. 52; DIRS 182821-Converse Consultants 2005, p. 49 and Plate 4-5. Groundwater depths are for those areas underlying the general vicinity of the alignment; groundwater depths in other areas of the basins could be different.
c. To convert feet to meters, multiply by 0.3048.
d. To convert acre-feet to cubic meters, multiply by 1,233.49; unless otherwise specified, the groundwater quality refers to the upper 100 feet of the saturated alluvial valley-fill material in the hydrographic area.
e. Many reference sources list a concentration value in mg/L (milligrams per liter), which, for materials or contaminants in most groundwaters, is approximately equivalent to parts per million (ppm).
f. Source: DIRS 180754-Rush et al. 1971, all.
g. Source: DIRS 180887-Converse Consultants 2007, pp. 34, 40, 46, and 52.
h. Source: DIRS 173179-Belcher 2004, p. 28 and Figure B-1.
i. Source: DIRS 182821-Converse Consultants 2005, p. 49.

Depth to groundwater in hydrographic area 142 varies from less than 2 to 146 meters (7 to 480 feet) below ground surface (DIRS 180887-Converse Consultants 2007, p. 39). Depth to groundwater underlying the alignment in area 142 varies from 18 to 52 meters (60 to 170 feet) (see Table 3-120). Groundwater quality in Alkali Spring Valley varies throughout the basin.

The northeastern part has the best water quality, with lower total dissolved solids; while the playa area and the vicinity of Alkali Hot Spring has groundwater that is high in sodium sulfate and total dissolved solids (see Table 3-120).

Lida Valley (hydrographic area 144) is not a designated groundwater basin, and the committed groundwater resources are less than the perennial yield of approximately 432,000 cubic meters (350 acre-feet) (see Table 3-113). As described previously in Section 3.3.6.3.5, there are no documented pending underground annual duties in area 144. Geologic units in hydrographic area 144 include primarily alluvial valley fill, rhyolite volcanic rocks, (including tuffs of the Stonewall Flat and tuffs of the Thirty Canyon Group), and older rock units including claystone, siltstone, and limestone (see Table 3-120). Groundwater is mostly found in unconfined aquifers of the alluvial valley-fill materials (DIRS

180887-Converse Consultants 2007, p. 32). Most aquifer recharge is derived from precipitation and subsurface inflow from Stonewall Basin, and groundwater exits the basin in the form of outflow to Sarcobatus Flats (DIRS 180887-Converse Consultants 2007, pp. 34 and 35).

Depth to groundwater in hydrographic area 144 varies from approximately 7.9 to 110 meters (26 to 360 feet) below ground surface (see Table 3-120). Depth to groundwater underlying the rail alignment varies from 73 to 85 meters (240 to 280 feet). Groundwater quality is reflected in the total dissolved solids, which are given in Table 3-120.

Two proposed groundwater supply-well locations for Montezuma alternative segment 2, BSa-2a and BSa-3a, both in Big Smoky Valley, are within several kilometers of faults that may act as conduits for a significant amount of groundwater, thus influencing groundwater flow and pumping conditions in the area (DIRS 180888-Converse Consultants 2007, Appendix B).

There are four locations where wells are proposed to support construction of Montezuma alternative segment 2 that would be outside the construction right-of-way. All of these proposed well locations would be located on grazing land (Section 4.3.2). A proposed set of groundwater supply-well locations (ASV4/ASV5/ASV8/ASV9) east of Montezuma alternative segment 2 in hydrographic area 142 (Figure 3-194) are at the same location as a set of wells of the same name that were proposed to support construction of Goldfield alternative segments, as described in Section 3.2.6.3.7 (DIRS 180888-Converse Consultants 2007, Appendix C). A proposed set of groundwater supply-well locations in hydrographic area 144 (LV10/LV11/LV12) west of the Montezuma alternative segment 2 in hydrographic area 144 are the same set of wells of the same name as those proposed for Caliente common segment 4, as described in Section 3.2.6.3.8. Up to two wells each at either proposed well site ASV6, or at a proposed alternate well site ASV7, if needed, west and northwest of Goldfield, respectively (Figure 3-194), could supply water to a potential quarry site (quarry ES-7) in that area. These wells would only be required if Montezuma alternative segment 2 were selected (DIRS 180875-Nevada Rail Partners 2007, pp. 3 and 4). Geologic conditions present at these proposed well sites include fractured volcanic rock units (ASV6 site) and alluvial fan deposits (ASV7 site) (DIRS 180888-Converse Consultants 2007, Appendix D).

Hydrographic area 145 (Stonewall Flat) is not a designated groundwater basin. Committed groundwater resources as of September 2006 do not exceed the perennial yield of approximately 120,000 cubic meters (100 acre-feet) (see Table 3-113). There could be approximately 1 billion cubic meters (820,000 acre-feet) of recoverable groundwater in the upper 30 meters (100 feet) of saturated aquifer materials within area 145. NDWR data indicate that there are no documented pending underground annual duties in hydrographic area 145 (see Table 3-113). Geologic units underlying hydrographic area 145 include alluvial valley-fill deposits, volcanic rocks, and older sedimentary rocks (DIRS 173179-Belcher 2004, p. 28 and Figure B-1).

Only a small portion (less than 8 kilometers [5 miles]) of Montezuma alternative segment 2 would overlie hydrographic area 145, and there are no proposed water supply-well locations within this hydrographic area (DIRS 180888-Converse Consultants 2007, Appendix A and Plate 4-1). Depth to groundwater is uncertain along Montezuma alternative segment 2 where it would cross a small portion of Stonewall Flat. However, based on projections from nearby areas, depth to groundwater could be approximately 37 to 60 meters (120 to 200 feet) (see Table 3-120). Groundwater quality is relatively good, with low total dissolved solids concentrations (see Table 3-120). Alluvial valley-fill material, volcanic rock, and older sedimentary rocks are the primary geologic units in the basin (see Table 3-120). There are no existing wells (USGS and NDWR) or springs, seeps, or other surface-water-right locations in Stonewall Flat that are within 1.6 kilometers (1 mile) of Montezuma alternative segment 2.

3.3.6.3.7 Montezuma Alternative Segment 3

Montezuma alternative segment 3 would initially follow the same path as the first portion of proposed Montezuma alternative segment 2, proceeding eastward/northeastward from near Blair Junction through a portion of Big Smoky Valley (hydrographic area 137A) and then proceed southeastward and southward, passing through Alkali Spring Valley (hydrographic area 142). In the Alkali Spring Valley hydrographic area, Montezuma alternative segment 3 would proceed westward beginning at a point along Montezuma alternative segment 2 to where it would intersect with a portion of a segment that would be the same as the eastern and southeastern portion of Montezuma alternative segment 1. Montezuma alternative segment 3 (comprised of the northern portion of Montezuma alternative segment 2, the short connecting Montezuma alternative segment 3, and the southern portion of Montezuma alternative segment 1) would then follow the same path as the southern portion of Montezuma alternative segment 1 through the Clayton Valley and Lida Valley areas, to the beginning of Mina common segment 2, southeast of the Cuprite Hills (Figures 3-193 and 3-194).

Aquifer characteristics, such as aquifer types(s), groundwater quality, and depth to groundwater underlying the portions of Montezuma alternative segments 1 and 2 would be the same as the northern and southern portions of Montezuma alternative segment 3 previously described in Sections 3.3.6.3.4 and 3.3.6.3.5, but this information is again presented here for convenience.

Big Smoky Valley (hydrographic area 137A), which the northern portion of Montezuma alternative segment 3 would cross, is a designated groundwater basin, and the committed groundwater resources exceed the perennial yield of 7.4 million cubic meters (6,000 acre-feet) (see Table 3-113). There are existing groundwater-rights appropriations in hydrographic area 137A, but there are no pending underground annual duties (see Table 3-113). Geologic units in this hydrographic area include primarily alluvial valley fill, volcanic rocks, intrusive and metamorphic rocks, and clastic rocks (see Table 3-121). The alluvial valley-fill materials include sands and gravels along alluvial fans and washes, and silts and clays along the valley floor; most of the available groundwater in Big Smoky Valley is found in unconfined and semi-unconfined aquifers of these alluvial valley-fill sediments.

Depth to groundwater underlying the alignment in hydrographic area 137A typically varies from less than 3 to more than about 30 meters (10 to 100 feet) below ground surface (see Table 3-121). Depth to groundwater in hydrographic area 137A could vary from less than 1 meter (2 feet) to as deep as 220 meters (720 feet) below ground surface reported for some locations in the alluvial apron (DIRS 180887-Converse Consultants 2007, pp. 51 and 52). Groundwater in hydrographic area 137A contains dominant ions of calcium and bicarbonate, and total dissolved solids are relatively low, under 500 ppm (see Table 3-121), although discharge areas in the center of the valley may have higher concentrations.

Alkali Spring Valley (hydrographic area 142), which Montezuma alternative segment 3 would cross, is not a designated groundwater basin, and the total active annual duties for the basin do not exceed the perennial yield of 3.7 million cubic meters (3,000 acre-feet) (see Table 3-113). There are existing groundwater-rights appropriations in hydrographic area 142, but there are no pending underground annual duties (see Table 3-113) (DIRS 183991-Luellen 2007, all).

Geologic units in this hydrographic area include primarily alluvial valley fill, volcanic rocks, rhyolite, and clastic and carbonate rocks (see Table 3-121). The alluvial valley deposits of Alkali Spring Valley contain most of the available groundwater, and groundwater production comes mainly from valley-fill wells. However, fractured rock is the source of groundwater discharging from small springs on the south side of the basin. Most aquifer recharge is from subsurface inflow from Ralston Valley, and groundwater in Alkali Spring Valley flows to the southwest, with the majority of groundwater leaving as outflow to Clayton Valley (DIRS 180887-Converse Consultants 2007, pp. 40 and 41).

Table 3-121. General groundwater-quality and aquifer characteristics – Montezuma alternative segment 3.

Hydrographic area number and name	Aquifer geologic characteristics[a]	Depth to groundwater (feet)[b,c]	Estimated recoverable groundwater (acre-feet)[d]	Groundwater quality[e]
137A Big Smoky Valley	Alluvial valley fill, volcanic rocks, intrusive and metamorphic rocks, clastic rocks	Less than 10 to more than 100	7 million[f]	Total dissolved solids: 300 to 4,000 ppm[g] 6,500 ppm (valley center discharge locations)[g]
142 Alkali Spring Valley (Esmeralda)	Alluvial valley fill, clastic and subordinate carbonate rocks, rhyolite dikes, volcanic rocks	60 to 170	1.3 million[f]	Total dissolved solids: Less than 1,000 ppm[g] 1,000 to 3,000 ppm (in playa area)[g]
143 Clayton Valley	Alluvial valley fill, carbonate and clastic rocks, volcanic rocks	Less than 10 to 50	1.3 million[f]	Total dissolved solids: Up to 1,700 ppm[g] (more than 10,000 ppm lower parts of the basin)[g]
144 Lida Valley	Alluvial valley fill, rhyolite volcanic sediments (including tuffs of the Stonewall Flat and tuffs of the Thirty Canyon Group), older rock units including claystone, siltstone, and limestone	140 to 280	1.5 million[f]	Total dissolved solids: 400 to 1,100 ppm[g] Sulfate: 61 to 284 ppm[g]

a. Sources: DIRS 180887-Converse Consultants 2007, pp. 32, 39, 44, 45, and 51; DIRS 183639-Shannon & Wilson 2007, pp. 22 to 35.
b. The listed depth to groundwater ranges generally apply to areas underlying the alignment obtained from DIRS 180887-Converse Consultants 2007, Plates 4-1 through 4-4; groundwater can vary over a wide range of depth depending on location in each hydrographic area (DIRS 180887-Converse Consultants 2007, pp. 32, 39, 45, 51, and 52); DIRS 182821-Converse Consultants 2005, Plate 4-5.
c. To convert feet to meters, multiply by 0.3048.
d. To convert acre-feet to cubic meters, multiply by 1,233.49; unless otherwise specified, the groundwater quality refers to the upper 100 feet of the saturated alluvial valley-fill material in the hydrographic area.
e. Many reference sources list a concentration value in mg/L (milligrams per liter), which, for materials or contaminants in most groundwaters, is approximately equivalent to parts per million (ppm).
f. Source: DIRS 180754-Rush et al. 1971, all.
g. Source: DIRS 180887-Converse Consultants 2007, pp. 34, 40, 46, and 52.

Depth to groundwater in hydrographic area 142 varies from approximately 2 to 150 meters (7 to 480 feet) below ground surface (DIRS 180887-Converse Consultants 2007, p. 39). Depth to groundwater underlying the rail alignment in Alkali Spring Valley varies from 27 to 61 meters (90 to 200 feet) (Table 3-121). Groundwater quality in Alkali Spring Valley varies throughout the basin. The northeastern part has the best water quality, with lower total dissolved solids, while the playa area and the vicinity of Alkali Hot Spring has groundwater that is high in sodium sulfate and total dissolved solids (see Table 3-121).

Clayton Valley (hydrographic area 143), which a portion of Montezuma alternative segment 3 would cross, is a designated groundwater basin, and the total active annual duties for this basin exceed the perennial yield of 24.7 million cubic meters (20,000 acre-feet) (see Table 3-113). There are no pending underground annual duties for hydrographic area 143 (see Table 3-113).

Alluvial valley deposits consisting of silts and clays comprise the center of the valley and are hundreds of feet thick. Alluvial valley-fill materials, volcanic rocks, and carbonate and clastic rocks are the major geologic units encountered (see Table 3-121).

Depth to groundwater in hydrographic area 143 ranges from about 0.61 to 72 meters (2 to 237 feet) below ground surface. Depth to groundwater underlying the rail alignment in Clayton Valley ranges from less than 3 to 15 meters (10 to 50 feet), as summarized in Table 3-121. Groundwater in Clayton Valley is highly mineralized with elevated sodium and chloride concentrations, with total dissolved solids as high as 10,000 ppm in the lower parts of the basin (see Table 3-121) (DIRS 180760-Albers and Stewart 1981, p. 2).

Lida Valley (hydrographic area 144), which a portion of Montezuma alternative segment 3 would cross, is not a designated groundwater basin, and the committed groundwater resources are less than the perennial yield of 430,000 cubic meters (350 acre-feet) (Table 3-113). As described previously in Section 3.3.6.3.5, there are no documented pending underground annual duties in area 144. Geologic units in hydrographic area 144 include primarily alluvial valley fill, volcanic rocks, limestone and dolomite, hornfels, phyllite, and quartzite (see Table 3-121). Groundwater is mostly found in unconfined aquifers of the alluvial valley-fill materials.

Depth to groundwater in hydrographic area 144 varies from approximately 8 to 110 meters (26 to 360 feet) below ground surface (see Table 3-121). Depth to groundwater underlying the rail alignment varies from 43 to 85 meters (140 to 280 feet). Groundwater quality is reflected in the total dissolved solids, which are listed in Table 3-121.

As described in Section 3.3.6.3.6, up to two wells each that would be required if Montezuma alternative segment 2 is selected at either proposed well site ASV6, or at proposed alternate well site ASV7, west and northwest of Goldfield, respectively (Figure 3-194), would not be required if Montezuma alternative segment 3 is selected.

There are no proposed groundwater supply-well locations for the portion of Montezuma alternative segment 3 that is different from Montezuma alternative segments 1 and 2 that would lie outside the construction right-of-way (DIRS 180888-Converse Consultants 2007, Appendix A).

3.3.6.3.8 Mina Common Segment 2

Mina common segment 2 would begin at a point southeast of the Cuprite Hills in hydrographic area 144 (Lida Valley), and then proceed southeastward through that hydrographic area to the beginning of Bonnie Claire alternative segments 2 and 3 (Figures 3-194 and 3-195). Aquifer characteristics, such as groundwater quality and depth to groundwater underlying Mina common segment 2, would vary depending on the location within hydrographic area 144. Table 3-122 summarizes the groundwater-quality and aquifer characteristics for the Lida Valley hydrographic area.

Aquifer characteristics for hydrographic area 144, Lida Valley, have previously been described. Section 3.3.6.3.5 (Montezuma alternative segment 1) provides information regarding geology, groundwater quality, aquifer characteristics, and groundwater uses for this hydrographic area, as well as information regarding existing wells, springs, seeps, and other surface-water-right locations in the vicinity of the proposed rail alignment segment. As described previously in Section 3.3.6.3.5, there are no documented pending underground annual duties in area 144. There are no proposed groundwater supply wells for Mina common segment 2 (DIRS 180888-Converse Consultants 2007, Appendix A). Also, there are two existing USGS NWIS wells, no NDWR wells with water rights, no NDWR domestic wells, and no springs, seeps, or other surface-water-right locations in Lida Valley that are within 1.6 kilometers (1 mile) of Mina common segment 2 and/or within 1 mile of any proposed new well along this alignment segment.

Table 3-122. General groundwater-quality and aquifer characteristics – Mina common segment 2.

Hydrographic area number and name	Aquifer geologic characteristics[a]	Depth to groundwater (feet)[b,c]	Estimated recoverable groundwater (acre-feet)[d]	Groundwater quality[e]
144 Lida Valley	Alluvial valley fill, rhyolite volcanic sediments, (including tuffs of the Stonewall Flat and tuffs of the Thirty Canyon Group) and older rock units including claystone, siltstone, and limestone	240 to 280	1.5 million[f]	Total dissolved solids: 400 to 1,100 ppm[g] Sulfate: 61 to 284 ppm[g]

a. Sources: DIRS 180887-Converse Consultants 2007, pp. 31 and 32; DIRS 182821-Converse Consultants 2005, Plate 4-5.
b. Estimated depth to groundwater obtained from DIRS 180887-Converse Consultants 2007, Plates 4-1, and DIRS 182821-Converse Consultants 2005, Plate 4-5. Groundwater depths are for those areas underlying the general vicinity of the alignment; groundwater depths in other areas of the basins could be different.
c. To convert feet to meters, multiply by 0.3048.
d. To convert acre-feet to cubic meters, multiply by 1,233.49; unless otherwise specified, the groundwater quality refers to the upper 100 feet of the saturated alluvial valley-fill material in the hydrographic area.
e. Many reference sources list a concentration value in mg/L (milligrams per liter), which, for materials and contaminants in most groundwaters, is approximately equivalent to parts per million (ppm).
f. Source: DIRS 180754-Rush et al. 1971, all.
g. Source: DIRS 180887-Converse Consultants 2007, p. 34.

3.3.6.3.9 Bonnie Claire Alternative Segments

From north to south, Bonnie Claire alternative segments 2 and 3 would cross hydrographic areas 144 (Lida Valley) and 146 (Sarcobatus Flat) (Figure 3-195). Section 3.3.6.3.5 provides information regarding geology, groundwater quality, aquifer characteristics, and groundwater uses for hydrographic area 144, as well as information regarding existing wells, springs, seeps, and other surface-water-right locations in the vicinity of the proposed rail alignment segments. As described in Section 3.3.6.3.5, there are no documented pending underground annual duties in area 144. There is one existing NDWR well with water rights, no NDWR domestic wells, no existing USGS NWIS wells, and no existing springs, seeps, or other surface-water-right locations in hydrographic area 144 within 1.6 kilometers (1 mile) of the proposed Bonnie Claire alternative segments. There are four NDWR wells with water rights, no NDWR domestic wells, no USGS NWIS wells, and no existing springs, seeps, or other surface-water-right locations in area 146 within 1.6 kilometers of the center lines of the proposed Bonnie Claire alternative segments.

The Bonnie Claire alternative segments would predominantly overlie alluvial valley fill (see Table 3-123). Geologic units Bonnie Claire alternative segments 2 and 3 would cross primarily include alluvial valley-fill deposits and some volcanic rocks (DIRS 183639-Shannon & Wilson 2007, p. 28). The primary volcanic unit encountered along Bonnie Claire alternative segments 2 and 3 is tuff of the Timber Mountain Group (DIRS 183639-Shannon & Wilson 2007, p. 30 and Plate 2).

Hydrographic area 146, Sarcobatus Flat, is a designated groundwater basin, and has a perennial yield of 3.7 million cubic meters (3,000 acre-feet) (see Table 3-113). Committed groundwater resources in hydrographic area 146 exceed the estimated perennial yield, but as previously noted, all committed resources within a hydrographic area might not be in use at the same time. There could be approximately2.96 billion cubic meters (2.4 million acre-feet) of recoverable groundwater in the upper 30 meters (100 feet) of saturated aquifer materials within area 146. NDWR data indicate that there are no documented pending underground annual duties in hydrographic area 146 (see Table 3-113).

Table 3-123. General groundwater-quality and aquifer characteristics – Bonnie Claire alternative segments.

Hydrographic area number and name	Aquifer geologic characteristics[a]	Depth to groundwater (feet)[b,c]	Estimated recoverable groundwater (acre-feet)[d]	Groundwater quality[e]
144 Lida Valley	Alluvial valley fill, rhyolite, volcanic sediments, (including tuffs of Stonewall Flat and tuffs of the Thirsty Canyon Group) and older rock units including claystone, siltstone, and limestone	240 to 280	1.5 million[f]	Total dissolved solids: 400 to 1,100 ppm[g] Sulfate: 61 to 284 ppm[g]
146 Sarcobatus Flat	Alluvial valley-fill deposits, older carbonate rocks, and some volcanic rocks[h] (Volcanic units are tuff of the Timber Mountain Group)[i]	Less then 40 to 120	2.4 million[f]	Total dissolved solids: 540 ppm[j]

a. Sources: DIRS 180887-Converse Consultants 2007, pp. 31 and 32.
b. Estimated depths to groundwater obtained from DIRS 180887-Converse Consultants 2007, Plate 4-1; DIRS 182821-Converse Consultants 2005, p. 112 and Plate 4-5. The listed range of depths generally applies to the area underlying the proposed Bonnie Claire alternative segments.
c. To convert feet to meters, multiply by 0.3048.
d. To convert acre-feet to cubic meters, multiply by 1,233.49; unless otherwise specified, the groundwater quality refers to the upper 100 feet of the saturated alluvial valley-fill material in the hydrographic area.
e. Many reference sources list a concentration value in mg/L (milligrams per liter), which, for materials or contaminants in most groundwaters, is approximately equivalent to parts per million (ppm).
f. Source: DIRS 180754-Rush et al. 1971, all.
g. Source: DIRS 182759-Converse Consultants 2007, p. 34.
h. Source: DIRS 182821-Converse Consultants 2005, p. 40; DIRS 173179-Belcher 2004, Figures E-34 and E-35; DIRS 177741-State of Nevada 2005, all, with rail alignment overlay.
i. Sources: DIRS 183639-Shannon & Wilson 2007, pp. 23 and 24, 29, 30, and 33 to 35, and Plate 2; DIRS 173179-Belcher 2004, Figure B-1.
j. Source: DIRS 182821-Converse Consultants 2005, p. 42.

There are no existing water-supply wells or springs, seeps, or other surface-water-right locations in hydrographic area 146 within 1.6 kilometers (1 mile) of the centerlines of Bonnie Claire alternative segments.

Table 3-123 summarizes general groundwater characteristics in hydrographic areas 144 and 146. Groundwater in hydrographic area 146 contains elevated levels of sodium bicarbonate.

Most of the existing groundwater wells in hydrographic area 146 are ***screened*** in the alluvial valley fill; a few wells in the western portion of the basin are screened in volcanic rocks. The total volume of alluvial valley fill comprising the primary aquifer reservoir in hydrographic area 146 is not known because of variations in the thickness of valley fill that result in variations in the surface of the underlying bedrock. However, Malmberg and Eakin (DIRS 106695-Malmberg and Eakin 1962, pp. 13 and 19) suggested the maximum thickness of valley fill in hydrographic area 146 could be as much as thousands of meters (several thousand feet).

Figure 3-195 shows DOE-proposed wells for supplying water to support construction of Bonnie Claire alternative segments. All proposed water wells would be within the nominal width of the construction right-of-way of the selected alternative segment. There are no potential quarry sites along Bonnie Claire alternative segments.

3.3.6.3.10 Common Segment 5 (Sarcobatus Flat Area)

Crossing from north to south, common segment 5 would overlie hydrographic area 146 (Sarcobatus Flat) and a small portion of hydrographic area 228 (Oasis Valley) (Figures 3-195 and 3-196). Section 3.3.6.3.9 describes the groundwater-quality and aquifer characteristics of hydrographic area 146, which are summarized in Table 3-123. As described in Section 3.3.6.3.9, there are no documented pending underground annual duties in area 146. There are a total of 17 USGS NWIS wells, NDWR wells with water rights, NDWR domestic wells, and no springs, seeps, or other surface-water-right locations within approximately 1.6 kilometers (1 mile) of the centerline of common segment 5 within area 146 and/or within 1 mile of any proposed new wells along this alignment segment.

The categories for the NDWR wells with water rights are irrigation, quasi-municipal, and stock-watering (see Table 3-114). Most wells in hydrographic area 146 are screened in alluvial valley fill; a few wells are screened in volcanic rocks on the west side of the basin (DIRS 182821-Converse Consultants 2005, pp. 41 and 42).

Section 3.3.6.3.11 describes the hydrogeologic characteristics of hydrographic area 228, including groundwater-quality and aquifer characteristics; Table 3-124 summarizes those characteristics. Committed groundwater resources in these areas exceed estimated perennial yields (see Table 3-113). However, as previously noted, all committed resources within a hydrographic area might not be in use at the same time. There are no NDWR wells with water rights, no USGS NWIS wells, and no springs, seeps, or other surface-water-right locations within hydrographic area 228 that are within approximately 1.6 kilometers (1 mile) of the centerline of common segment 5 and/or within 1 mile of any proposed new wells along this alignment segment, as shown on Figures 3-195 and 3-196 (DIRS 182821-Converse Consultants 2005, all; DIRS 176325-USGS 2006, all).

Common segment 5 would predominantly overlie alluvial valley fill, with depth to groundwater generally 3 to 55 meters (10 to 180 feet) in those portions of hydrographic areas 146 and 228 the rail line would cross. Volcanic rocks are the predominant rock type comprising the hills surrounding the basin.

Table 3-124. General groundwater-quality characteristics – Oasis Valley alternative segments.

Hydrographic area number and name	Aquifer geologic characteristics	Depth to groundwater (feet)[a,b]	Estimated recoverable groundwater (acre-feet)[c]	Groundwater quality[d]
228 Oasis Valley	Volcanic rocks, clastic rocks, older carbonate rocks, and alluvial valley fill[e]	Less than 10 to 150	Upper 100 feet of alluvium: 400,000[f]	Total dissolved solids: Less than 500 to 1,000 ppm[g] Fluoride: 1 to more than 4 ppm[h]

a. Estimated depth to groundwater obtained from DIRS 182821-Converse Consultants 2005, p. 38. The listed depth range generally applies to the area underlying the proposed Oasis Valley alternative rail alignments; depth to groundwater is much greater in the central and northern parts of hydrographic area 228 (DIRS 182821-Converse Consultants 2005, Plate 4-3).
b. To convert feet to meters, multiply by 0.3048.
c. To convert acre-feet to cubic meters, multiply by 1,233.49; unless otherwise specified, the groundwater quality refers to the upper 100 feet of the saturated alluvial valley-fill material in the hydrographic area.
d. Many reference sources list a concentration value in mg/L (milligrams per liter), which, for materials or contaminants in most groundwaters, is approximately equivalent to parts per million (ppm).
e. Sources: DIRS 182821-Converse Consultants 2005, p. 36; DIRS 181909-Fridrich et al. 2007, all; DIRS 173179-Belcher 2004, Figures E-34 and E-35; DIRS 177741-State of Nevada 2005, all, within rail alignment overlay.
f. Source: DIRS 180754-Rush et al. 1971, all.
g. Source: DIRS 172905-USGS 1995, Figure 70, with overlay of hydrographic area boundaries.
h. Source: DIRS 182821-Converse Consultants 2005, p. 38.

Figures 3-195 and 3-196 show DOE-proposed wells (see Section 4.3.6) for supplying water to support construction of common segment 5. All proposed water wells would be within the rail line construction right-of-way. There are no potential quarry sites along common segment 5.

3.3.6.3.11 Oasis Valley Alternative Segments

Oasis Valley alternative segments 1 and 3 would cross hydrographic area 228 (Oasis Valley) (Figure 3-196). This area is a designated groundwater basin with an estimated perennial yield in the range of 1.23 to 2.46 million cubic meters (1,000 to 2,000 acre-feet) (DIRS 147766-Thiel 1999, pp. 6 to 12) (see Table 3-113). Committed groundwater resources in hydrographic area 228 total 1.6 million cubic meters (1,300 acre-feet) per year (see Table 3-113). However, as previously noted, all committed resources within a hydrographic area might not be in use at the same time. There could be approximately 493 million cubic meters (400,000 acre-feet) of recoverable groundwater in the upper 30 meters (100 feet) of saturated aquifer materials within area 228 (DIRS 180754-Rush et al. 1971, all). NDWR data indicate that there are no documented pending underground annual duties in area 228A (see Table 3-113).

Geologic units Oasis Valley alternative segments 1 and 3 would cross include sedimentary rocks, small areas underlain by volcanic rocks, and some alluvial valley fill (see Table 3-124). Depth to groundwater is generally 3 to 46 meters (less than 10 to 150 feet), with the shallowest groundwater occurring along Oasis Valley alternative segment 1, northeast of Springdale (see Table 3-124).

Oasis Valley has several springs and seeps. The locations of these springs and seeps are dictated by structurally controlled changes in rock unit ***lithology*** and thickness and conduits. The springs, seeps, and shallow groundwater in the valley are maintained primarily by groundwater flow moving into the area through a regional volcanic rock aquifer system (DIRS 169384-Reiner et al. 2002, p. 8). Most groundwater flowing south-southeastward into Oasis Valley through the welded tuff aquifer is diverted upward along faults where it either forms springs or flows laterally out of Oasis Valley as underflow, indicating a regional groundwater inflow component to the flow at the springs. Springs and seeps occur where upward diversion coincides with areas where the potentiometric surface is above the ground surface (DIRS 169384-Reiner et al. 2002, pp. 9 and 10). Most historical groundwater resource development in this area has been from springs.

Available information indicates a non-welded confining tuff unit separates the alluvial aquifer from a regional welded tuff volcanic rock aquifer throughout much of Oasis Valley, and indicates the regional welded tuff aquifer has moderate fracture ***permeability***. Most groundwater flowing south-southeastward into Oasis Valley through the welded tuff aquifer is also diverted upward along faults where it either forms springs or flows laterally out of Oasis Valley as underflow, indicating a regional groundwater inflow component to the flow at the springs (DIRS 169384-Reiner et al. 2002, pp. 9 and 10).

Groundwater in much of Oasis Valley exhibits elevated levels of fluoride, in excess of the 4 milligrams per liter Nevada drinking water standard level (see Table 3-124). Dissolved solids concentrations in the alluvial valley fill are expected to be less than 500 milligrams per liter (approximately 500 parts per million) in the vicinity of the Oasis Valley alternative segments.

Figure 3-196 shows DOE-proposed wells for supplying water to support construction of the Oasis Valley alternative segments. In addition to a series of new wells proposed for installation within the construction right-of-way, DOE might install other wells at other locations outside the construction right-of-way, and use them either as principal water wells or in combination with other water wells installed within the construction right-of-way. These wells would be drilled in cases where either (1) groundwater resources within the construction right-of-way would not be adequate for meeting construction or operations needs, or (2) groundwater withdrawals would need to be spread out to reduce potential impacts on existing groundwater resources (see Section 4.3.6). Possible locations for wells in this category that could be used to obtain water for constructing the Oasis Valley alternative segments include the following (Figure 3-196):

- Up to two locations in the Oasis Valley groundwater basin, approximately 5.6 to 5.8 kilometers (3.5 to 3.6 miles) southwest of the centerline of common segment 6 (locations OV6 and OV8, or OV14 and OV16, depending on alternative segment). The target water source at this location would be alluvial valley fill (DIRS 182822-Converse Consultants 2006, Appendices A and B, and Maps 14a and 14b).
- Locations in the southeastern part of Oasis Valley, approximately 0.8 kilometer (0.5 mile) west of common segment 6 (well location OV22 or OV23, depending on alternative segment). The target water source at this location would be a possibly water-bearing fault system (DIRS 182822-Converse Consultants 2006, Appendices A and B, and Maps 14a and 14b).

Review of NDWR and USGS database data and other published information (DIRS 169384-Reiner et al. 2002, Plate 2) on existing wells, springs, seeps, and other surface-water-right locations indicates the following:

- Based on a review of the NDWR and USGS NWIS databases and other published information, there are 10 USGS NWIS wells, four springs, and one surface-water body within approximately 1.6 kilometers (1 mile) of the centerlines of the Oasis Valley alternative segments. There are no existing NDWR wells with water rights within 1.6 kilometers of the centerlines of the Oasis Valley alternative segments.
- There is one cluster of three USGS-installed wells within approximately 0.64 kilometer (0.40 mile) of the centerline of Oasis Valley alternative segment 3 (wells ER-OV-01, ER-OV-06a, and ER-OV-06a2), and one USGS-installed well (ER-OV-02) within approximately 0.40 kilometer (0.25 mile) of Oasis Valley alternative segment 1 (DIRS 182821-Converse Consultants 2005, Plate 4-3 and Appendix A; DIRS 176325-USGS 2006, all; DIRS 177294-MO0607USGSWNVD.000, all; DIRS 169384-Reiner et al. 2002, Plate 2). The use category for these wells is monitoring. There are three additional shallow USGS-installed wells (the OVU-Dune Well, OVU-Middle ET Well, and the OVU-Lower ET Well), used for monitoring groundwater levels, within approximately 0.32 to 0.48 kilometer (0.20 to 0.30 mile) of Oasis Valley alternative segment 1 (DIRS 182821-Converse Consultants 2005, Plate 4-3 and Appendix A; DIRS 169384-Reiner et al. 2002, Plate 2). Figure 3-82 does not show all existing wells in area 228 that lie within 1.6 kilometers (1 mile) of the centerlines of the Oasis Valley alternative segments because some wells are at very nearly the same locations and cannot be shown at the scale used in the figure.
- There is one domestic well within 0.79 kilometer (0.49 mile) and 1.1 kilometers (0.7 mile) of proposed well locations OV9 and OV5, respectively (Figure 3-196).
- There is one domestic well within 1.4 kilometers (0.9 mile) and 1.5 kilometers (0.94 mile) of proposed well locations OV20 and OV2, respectively (Figure 3-196).
- Springs in the Upper Oasis Valley Ranch Springs area southwest of a portion of the OV1 segment lie approximately 0.6 kilometer (0.4 mile) or farther to the west of proposed well location OV9 (DIRS 181909-Fridrich et al. 2007, all; Figure 3-196).
- There are two existing NDWR wells with water rights, no NDWR domestic wells, and no USGS NWIS wells within 1.6 kilometers (1 mile) of locations OV6 and OV8, or OV14 and OV16; however, two springs (Ute Springs and Manley Springs) lie within approximately 1.3 to 1.4 kilometers (0.8 to 0.9 mile) east of locations OV6 and OV8, or OV14 and OV16.
- There is one (vested) surface-water-right location approximately 1.4 kilometers (0.9 mile) from proposed new well location OV16 (DIRS 183991-Luellen 2007, all).

- There are no known existing wells or springs, seeps, or other surface-water-right locations within 1.6 kilometers (1 mile) of the proposed alternative well location at OV22/OV23.

3.3.6.3.12 Common Segment 6 (Yucca Mountain Approach)

From north to south, common segment 6 would cross a portion of hydrographic area 228 (Oasis Valley), all of hydrographic area 229 (Crater Flat), and a portion of hydrographic area 227A (Jackass Flats), as shown in Figure 3-196. Section 3.3.6.3.11 describes, and Table 3-125 summarizes groundwater-quality and aquifer characteristics of hydrographic area 228.

There are a total of 17 USGS NWIS wells, four NDWR wells with water rights, no NDWR domestic wells, and no springs, seeps, or other surface-water-right locations within approximately 1.6 kilometers (1 mile) of the centerline of common segment 6, as shown on Figure 3-196 (DIRS 182821-Converse Consultants 2005, all; DIRS 176325-USGS 2006, all; DIRS 177294-MO0607USGSWNVD.000, all; DIRS 183991-Luellen 2007, all; DIRS 183990-Luellen 2007, all; DIRS 176979-MO0605GISGNISN.000, all; DIRS 182759-Converse Consultants 2007, all; DIRS 177712-MO0607NHDPOINT.000, all). Figure 3-196 does not show all existing wells in hydrographic area 227A that lie within 1.6 kilometers of the centerline of common segment 6 because some wells, particularly in hydrographic area 227A, are at very nearly the same locations and cannot be shown at the scale used in this figure.

Geologic units that common segment 6 would cross include volcanic rocks and basin-fill alluvium (DIRS 173179-Belcher 2004, p. 28). Specific volcanic rock units the segment would cross include volcanic rocks of the Crater Flat and Paintbrush Groups (DIRS 183639-Shannon & Wilson 2007, Plate 2).

Hydrographic area 229, Crater Flat, is not a designated groundwater basin. Committed groundwater resources exceed the estimated perennial yield of about 271,000 cubic meters (220 acre-feet) (see Table 3-113). As previously noted, all committed resources within a hydrographic area might not be in use at the same time. There could be approximately 431 million cubic meters (350,000 acre-feet) of recoverable groundwater in the upper 30 meters (100 feet) of saturated aquifer materials within area 229. In addition to existing groundwater wells in hydrographic area 229 that have water-rights appropriations, NDWR data indicate that approximately 101,000 cubic meters (82 acre-feet) of pending annual duties (see Table 3-113) exist in hydrographic area 229. The pending water-rights locations are not within 1.6 kilometers (1 mile) of the centerline of common segment 6.

Table 3-125 summarizes groundwater-quality and aquifer characteristics of hydrographic area 229. Groundwater is typically very deep in hydrographic area 229 beneath the rail alignment, generally 180 to 370 meters (600 to 1,200 feet) below ground. In the northwestern portion of hydrographic area 229 and west of the rail alignment, groundwater occurs within two aquifers and the estimated depth to groundwater varies from 55 to 200 meters (180 to 650 feet). There are three USGS NWIS wells, four NDWR wells with water rights, no domestic wells, and no springs, seeps, or other surface-water-right locations in hydrographic area 229 within approximately 1.6 kilometers (1 mile) of the centerline of common segment 6, as shown on Figure 3-196 (DIRS 182821-Converse Consultants 2005, all; DIRS 176325-USGS 2006, all; DIRS 177294-MO0607USGSWNVD.000, all; DIRS 183990-Luellen 2007, all; DIRS 183991-Luellen 2007, all; DIRS 176979-MO0605GISGNISN.000, all).

Hydrographic area 227A, Fortymile Canyon (Jackass Flats), is not a designated groundwater basin. Committed groundwater resources do not exceed the total perennial yield value of 1.09 million cubic meters (880 acre-feet) per year estimated for the entire hydrographic area (see Table 3-113). NDWR data indicate that there are no documented pending underground annual duties in hydrographic area 227A (see Table 3-113) (DIRS 178726-State of Nevada 2006, all). The perennial yield estimate for the western two-thirds of hydrographic area 227A is assumed to be approximately 720,000 cubic meters (580 acre-feet)

Table 3-125. General groundwater-quality and aquifer characteristics – common segment 6.

Hydrographic area number and name	Aquifer geologic characteristics	Depth to groundwater (feet)[a,b]	Estimated recoverable groundwater (acre-feet)[c]	Groundwater quality[d]
228 Oasis Valley	Volcanic rocks, clastic rocks, older carbonate rocks, and alluvial valley-fill deposits[e]	50 to 150	400,000[f]	Total dissolved solids: Less than 500 to 1,000 ppm[g] Fluoride: 1 to more than 4 ppm[h]
229 Crater Flat	Volcanic rocks, older carbonate rocks, and alluvial valley fill[e]	600 to 1,200	350,000[f]	Total dissolved solids: 270 ppm[h]
227A Fortymile Canyon, Jackass Flats	Volcanic rocks, older carbonate rocks and alluvial valley fill[e]	700 to 1,200	740,000[f]	Total dissolved solids: Less than 500 to 1,000 ppm[g]

a. Estimated depth to groundwater obtained from DIRS 182821-Converse Consultants 2005, p. 31, 32, 35, and 39. The listed depth range for hydrographic area 228 generally applies to the area underlying the rail alignment; depth to groundwater is much greater in the central and northern parts of hydrographic area 228 (DIRS 182821-Converse Consultants 2005, Plate 4-3). The listed depth range for hydrographic area 229 generally applies to the area underlying the rail alignment; depth to groundwater is less in the northwestern and southern parts of hydrographic area 229 (DIRS 182821-Converse Consultants 2005, Plate 4-2).
b. To convert feet to meters, multiply by 0.3048.
c. To convert acre-feet to cubic meters, multiply by 1,233.49; unless otherwise specified, the groundwater quality refers to the upper 100 feet of the saturated alluvial valley-fill material in the hydrographic area.
d. Many reference sources list a concentration value in mg/L (milligrams per liter), which, for materials or contaminants in most groundwaters, is approximately equivalent to parts per million (ppm).
e. Sources: DIRS 182821-Converse Consultants 2005, p. 36; DIRS 181909-Fridrich et al. 2007, all; DIRS 173179-Belcher 2004, Figures E-34 and E-35; DIRS 177741-State of Nevada 2005, all, with rail alignment overlay.
f. Source: DIRS 180754-Rush et al. 1971, all.
g. Sources: DIRS 172905-USGS 1995, Figure 70; DIRS 177741-State of Nevada 2005, all, with overlay of hydrographic area boundaries.
h. Source: DIRS 182821-Converse Consultants 2005, pp. 36 and 39.

per year, while the perennial yield estimate for the eastern one-third of this hydrographic area has been estimated at approximately 370,000 cubic meters (300 acre-feet) per year. There could be approximately 910 million cubic meters (740,000 acre-feet) of recoverable groundwater in the upper 30.5 meters (100 feet) of saturated aquifer materials within area 227A.

Table 3-125 summarizes groundwater-quality and aquifer characteristics of hydrographic area 227A. In hydrographic area 227A, groundwater occurs in alluvial valley-fill deposits in the southern portion of the area and deeper in volcanic rocks in the central part of the basin. The depths to groundwater in wells throughout the area vary from approximately 12 to 650 meters (38 to 2,150 feet) (DIRS 182821-Converse Consultants 2005, p. 31). Most groundwater storage in hydrographic area 227A occurs toward the southern end of the basin, south of the rail alignment. Groundwater is typically very deep near the rail alignment, generally 210 to 370 meters (700 to 1,200 feet) below ground.

Most wells penetrating the volcanic rocks are monitoring wells used for monitoring groundwater conditions southwest, southeast, and south of the Yucca Mountain Site. There are fourteen USGS NWIS wells, no NDWR wells with water rights, no NDWR domestic wells, and no springs, seeps, or other surface-water-right locations in area 227A within 1.6 kilometers (1 mile) of the centerline of common segment 6 (Figure 3-196). The volcanic rocks in this area generally have low porosity, and are not considered suitable for groundwater production except in major fractured areas.

Figure 3-196 shows DOE-proposed wells for supplying water to support construction of common segment 6. All proposed water wells would be within the rail alignment construction right-of-way. There are no potential quarry sites along common segment 6.

3.3.7 BIOLOGICAL RESOURCES

This section describes the biological resources that could be affected by construction and operation of the proposed railroad along the Mina rail alignment.

Biological resources include vegetation, wildlife, special status species, game species, and wild horses and burros within or near the construction right-of-way described in Section 3.3.7.1. This discussion of biological resources is based on the results of a review of available data from federal, State of Nevada, local agencies, and data gathered during field investigations.

Special Status Species

Endangered species are classified under the Endangered Species Act as being in danger of extinction throughout all or a significant part of their range.

Threatened species are classified under the Endangered Species Act as likely to become endangered species in the foreseeable future.

Proposed species are plants and animals for which the U.S. Fish and Wildlife Service has sufficient information on their biological status and threats and that are the subject of a Fish and Wildlife Service *Federal Register* rulemaking notice to list them as endangered or threatened.

Candidate species are plants and animals for which the U.S. Fish and Wildlife Service has sufficient information to support a proposal to list as endangered or threatened, but development of a listing regulation is precluded by other higher priority listing activities.

Endangered Species Act candidate species are plants and animals for which the U.S. Fish and Wildlife Service has sufficient information on their biological status and threats to propose them as endangered or threatened under the Endangered Species Act.

State protected plant and animal species. Wildlife species or subspecies are classified as protected under Nevada Administrative Code (NAC) Chapter 503 if one or more of the following criteria exists:

1. The wildlife is found only in the State of Nevada and its population, distribution, or habitat is limited.
2. The limited population or distribution within Nevada is likely to decline.
3. The population is threatened as a result of the deterioration or loss of its habitat.
4. The wildlife has ecological, scientific, educational, or other value that justifies its classification as protected.
5. The available data is not adequate to determine the exact status of the wildlife population, but does indicate a limited population, distribution, or habitat.
6. The wildlife is listed by the U.S. Fish and Wildlife Service as a candidate species, or it is classified as threatened or endangered in the federal Endangered Species Act.
7. Other evidence exists to justify classifying the wildlife as protected.

Under NAC Chapter 527, plants are classified as being in danger of extinction if their survival requires assistance because of overexploitation, disease, or other factors or because its habitat is threatened with destruction, drastic modification, or severe curtailment. There are no State of Nevada-listed endangered plants present in the areas of assessment.

BLM-designated sensitive species are species other than federally listed, proposed, or candidate species, and may include such native species as those that:

1. Could become endangered in or extirpated from a state or within a significant portion of their distribution in the foreseeable future;
2. Are undergoing a status review by the U.S. Fish and Wildlife Service to determine whether to list the species as a threatened or endangered species across all or a significant portion of its range under the Endangered Species Act;
3. Are undergoing significant current or predicted downward trends in habitat capability that would reduce their existing distribution;
4. Are undergoing significant current or predicted downward trends in population or density such that federally listed, proposed, candidate, or state listed status might become necessary;
5. Have typically small and widely dispersed populations;
6. Are inhabiting ecological refugia or specialized or unique habitats; or
7. Are state listed but might be better conserved through application of BLM sensitive species status. Such species should be managed to the level of protection required by state laws or under the BLM policy for candidate species, whichever would provide better opportunity for their conservation.

Section 3.3.7.2 provides a general overview of biological resources, including vegetation, wildlife, special status species, game species, and wild horses and burros along the Mina rail alignment. Section 3.3.7.3 describes biological resources unique to each Mina rail alignment alternative segment and common segment. Appendix H, Biological Resources, provides additional information regarding biological resources along the Mina rail alignment.

3.3.7.1 Areas of Assessment

DOE used two areas of assessment to describe the affected environment for biological resources: the greater study area and the construction right-of-way area.

3.3.7.1.1 Construction Right-of-Way

The rail line construction right-of-way would be a nominal width of 300 meters (1,000 feet), which is 150 meters (500 feet) on either side of the rail alignment centerline. The footprint, which would be within the construction right-of-way, is the area that would involve clearing of vegetation, excavation, and filling for subgrade to support the rail line. This area would be directly affected, long term, by rail line construction activities. The footprint would fluctuate throughout the alignment due to topography, cut and fill requirements, land use, and the selected alternative segment. The footprint could also vary based on land use and avoidance or minimization of impacts to other resources (for example, water and structures) but generally would be 300 meters or less. The area between the footprint and the outer edge of the construction right-of-way would be directly affected, short term, by construction-related activities such as construction staging and temporary access roads construction. DOE analyzed the area between the footprint and the outer edge of the construction right-of-way for ***short-term impacts*** even though the use of this area would be minimized and the area might not be disturbed. For purposes of this analysis, DOE has taken a conservative approach of potentially overstating the environmental impacts to biological resources. For facilities that would be outside the nominal width of the rail line construction right-of-way (such as quarries and other ***infrastructure***), the area DOE assessed as the affected environment is the maximum area or the footprint of the proposed facility.

3.3.7.1.2 Study Area

DOE identified a study area (16 kilometers [10 miles] wide, extending 8 kilometers [5 miles] on either side of the centerline of the rail alignment) for use in database and literature searches to ensure the identification of sensitive habitat areas near the Mina rail alignment and transient or migratory wildlife, particularly special status species, that could pass through the construction right-of-way. Using the larger study area also increased the chance of identifying special status species and/or habitat that could be present near the rail alignment, to better describe the habitat value and species use within the construction right-of-way.

3.3.7.2 General Environmental Setting and Characteristics

This section describes the affected environment for biological resources that could be present or have the potential to occur within the construction right-of-way or the study area. DOE used the 2004 Southwest Regional Gap Analysis Project (DIRS 174324-NatureServe 2004, all), which the BLM currently uses in its conservation and management actions, to characterize the land-cover types for the affected environment for the Mina rail alignment.

As a starting point for classification, the 2004 Southwest Regional Gap Analysis Project divided the southwestern United States into general ***ecoregions*** (relatively discrete sets of ecosystems characterized by certain plant communities or assemblages) based on physical and biological similarities. Using satellite imagery and field data, the Project classified geographic areas or “mapping zones” within each ecoregion based on their land-cover types, and generated maps of these land-cover types. The Project classified naturally vegetated types using the "ecological systems" and developed and described types based on dominant vegetation, physical characteristics of the land, hydrology, and climate in the area (DIRS 176369-Lowry et al. 2005, all; DIRS 173051-Comer et al. 2003, all). These mapping zones represent recurring groups of biological communities that are found in similar physical environments and are influenced by similar dynamic ecological processes, such as fire or flooding. As shown in Figure 3-197, the Mina rail alignment would cross three mapping zones: the Humboldt, the Nellis, and the Mojave. However, only the Nellis and Mojave mapping zones are considered in the analysis because the segment that crosses the Humboldt is an existing Union Pacific Railroad rail line and there would be no construction-related impacts. The land-cover types are grouped into land-cover classes. Eleven land-cover classes occur in this part of Nevada. To identify the land-cover types and classes within the construction right-of-way and the study area, digital maps of the land-cover types within the affected map zones were overlain (spatial analysis using a Geographic Information System) with the Mina rail alignment construction right-of-way and operations facilities. The Mina rail alignment construction right-of-way would cross nine of the 11 classes (DIRS 174324-NatureServe 2004, all). Table 3-126 lists classes and types, and Figures 3-198 through 3-204 show the classes the rail alignment would cross.

To document additional site-specific information regarding vegetation and habitat, DOE performed literature and database searches, and consulted with land and resource management agencies and authorities, including the BLM, the U.S. Fish and Wildlife Service, the Nevada Natural Heritage Program, the Nevada Department of Wildlife, the University of Nevada–Reno, and the Nevada Division of Forestry.

In addition to the review of existing information, DOE conducted field surveys and gathered data to further characterize the mapping zones and associated vegetation communities, and to further characterize the habitats in the study area that might support special status species. DOE chose field survey locations to provide representative survey coverage of the different types of vegetation along the Mina rail alignment, specifically in the construction right-of-way, but also in the larger study area. The field survey data DOE collected helped further characterize the types of habitats in the construction right-of-way and those identified by the Southwest Regional Gap Analysis Project (DIRS 174324-NatureServe 2004, all). Appendix H describes the field survey methodology. The additional surveys and data searches are outlined in each specific resource area below.

3.3.7.2.1 Vegetation

The Mina rail alignment is situated within two large deserts: the Great Basin and the Mojave. The Great Basin Desert is considered a cold desert and has been referred to as the Basin and Range region due to its parallel north-south trending ranges, or mountains, and intervening basins, or valleys. This region covers most of central and northern Nevada, with its southern extent ending roughly in southern Lincoln, Esmeralda, and Nye Counties. The Mojave Desert is considered a hot desert and covers most of southern Nevada and much of southeastern California (DIRS 174412-Ryser 1985, p. 4). Although the two deserts are distinguished from one another climatically, the predominant vegetation and vegetation communities also distinguish each desert.

The Great Basin Desert is generally characterized by big sagebrush (*Artemisia tridentata*), which is mostly absent from the Mojave Desert except at moderate to high elevations in the mountains. Alternatively, the Mojave Desert is dominated by creosote bush (*Larrea tridentata* var. *arenaria*), which is mostly absent from the Great Basin Desert. There is a broad transitional zone where these two deserts meet, which exhibits characteristics of both regions.

Based on the spatial analysis described above, the Mina rail alignment would intersect 25 land-cover types, which are listed in Table 3-126 and shown in Figures 3-203 through 3-204. The most common

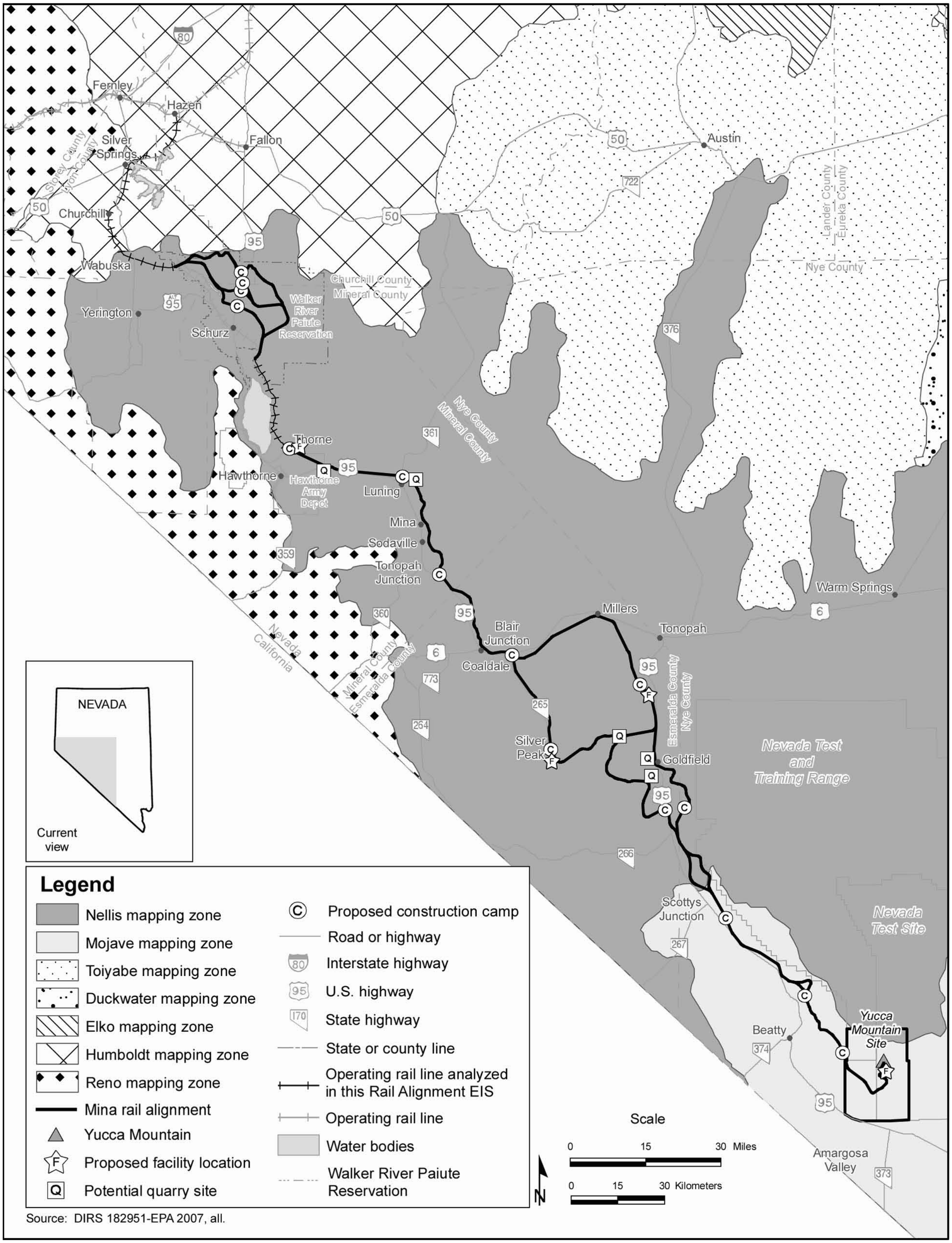


Figure 3-197. Mapping zones along the Mina rail alignment.

Table 3-126. Land-cover classes and types in the mapping zones.[a]

Class and type[b]	Total amount of classes and land-cover types within the Mojave and Nellis mapping zones (acres)[c]
Barren Lands	
Inter-Mountain Basins Playa	280,000
Inter-Mountain Basins Cliff and Canyon	100,000
North American Warm Desert Playa	130,000
North American Warm Desert Bedrock Cliff and Outcrop	450,000
Inter-Mountain Basins Active and Stabilized Dune	4,000
Evergreen Forest	
Great Basin Pinyon-Juniper Woodland	1,200,000
Scrub/Shrub	
Inter-Mountain Basins Mixed Salt Desert Scrub	6,300,000
Inter-Mountain Basins Big Sagebrush Shrubland	1,900,000
Sonora-Mojave Creosotebush-White Bursage Desert Scrub	4,800,000
Great Basin Xeric Mixed Sagebrush Shrubland	1,600,000
Mojave Mid-Elevation Mixed Desert Scrub	2,500,000
Sonora-Mojave Mixed Salt Desert Scrub	370,000
Grassland/Herbaceous	
Inter-Mountain Basins Semi-Desert Shrub Steppe	1,200,000
Inter-Mountain Basins Semi-Desert Grassland	20,000
Woody Wetland	
Inter-Mountain Basins Greasewood Flat	350,000
Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland	19,000
North American Warm Desert Lower Montane Riparian Woodland and Shrubland	7,100
Emergent Herbaceous Wetland	
North American Arid West Emergent Marsh	8,300
Altered or Disturbed	
Invasive Annual Grassland	13,000
Invasive Annual and Biennial Forbland	7,600
Developed and Agriculture	
Developed, Open Space - Low Intensity	110,000
Developed, Medium-High Intensity	21,000
Other	
Barren Lands, Non-Specific	8,000

a. Source: DIRS 174324-NatureServe 2004, all.
b. Mojave and Nellis ecoregions are included in totals. Humboldt ecoregion was excluded because construction-related impacts would not occur there.
c. To convert acres to square kilometers, multiply by 0.0040469.

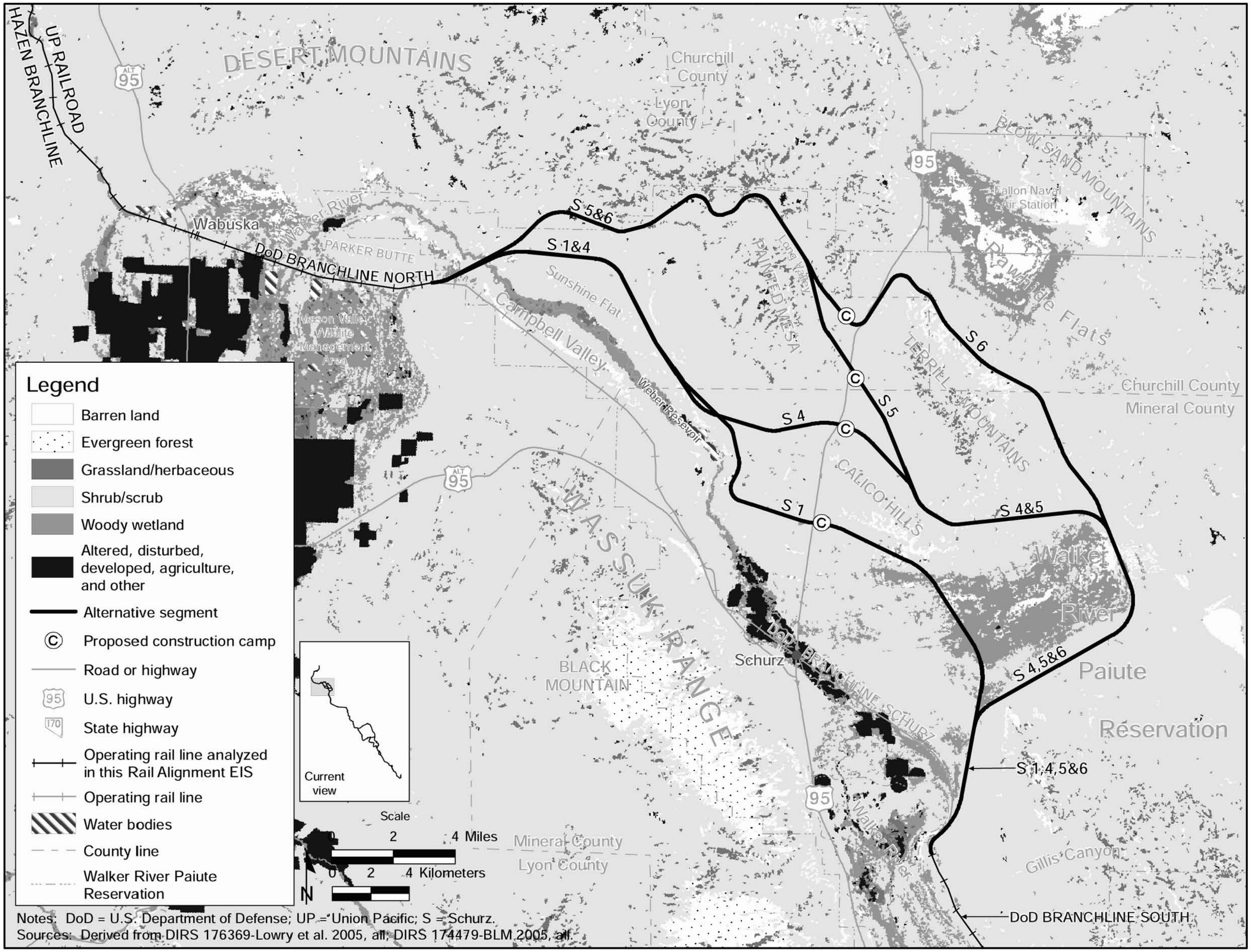


Figure 3-198. Land-cover classes the Mina rail alignment would cross within map area 1.

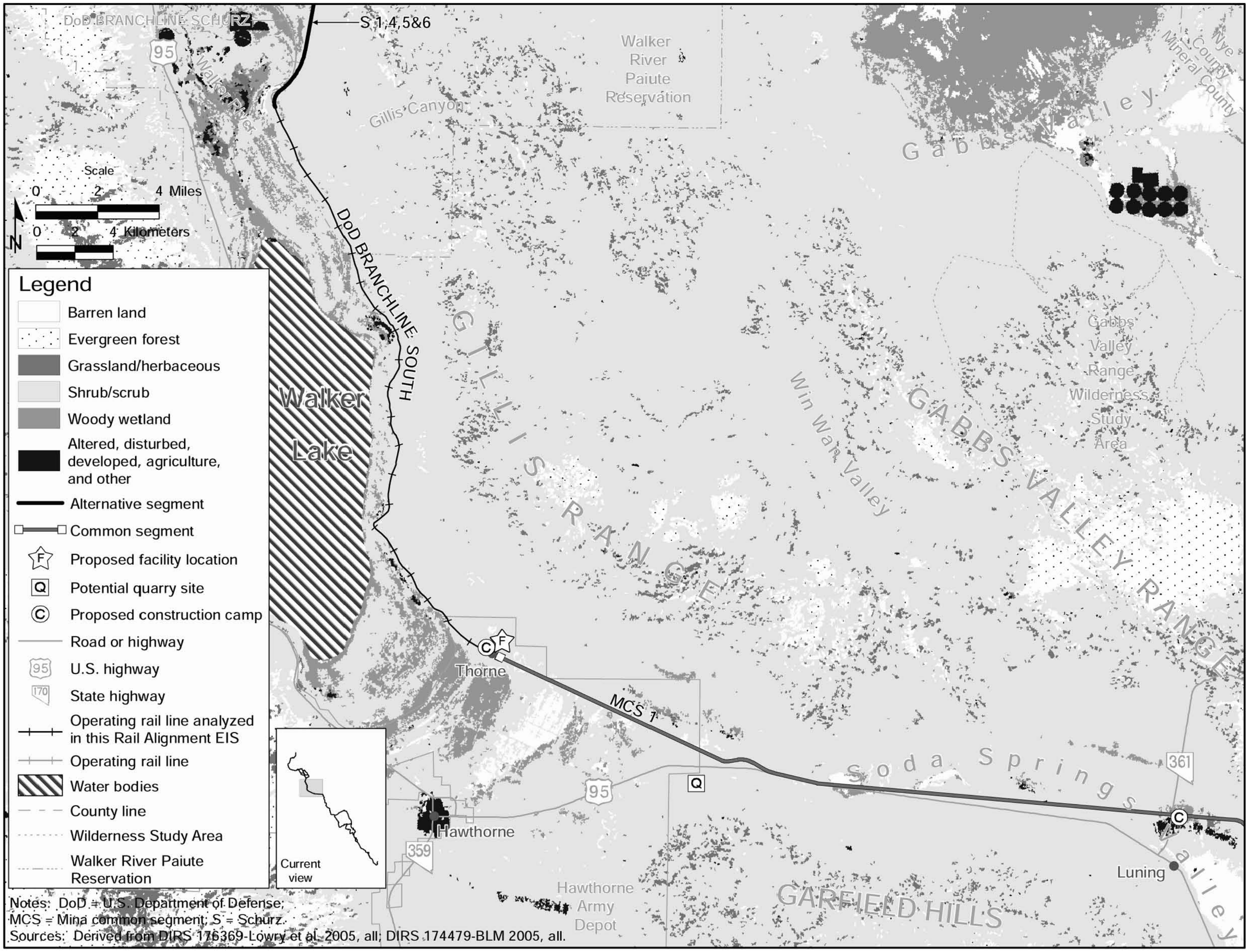


Figure 3-199. Land-cover classes the Mina rail alignment would cross within map area 2.

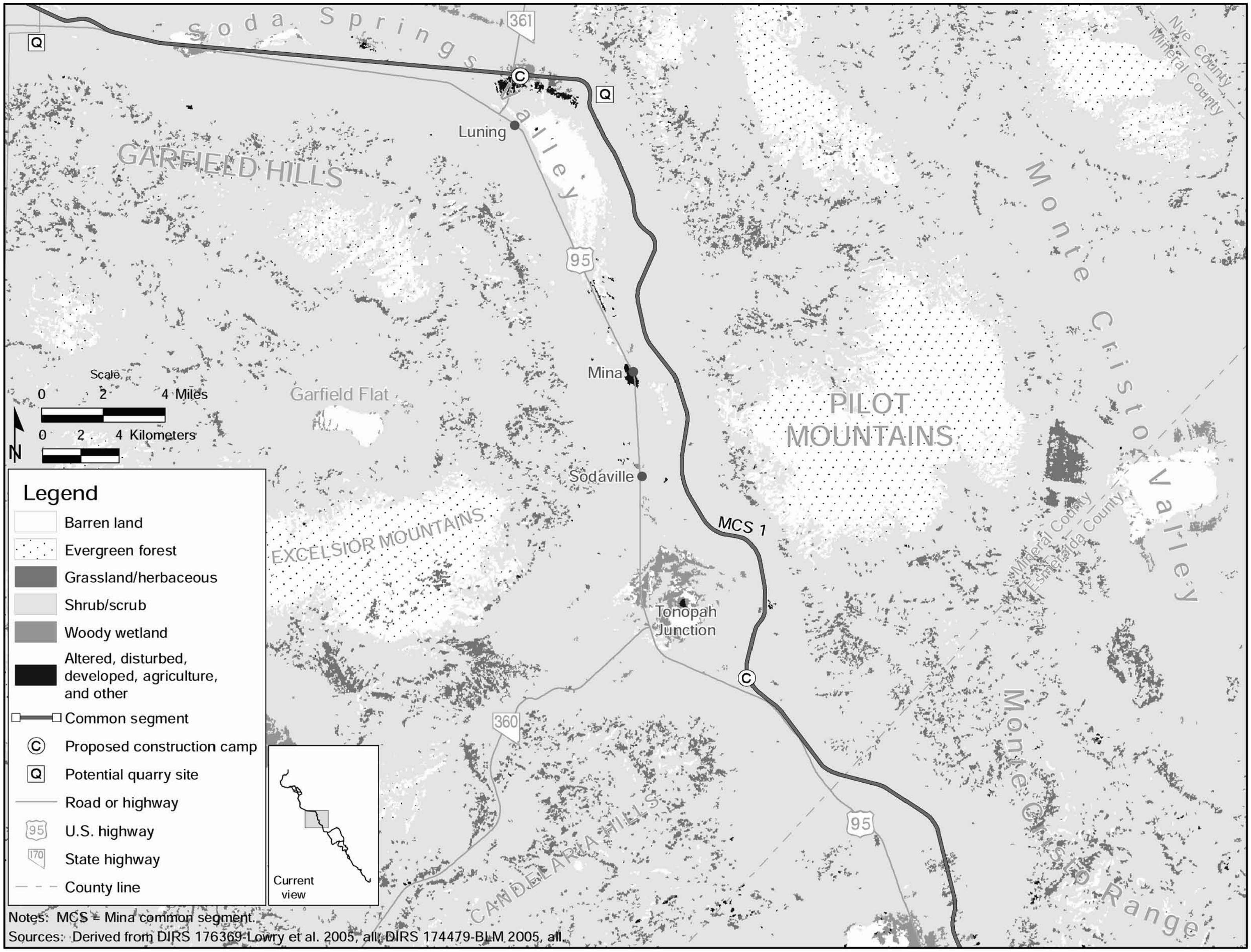


Figure 3-200. Land-cover classes the Mina rail alignment would cross within map area 3.

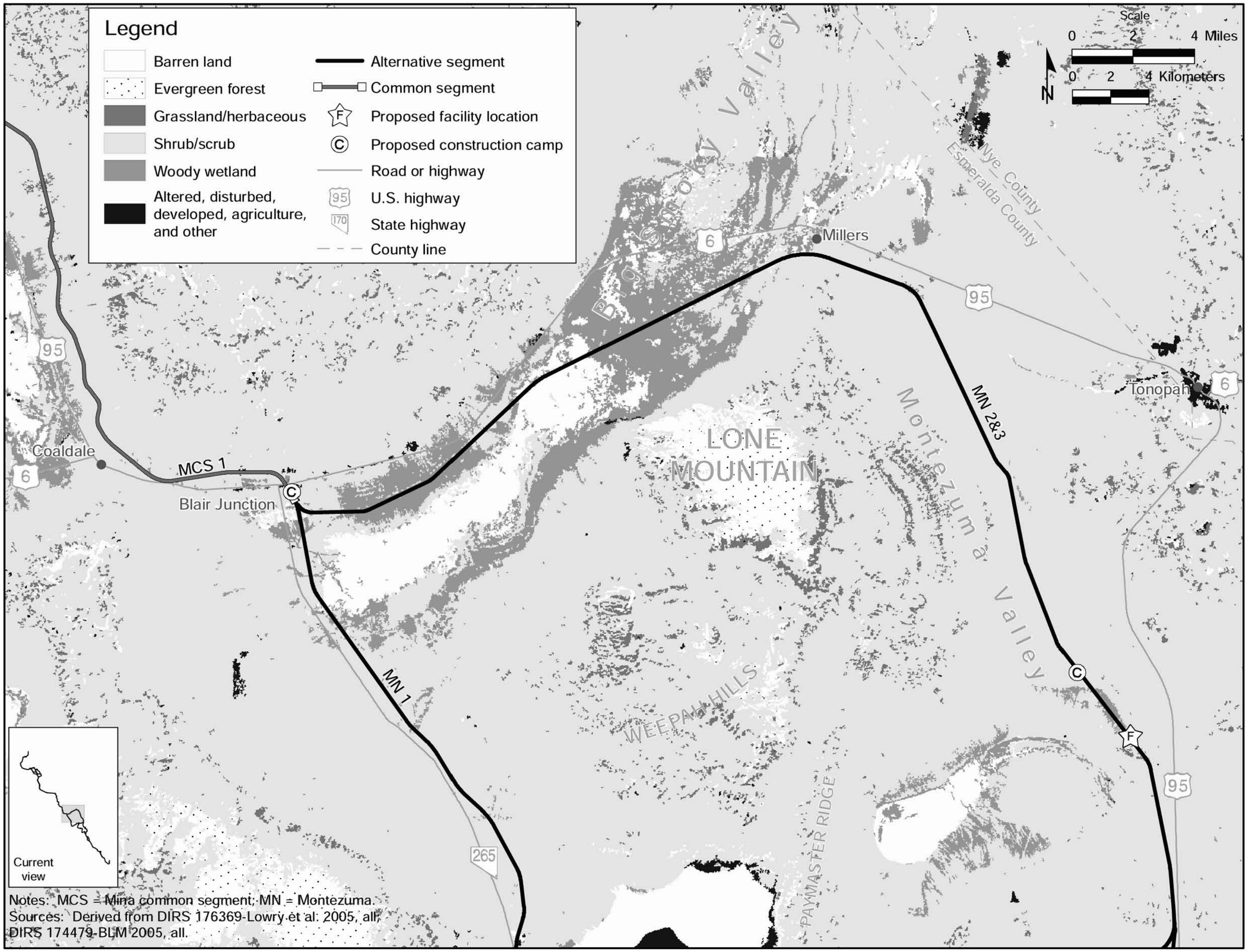


Figure 3-201. Land-cover classes the Mina rail alignment would cross within map area 4.

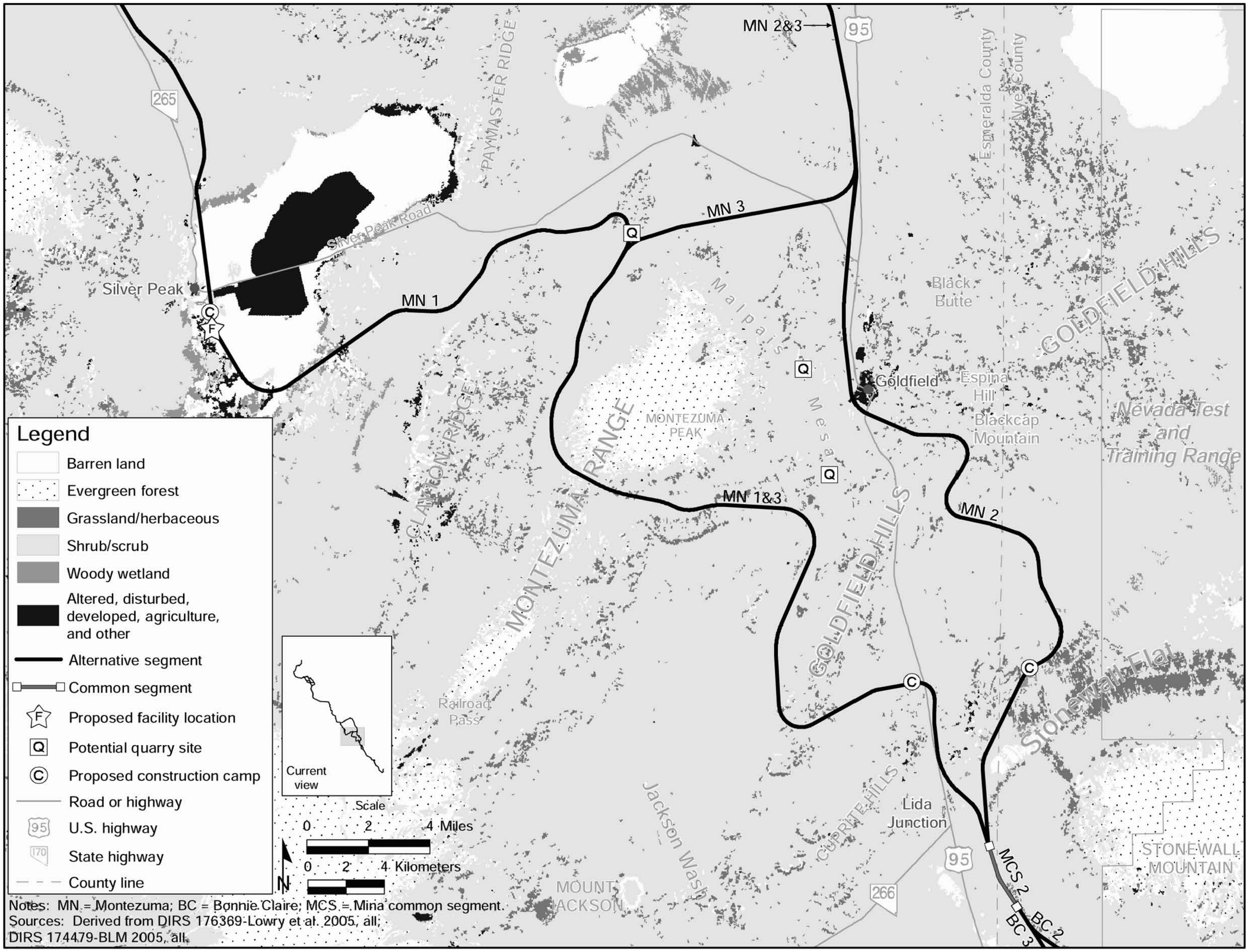


Figure 3-202. Land-cover classes the Mina rail alignment would cross within map area 5.

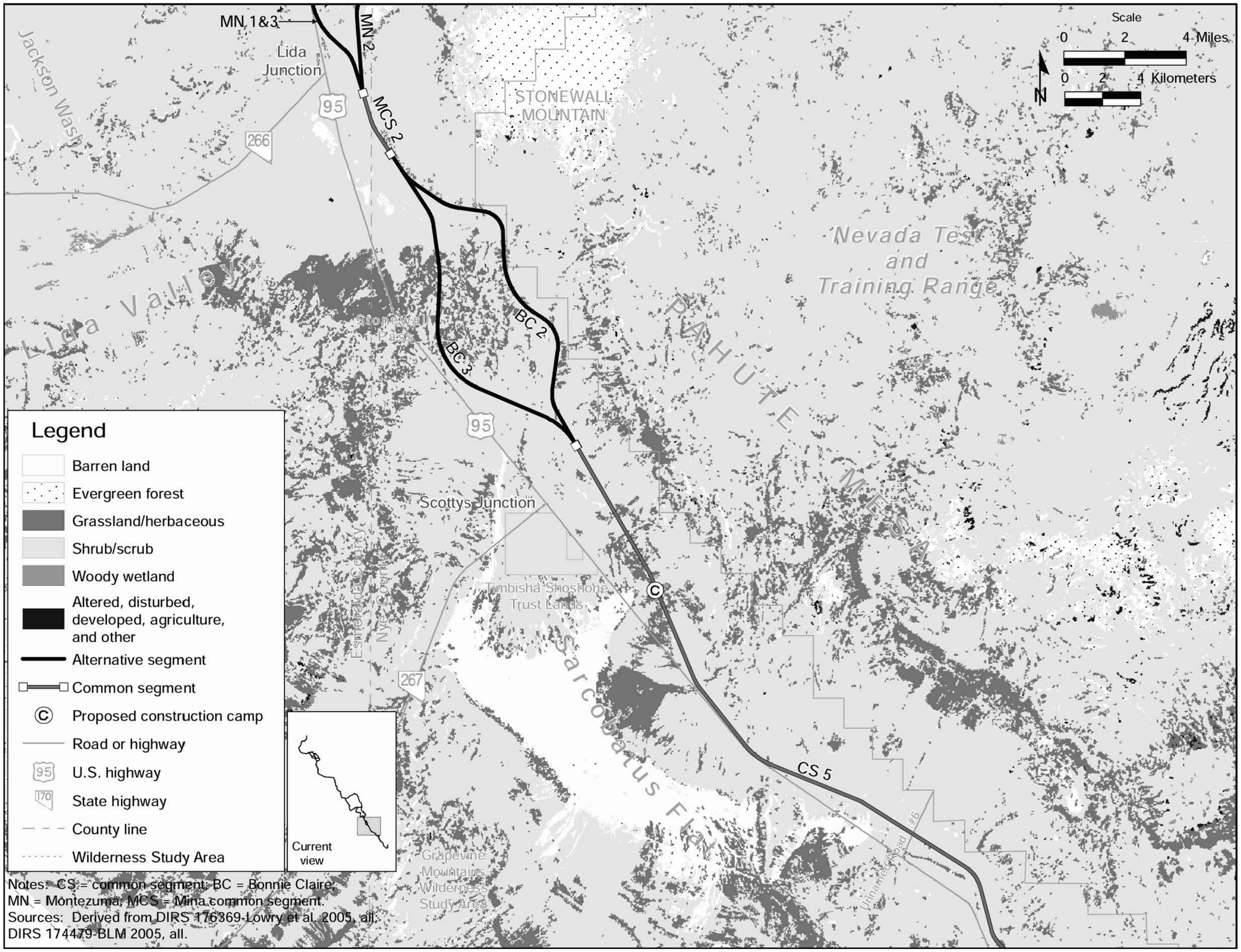


Figure 3-203. Land-cover classes the Mina rail alignment would cross within map area 6.

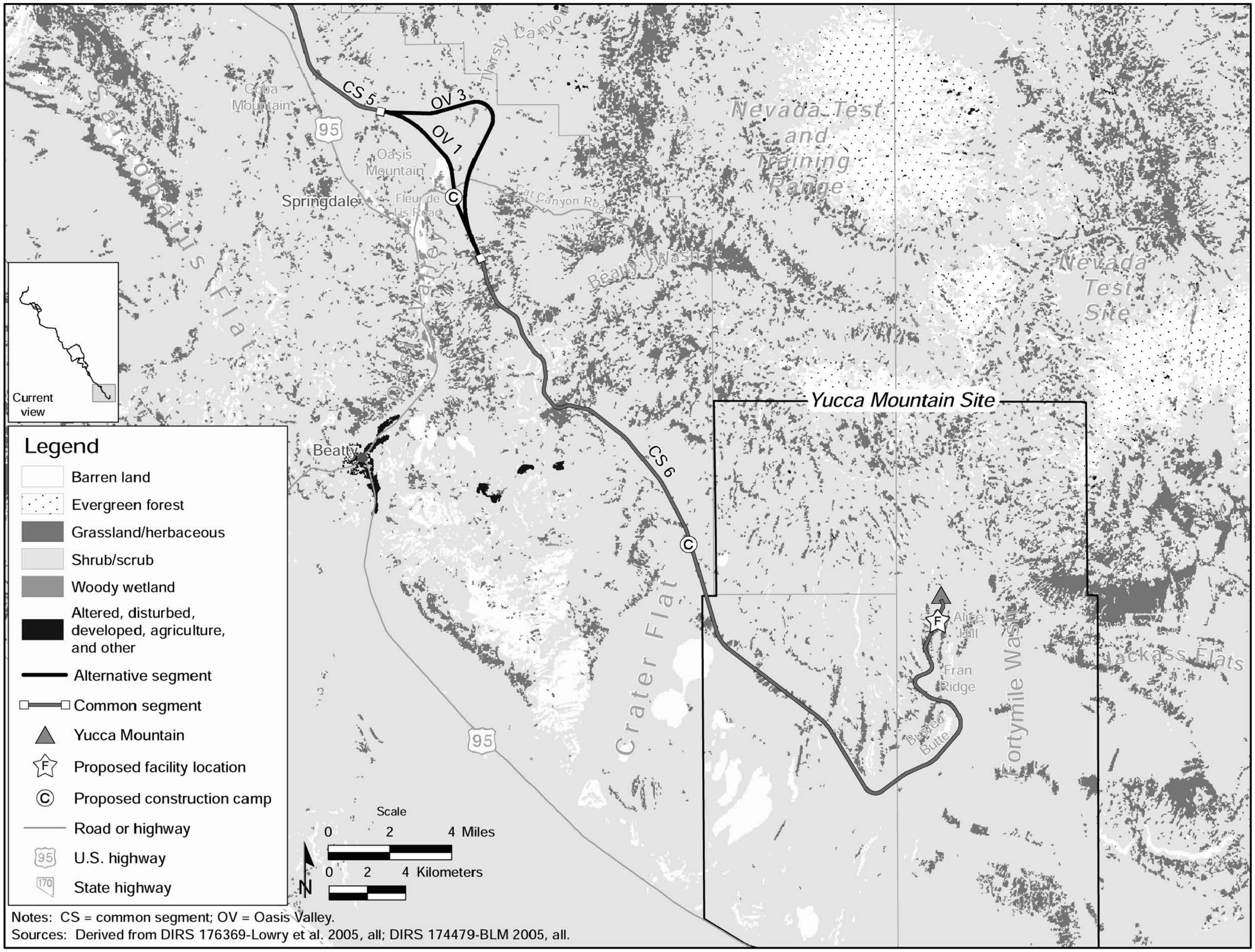


Figure 3-204. Land-cover classes the Mina rail alignment would cross within map area 7.

Non-native plant species: A species found in an area where it has not historically been found.

Native plant species: With respect to a particular ecosystem, a species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem (Executive Order 13112, *Invasive Species*).

Invasive plant species: An alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health (Executive Order 13112, *Invasive Species*).

Noxious weeds: The BLM defines noxious weeds as: "A plant that interferes with management objectives for a given area of land at a given point in time" (DIRS 177037-BLM 1996, p. 3). The State of Nevada defines noxious weeds as: "Any species of plant which is, or is likely to be, detrimental or destructive and difficult to control or eradicate..." (Nevada Revised Statute 555.005).

Weeds can be native or nonnative, invasive or non-invasive, and noxious or not noxious. Invasive species include not only noxious weeds, but also other nonnative plants. The BLM considers plants invasive if they have been introduced into an environment where they did not evolve. As a result, invasive species usually have no natural enemies to limit their spread and can produce significant detrimental changes.

land-cover types within the construction right-of-way and study area are the Inter-Mountain Basins Mixed Salt Desert Scrub and the Inter-Mountain Basins Big Sagebrush Shrubland.

Appendix H, Table H-1, describes land-cover types.

Undisturbed areas of winterfat, or whitesage (*Krascheninnikovia lanata*), are present, but uncommon, within the construction right-of-way. While they have no official protected status with any federal or state agency, the BLM has identified these vegetation communities as important and their conservation or protection should be considered during development of any projects.

In addition to shrubs and grasses, biological soil crusts are an important component to both the Mojave and Great Basin ecosystems. Biological crusts are comprised of multiple species of lichen, moss, cyanobacteria, and algae which live on top of the soil surface, binding with soil particles and forming a cohesive mat or crust on the surface of arid landscapes (DIRS 181866-Belnap 2006, p. 1). Biological crusts (if present) could play an important role in maintaining the health of some of the desert vegetation communities listed in Table 3-126, including but not limited to facilitating water infiltration, retaining soil moisture, and reducing soil loss from wind and water erosion (DIRS 181957-Kaltenecker and Wicklow-Howard 1994, p. 1-8). Crusts are highly sensitive to surface disturbance and are easily destroyed. Biological crusts likely occur within the region of influence in some areas where there has been no surface disturbance. Biological crusts are potentially present in areas where construction would occur, but because of insufficient data regarding the location and extent of biological crusts in the region of influence, Section 4.3.7 does not discuss impacts to biological crusts.

3.3.7.2.1.1 Noxious Weeds and Invasive Species. The Great Basin-Mojave Desert region is threatened by a number of non-native, invasive plant species that have displaced ***native plant species***. Invasive plant species, such as red brome *(Bromus rubens)*, tamarisk *(Tamarix ramosissima)*, and cheatgrass *(Bromus tectorum)*, have the ability to out-compete individual species of native range plants, which results in extensive monocultures of the introduced species. ***Invasive species*** usually have little to no nutritional value for livestock and wildlife; some invasive species are toxic or physically injurious to animals, can increase the frequency of wildfires, and degrade wildlife habitat by reducing the diversity of native vegetation (DIRS 155925-Nevada Weed Action Committee 2000, p. 5).

Some plant species are considered ***noxious weeds***, an official designation used by federal and state authorities to identify species with a high likelihood of being very destructive or difficult to control or eradicate. Chapter 555.010 of the Nevada Administrative Code lists species designated as noxious.

Chapter 555 of the Nevada Revised Statutes directs that designated noxious weeds are to be controlled on both public and private land, and provides for enforcement measures should the landowner or occupier fail to take corrective action. While many noxious species are invasive, invasiveness is not required for a species to be designated noxious. Some species managed as noxious weeds are not considered truly invasive because they cannot effectively out-compete healthy communities of native vegetation.

3.3.7.2.1.2 Wetlands and Riparian Habitats. Riparian habitats are transition areas from wetland or stream habitat to upland habitat. Wetlands are areas that are saturated by water for a sufficient amount of time to support vegetation that is adapted to saturated soil conditions. While wetland and riparian habitats in Nevada cover a very small percentage of the total area of the state, they support a comparatively high number and large diversity of species, many of which are locally ***endemic***. Wetland and riparian habitats have been reduced in the region over the years due in part to water removal, drought, and the presence of invasive species, such as tamarisk (DIRS 174518-BLM 2005, p. 3.5-9). Appendix F contains specific information on wetlands function within the project area and Sections 3.3.5 and 4.3.5 discuss impacts in relation to Section 404 of the Clean Water Act and wetland fill permitting. This section discusses wetlands and riparian habitats that support terrestrial and aquatic species. Additional information on wetlands impacts and functions lost can be found in Appendix F.

To maintain consistency within this section, DOE assessed the amount and types of wetland and riparian habitat utilizing the 2004 Southwest Regional Gap Analysis Project (DIRS 174324-NatureServe 2004, all). Section 3.3.5, Surface-Water Resources, utilizes National Wetlands Inventory maps (DIRS 176976-MO0605GISNWIDO.000) and the results of the wetland delineations conducted during the field surveys in 2007 (DIRS 180889-PBS&J 2007, all) and 2006 (DIRS 180889 PBS&J 2007, pp. 11 and 12) to calculate the area of the wetlands. Therefore, the area totals differ between Sections 3.3.5 and 3.3.7 because Section 3.3.7 analyzes wetland and riparian habitat and Section 3.3.5 analyzes only the wetland areas.

According to the Southwest Regional Gap Analysis Project, there are three types of wetland or riparian land-cover types along the Mina rail alignment and at locations of the proposed rail line construction and operations support facilities: North American Warm Desert Lower Montane Riparian Woodland and Shrubland; Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland; and North American Arid West Emergent Marsh (Figures 3-205 to 3-211 and Table 3-126).

The North American Warm Desert Lower Montane Riparian Woodland and Shrubland is found along perennial and seasonally intermittent streams. Generally located in middle to low elevations and found in canyons and valleys, vegetation in this land-cover type depends on seasonal flooding and removal of sediment that occurs during these flood events. The vegetation is a mix of tree and shrub species such as Fremont cottonwood (*Populus fremontii*) and willows, including sandbar willows (*Salix exigua*) and seep willows (*Baccharis salicifolia*) (DIRS 174324-NatureServe 2004, pp. 140 to 142).

The Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland land cover occurs in the mountains of the Great Basin from middle to high elevations. This habitat requires flooding, and the scouring and subsequent deposition of soils that occurs during flood events, for maintenance and germination of vegetation. Vegetation typically associated with this type of riparian habitat includes Fremont cottonwood, willows, rushes (*Juncus* spp.), and sedges (*Carex* spp.) (DIRS 174324-NatureServe 2004, pp. 149 and 150).

The North American Arid West Emergent Marsh land-cover type occurs throughout the arid regions of the western United States. This land cover occurs along slow-moving streams, has soils that are able to accumulate organic material, and contains vegetation that is adapted to frequently or continually saturated soil conditions. Vegetation commonly found in marsh areas includes bulrushes (*Scirpus* spp.), cattails (*Typha* spp.), and rushes (DIRS 174324-NatureServe 2004, pp. 154 to 156).

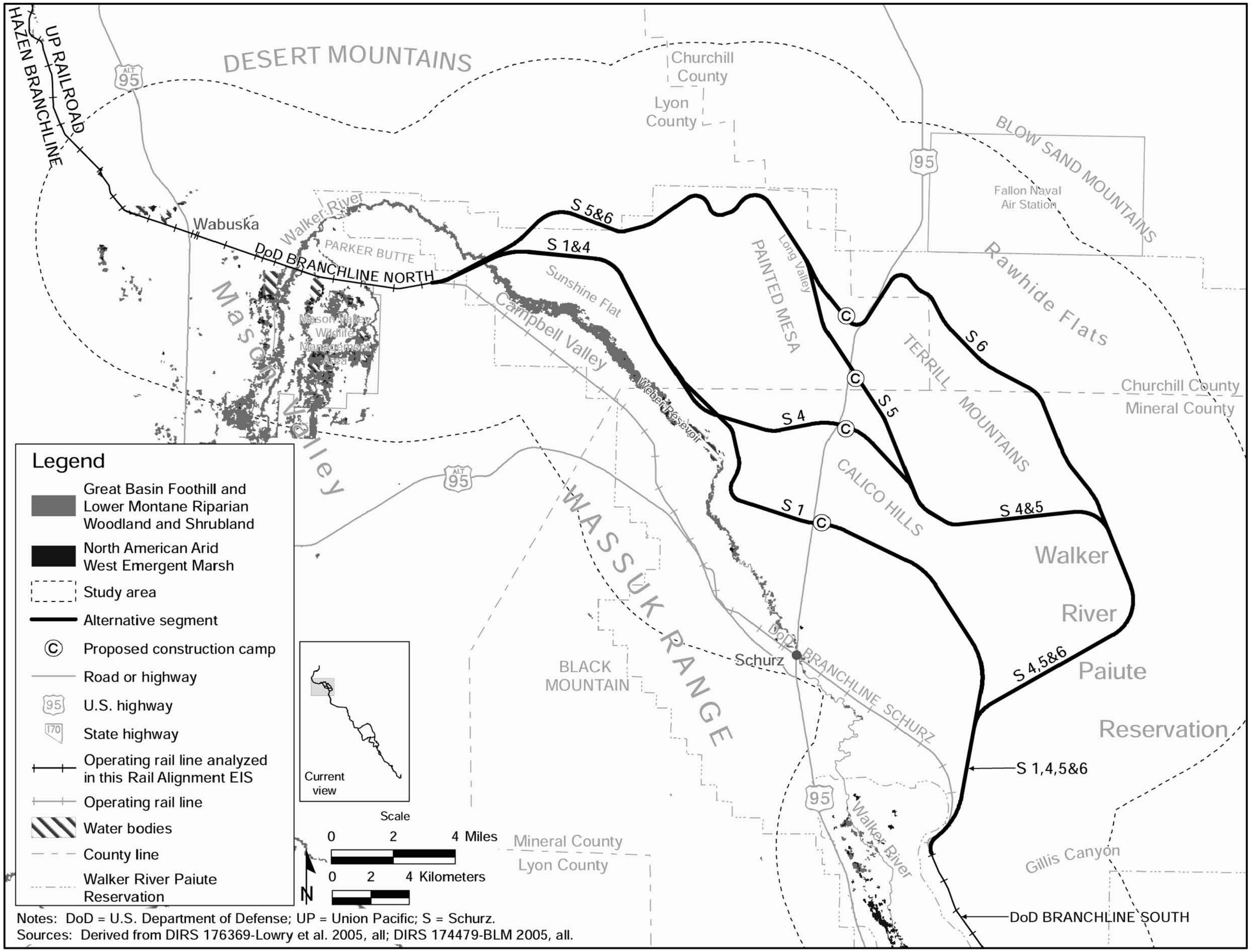


Figure 3-205. Wetland/riparian habitat the Mina rail alignment would cross in map area 1.

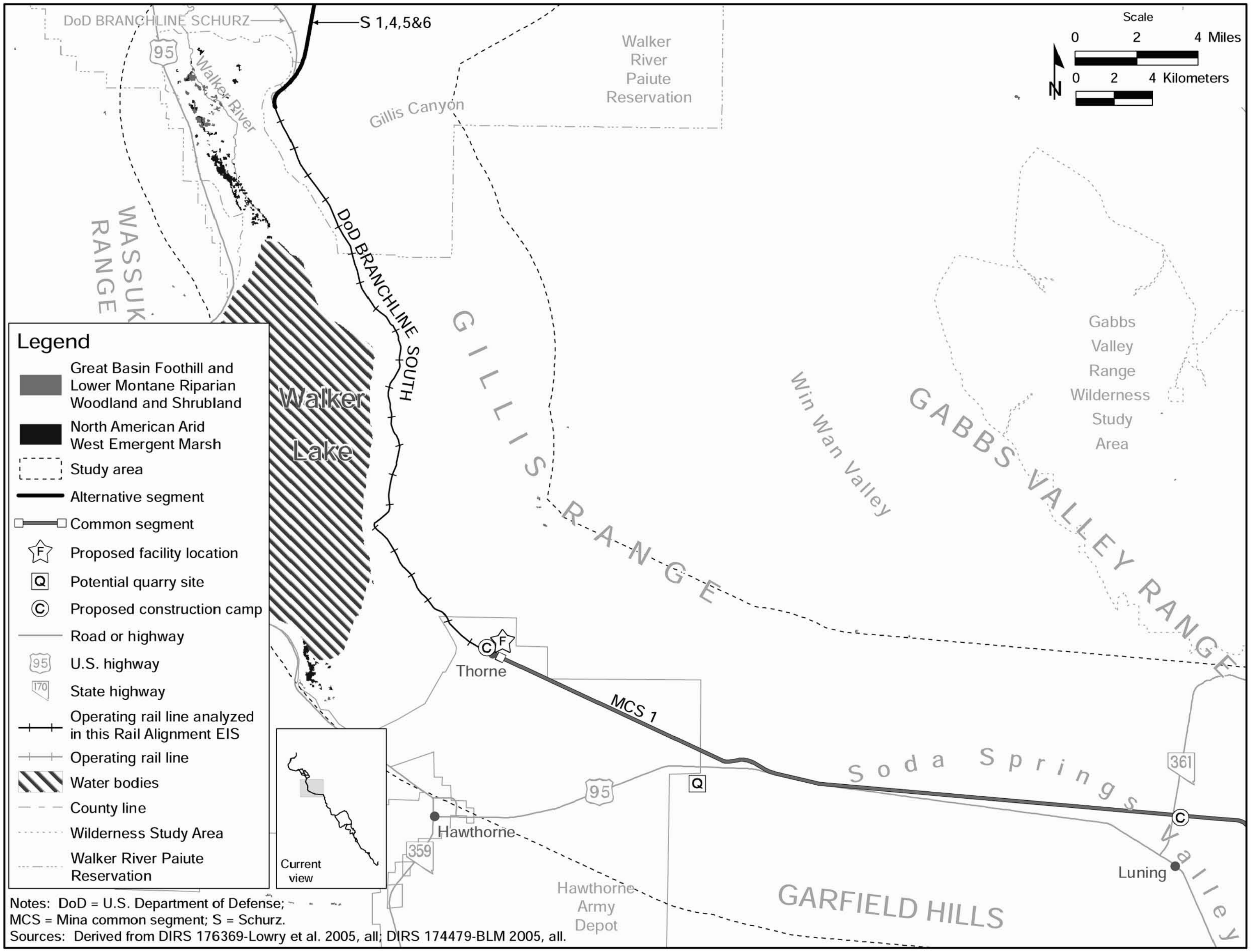


Figure 3-206. Wetland/riparian habitat the Mina rail alignment would cross in map area 2.

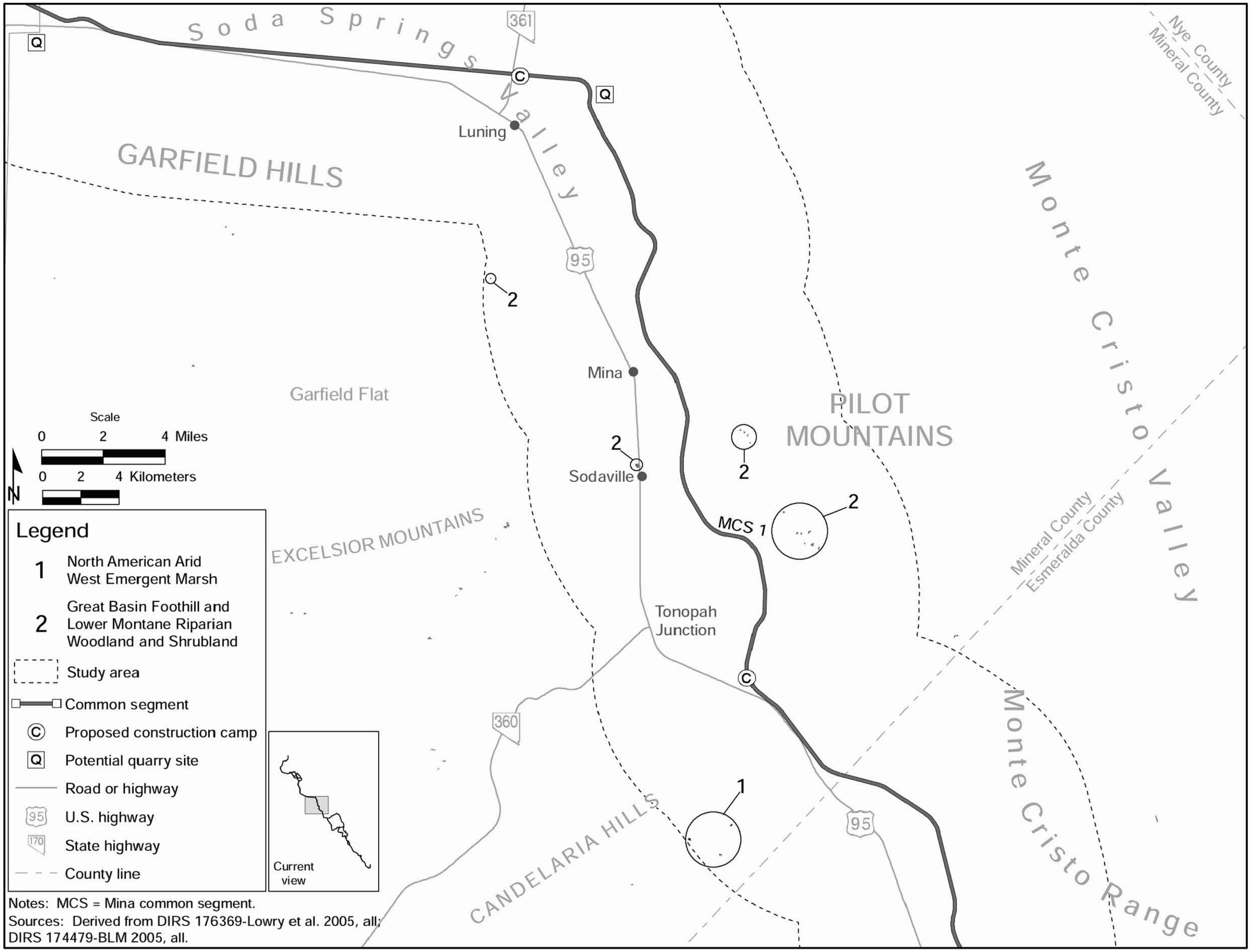


Figure 3-207. Wetland/riparian habitat the Mina rail alignment would cross in map area 3.

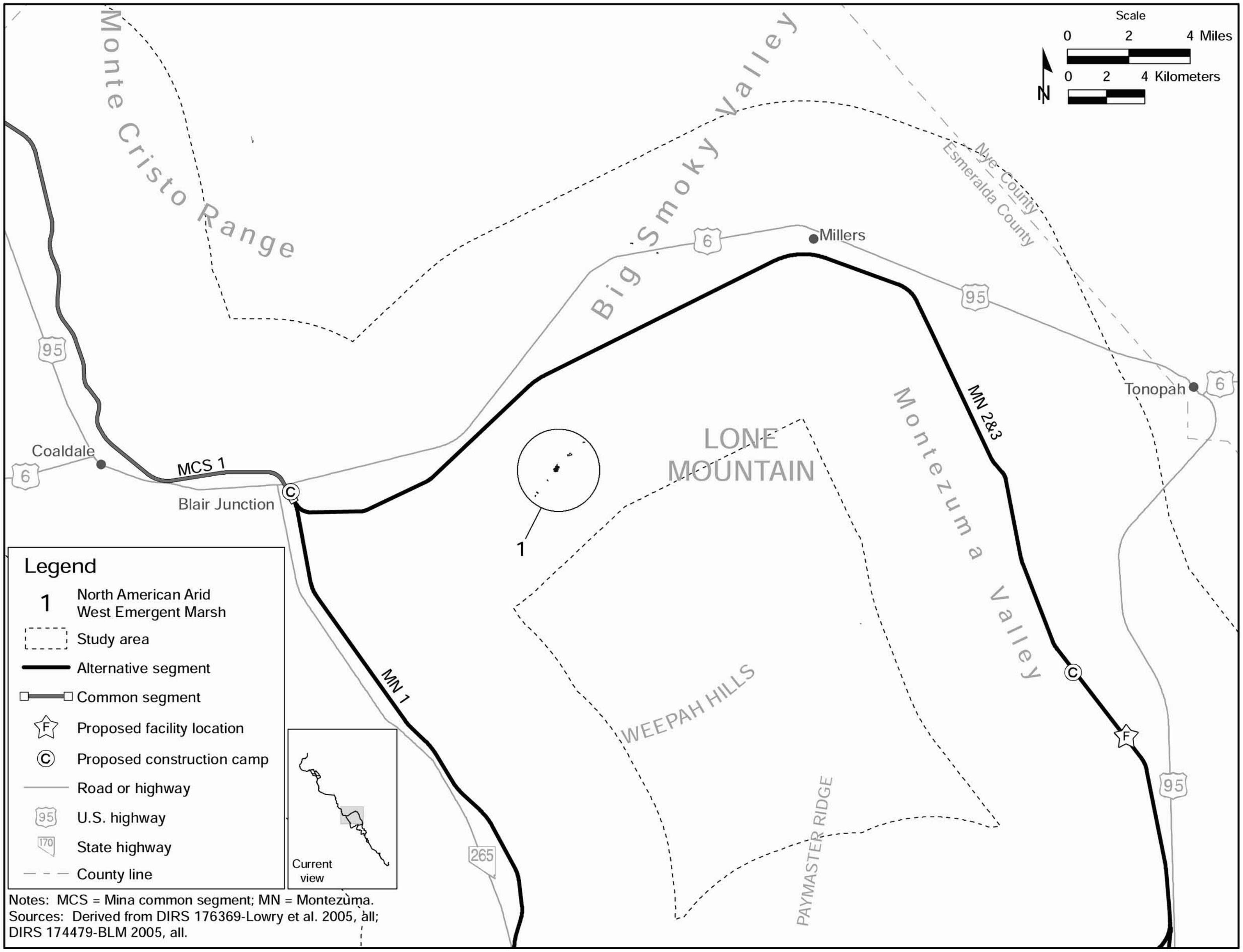


Figure 3-208. Wetland/riparian habitat the Mina rail alignment would cross in map area 4.

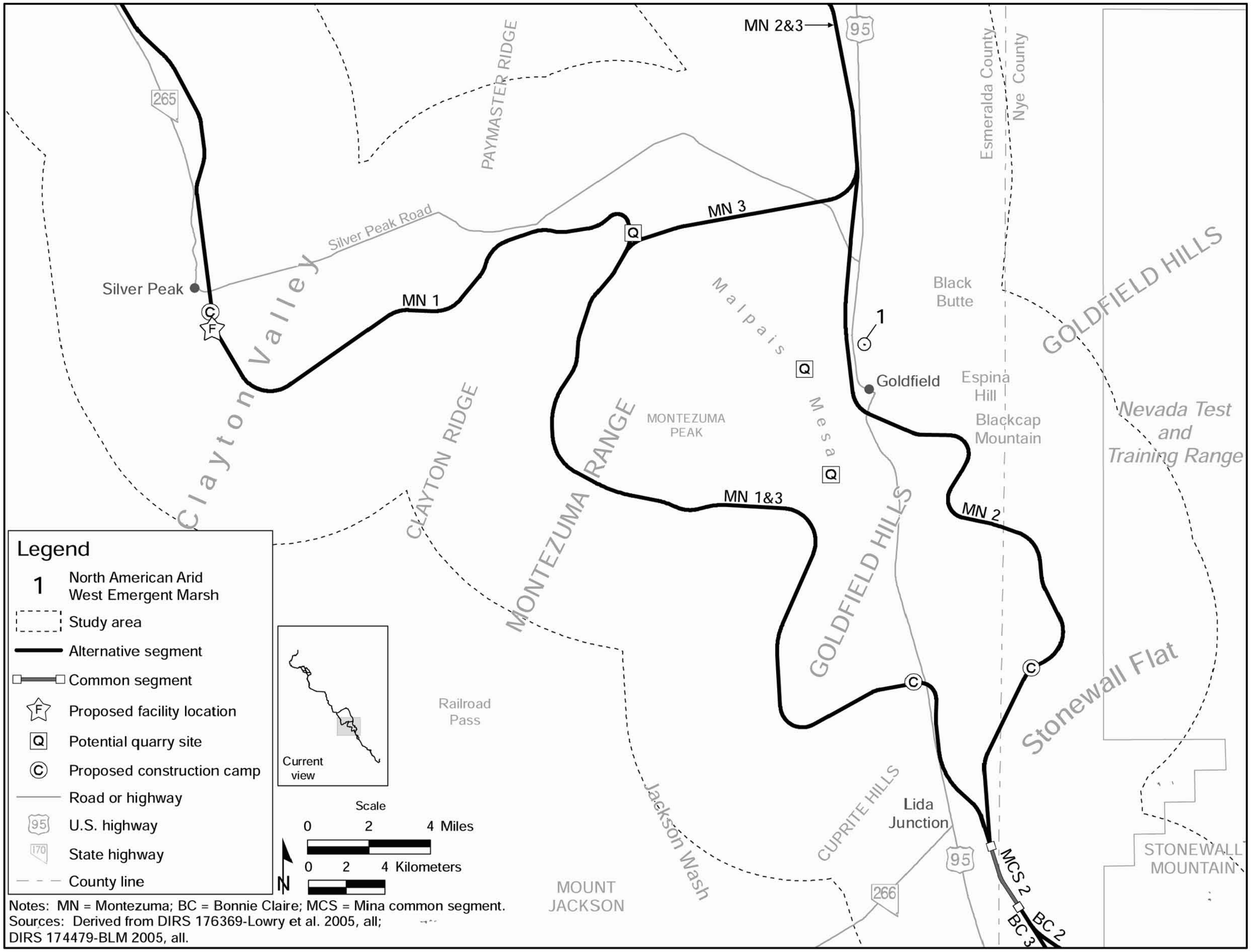


Figure 3-209. Wetland/riparian habitat the Mina rail alignment would cross in map area 5.

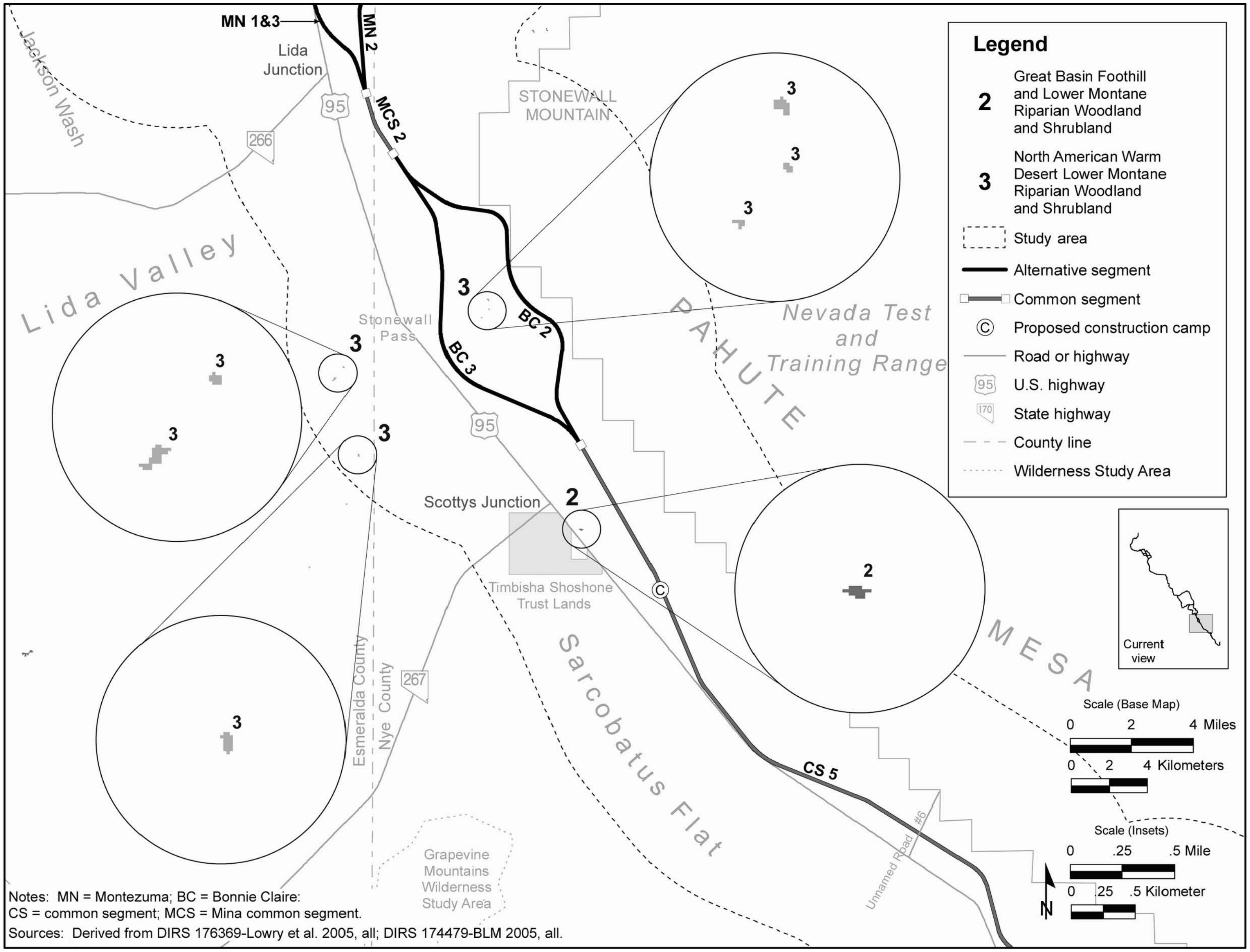


Figure 3-210. Wetland/riparian habitat the Mina rail alignment would cross in map area 6.

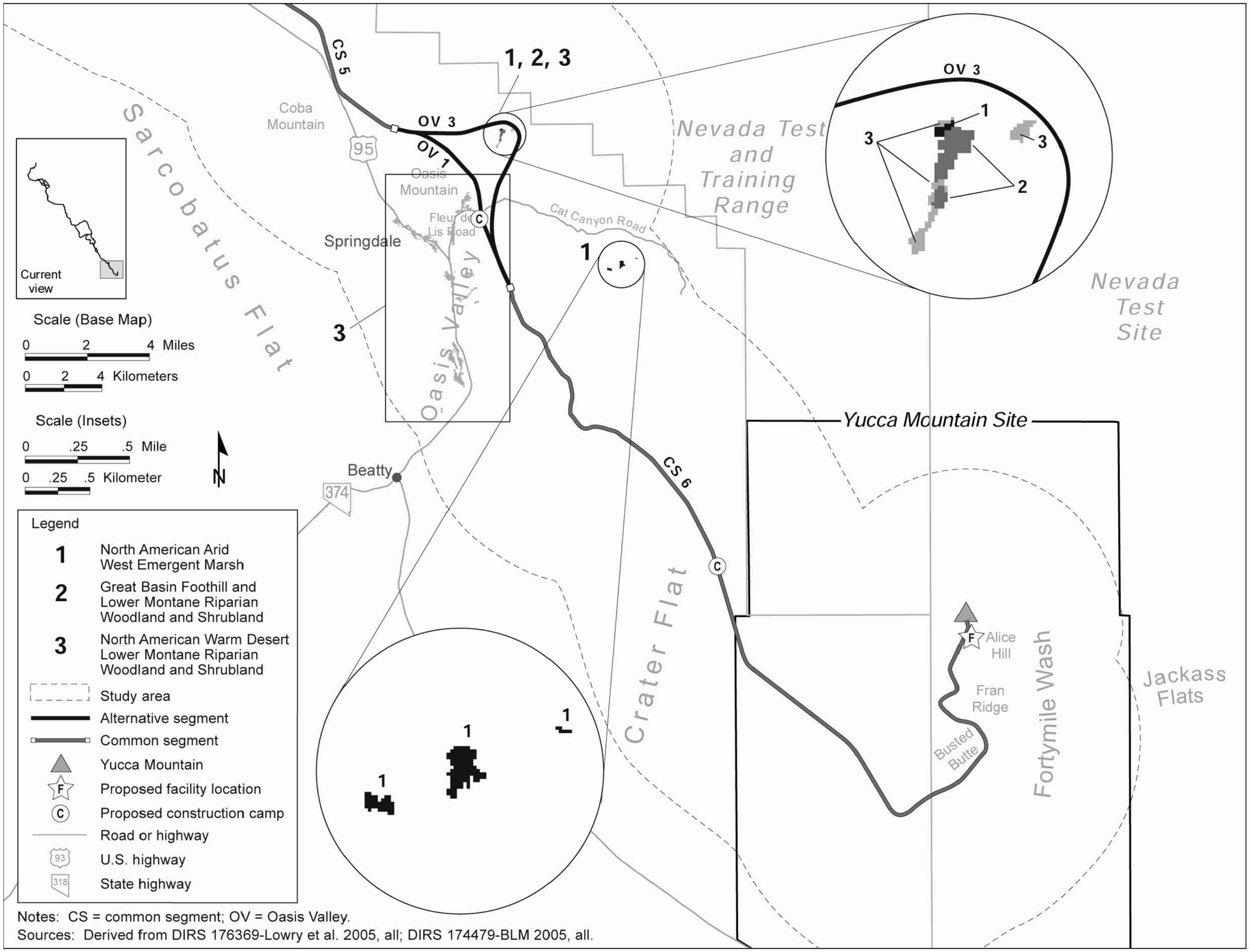


Figure 3-211. Wetland/riparian habitat the Mina rail alignment would cross in map area 7.

3.3.7.2.2 Wildlife

As with the vegetation communities and wetland habitats, DOE gathered data on wildlife communities to identify existing information regarding the occurrence and distribution of wildlife, including mammals, birds, reptiles, and aquatic species, within the construction right-of-way. These investigations incorporated literature and database searches and consultations with land and resource management agencies and authorities, including the BLM, the U.S. Fish and Wildlife Service, the Nevada Natural Heritage Program, and the Nevada Department of Wildlife. DOE also obtained information regarding Nevada game species from these agencies. Concurrent with other field surveys, the Department gathered information during field observations to identify the presence of wildlife within the construction right-of-way. DOE used habitat-related information from the Southwest Regional Gap Analysis Project to identify areas where a high probability of species existence occurred in relation to the construction right-of-way. Appendix H contains a map detailing field survey locations.

3.3.7.2.3 Special Status Species

Special status species are plants, fish, and wildlife species that are afforded some level of protection or special management under federal or state laws or regulations. DOE contacted the U.S. Fish and Wildlife Service to obtain a list of species protected under the federal Endangered Species Act that are known to exist or could exist within the construction right-of-way or within the study area (DIRS 181055-Williams 2007). The Department assessed the potential for federally listed species to occur within the construction right-of-way by reviewing agency listings of known, or potentially occurring, listed species, and through a review of potential habitat for those species along the Mina rail alignment. The Department also obtained location records for special status species from a statewide database managed by the Nevada Natural Heritage Program that contains records of incidental observations of rare or protected plants, fish, and wildlife species (DIRS 185440-BSC 2008, all). The special status species DOE selected for further consideration are one or a combination of the following:

- Special status species documented as occurring within the study area (Figures 3-212 and 3-213)
- Special status species identified as potentially occurring in the study area by personnel affiliated with appropriate resource management agencies, including the BLM (DIRS 172900-BLM 2003, all), the U.S. Fish and Wildlife Service, the Nevada Department of Wildlife, or the Nevada Division of Forestry
- Special status species identified as potentially occurring in the study area because field personnel identified potentially suitable habitat during the field surveys

DOE used a Geographic Information System database to map the documented occurrences of special status plants and wildlife species within the study area in relation to the Southwest Regional Gap Analysis Project land-cover types. The Department then used these maps to identify areas of potential habitat and the presence of the documented special status species. Through field surveys, the Department further evaluated areas that appeared to contain viable habitat for a special status species. Appendix H provides details on the survey methodology for special status species.

3.3.7.2.4 State of Nevada Game Species

Table 3-127 lists the game species identified in the Nevada Administrative Code Sections 503.020, 503.045, and 503.060 that potentially occur in the study area and construction right-of-way. Game species identified in these sections of the Nevada Administrative Code that are absent from the study area are listed in Appendix H, Table H-5, and are not considered further in this Rail Alignment EIS.

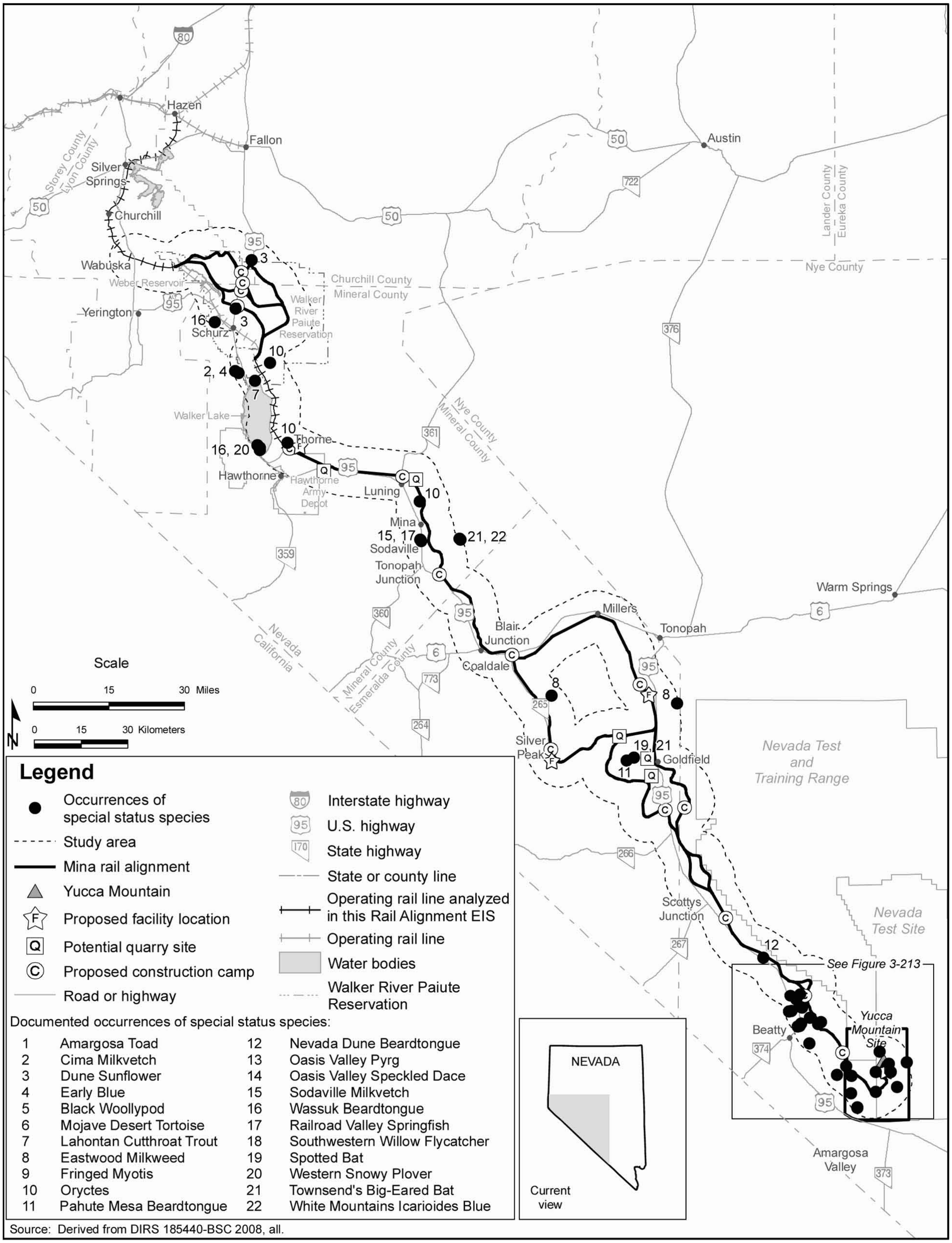


Figure 3-212. Occurrences of special status species documented in the Nevada Natural Heritage Program database along the Mina rail alignment.

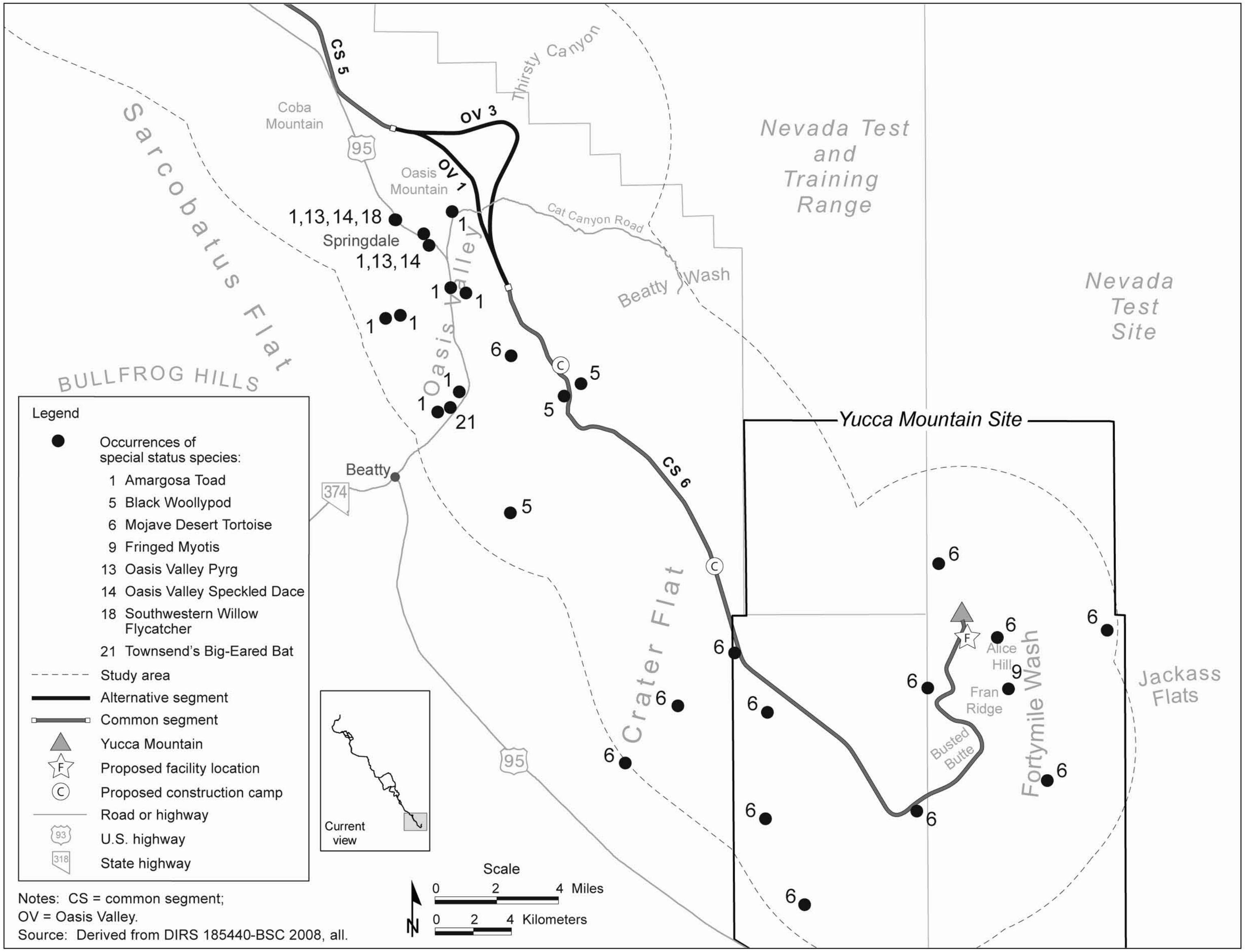


Figure 3-213. Occurrences of special status species documented in the Nevada Natural Heritage Program database adjacent to the Oasis Valley alternative segments and the Yucca Mountain Site.

Table 3-127. Nevada game species present or potentially present in the biological resources study area – Mina rail alignment.[a]

Common name	Scientific name	Occurrence within the study area
Game mammals		
Pronghorn antelope	*Antilocapra americana*	Present
Mule deer	*Odocoileus hemionus*	Present
Mountain lion	*Felis concolor*	Present
Cottontail rabbit	*Sylvilagus* spp.	Present
Black-tailed jackrabbit	*Lepus californicus*	Present
Bighorn sheep	*Ovis canadensis*	Present
Elk	*Cervus elaphus*	Present
Upland and migratory game birds		
Greater sage-grouse	*Centrocercus urophasianus*	Potentially present
Chukar	*Alectoris chukar*	Present
Ring-necked pheasant	*Phasianus colchicus*	Present
Gambel's quail	*Callipepla gambelii*	Present
Wild turkey	*Meleagris gallopavo*	Present
American crow	*Corvus brachyrhynchos*	Present
Ducks, geese, and swans	Family *Anatidae*	Present only in wetland/marsh areas
Wild doves and pigeons	Family *Columbidae*	Present
Cranes	Family *Gruidae*	Present only in wetland/marsh areas
Rails, coots, and gallinules	Family *Rallidae*	Present only in wetland/marsh areas
Woodcocks and snipes	Family *Scolopacidae*	Present only in wetland/marsh areas
Game fish		
Lahontan cutthroat trout	*Oncorhynchus clarki henshawi*	Present
Brown trout	*Salmo trutta*	Present
Rainbow trout	*Oncorhynchus mykiss*	Present
Mountain whitefish	*Prosopium williamsoni*	Present
Channel catfish	*Ictalurus punctatus*	Present
White catfish	*Ameiurus catus*	Present
White bass	*Morone chrysops*	Present
Largemouth black bass	*Micropterus salmoides*	Present
Spotted bass	*Micropterus punctulatus*	Present
White crappie	*Pomoxis annularis*	Present
Yellow perch	*Perca flavescens*	Present
Bluegill sunfish	*Lepomis macrochirus*	Present
Walleye	*Stizostedion vitreum*	Present

a. Source: Nevada Administrative Code Sections 503.020, 503.045, and 503.060.

The greater sage-grouse (*Centrocercus urophasianus*) and pygmy rabbit (*Sylvilagus idahoensis*) are game species that are also BLM-listed sensitive and State of Nevada protected. The bighorn sheep is a BLM-listed sensitive species that is managed by the Nevada Department of Wildlife as a big game mammal.

DOE conducted surveys along the Mina rail alignment to further characterize the presence or absence of game species. Observations included identification of tracks and fecal pellets, and direct observation of animals on or near the rail alignment. Results do not imply population level or habitat quality, only the presence or absence of game species and their approximate level of use.

3.3.7.2.5 Wild Horses and Burros

The BLM has delineated herd management areas within the wild horse herd areas. Each herd management area has an appropriate management level determined by the BLM through a rangeland assessment and a public review process. The appropriate management level is the number of wild horses and burros that the herd management area is managed for, and it is established to avoid the ecological degradation of the herd management area. DOE reviewed the Tonopah Resource Management Plan (DIRS 173224-BLM 1997, all), Carson City Consolidated Resource Management Plan (DIRS 179560-BLM 2001, all), and herd management plans for the Battle Mountain and Carson City BLM Districts to obtain current information on herd management areas. The Department contacted the BLM to obtain Geographic Information System data on management areas and to obtain data regarding the use of the herd management areas by wild horses and burros (Figure 3-214). Concurrent with other field investigations, DOE performed observations for wild horses and burros, or signs of their presence. Section 3.3.2, Land Use and Ownership, describes the grazing allotment planning process.

3.3.7.3 Affected Environment along Alternative Segments and Common Segments

This section describes biological resources in the Mina rail alignment construction right-of-way and study area. To avoid unnecessary repetition, this section discusses biological resources by resource type (vegetation, wildlife, special status species, migratory birds, State of Nevada game species, and wild horses and burros) rather than by alternative segment or common segment.

3.3.7.3.1 Vegetation

There are 25 different land-cover types within the construction right-of-way and multiple options for the proposed Mina railroad construction and operations support facilities. Tables 3-128 through 3-130 list land-cover types along the rail alignment and the areas of proposed operations support facilities. The percentages disclosed are the percent of land-cover types that could be affected and these percentages are related to the total acreages in the Mojave and Nellis mapping zones (see Table 3-126). The land-cover types listed and the percentages that could be affected are based on the nominal width of the rail line construction right-of-way for the alternative segments and common segments and the footprint of each proposed operation support facility. Table 3-131 lists the land-cover types present in the areas of the potential quarry sites.

3.3.7.3.1.1 Noxious Weeds and Invasive Species. Cheatgrass is found along most of the Mina rail alignment where it fills open space between shrubs. Red brome is also common, although it is generally confined to areas along the rail alignment that would cross the Mojave Desert region. These observations were made during the 2005 field surveys.

Table H-2 in Appendix H of this Rail Alignment EIS lists invasive and noxious species likely to occur in the area around the Mina rail alignment. The information is based on general habitat requirements or documented occurrences.

3.3.7.3.1.2 Wetlands and Riparian Habitat. Before conducting field surveys, DOE reviewed pertinent maps, the 2004 Southwest Regional Gap Analysis Project (DIRS 174324-NatureServe 2004, all), and available state wetland and land-use inventories to identify the locations of possible wetland and riparian habitat within the rail line construction right-of-way and the study area.

DOE identified wetland and riparian habitat along the following portions of the Mina rail alignment using a combination of fieldwork and the 2004 Southwest Regional Gap Analysis Project (see Figures 3-205 to 3-211):

- Schurz alternative segments
- Mina common segment 1
- Bonnie Claire alternative segments
- Oasis Valley alternative segments

This section discusses only portions of the Mina rail alignment in which there are wetland and/or riparian habitats. Section 3.3.5, Surface-Water Resources, and Appendix F provide information on springs and their locations and specific information on function and value of wetlands for Section 404 compliance. Table 3-132 details the identified wetland and riparian land-cover types found in the construction right-of-way and the study area along alternative segments and common segments of the Mina rail alignment.

Wetlands within and adjacent to the Mina rail alignment were classified as Great Basin foothill and lower mountain riparian woodland and shrubland; North American arid west emergent marsh; and North American warm desert lower montane riparian woodland and shrubland (DIRS 180889-PBS&J 2007, p. 16). Plant species considered indicators of wetland conditions that were found within and adjacent to the Mina rail alignment include bulrushes, sedges, Fremont cottonwood, willows (including sandbar willow), broadleaf cattail (*Typha latifolia*), Baltic rush (*Juncus balticus*), common reed (*Phragmites australis*), tamarisk, and Russian olive (*Eleagnus angustifolia*) (DIRS 180889-PBS&J 2007, p. 17).

Oasis Valley alternative segment 3 contains a small (approximately 0.02 square kilometer [5 acres]) wetland area within the construction right-of-way (Figure 3-211). See Section 3.3.5, Surface-Water Resources, and Appendix F for more specific information on wetlands.

3.3.7.3.2 Wildlife

This section describes the wildlife and wildlife communities potentially present in the Mina rail alignment construction right-of-way. Figures 3-215 through 3-218 detail the manmade wildlife water sources, also called ***wildlife guzzlers***, within the study area. There are 46 wildlife guzzlers within the study area. The largest concentrations of guzzlers are located along Schurz alternative segments 5 and 6 (10 guzzlers), and along Mina common segment 1 (35 guzzlers.) The wildlife guzzlers closest to the Mina rail alignment are DM#24, which is approximately 1.6 kilometers (1 mile) north of Schurz alternative segments 5 and 6; and PI#1 and PI#4, which are both approximately 1.6 kilometers east of Mina common segment 1. Section 3.3.5, Surface-Water Resources, provides information about and locations of other sources of water available to wildlife.

A **wildlife guzzler** is a water development for wildlife that relies on rainfall or snowmelt to recharge it, rather than springs or streams. Usually used where there are no other sources of water for wildlife.

The following sections describe the most common species of mammals, birds, reptiles, amphibians, and fish potentially found within the study area or construction right-of-way of the Mina rail alignment, including federally listed threatened and endangered species, and federally and state-listed sensitive or protected species, migratory birds, Nevada game species, and wild horses and burros.

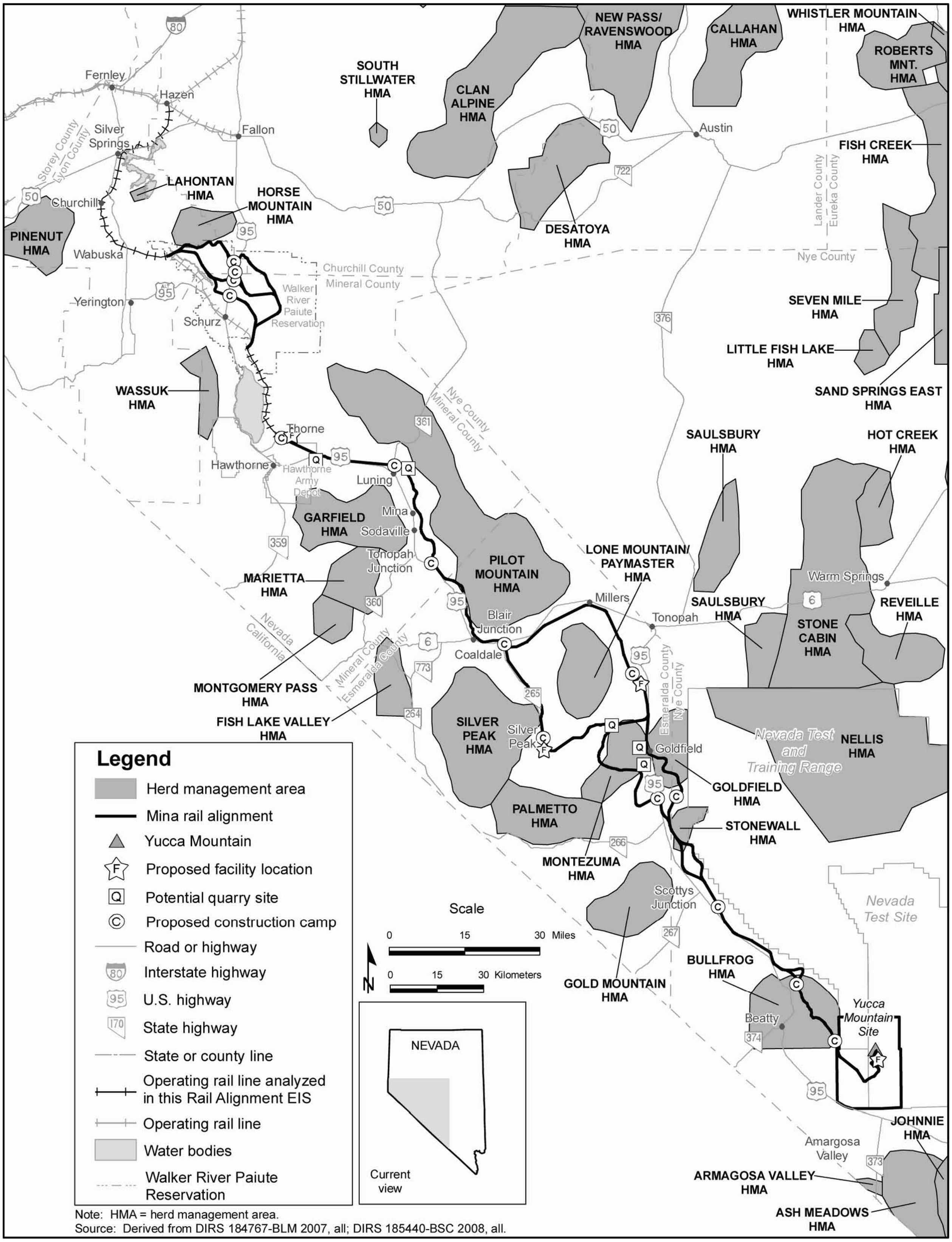


Figure 3-214. Herd management areas along the Mina rail alignment.

Table 3-128. Land-cover types and percentages within the construction right-of-way by common segment.[a]

Land-cover type	Area covered by common segment[b] (percent)			
	CS1	CS2	CS5	CS6
Barren Lands, Non-Specific	0.23	0	0	0
Inter-Mountain Basins Active and Stabilized Dune	0.29	0		0
Inter-Mountain Basins Cliff and Canyon	<0.01	0		0
Great Basin Pinyon-Juniper Woodland	0	0	0.10	0
Great Basin Xeric Mixed Sagebrush Shrubland	0	0	0	0
Inter-Mountain Basins Big Sagebrush Shrubland	0	0	0.05	0
Inter-Mountain Basins Greasewood Flat	1.87	0	0	0
Inter-Mountain Basins Mixed Salt Desert Scrub	93.78	93.81	0	0
Inter-Mountain Basins Playa	1.95	0	0	0
Inter-Mountain Basins Semi-Desert Grassland	0	0	0	0
Inter-Mountain Basins Semi-Desert Shrub Steppe	1.81	6.19	7.55	13.59
Invasive Annual and Biennial Forbland	0.06	0	0	0
Invasive Annual Grassland	0.02	0	0	0
Mojave Mid-Elevation Mixed Desert Scrub	0	0	12.46	23.92
North American Warm Desert Bedrock Cliff and Outcrop	0	0	0	0.39
North American Warm Desert Playa	0	0	<0.01	0.13
Sonora-Mojave Creosotebush-White Bursage Desert Scrub	0	0	26.47	61.38
Sonora-Mojave Mixed Salt Desert Scrub	0	0	53.37	0.59
Totals[c]	100	100	100	100

a. Source: DIRS 174324-NatureServe 2004.
b. CS = common segment; < = less than.
c. Totals might differ from sums of values due to rounding.

3.3.7.3.2.1 Mammals. Mammals are known to exist within the study area along the entire length of the Mina rail alignment. The types of mammals found within the study area would depend on the vegetation communities. Mammals that occur in the greater study area and the construction right-of-way of the Mina rail alignment include:

- Mountain lion *(Felis concolor)*
- Bighorn sheep *(Ovis Canadensis)*
- Kit fox *(Vulpes macrotis)*
- Coyote *(Canis latrans)*
- Bobcat *(Lynx rufus)*
- Badger *(Taxidea taxus)*
- Beaver *(Castor canadensis)*
- Raccoon *(Procyon lotor)*
- Cottontail rabbit *(Sylvilagus* spp.*)*
- Various rodents
- Pronghorn antelope *(Antilocapra americana)*
- Grey fox *(Urocyon cinereoargenteus)*
- Mule deer *(Odocoileus hemionus)*
- Black-tailed jackrabbit *(Lepus californicus)*
- Ringtail *(Bassariscus astutus)*
- Common muskrat *(Ondatra zibethicus)*
- Striped skunk *(Mephitis mephitis)*
- Various bats
- Ground squirrels (*Spermophilus* spp.)

Table 3-129. Land-cover types and percentages within the construction right-of-way by alternative segment[a] (page 1 of 2).

	Area covered by alternative segment (percent)[b]											
	Schurz				Montezuma				Bonnie Claire		Oasis Valley	
Land-cover type	S1	S4	S5	S6	MN1	MN2	MN1/ MN3	MN3	BC2	BC3	OV1	OV3
Barren Lands, Non-Specific	0	0	0	0	1.12	0.03	0	0	0	0	0	0
Developed, Medium-High Intensity	0	0	0	0	0	0.08	0	0	0	0	0	0
Developed, Open Space – Low Intensity	0	0	0	0	0	0.24	0	0	0	0	0	0
Inter-Mountain Basins Active and Stabilized Dune	1.95	0.84	0.35	0.42	<0.01	0	0	0	0	0	0	0
Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland	0.35	0.27	0.25	0.23	0	0	0	0	0	0	0	0
Great Basin Pinyon-Juniper Woodland	0	0	0	0	0	0	0.047	0	0	0	0	0
Great Basin Xeric Mixed Sagebrush Shrubland	0	0	0	0	0.84	1.60	8.05	<0.01	0.11	0	0	0
Inter-Mountain Basins Big Sagebrush Shrubland	0	0	0.04	0.04	0.56	11.40	17.87	7.38	5.04	0.80	0	0
Inter-Mountain Basins Cliff and Canyon	0	0	0	0.01	0	0	0	0	0	0	0	0
Inter-Mountain Basins Greasewood Flat	15.1	5.85	4.21	3.93	0	1.54	0	0	0	0	0	0
Inter-Mountain Basins Mixed Salt Desert Scrub	82.0	92.95	94.02	94.03	75.59	2.71	1.93	0	33.59	30.27	0	0
Inter-Mountain Basins Playa	0	0	0	0	16.53	0	0	0	0.51	0	0	0

Table 3-129. Land-cover types and percentages within the construction right-of-way by alternative segment[a] (page 2 of 2).

Land-cover type	Area covered by alternative segment (percent)[b]											
	Schurz				Montezuma				Bonnie Claire		Oasis Valley	
	S1	S4	S5	S6	MN1	MN2	MN1/ MN3	MN3	BC2	BC3	OV1	OV3
Inter-Mountain Basins Semi-Desert Shrub-Steppe	0	0	0	0	0.32	2.71	1.93	0	0	0	0	0
Inter-Mountain Basins Playa	0.55	0	0	0.04	16.53	0	0	0	0	0.51	0	0
Inter-Mountain Basins Semi-Desert Grassland	0	0.09	0.07	0.10	0	0	0	0	0	0	0	0
Inter-Mountain Basins Semi-Desert Shrub Steppe	0	0	0	0	0.32	2.71	1.93	0	10.66	16.53	4.88	3.13
Inter-Mountain Basins Wash	0	0	0	0	0	0	0	0	0	0	0	0
Invasive Annual Grassland	0	0	0.41	0.39	0	0	0	0	0	0	0	0
Invasive Annual and Biennial Forbland	0	0	<0.01	<0.01	0	0	0	0	0	0	0	0
Mojave Mid-Elevation Mixed Desert Scrub	0	0	0	0	0	0	0	0	31.44	23.43	3.61	0.45
North American Warm Desert Lower Montane Riparian Woodland and Shrubland	0	0	0	0	0	0	0	0	0	0	0	0.43
North American Warm Desert Playa	0	0	0	0	0	0	0	0	0	0	5.33	1.07
Sonora-Mojave Creosotebush-White Bursage Desert Scrub	0	0	0	0	0	0	0	0	13.88	27.01	77.56	72.68
Sonora-Mojave Mixed Salt Desert Scrub	0	0	0	0	0	0	0	0	5.29	1.84	8.63	22.24
Totals[c]	100	100	100	100	100	100	100	100	100	100	100	100

a. Source: DIRS 174324-NatureServe 2004.
b. < = less than.
c. Totals might differ from sums of values due to rounding.

Table 3-130. Land-cover types and percentages within facility footprints by facility.[a]

Land-cover type	Area covered by facility (percent) Staging Yard at Hawthorne	Silver Peak option Maintenance-of-Way Facility	Klondike option Maintenance-of-Way Facility	Rail Equipment Maintenance Yard
Great Basin Xeric Mixed Sagebrush Shrubland		0	0	0
Inter-Mountain Basins Active and Stabilized Dune	0.14	0.05	0	0
Inter-Mountain Basins Greasewood Flat	0.93	2.65	45.35	0
Inter-Mountain Basins Mixed Salt Desert Scrub	98.93	9.40	53.40	0
Inter-Mountain Basins Playa	0	87.91	0	0
Inter-Mountain Basins Semi-Desert Grassland	0	0	0	0
Inter-Mountain Basins Semi-Desert Shrub Steppe	0	0	1.26	15.04
Mojave Mid-Elevation Mixed Desert Scrub	0	0	0	8.04
Sonora-Mojave Creosotebush-White Bursage Desert Scrub	0	0	0	74.94
Sonora-Mojave Mixed Salt Desert Scrub	0	0	0	1.98
Totals	100	100	100	100

a. Source: DIRS 174324-NatureServe 2004.
b. Totals might differ from sums of values due to rounding.

Table 3-131. Land-cover types and percentages within the footprints of potential quarry sites[a] (page 1 of 2).

Land-cover type	Area covered (percent)
Garfield Hills	
Great Basin Xeric Mixed Sagebrush Shrubland	99.99
Inter-Mountain Basins Big Sagebrush Shrubland	<0.01[c]
Total[b]	100
Gabbs Range	
Inter-Mountain Basins Big Sagebrush Shrubland	0.38
Inter-Mountain Basins Mixed Salt Desert Scrub	99.62
Total	100
North Clayton	
Great Basin Xeric Mixed Sagebrush Shrubland	7.37
Inter-Mountain Basins Big Sagebrush Shrubland	20.21
Inter-Mountain Basins Mixed Salt Desert Scrub	68.43
Inter-Mountain Basins Semi-Desert Shrub Steppe	3.99
Total	100

Table 3-131. Land-cover types and percentages within the footprints of potential quarry sites[a] (page 2 of 2).

Land-cover type	Area covered (percent)
Quarry ES-7	
Great Basin Xeric Mixed Sagebrush Shrubland	29.69
Inter-Mountain Basins Big Sagebrush Shrubland	48.14
Inter-Mountain Basins Mixed Salt Desert Scrub	20.68
Inter-Mountain Basins Semi-Desert Shrub Steppe	1.48
Total	100
Malpais Mesa	
Great Basin Xeric Mixed Sagebrush Shrubland	6.58
Inter-Mountain Basins Big Sagebrush Shrubland	55.48
Inter-Mountain Basins Mixed Salt Desert Scrub	34.86
Inter-Mountain Basins Semi-Desert Shrub Steppe	3.08
Total	100

a. Source: DIRS 174324-NatureServe 2004.
b. Totals might differ from sums of values due to rounding.
c. < = less than.

3.3.7.3.2.2 Birds. A variety of bird species are commonly observed in central and southern Nevada, including year-round residents, summer residents, migratory species breeding in southern Nevada, winter residents that breed to the north, and seasonal migrants passing through central and southern Nevada en route to breeding ranges to the north and winter ranges to the south. Table H-4 in Appendix H lists the bird species that could occur along the Mina rail alignment. Several federal laws and state statutes protect various groups of birds. Chapter 6, Statutory, Regulatory, and Other Applicable Requirements, details these protections.

The Great Basin region of Nevada is an important migration route for waterfowl and other species of birds traveling between southern wintering areas and northern breeding territories; however, suitable habitat for waterfowl and shorebirds is limited to the Walker River, Walker Lake, and other rare open-water areas. No waterfowl or shorebirds were observed during the 2006 field surveys; however, DOE assumes that there are such birds on Walker Lake that may move through the study area and construction right-of-way. Walker Lake is approximately 1 kilometer (0.6 mile) from the Mina rail alignment.

Common species of resident and migrating birds observed along the Mina rail alignment include:

- Common raven *(Corvus corax)*
- Black-billed magpie *(Pica hudsonia)*
- Horned lark *(Eremophila alpestris)*
- Northern oriole *(Icterus galbula)*
- Red-winged blackbird *(Agelaius phoenicius)*
- American crow *(Corvus brachyrhynchos)*
- House wren *(Troglodytes aedon)*
- Killdeer *(Charadrius vociferous)*
- Loggerhead shrike *(Lanius ludovicianus)*
- Yellow warbler *(Dendroica petechia)*

Two upland game bird species are expected to occur within the Mina rail alignment construction right-of-way: chukar (*Alectoris chukar*) and Gambel's quail (*Callipepla gambelii*). Chukars were observed during surveys conducted along the rail alignment. Chukars were recorded in cliff and talus habitat in the Beatty Wash area. Mourning doves are common and were observed at multiple locations along the rail alignment. The greater sage-grouse (*Centrocercus urophasianus*) is a BLM-listed special status species and receives additional protection from the State of Nevada (see Section 3.3.7.3.3). The greater sage-grouse is an upland game bird that has historically occurred in low abundance near portions of the rail alignment, but outside of the study area (Figure 3-219).

Table 3-132. Wetland and riparian land-cover types within the Mina rail alignment construction right-of-way and study area.[a]

Segment/land-cover type	Amount in construction right-of-way (acres)[b]	Amount in study area (acres)
Schurz alternative segment 1		
Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland	3.45	5,130
North American Arid West Emergent Marsh	0	716
Schurz alternative segment 4		
Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland	3.19	4,950
North American Arid West Emergent Marsh	0	708
Mina common segment 1		
Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland	0	47.6
North American Arid West Emergent Marsh	0	8.89
Bonnie Claire alternative segment 2		
Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland	0	8.22
North American Warm Desert Lower Montane Riparian Woodland and Shrubland	0	8.22
Bonnie Claire alternative segment 3		
Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland	0	4.22
North American Warm Desert Lower Montane Riparian Woodland and Shrubland	0	18
Oasis Valley alternative segment 1		
Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland	0	20
North American Arid West Emergent Marsh	0	32.5
North American Warm Desert Lower Montane Riparian Woodland and Shrubland	0	499
Oasis Valley alternative segment 3		
North American Warm Desert Lower Montane Riparian Woodland and Shrubland/jurisdictional wetlands	4.67/0.0060	4.99
North American Arid West Emergent Marsh	0	56.3
Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland	0	20

a. Source: DIRS 174324-NatureServe 2004, all.
b. To convert acres to square kilometers, multiply by 0.0040469.

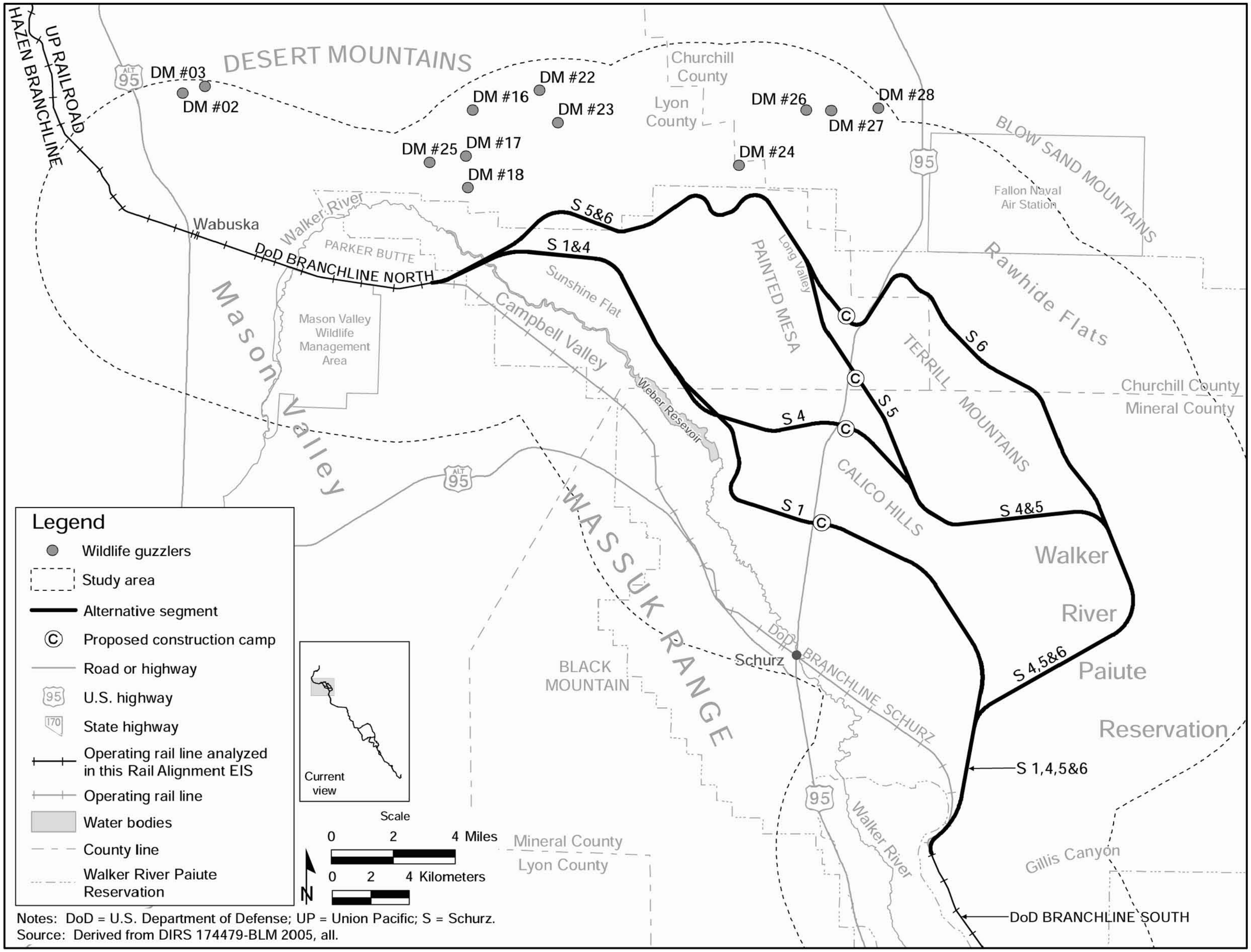


Figure 3-215. Wildlife guzzlers located along the Mina rail alignment within map area 1.

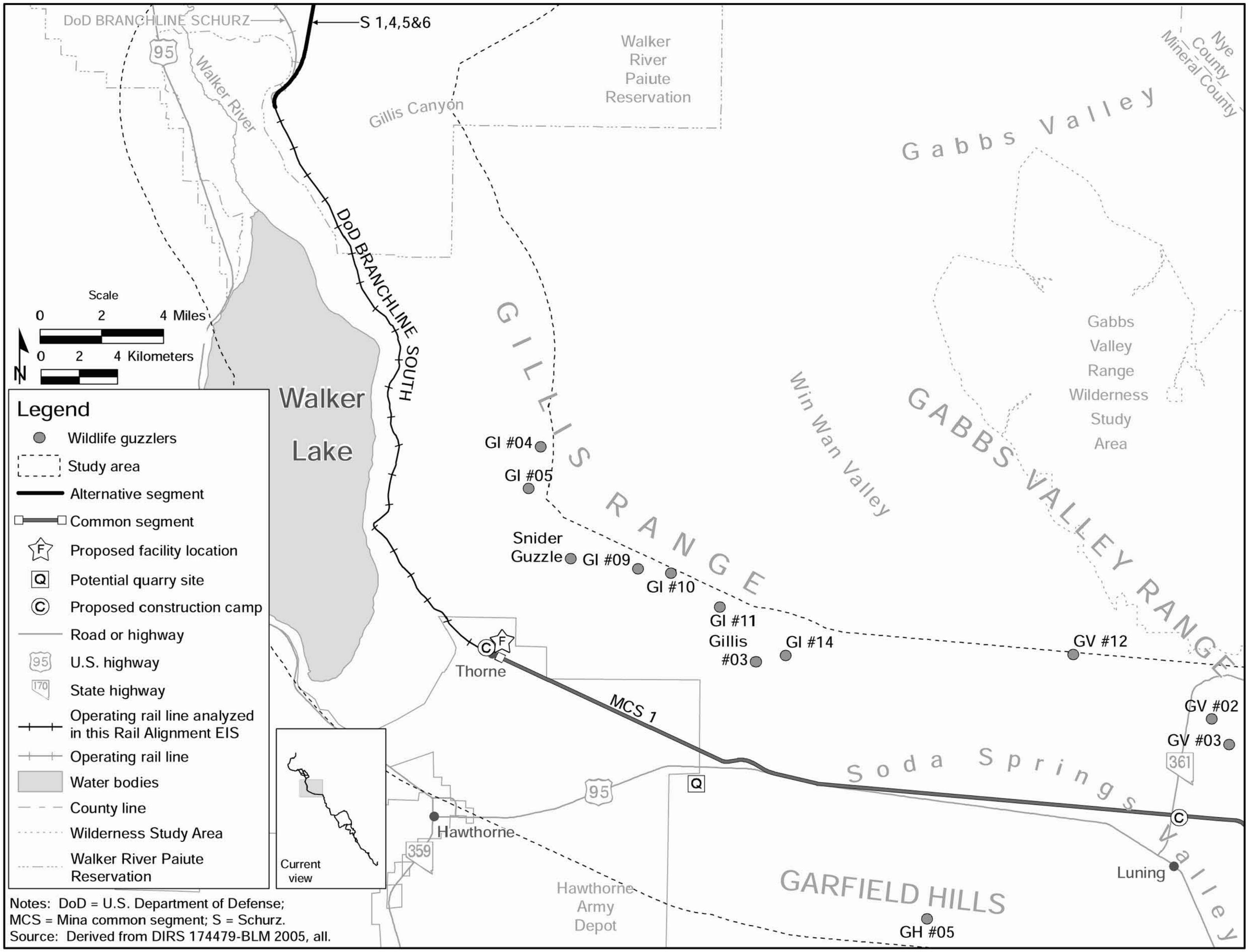


Figure 3-216. Wildlife guzzlers located along the Mina rail alignment within map area 2.

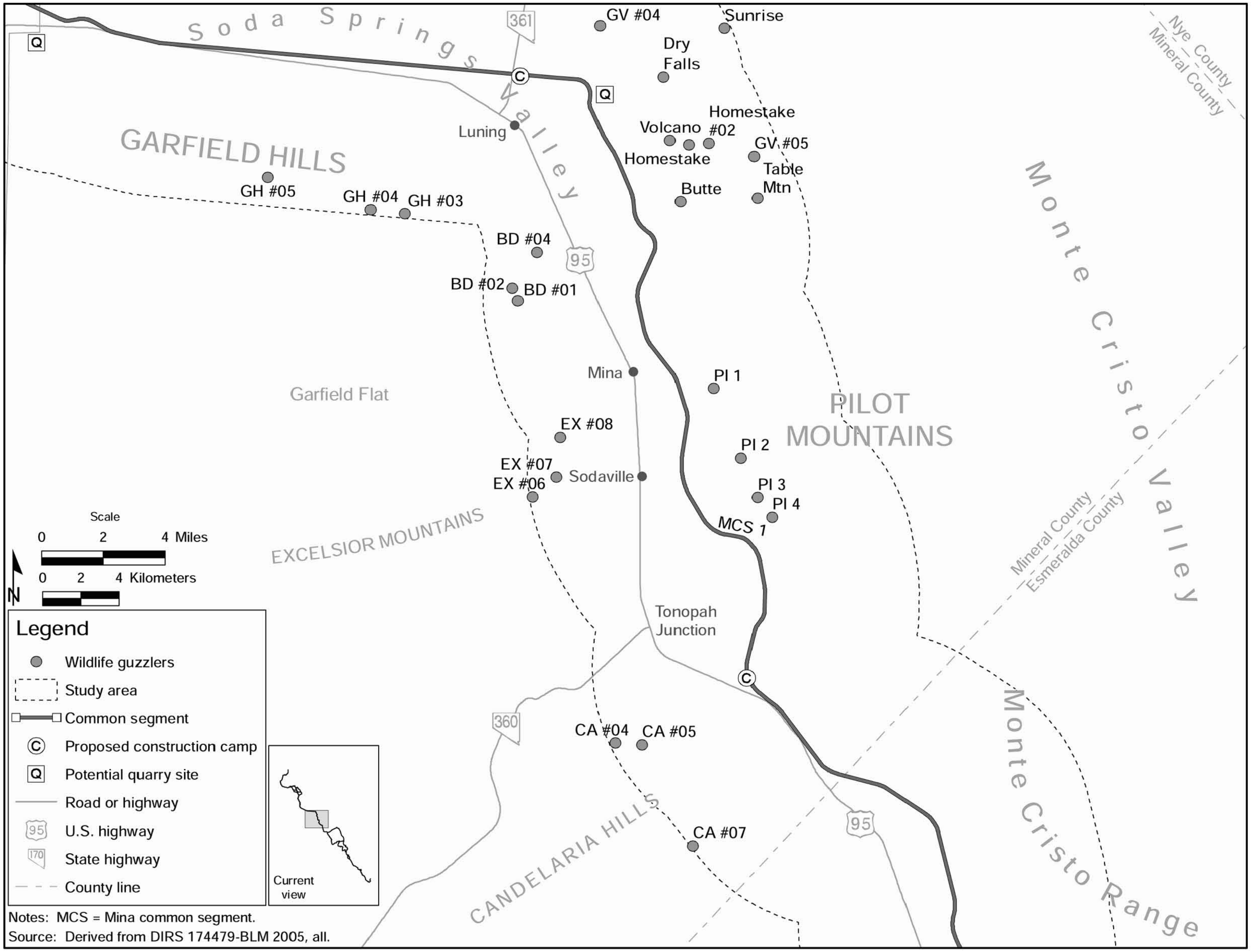


Figure 3-217. Wildlife guzzlers located along the Mina rail alignment within map area 3.

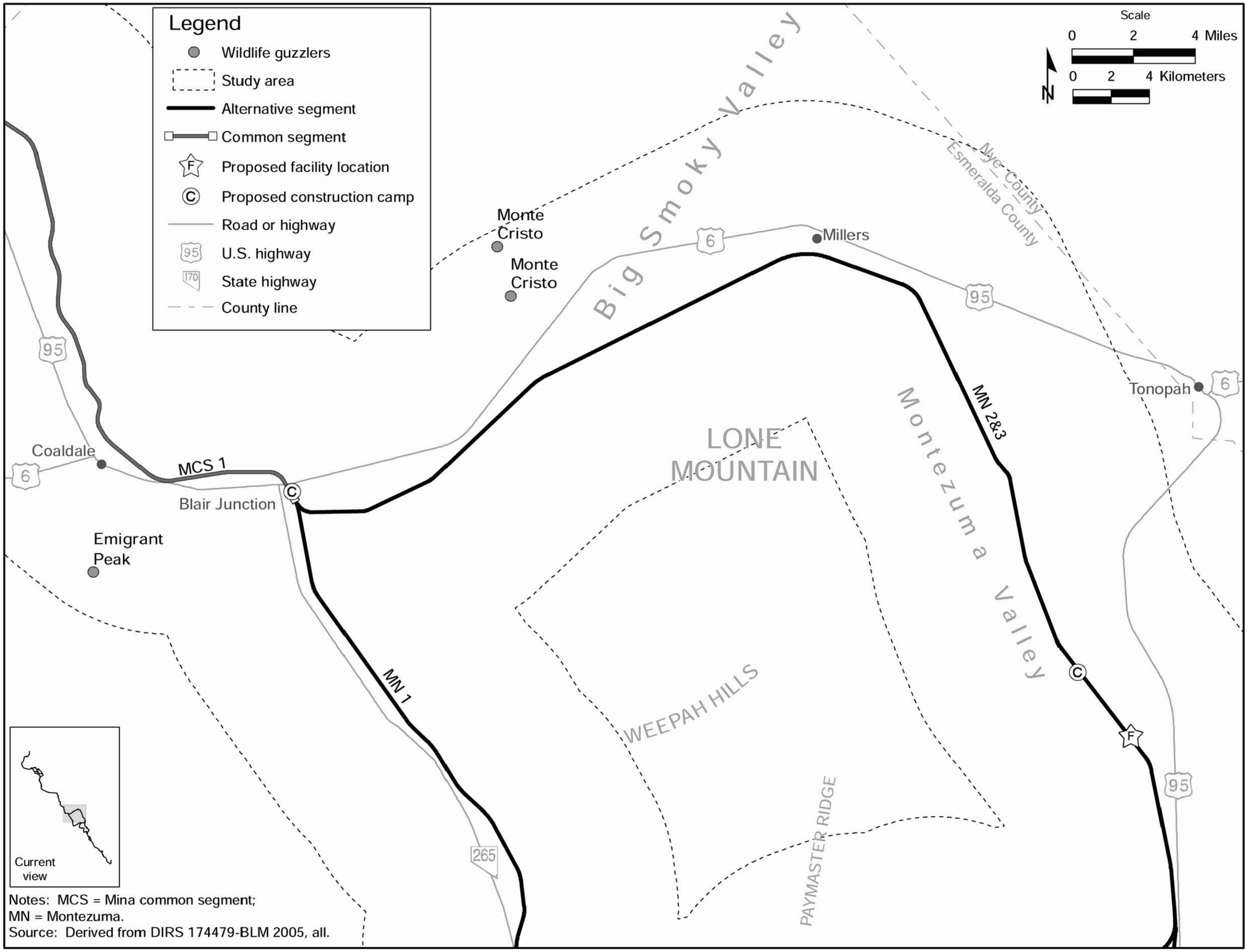


Figure 3-218. Wildlife guzzlers located along the Mina rail alignment within map area 4.

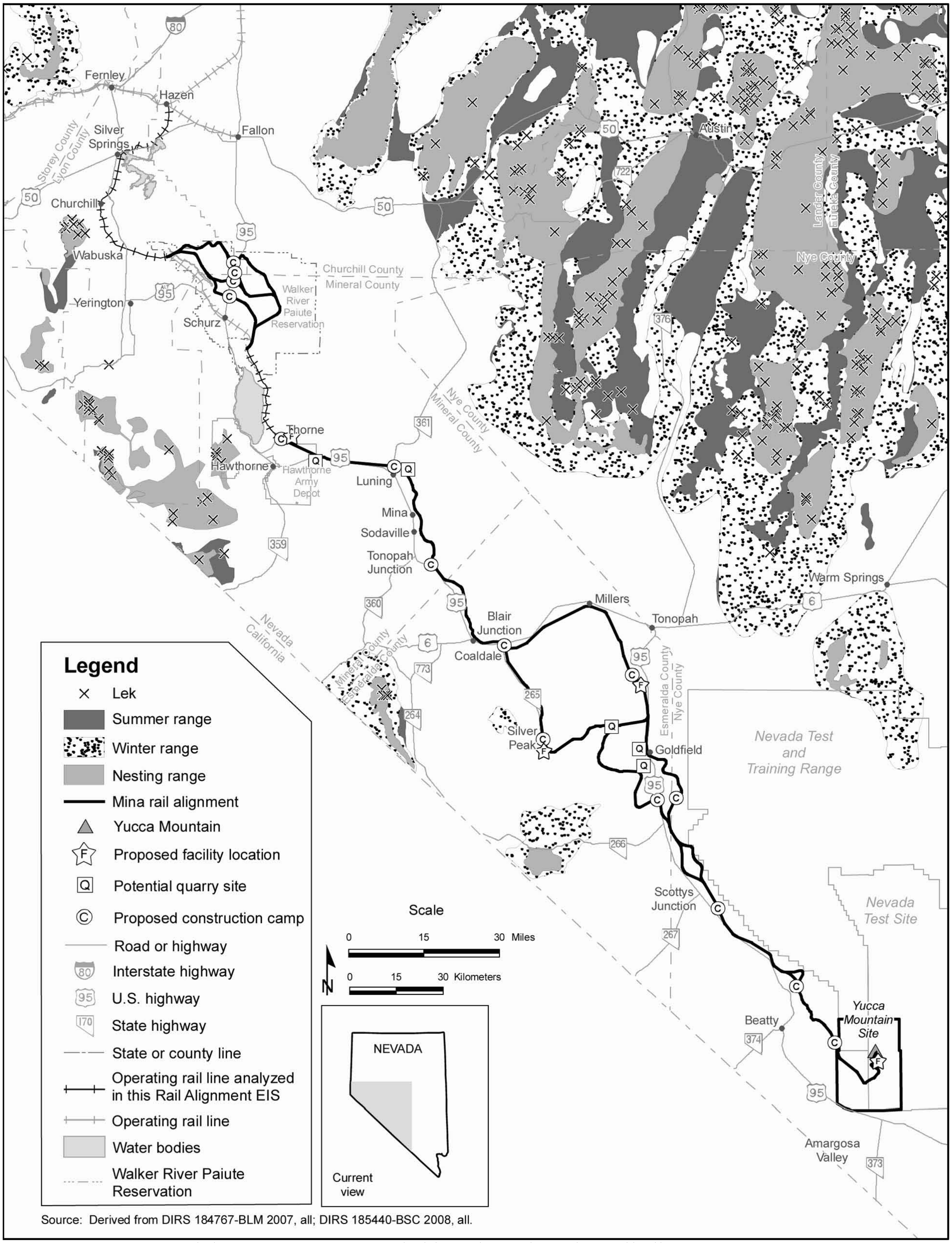


Figure 3-219. Potential greater sage-grouse habitat along the Mina rail alignment.

Populations of raptors are typically low in numbers and occurrence in the rail line construction right-of-way due to minimal roosting, nesting, and foraging potential along the alignment. Raptors observed during field surveys included prairie falcon (*Falco mexicanus*), red-tailed hawk (*Buteo jamaicensis*), rough-legged hawk (*Buteo lagopus*), northern harrier (*Circus cyaneus*), burrowing owl (*Athene cunicularia*), great-horned owl (*Bubo virginianus*), turkey vulture (*Cathartes aura*), and golden eagle (*Aquila chrysaetos)*. In addition, ferruginous hawks (*Buteo regalis*) have been reported to occupy, and in some cases nest in, areas with trees adjacent to the construction right-of-way (DIRS 174519-Bennett 2005, Plate 5).

Waterfowl are abundant within the study area in the vicinity of the Walker River. Common species include mallard (*Anas playrhynchos*), Canada goose (*Branta canadensis*), and blue-winged teal (*Anas discors*) (DIRS 182302-Miller Ecological Consultants 2005, p. 3-30).

Populations of bird species that rely on sagebrush habitat in Nevada are declining because cattle grazing and the proliferation of non-native weeds have degraded the native sagebrush habitat (DIRS 174518-BLM 2005, pp. 3.6-10 and 3.6-11). Sagebrush-dependent species that might occupy habitat along the proposed rail alignment could include sage thrasher (*Oreoscoptes montanus)*, sage sparrow (*Amphispiza belli*), Brewer's sparrow (*Spizella breweri*), and vesper sparrow (*Pooecetes gramineus*). The Mina rail alignment (Montezuma alternative segments 2 and 3) would cross sagebrush habitat in southeastern Railroad Valley and the Montezuma Range.

3.3.7.3.2.3 Reptiles. A variety of species of lizards and snakes are present throughout the southern Great Basin Desert and northern Mojave Desert and along the Mina rail alignment. Table H-6 in Appendix H lists the reptiles that could occur along the Mina rail alignment The desert tortoise *(Gopherus agassizii)* is found within the proposed rail alignment at its southern end, from the Goldfield area to Yucca Mountain. The most common lizard species observed during the 2005 and 2006 field surveys were:

- Western fence lizard (*Sceloporus occidentalis*)
- Western whiptail lizard (*Cnemidophorus tigris*)
- Long-nosed leopard lizard (*Gambelia wislezenii*)
- Side-blotched lizard (*Uta stansburiana*)
- Sagebrush lizard (*Sceloporus graciosus*)
- Desert horned lizard (*Phrynosoma platyrhinos*)

Other lizard species that were observed, but did not appear to be common, were:

- Zebra-tailed lizard (*Callisaurus draconoides*)
- Desert spiny lizard (*Sceloporus magister*)
- Desert iguana (*Dipsosaurus dorsalis*)

Great Basin collared lizards (*Crotaphytus bicinctores*) and desert night lizards (*Xantusia vigilis*) were not observed during field surveys, but probably occur in the study area and potentially in the construction right-of-way. Chuckwalla (*Sauromalus ater*) commonly occurs in the southern portion of common segment 6, although none were observed during field surveys. This species is found in rocky outcrops and is rarely seen above ground. Various other species of snakes are likely to occur in the study area and potentially in the construction right-of-way, but were not directly observed during field surveys.

3.3.7.3.2.4 Aquatic Species. Aquatic species are species that require wet environments for at least part of their life cycle. The only native fish species found within the Mina rail alignment study area are special status species and include:

- Lahontan cutthroat trout (*Onchorynchus clarki henshawii*)
- Railroad Valley springfish (*Crenichthys nevadae*)
- Oasis Valley speckled dace (*Rhinichthys osculus* ssp. 6 [unnamed])

Nine other species of amphibians may be found in the southern Great Basin Desert and northern Mojave Desert outside of the rail alignment study area or construction right-of-way and are listed in Appendix H. Potential amphibian habitat correlates with the riparian and wetland habitat found along the rail alignment. The Amargosa toad (*Bufo nelsoni*) occurs only in Oasis Valley north of Beatty. Non-native bullfrogs (*Rana catesbeiana*) are also present in some waterways and water bodies in the Mina rail alignment study area.

3.3.7.3.3 Special Status Species

Special status species are plants or wildlife species that are afforded some level of protection or special management under federal or state laws or regulations. Sections 3.3.7.3.3.1 and 3.3.7.3.3.2 describe two categories for special status species, including threatened or endangered species and BLM special status (designated sensitive) and State of Nevada protected species. Table 3-133 lists special status species, their BLM, state, and federal status, and their likely occurrence within the Mina rail alignment study area. Figures 3-212 and 3-213 show documented locations of special status species along the rail alignment from the Nevada Natural Heritage Program database. Not all special status species listed in Table 3-133 appear on the figures because this table represents a compilation of sources including the BLM, the U.S. Fish and Wildlife Service, the Nevada Department of Wildlife, or the Nevada Division of Forestry, and the Nevada Natural Heritage Program database (DIRS 185440-BSC 2008, all). The review of the Nevada Natural Heritage Program database for the study area revealed 54 special status species that occur or may occur within the study area and potentially within the construction right-of-way.

Table 3-133. Special status species potentially within the Mina rail alignment study area[a] (page 1 of 5).

Common name	Species name	Status			Portion of the Mina rail alignment where species could be found
		BLM[b]	State[c]	FWS[d]	
Plants					
Bodie Hills rockcress	*Arabis bodiensis*				
Eastwood milkweed	*Asclepias eastwoodiana*	N		xC2	Montezuma alternative segments 2 and 3
Cima milkvetch	*Astragalus cimae* var. *cimae*				Schurz alternative segments 4 and 5
Sodaville milkvetch	*Astragalus lentiginosus* var. *sesquimetralis*		P		Mina common segment 1
Black woollypod	*Astragalus funereus*	N		xC2	Common segment 6; Oasis Valley alternative segments 1 and 3
Tiehm buckwheat	*Eriogonum tiehmii*	N		xC2	Mina common segment 1
Dune sunflower	*Helianthus deserticola*				All segments
Oryctes	*Oryctes nevadensis*				Department of Defense Branchline South; Staging Yard at Hawthorne; Mina common segment 1

Table 3-133. Special status species potentially within the Mina rail alignment study area[a] (page 2 of 5).

Common name	Species name	Status			Portion of the Mina rail alignment where species could be found
		BLM[b]	State[c]	FWS[d]	
Plants (continued)					
Nevada dune beardtongue	*Penstemon arenarius*	N		xC2	Mina common segment 1; Schurz alternative segments 1, 4, and 5; Montezuma alternative segments 2 and 3; common segment 5
Pahute Mesa beardtongue	*Penstemon pahutensis*	N		xC2	Montezuma alternative segments 1 and 3
Rock purpusia	*Ivesia arizonica* var. *saxosa*	N			Common segment 6
Wassuk beardtongue	*Penstemon rubicundus*				All segments
Mono County phacelia	*Phacelia monoensis*	N		xC2	
Lone Mountain tonestus	*Tonestus graniticus*	N		xC2	Montezuma alternative segments 1 and 3
Invertebrates					
Oasis Valley pyrg	*P. micrococcus*	N		xC2	Oasis Valley alternative segments 1 and 3; common segments 5 and 6
Nevada viceroy	*Limenitis archippus lahontani*	N		xC2	
Early blue	*Euphilotes enoptes primavera*	N			Department of Defense Branchline South
White Mountains icarioides blue	*Icaricia icarioides albihalos*			xC2	Mina common segment 1
Fish					
Railroad Valley springfish	*Crenichthys nevadae*	--	T	LT	Schurz alternative segments 1 and 6
Oasis Valley speckled dace	*Rhinichthys osculus* spp. 6	N	P	--	Common segments 5 and 6; Oasis Valley alternative segments 1 and 3
Lahontan cutthroat trout	*Oncorhynchus clarki henshawi*	--	G	LT	Schurz alternative segments 1 and 6; Department of Defense Branchline South
Amphibians and reptiles					
Amargosa toad	*Bufo nelsoni*	N	P	--	Oasis Valley alternative segments 1 and 3; common segments 5 and 6
Southwestern toad	*Bufo microscaphus*	N			Common segment 6
Desert tortoise (Mojave Desert pop.)	*Gopherus agassizii*	N	T	LT	Common segment 6
Chuckwalla	*Sauromalus ater*	N	--	xC2	Common segment 6
Birds					
Common loon	*Gavia immer*	--	P	--	Department of Defense Branchline South
Western snowy plover	*Charadrius alexandrinus nivosus*	N	P	LT*	Department of Defense Branchline South
Western least bittern	*Ixobrychus exilis hesperis*	N	P	xC2	Montezuma alternative segments 1, 2 and 3; common segment 5

Table 3-133. Special status species potentially within the Mina rail alignment study area[a] (page 3 of 5).

Common name	Species name	Status BLM[b]	Status State[c]	Status FWS[d]	Portion of the Mina rail alignment where species could be found
Birds (continued)					
White-faced ibis	*Plegadis chihi*	N	P	xC2	Union Pacific Railroad Hazen Branchline; Department of Defense Branchline South; Mina common segment 1; Oasis Valley alternative segments 1 and 3; common segment 6
Western burrowing owl	*Athenes cunicularia*	N		xC2	All segments
Flammulated owl	*Otus flammeolus*	N	P	--	None
California spotted owl	*Strix occidentalis occidentalis*	N	P	xC2	None
Greater sage-grouse	*Centrocercus urophasianus*	N	G	--	Union Pacific Railroad Hazen Branchline; Montezuma alternative segment 1
Western yellow-billed cuckoo	*Coccyzus americanus*		P	C	Montezuma alternative segments 2 and 3
Southwestern willow flycatcher	*Empidonax traillii extimus*		E	LE	Montezuma alternative segments 2 and 3; Oasis Valley alternative segments 1 and 3
Ferruginous hawk	*Buteo regalis*	N		xC2	Montezuma alternative segments 2 and 3; common segment 5
Swainson's hawk	*Buteo swainsoni*	N		--	Schurz alternative segment 2; Oasis Valley alternative segments 1 and 3; common segment 6
Peregrine falcon	*Falco peregrinus*	N	E	NL	Oasis Valley alternative segments 1 and 3; common segment 6
Bald eagle	*Haliaeetus leucocephalus*	N	E	Delisted 2007	Union Pacific Railroad Hazen Branchline; Schurz alternative segments 1 and 4; Department of Defense Branchline South
Loggerhead shrike	*Lanius ludovicianus*	N	S	xC2	All segments
Sage thrasher	*Oreoscotes montanus*	N	S	--	Oasis Valley alternative segments 1 and 3; Montezuma alternative segments 2 and 3
Phainopepla	*Phainopepla nitens*	N		--	Oasis Valley alternative segments 1 and 3; common segment 6
Brewer's sparrow	*Spizella breweri*	N	S	--	Oasis Valley alternative segments 1 and 3; Montezuma alternative segments 2 and 3; common segment 6
Mammals					
Pygmy rabbit	*Brachylagus idahoensis*	N	G	xC2	Montezuma alternative segments 1 and 3
Pale kangaroo mouse	*Microdipidops pallidus*	--	P	--	Montezuma alternative segments 2 and 3
Dark kangaroo mouse	*Microdipodops megacephalus albiventer*	N	P	xC2	Montezuma alternative segments 2 and 3
Desert bighorn sheep	*Ovis canadensis*	N	G	--	Mina common segment 1; Montezuma alternative segments 2 and 3; Mina common segment 2; Bonnie Claire alternative segment 2; common segment 5; common segment 6

Table 3-133. Special status species potentially within the Mina rail alignment study area[a] (page 4 of 5).

Common name	Species name	Status			Portion of the Mina rail alignment where species could be found
		BLM[b]	State[c]	FWS[d]	
Mammals (continued)					
Townsend's big-eared bat	*Corynorhinus townsendii*	N	S	--	Schurz alternative segments 1 and 4; Department of Defense Branchline South; Goldfield alternative segment 4; Oasis Valley alternative segments 1 and 3; common segment 6
Spotted bat	*Euderma maculatum*	--	T	xC2	Schurz alternative segments 1 and 4; Department of Defense Branchline South
Western red bat	*Lasiurus blossivillii*	N	S	--	Schurz alternative segments 1 and 4; Department of Defense Branchline South; Goldfield alternative segment 4; common segment 5; Oasis Valley alternative segments 1 and 3; common segment 6
California myotis	*Myotis californicus*	N	--	--	Union Pacific Railroad Hazen Branchline; Schurz alternative segments 1 and 4; Department of Defense Branchline South; Goldfield alternative segment 4; common segment 5; Oasis Valley alternative segments 1 and 3; common segment 6
Little brown myotis	*Myotis lucifugus*	N	--	--	Union Pacific Railroad Hazen Branchline; Schurz alternative segments 1 and 4; Department of Defense Branchline South; Goldfield alternative segment 4; common segment 5; Oasis Valley alternative segments 1 and 3; common segment 6
Small-footed myotis	*Myotis ciliolabrum*	N	--	xC2	Union Pacific Railroad Hazen Branchline; Schurz alternative segments 1 and 4; Department of Defense Branchline South; Goldfield alternative segment 4; common segment 5; Oasis Valley alternative segments 1 and 3; common segment 6
Fringed myotis	*Myotis thysanodes*	N	P	xC2	Union Pacific Railroad Hazen Branchline; Schurz alternative segments 1 and 4; Department of Defense Branchline South; common segment 6
Big brown bat	*Eptesicus fuscus*	N			All segments
Greater western mastiff bat	*Eumops perotis*	N	S	xC2	All segments
Allen's lappet-browed bat	*Idionycteris phyllotis*	N	P	xC2	All segments
Hoary bat	*Lasiurus cinereus*	N			All segments
Pallid bat	*Antrozous pallidus*		P		All segments
Silver-haired bat	*Lasionycteris noctivagans*	N			All segments
California leaf-nosed bat	*Macrotus californicus*	N	S	xC2	All segments
Long-eared myotis	*Myotis evotis*	N			All segments
Cave myotis	*Myotis velifer*	N		xC2	All segments
Long-legged myotis	*Myotis volans*	N			All segments

Table 3-133. Special status species potentially within the Mina rail alignment study area[a] (page 5 of 5).

Common name	Species name	Status BLM[b]	State[c]	FWS[d]	Portion of the Mina rail alignment where species could be found
Mammals (continued)					
Yuma myotis	*Myotis yumanensis*	N			All segments
Western pipistrelle	*Pipistrellus hesperus*	N			All segments
Brazilian free-tailed bat	*Tadariada brasilliansis*	N	P		All segments

a. Source: DIRS 185440-BSC 2008, all.
b. BLM = U.S. Bureau of Land Management. Status definitions: N = designated sensitive by the BLM state office.
c. State = State of Nevada Protected Species (under NAC 503). Status definitions: G = game; P = protected; T = threatened; E = endangered; S = sensitive; CE = critically endangered plant; CY = state-protected cactus and yucca; CE# = recommended for listing as CE.
d. FWS = U.S. Fish and Wildlife Service. Status definitions: LE = listed endangered; LT = listed threatened; C = candidate, xC2= former Category-2 candidate, now "species of concern;" NL = not listed (removed from list); * = not listed part of range that overlaps project.
e. Numbers refer to unnamed subspecies.

3.3.7.3.3.1 Threatened and Endangered Species. Table 3-133 identifies six federally listed fish and wildlife species, or candidates for listing, with the potential to occur along the Mina rail alignment, including two fish, one reptile, and three bird species. However, in 2007, the U.S. Fish and Wildlife Service delisted the bald eagle and the golden eagle. These two species are protected under the Bald and Golden Eagle Protection Act, but are no longer federally listed (see Section 3.3.7.3.3.2). There are no federally listed mammals or plant species along the Mina rail alignment.

Fish The Lahontan cutthroat trout was listed as threatened in 1970 under the Endangered Species Act. This species is found in Walker Lake and its associated tributaries, including the Walker River up to the Weber Dam. Currently no Lahontan cutthroat trout are within the area proposed for the crossing of the Walker River due to the passage barrier of Weber Dam. In 2005 the Bureau of Reclamation completed the Record of Decision to repair and modify Weber Dam and include a fish passage structure. This structure is consistent with the recovery plan and will provide passage into the Walker River to the site where the rail line crossing would take place. The analysis for Lahontan cutthroat trout for the Mina rail alignment is based on the future foreseeable action of the Bureau of Reclamation's Record of Decision.

The Lahontan cutthroat trout is an inland subspecies of cutthroat trout belonging to the Salmonidae family. Life history characteristics are greatly influenced by stream conditions. Stream-dwellers generally live less than 5 years, and lake-dwellers live between 5 and 9 years. Lahontan cutthroat trout range between 25 and 38 centimeters (10 and 15 inches) in length, and feed on terrestrial and aquatic insects (DIRS 181900-Coffin and Cowan 1995, p. 22). Lahontan cutthroat trout, like other trout species, are found in a wide variety of cold-water habitats including large terminal alkaline lakes, such as Walker Lake. Generally, Lahontan cutthroat trout occur in cool flowing water with available cover, velocity breaks, well-vegetated and stable stream banks, and relatively silt free, rocky ***substrate*** in riffle-run areas. Spawning occurs in spring or early summer, the timing depending on stream flow and temperature.

Lacustrine Lahontan cutthroat trout populations have adapted to a wide variety of lake habitats from small alpine lakes to large desert waters.

The Railroad Valley springfish was listed as threatened in 1986 under the Endangered Species Act. The Railroad Valley springfish is the only fish species native to the thermal spring systems of Railroad Valley, Nye County, Nevada, and have been introduced into four other springs in Nevada. This species is typically found in warm spring pools, outflow streams, and adjacent marshes. Railroad Valley springfish have been documented to occur at the southernmost of two spring groups near Sodaville, Nevada. Railroad Valley springfish are uniquely adapted to survive in an environment of high water temperature

(30° to 38° Centigrade [86° to 100° Fahrenheit] at the spring source) and low dissolved-oxygen content (1.5 to 6.0 parts per million). In their natural environment, Railroad Valley springfish will occupy habitats with water temperatures at the extremes of their tolerance limits for limited amounts of time. There are no known springfish within the construction right-of-way or habitat that supports them that would be impacted by the Mina alignment.

Amphibians and Reptiles The desert tortoise, which is listed as threatened under the Endangered Species Act and by the State of Nevada (Mojave Desert population only), is found along the southern end of the Mina rail alignment from approximately Beatty Wash to Yucca Mountain (DIRS 101830-Bury et al. 1994, pp. 57 to 72). The desert tortoise's range in this portion of Nevada extends approximately 16 kilometers (10 miles) north of Beatty near Springdale (DIRS 176649-Williams 2003, all). Approximately 48 kilometers (30 miles) of the rail alignment is within potentially suitable desert tortoise habitat (Figure 3-220). Mojave Desert tortoises are generally confined to warm, creosote bush and shadscale (*Atriplex confertafolia*) scrub habitats with well-drained sandy loam soils. These soils are composed of sand or sandy gravel that permit the tortoises to burrow and nest (DIRS 102475-Brussard et al. 1994, p.15). The area through which common segment 6 would pass and the location of the Rail Equipment Maintenance Yard are not designated as critical habitat for the desert tortoise. This area is primarily considered low-density for the desert tortoise, with the population of tortoises at a low level in relation to other areas within the range of this species in Nevada. There are 12 records of this species along common segment 6; the closest record is approximately 0.2 kilometer (0.12 mile) away from common segment 6, which is outside of the construction right-of-way (Figure 3-220).

Birds The southwestern willow flycatcher, listed as endangered under the Endangered Species Act, is potentially present in Nevada from May through September, where it breeds in dense riparian habitat. This species' preferred habitat is typically dominated by willows, cottonwood, or invasive tamarisk. Southwestern willow flycatchers have been documented to occur approximately 19 kilometers (12 miles) north of Beatty, near Oasis Valley (DIRS 185440-BSC 2008, all). This recorded occurrence was approximately 4.4 kilometers (2.7 miles) southwest of Oasis Valley alternative segment 1 and well outside the Mina rail alignment construction right-of-way. Potentially suitable foraging and roosting habitat exists along Schurz alternative segments 1 and 4, where it passes within 0.8 kilometer (0.5 mile) of the Walker River. The nearest documented occurrence of this species is approximately 4.5 kilometers (2.8 miles) away from Oasis Valley alternative segment 1, outside the construction right-of-way (DIRS 185440-BSC 2008, all). There is no suitable breeding habitat for southwestern willow flycatchers within the construction right-of-way and this species has not been documented within the construction right-of-way. The area with the greatest potential for southwestern willow flycatchers is the area where the new construction would be on the old rail roadbed and where the river crossings would require some of the trees and surrounding riparian vegetation to be removed. However, this habitat is marginal and only a small amount would be affected by construction.

The yellow-billed cuckoo is a federal ***candidate species*** under the Endangered Species Act. The nearest documented nest site for this species was recently located near the City of Caliente and approximately 260 kilometers (160 miles) east of the Mina rail alignment (DIRS 173227-Micone and Tomlinson 2000, all; DIRS 173228-Gallagher, Tomlinson, and Furtek 2001, p. 10; DIRS 173229-Furtek, Tomlinson, and Griego 2002, pp. 13 to 21; DIRS 173230-Furtek, Tomlinson, and Willians 2003, pp. 18 to 23; DIRS 173231-Furtek and Tomlinson 2003, pp. 16 to 22). Yellow-billed cuckoos nest in tall cottonwood trees and willow riparian woodlands in the West and require patches of an average of 0.17 square kilometer (42 acres) of dense riparian habitat with at least 0.03 square kilometer (7 acres) of it closed canopy (DIRS 175505-Laymon and Halterman 1987, pp. 19 to 25). There is no suitable breeding habitat for yellow-billed cuckoos within the Mina rail alignment construction right-of-way. Potential suitable foraging and roosting habitat for this species is limited to riparian habitat along the Carson and Walker Rivers. These areas of riparian vegetation would not be disturbed during the construction phase.

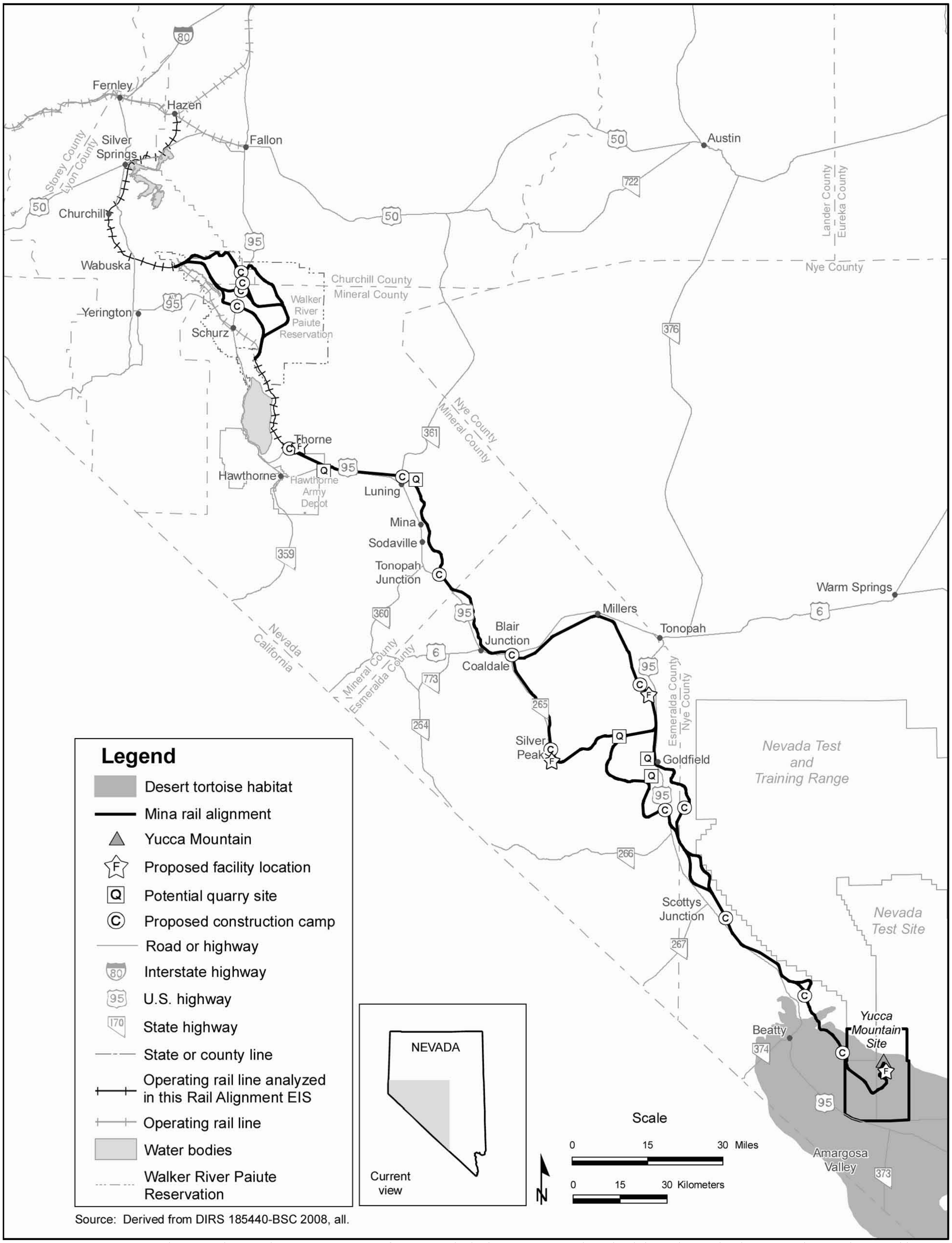


Figure 3-220. Estimated northern extent of potential desert tortoise habitat in relation to the Mina rail alignment.

The lack of confirmed records for this species throughout Nevada and the lack of sufficient breeding habitat within the Mina rail alignment construction right-of-way suggest that it is highly unlikely that the yellow-billed cuckoo would occur within the project area.

3.3.7.3.3.2 BLM Special Status and State of Nevada Protected Species. The BLM State Office and the State of Nevada have identified a number of species as requiring conservation and protection. The BLM State Office designates species as sensitive and the State of Nevada designates species as protected. Many of the species designated as sensitive by the BLM are also designated as protected by the State of Nevada. Additionally, a few ***BLM-designated sensitive species*** and State of Nevada-designated protected species are also listed as threatened, endangered, proposed, or candidate under the Endangered Species Act. Federally listed species are addressed above in Section 3.3.7.3.3.1. Table 3-133 lists BLM-designated sensitive and State of Nevada-designated protected species and provides information on their status and known or potential locations along the Mina rail alignment. These species are described below by plant and animal categories.

Plants DOE performed field surveys in June 2006 to confirm the presence of BLM-designated sensitive species and to identify potential habitat for such species along the Mina rail alignment. Appendix H contains detailed survey information.

In addition to location records for BLM-designated sensitive species obtained from the Nevada Natural Heritage Program (DIRS 185440-BSC 2008, all), these species were passively observed in other locations with habitat characteristics of the species. Because the field surveys did not cover the entire construction right-of-way, and there is both seasonality to the presence or absence of visible signs of plants and annual variability among plant species, the fact that a BLM-designated sensitive species was not documented at a specific location does not indicate a definitive absence of the species.

Bodie Hills rockcress is found growing in dry, rocky granitic sites associated with sagebrush within pinyon-juniper and mountain sagebrush communities in the range of 2,048 to 3,039 meter (6,720-9,970 feet) elevations (DIRS 181868-NNHP 2001, all). This species' known population in Nevada is limited to Mineral County within the Walker River watershed (DIRS 182068-NatureServe Explorer 2003, all). Potential habitat for this species occurs within the Wassuk Range and White Mountains west of Schurz but is not found within the construction right-of-way.

The Eastwood milkweed has been documented approximately 8 kilometers (5 miles) east of Montezuma alternative segments 2 and 3, near Mud Lake (DIRS 185440-BSC 2008, all), outside the construction right-of-way. It is also known to occur west of Tonopah and north of Silver Peak, 4.6 kilometers (2.9 miles) east of Montezuma alternative segment 1. Typical habitat for this species consists of sandy soils in mixed desert shrub or salt desert scrub, and sagebrush from 1,400 to 2,150 meters (4,600 to 7,000 feet) elevation (DIRS 181869-NNHP 2001, all).

Typical habitat for Cima milkvetch includes dry, barren calcareous slopes at elevations ranging from 1,554 to 1,956 meters (5,100 to 6,416 feet) (DIRS 181870-NNHP 2001, all). There are several areas along the Mina rail alignment that support potential habitat for this species, including the Calico Hills within the Terrill Mountain Range on the Walker River Paiute Reservation (Schurz alternative segments 4 and 5) and the southeast-facing side of the Montezuma Mountain Range (Montezuma alternative segments 1 and 3). There is a documented occurrence about 7 kilometers (4 miles) east of Department of Defense Branchline South on the west side of Highway 95 (DIRS 185440-BSC 2008, all), but no occurrences within the construction right-of-way for all segments.

Sodaville milkvetch has a limited range in Nevada and is associated with moist, alkaline drainages within the *Sarcobatus* ssp. community type and is wetland-dependent (DIRS 181871-NNHP 2001, all). This species was proposed to be listed under the Endangered Species Act in 1992 but the proposal was withdrawn in 1998 due to insufficient evidence of its habitat being threatened, and because one population occurs within lands designated as wilderness, where potential threats are minimized (Death Valley National Monument) (*Endangered and Threatened Wildlife and Plants; Withdrawal of Proposed Rule to List the Plants Astragalus lentiginosus var. micans (shining milk-vetch) and Astragalus lentiginosus var. sesquimetralis (Sodaville milk-vetch) as Threatened* [63 *FR* 53631, October 6, 1998]). One population has been documented near Sodaville, 2.5 kilometers (1.5 miles) west of Mina common segment 1 (DIRS 185440-BSC 2008, all) outside the construction right-of-way. Habitat for this population is associated with Soda Springs.

The black woollypod has been observed approximately 6 kilometers (4 miles) east of U.S. Highway 95, near Beatty Wash (Figure 3-216). The closest occurrence to the alignment is 240 meters (790 feet) southeast of the centerline of common segment 6, within the construction right-of-way. Field surveys along common segment 6 in Beatty Wash confirmed the presence of this species. This plant is common locally on very steep, gravelly slopes of light-colored volcanic tuff in the area where there is little competition from other species. Habitat for this species is characterized by open, talus, or gravelly slopes on alluvium soils composed of volcanic tuff around 975 to 2,340 meters (3,200 to 7,700 feet) elevation (DIRS 181872-NNHP 2001, all).

Tiehm buckwheat is known to occur within a small distribution range in Nevada in the Silver Peak Range. This species' preferred habitat consists of light-colored clay soils on steep slopes within the *Atriplex confertifolia* community type (DIRS 181873-NNHP 2001, all). Potential habitat occurs on the slopes within Soda Spring Valley, in the vicinity of Mina common segment 1. However, there are no documented occurrences of this species within the study area or construction right-of-way.

The dune sunflower is dependent on stabilized vegetated sand dunes or deep, loose sand on flats or slopes, associated with *Tetradymia* ssp. and *Sarcobatus* ssp. community types (DIRS 182786-Nevada Natural Heritage Program 2001, all). This species has been found just north of the Terrill Mountains, 1.8 kilometers (1 mile) north of Schurz alternative segment 6 and 0.8 kilometer (0.5 mile) southwest of Schurz alternative segment 1. Potential habitat for this species occurs throughout the Mina rail alignment construction right-of-way where deep sandy soils and sand dunes are present, but no species were found.

Oryctes is dependent on sand dunes or deep, loose sand within washes or flats and is associated with various salt desert shrubs (DIRS 181874-NNHP 2001, all). This species is widely distributed in Nevada but population density at known locations were found to be low (DIRS 181883-NatureServe Explorer 2007, all). Potential habitat occurs on the east side of Walker Lake at the base of the Agai Pah Hills. There is a known occurrence just northeast of Walker Lake about 4 kilometers (2.5 miles) from Department of Defense Branchline South, and another occurrence 1.4 kilometers (0.8 mile) northeast of Department of Defense Branchline South and 1.2 (0.7 mile) kilometers northwest from the proposed Staging Yard at Hawthorne. An additional occurrence is located within Soda Spring Valley, 0.5 kilometer (0.3 mile) from Mina common segment 1 (DIRS 185440-BSC 2008, all).

Nevada dune beardtongue is known to occur within sandy soils associated with *Sarcobatus vermiculatus* and *Atriplex canescens* at elevations between 1,195 to 1,817 meters (3,920 to 5,960 feet) (DIRS 181875-NNHP 2001, all). Potential habitat for this species occurs throughout the proposed Mina rail alignment construction right-of-way, primarily within the areas associated with Mina common segment 1 and Montezuma alterative segments 2 and 3. It has been documented 0.8 kilometer (0.5 mile) west of common segment 5 (DIRS 185440-BSC 2008, all).

Potential habitat for the Pahute Mesa beardtongue occurs within juniper-pinyon or sagebrush communities at elevations between 1,634 to 2,512 meters (5,360 to 8,240 feet) in rocky or loose soils (DIRS 181876-NNHP 2001, all). This species is known to occur within the Montezuma Range, 5.5 kilometers (3.4 miles) from Montezuma alternative segments 1 and 3 (DIRS 185440-BSC 2008, all).

Wassuk beardtongue potential habitat occurs within the entire Mina rail alignment. This species prefers rocky to gravelly soils with ephemeral washes, roadsides, and recently disturbed areas (DIRS 181877-NNHP 2001, all). This species is documented within the east side of the Wassuk Range. The closest recorded occurrence is 6.8 kilometers (4.2 miles) from the Department of Defense Branchline South (DIRS 185440-BSC 2008, all). However, several barriers (preventing population expansion and any potential impacts) occur between the rail alignment and this occurrence, including Walker Lake and Highway 95.

Mono County phacelia is typically found within sparsely vegetated disturbed soils or road berms associated with alkaline or clay-like soils at elevations between 1,804 to 2,760 meters (5,920 to 9,055 feet). Documented populations occur within the Wassuk Range (DIRS 181873-NNHP 2001, all). However, there are no documented occurrences of this species within the study area or construction right-of-way.

Lone Mountain tonestus or granite serpent weed grows within crevices or rock outcrops of granite at high elevations, 2,377 meters (7,800 feet), in the pinyon-juniper zone (DIRS 181878-NNHP 2001, all). One occurrence has been documented within the Weepah Hills, south of Montezuma alternative segments 2 and 3, and north of Montezuma alternative segment 1, but these occurrences are outside of the study area. There is potential habitat for this species within the Montezuma Peak area within the study area of Montezuma alternative segments 1 and 3, but no individuals were observed within the construction right-of-way during the 2006 and 2007 field surveys.

As defined in Section 3.2.7.3.3, special status species are species that are afforded some level of protection or special management under federal or state laws or regulations. Cacti, yucca, and Christmas trees (evergreen trees) are considered special status because the State of Nevada (NRS 527.060 through 527.120 and NAC 527.500) protects their unauthorized removal or destruction and regulates removal for commercial purposes, and, in addition, cacti and yucca are afforded consideration by the BLM under protocols for salvage and replanting for land reclamation consistent with BLM Manual 6840, *Special Status Species Management* (DIRS 172901-BLM 2001, all). DOE would comply with the requirements of Nevada State law, and pursuant to BLM protocols would salvage and replant the minimal amounts of cacti and yucca that would be removed from the right-of-way during the construction phase.

Invertebrates The Oasis Valley pyrg, a snail, is known to occur in the Amargosa River drainage in Oasis Valley. Specifically, this snail has been documented to occur in an unnamed spring near Fleur de Lis Spring 12 kilometers (7.5 miles) from the community of Springdale (DIRS 104593-CRWMS M&O 1999, all) and potentially inhabits other springs in the Amargosa River drainage. It has been documented to occur approximately 2 kilometers (1.2 mile) southeast of Oasis Valley alternative segment 1 (DIRS 185440-BSC 2008, all). This snail inhabits small springs and stream outflows where it is typically found on stone, travertine, watercress, and plant debris (DIRS 175029-NatureServe Explorer 2005, all).

The larval host plant for the colonial early blue butterfly is wild buckwheat (*Eriogonum* spp.) (DIRS 182785-Shapiro 2007, all). The closest documented occurrence of this colonial butterfly is approximately 10.5 kilometers (6.5 miles) west of Department of Defense Branchline South (DIRS 185440-BSC 2008, all).

In Nevada, the White Mountains Icarioides blue is currently known from Esmeralda and Mineral Counties (DIRS 181845-NatureServe Explorer 2007, all) where it feeds primarily on lupine (*Lupinus* spp.). The closest documented occurrence of this rare butterfly is approximately 7.9 kilometers (5 miles) from Mina common segment 1 (DIRS 185440-BSC 2008, all).

Fish The Oasis Valley speckled dace occurs in the Amargosa River drainage and Fleur de Lis Spring near Springdale and Beatty, approximately 3 kilometers (1.8 miles) southeast from Oasis Valley alternative segment 1. This subspecies has a very limited range and is only known from the watershed in Oasis Valley. Specific distribution of this fish varies with available water.

Amphibians and Reptiles The Amargosa toad is found in or near riparian habitats associated with the Amargosa River drainage (Oasis Valley) and at Fleur de Lis Spring, Crystal Spring, Indian Spring, and other springs and seeps near the towns of Springdale and Beatty (DIRS 174414-Stebbins 2003, pp. 209 and 210; DIRS 104593-CRWMS M&O 1999, p. 3-20). Vegetation bordering this toad's habitat includes cottonwood trees, cattails, and sedges. Adult toads hide and rest under bushes and in rodent burrows, and generally hibernate from November to March. If moist soil is available, open water might not be necessary for the adult toad to survive (DIRS 176795-BLM [n.d.], all). The nearest documented occurrence of this species is approximately 2.7 kilometers (1.7 miles) away from Oasis Valley alternative segment 1. This species has also been documented along common segment 6 (DIRS 185440-BSC 2008, all).

The chuckwalla has been documented in the southeastern foothills of Yucca Mountain, adjacent to common segment 6. This area represents the chuckwalla's northernmost range in southern Nevada. This large lizard is typically found among talus slopes, large rocky outcrops and boulders, which provide cover and basking sites (DIRS 174414-Stebbins 2003, pp. 269 to 270). This species has not been documented within the study area.

Birds Western burrowing owls are known to occur throughout the Mojave and Great Basin Deserts (DIRS 176455-Dickinson, ed. 1999, p. 256). DOE identified one burrowing owl burrow, which appeared to be active, near the Mina rail alignment in the vicinity of Yucca Mountain. Typical burrowing owl habitat is characterized by well-drained, level-to-gently sloping areas in arid or semi-arid environments. This species has been known to overwinter throughout Nevada; however, they are predominantly encountered during their breeding season from mid-March through September (DIRS 176361-Klute et al. 2003, p. 1-12).

Bald eagles almost exclusively occupy habitat associated with large bodies of water during the breeding season, but occasionally use upland areas for food and roost sites. They usually nest in tall trees and they feed opportunistically on fish, waterfowl and seabirds, various mammals, and carrion. In the winter, bald eagles preferentially roost in large, shelter-providing trees (DIRS 180967-NatureServe [n.d.], all). Nevada's only nesting pair of bald eagles has been documented at the Lahontan Reservoir and approximately 0.97 kilometer (0.6 mile) east of the existing Union Pacific Railroad Hazen Branchline (DIRS 181844-Westover 2007, all). In addition to using the Lahontan Reservoir, this species is likely to forage in the Carson and Walker Rivers and Walker Lake and Weber Reservoir.

Ferruginous hawks have been reported to occupy and, in some cases, nest in areas adjacent to the Mina rail alignment (DIRS 174519-Bennet 2005, plate 5). The ferruginous hawk is a relatively rare breeder in the study area. This species prefers to nest in trees; however, in Nevada tall trees are scarce, so the species is often found in pinyon-juniper associations or occasionally on shrubs or rocks on the ground. Potentially suitable habitat for this species is present in higher elevation woodlands near Montezuma alternative segments 1 and 3. No ferruginous hawks or nests were observed during the 2005 or 2006 field surveys, although they have been previously reported in the area.

Peregrine falcons are found in a wide variety of habitats during the breeding season, from tundra, moorlands, steppe, and seacoasts to mountains, open forested regions, and human population centers. They typically nest on rocky cliffs. Outside the breeding season, the falcons occur in areas where prey (primarily birds) concentrate, including farmlands, marshes, lakeshores, river mouths, tidal flats, dunes and beaches, broad river valleys, cities, and airports (DIRS 180966-NatureServe Explorer 2007, all). There is potential nesting habitat for peregrine falcons on cliffs throughout the Mina rail alignment but outside the construction right-of-way for all segments.

Loggerhead shrikes have been documented along the Mina rail alignment where suitable habitat is present. Habitat used by this species during the breeding season includes open country with scattered trees and shrubs, savanna, desert scrub (southwestern U.S.) and, occasionally, open woodlands (DIRS 180963-NatureServe Explorer 2007, all). They typically nest in thick brush, shrubs, or small trees in open areas. Potentially suitable habitat for loggerhead shrikes occurs along all segments of the Mina rail alignment.

Sage thrashers are known to occur in sagebrush habitat within the Mina rail alignment construction right-of-way. Habitat for this bird species consists of large stands of sagebrush, which can be found in areas where the rail alignment would cross mountain ranges, including the Blow Sand Mountains, Wassuk Range, Clayton Ridge, Goldfield Hills, and Montezuma Range. There is potential sagebrush habitat within the Railroad Valley.

Phainopepla is known to occur in the southern portion of the Mina rail alignment at Oasis Valley and common segment 6. This species inhabits desert scrub and desert woodland habitats (DIRS 176455-Dickinson, ed. 1999, p. 364).

Brewer's sparrows are strongly associated with sagebrush over most of their range, in areas with scattered shrubs and short grass (DIRS 180959-NatureServe Explorer 2007, all). Sagebrush habitat can be found in areas where the rail alignment would cross mountain ranges, including Blow Sand Mountains, Wassuk Range, Clayton Ridge, Goldfield Hills, and Montezuma Range. Brewer's sparrows are likely to occur in sagebrush habitat within the Mina rail alignment construction right-of-way.

Mammals The State of Nevada classifies desert bighorn sheep as a game species. As further discussed in Section 3.3.7.3.5, the State of Nevada manages the desert bighorn sheep as a game species throughout the state.

The pygmy rabbit (*Brachylagus idahoensis*), a small sagebrush-dependent rabbit, is well distributed throughout the Great Basin; however, overall the populations tend to be locally clustered in areas of high-density sagebrush, which they use for both cover and food. Field surveys did not indicate the presence of pygmy rabbit habitat in the study area of the Mina rail alignment (DIRS 174519-Bennett 2005, Plate 3). The nearest documented sign (scat) of a pygmy rabbit is from the Kawich Range in Nye County and more than 120 kilometers (75 miles) east of the Mina rail alignment study area (DIRS 181899-USAF 2007, pp. 50 and 51). There is no known suitable pygmy rabbit habitat within the construction right-of-way or study area of the Mina alignment.

The dark kangaroo mouse and the closely related pale kangaroo mouse are known to occur in appropriate habitat near Goldfield (DIRS 174519-Bennett 2005, plates 1 and 2). Habitat for these two mice species is characterized by alkali (salt) sinks and desert scrub dominated by shadscale or big sagebrush. These rodents usually prefer soft sand accumulated at bases of shrubs for burrow sites (DIRS 176370-O'Farrell and Blaustein 1974, pp. 1 and 2; DIRS 176372-O'Farrell and Blaustein 1974, p. 1).

There are 23 species of bats in Nevada. In general, bats are highly mobile and all of the 23 species could at some time of the year fly over or, if appropriate habitat exists, roost and forage near the Mina rail alignment. Twenty-one of the 23 species of bats that occur in Nevada are considered BLM-sensitive (DIRS 172900-BLM 2003, p. 2) and nine are State of Nevada protected. Of these bat species, seven have a strong probability of utilizing habitat along the rail alignment (DIRS 181865-Bradley et al. 2006, all), as follows:

- Pallid bat
- Townsend's big-eared bat
- Big brown bat
- Small-footed myotis bat
- Western pipistrelle bat
- Brazilian free-tailed bat

- California myotis bat

All of these bat species are commonly found throughout the Mojave and southern Great Basin Deserts. These species are known to roost in cliff faces, caves, rocky outcrops, and man-made structures where available. Bats are also known to forage over natural or artificial water sources.

3.3.7.3.4 Migratory Birds

More than 300 species of birds are commonly observed in southern Nevada, including year-round residents, seasonal migrants that breed in southern Nevada, winter residents that breed in the north, and seasonal migrants that pass through southern Nevada while traveling in spring and fall between breeding ranges to the north and winter ranges to the south. All of the migratory birds found along the Mina rail alignment are protected under the Migratory Bird Treaty Act (16 U.S.C. 703 *et seq*.) and Executive Order 13186. Appendix H, Table H-4, lists bird species that could occur in the construction right-of-way.

3.3.7.3.5 State of Nevada Game Species

The Mina rail alignment would cross several areas designated as game habitat (DIRS 173224-BLM 1997, Maps 9 to 13; DIRS 174518-BLM 2005, Maps 3.6-1 to 3.6-4). As shown in Table 3-133, three game species that occur, or have the potential to occur, within or near the construction right-of-way are cross-listed as BLM-designated sensitive, are state protected, or both. The game species that are also BLM-designated sensitive include greater sage-grouse, pygmy rabbit, and desert bighorn sheep. The Nevada Department of Wildlife actively manages the desert bighorn sheep as a big game animal. Its distribution is shown on Figure 3-221. Other game species that could be affected by the proposed railroad construction and operation include mule deer, pronghorn antelope, and mountain lion. Figures 3-222 and 3-223 indicate the general habitat locations for mule deer and pronghorn antelope, respectively. Mountain lions occur throughout the State of Nevada in canyon, mountain, and forested areas; therefore, no distribution map is included for this species.

3.3.7.3.5.1 Desert Bighorn Sheep. Desert bighorn sheep are found predominantly in lower foothills and grasslands of mountain ranges, often where terrain is rough, rocky and steep, and broken up by canyons and washes. Desert bighorn sheep require access to freestanding water, especially during the summer, and distribution of water holes significantly influences patterns of home-range movement (DIRS 176363-Shackleton 1985, p. 4). Any natural or artificial water sources within this species' range could be subject to desert bighorn use. Year-round habitat for this species is found throughout much of the Mina alignment from south of Schurz to the Yucca Mountain Site. Common segment 6 would cross a ***movement corridor***, or an area of high use at certain times of the year, in the Beatty Wash area (Figure 3-221). The Mina rail alignment would not cross any crucial habitat for this species.

3.3.7.3.5.2 Mule Deer. Mule deer are fairly common in southern Nevada and throughout the western United States, and are found in a variety of habitats from coniferous forests at high elevations to desert shrub, chaparral, and grasslands at lower elevations (DIRS 176454-Whitaker 1992, p. 652). Mule deer are often associated with successional vegetation, especially near agricultural lands. Mule deer are found along the entire Mina rail alignment (Figure 3-222), but would most likely be encountered near the communities of Wabuska and Silver Peak. The rail alignment would not cross any mule deer crucial habitat.

3.3.7.3.5.3 Pronghorn Antelope. Most of the Mina rail alignment would abut year-round pronghorn antelope habitat located east of the rail alignment from Schurz to Beatty (Figure 3-223). The only areas of the rail alignment that would cross year-round pronghorn habitat would be between Churchill and Wabuska and also between Mills and Goldfield. Pronghorn antelope are generally found at lower elevations in open desert grasslands, salt desert scrub, or bunchgrass-sagebrush vegetation in the valleys and foothills throughout the western United States. This species also occurs in dense sagebrush communities at higher elevations during the breeding season (DIRS 176454-Whitaker 1992, pp. 662 and 663). The Nevada Department of Wildlife did not identify these areas as pronghorn antelope augmentation sites.

3.3.7.3.5.4 Mountain Lion. Mountain lions occur throughout the State of Nevada in low numbers in canyon, mountainous, and forested areas (DIRS 103439-Hall 1995, pp. 269 to 271) and are known to occur within the study area of the Mina rail alignment. Adult mountain lions are generally tawny in color with a white underbelly and are approximately 6 to 8 feet long (DIRS 103439-Hall 1995, pp. 269 to 271). The mountain lion's diet consists mostly of deer; however, they will also feed on rabbits and large rodents. This species is shy, solitary, secretive, and active mostly at night (DIRS 103439-Hall 1995, pp. 269 to 271).

Section 3.3.7.3.5 provides more information on this species and the other game mammals present in the study area.

3.3.7.3.6 Wild Horses and Burros

Wild horses are generally presumed to descend from horses that were released by, or escaped from, settlers of western North America, possibly dating as far back as Spanish settlers in the 1600s. The size, color, and confirmation of the horses depend on the type of stock or breed from which the wild horses descended (DIRS 174518-BLM 2005, p. 3.8-1).

Generally, burros live in the lower elevations year-round, while wild horses reside in the higher elevations in summer and migrate to the lower elevations in winter. Both wild horses and burros will travel as far as 16 kilometers (10 miles) away from permanent water sources. Their diets vary–burros prefer shrubs, while horses tend to prefer grasses (DIRS 103079-BLM 1998, p. 3-48).

Wild horse herd areas were originally identified by federal agencies in 1971, with passage of Public Law 92-195, the Wild Free-Roaming Horses and Burros Act. The BLM has delineated herd management areas within the wild horse herd areas. Each herd management area has an appropriate management level determined by the BLM through a rangeland assessment and a public review process. The appropriate management level is the number of wild horses and burros the herd management area population is managed to, and it is established to avoid the ecological degradation of the herd management area and any riparian areas within each herd management area (DIRS 176364-Department of Conservation & Natural Resources [n.d.], all).

The Mina rail alignment would cross approximately 7 designated wild horse and burro herd management areas (Figure 3-214). Appendix H provides detailed information on the individual herd management areas. Table 3-134 identifies each Mina rail alignment alternative segment and common segment that would cross or lie within herd management areas and describes the location, size, and management level of each herd management area.

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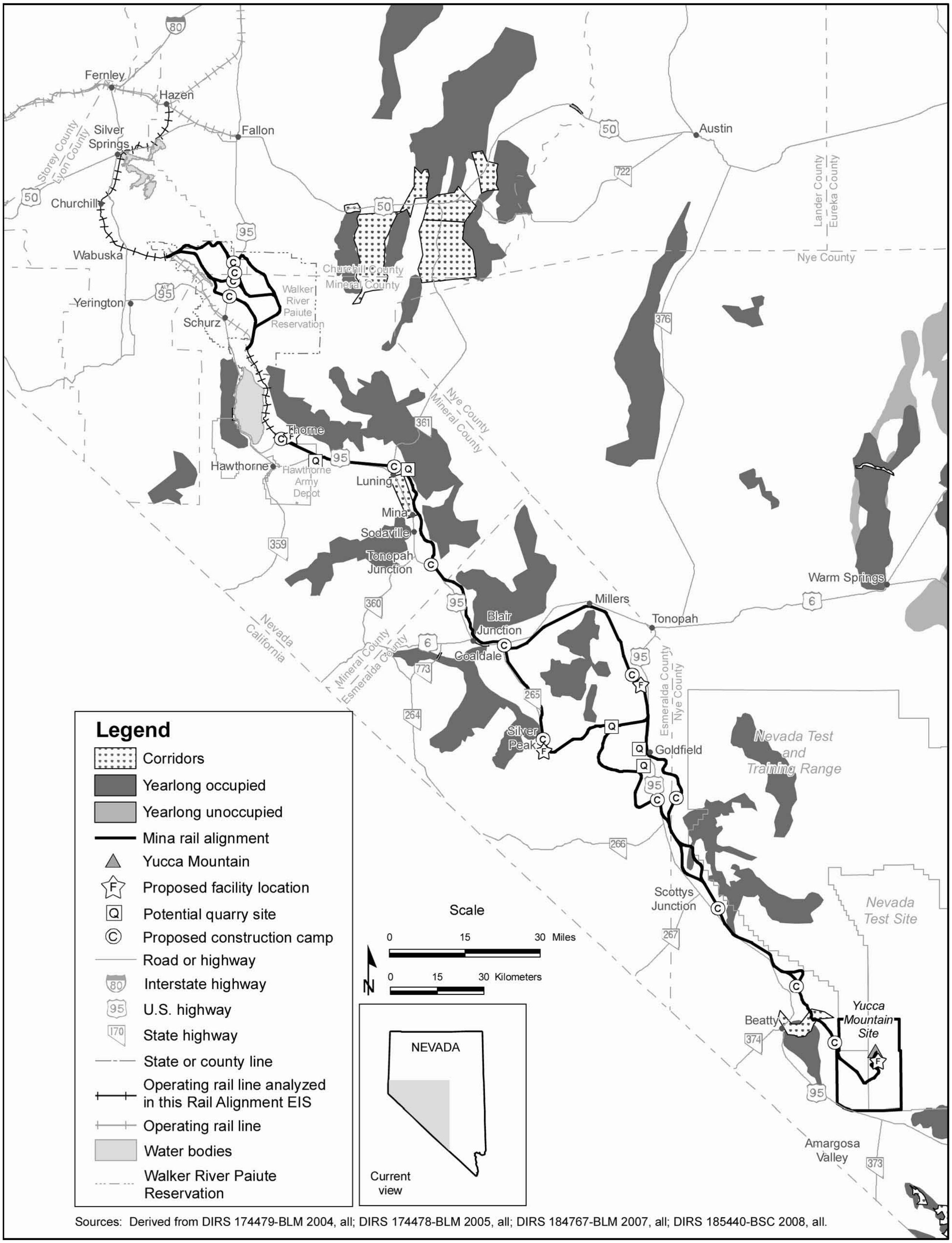


Figure 3-221. Desert bighorn sheep habitat along the Mina rail alignment.

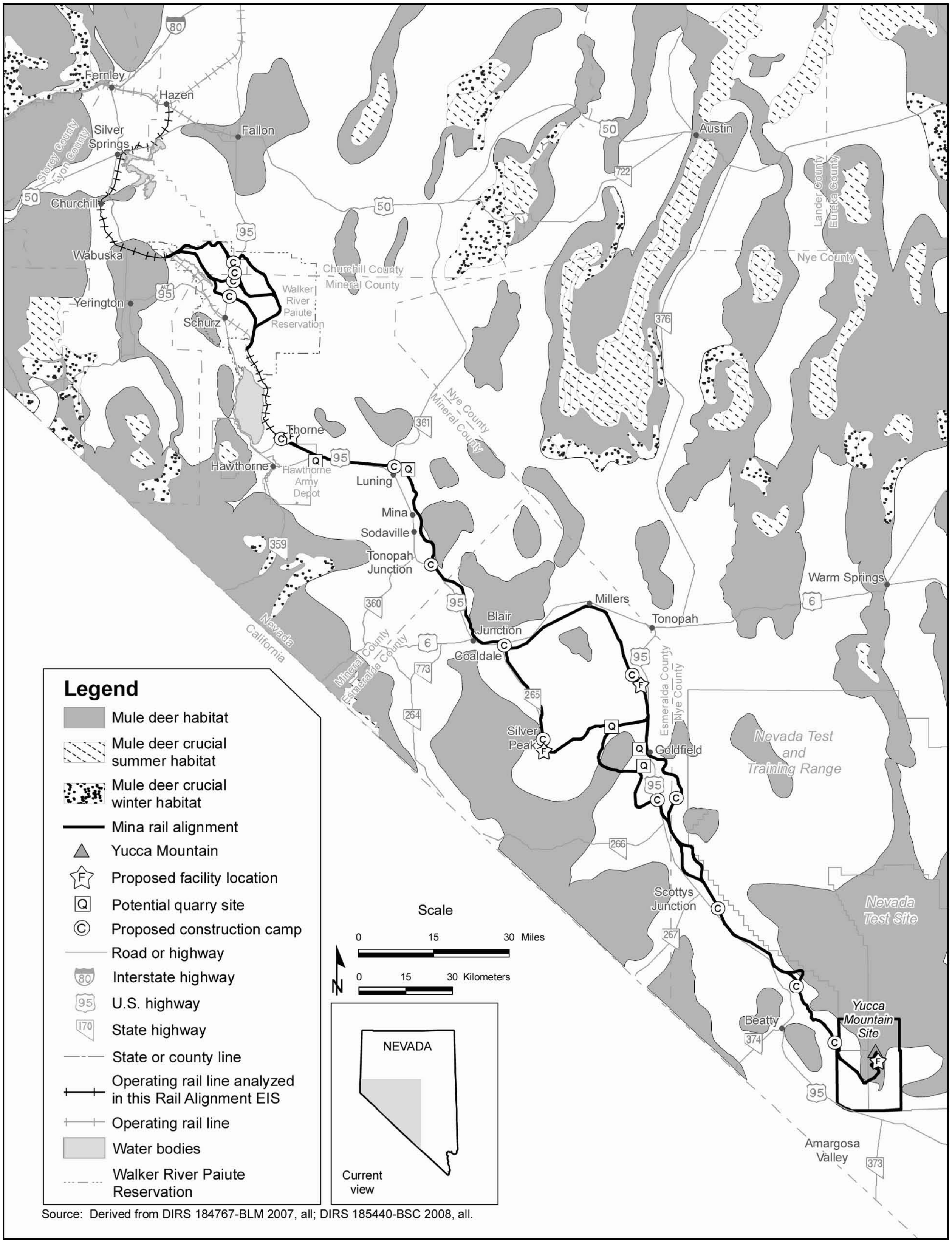


Figure 3-222. Mule deer habitat along the Mina rail alignment.

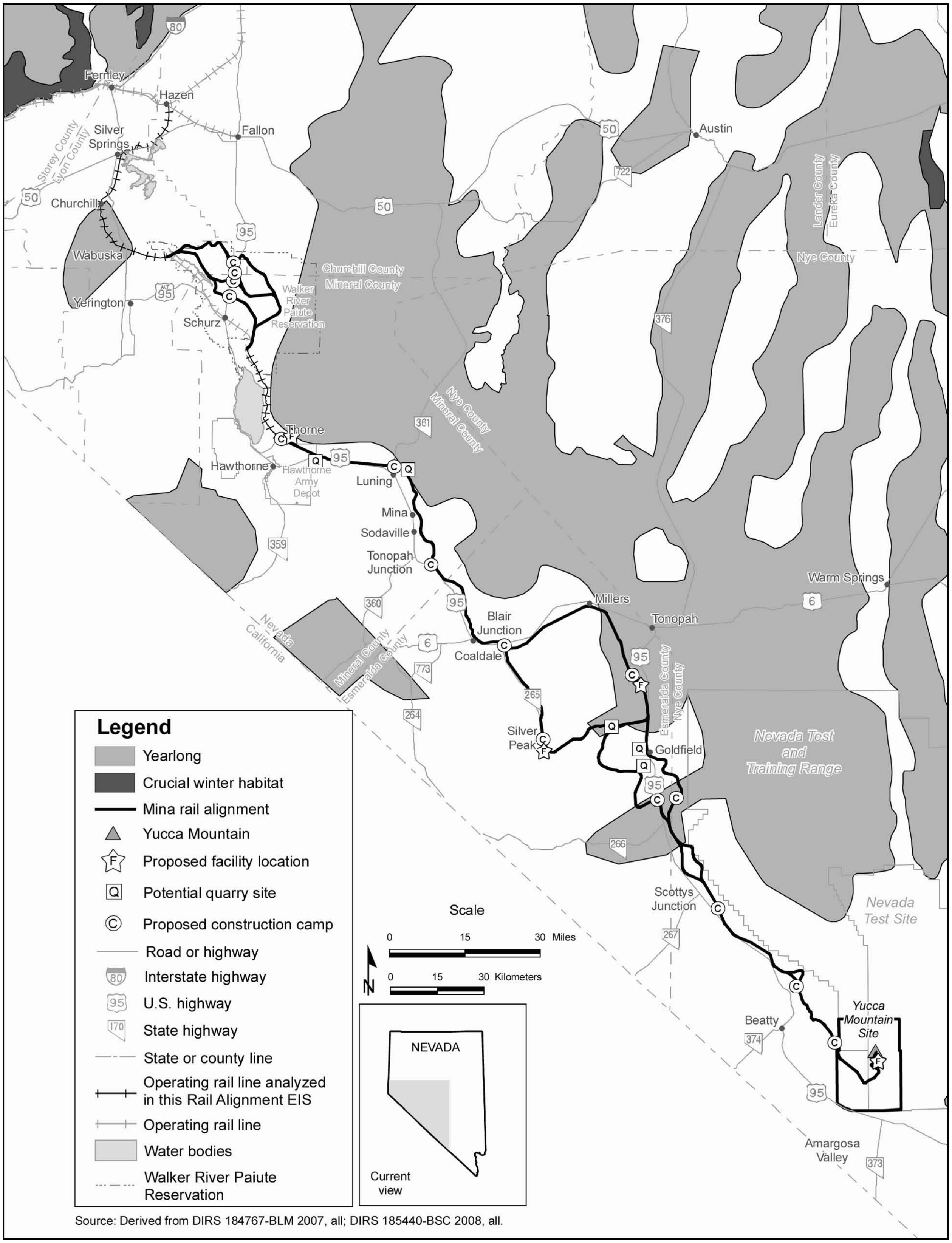


Figure 3-223. Pronghorn antelope habitat along the Mina rail alignment.

Table 3-134. Herd management areas the Mina rail alignment would cross.[a]

Herd management area	Location	Area (acres)[b]	Appropriate management level	Segment that would cross area
Horse Mountain	North of Schurz	48,000	0	Schurz alternative segment 6
Pilot Mountain	North-northeast of U.S. Highway 95, from Thorne to Blaire Junction	480,000	346 horses 0 burros	Mina common segment 1
Silver Peak	East of Silver Peak	240,000	61 horses 15 burros	Montezuma alternative segment 1
Goldfield	East of Goldfield	64,000	125 horses 50 burros	Montezuma alternative segment 2
Montezuma Peak	West of Goldfield	75,500	146 horses 10 burros	Montezuma alternative segments 1, 2, and 3
Stonewall	West of Lida Junction and south of Goldfield	24,800	50 horses 25 burros	Mina common segment 2; Bonnie Claire alternative segments 2 and 3
Bullfrog	Surrounds Beatty	128,000	12 horses 185 burros	Oasis Valley alternative segments 1 and 3; common segment 6

a. Sources: DIRS 174047-Bennett 2005, all; DIRS 174046-Bennett 2005, all; DIRS 174479-BLM 2003, all; DIRS 174478-BLM 2005, all; DIRS 174329-BLM [n.d.], all; DIRS 174333-BLM [n.d.], all; DIRS 174332-BLM [n.d.], all; DIRS 174330-BLM [n.d.], all; DIRS 173064-BLM 2007, all; DIRS 173063-BLM [n.d.], all; DIRS 173062-BLM [n.d.], all; DIRS 173061-BLM [n.d.], all; DIRS 173060-BLM [n.d.], all; DIRS 173059-BLM [n.d.], all; DIRS 173057-BLM [n.d.], all; DIRS 174518-BLM 2005, all; DIRS 181843-Westover 2007, all.

b. To convert acres to square kilometers, multiply by 0.0040469.

3.3.8 NOISE AND VIBRATION

This section describes existing noise and vibration in the Mina rail alignment region of influence. Section 3.3.8.1 describes the region of influence; Section 3.3.8.2 describes general regional characteristics for noise and vibration; and Section 3.3.8.3 describes the existing noise and vibration in more detail for the Mina rail alignment alternative segments and common segments.

Noise is considered a source of pollution because it can be a human health hazard. Potential health hazards range from hearing impairment at very high noise levels to annoyance at moderate to high noise levels. Sound waves are characterized by frequency and measured in ***hertz***; sound pressure is expressed as ***decibels*** (dB). Appendix I, Noise and Vibration Assessment Methodology, provides more information on the fundamentals of analyzing noise.

With the exception of prohibiting nuisance noise, neither the State of Nevada nor local governments have established numerical noise standards. Nevertheless, many federal agencies use ***day-night average noise levels*** (DNL) as guidelines for land-use compatibility and to assess the impacts of noise on humans.

Day-night average noise level (DNL): The energy average of A-weighted decibels (dBA) sound level over 24 hours; includes an adjustment factor for noise between 10 p.m. and 7 a.m. to account for the greater sensitivity of most people to noise during the night. The effect of nighttime adjustment is that one nighttime event, such as a train passing by between 10 p.m. and 7 a.m., is equivalent to 10 similar events during the day.

A-weighted decibels (dBA): A measure of noise level used to compare noise from various sources. A-weighting approximates the frequency response of the human ear.

For the operation of trains during proposed railroad construction and operations, DOE analyzed noise impacts under established STB criteria. The STB has environmental review regulations for noise analysis (49 CFR 1105.7e(6)), with the following criteria:

- An increase in noise exposure as measured by DNL of 3 ***A-weighted decibels*** (dBA) or more.
- An increase to a noise level of 65 DNL or greater.

If the estimated noise level increase at a location exceeds either of these criteria, the STB then estimates the number of affected noise-***sensitive receptors*** (such as schools, libraries, residences, retirement communities, nursing homes). The two components (3 dBA increase, 65 DNL) of the STB criteria are implemented separately to determine an upper bound of the area of potential noise impact. However, current noise research indicates that both criteria components must be met to cause an adverse impact from noise (DIRS 173225-STB 2003, p. 4-82). That is, noise levels would have to be greater than or equal to 65 DNL and increase by 3 dBA or more for an adverse noise impact to occur.

There are three potential ground-borne vibration (vibration propagating through the ground) impacts of general concern: annoyance to humans, damage to buildings, and interference with vibration-sensitive activities. To evaluate potential impacts of vibration from construction and operations activities, DOE used Federal Transit Administration building vibration damage and human annoyance criteria. Under these criteria, if vibration levels exceeded 80 VdB (human annoyance criterion for infrequent events) or if the vibration levels (measured as ***peak particle velocity***) exceeded 0.20 inches per second for fragile buildings or 0.12 inches per second for extremely fragile historic buildings, then there could be an impact from vibration (DIRS 177297-Hanson, Towers, and Meister 2006, all). Appendix I provides more information on the vibration metrics used in this study.

3.3.8.1 Region of Influence

Ambient noise: The sum of all noise (manmade and natural) at a specific location over a specific time is called ambient noise.

The region of influence for noise and vibration for construction and operation of a rail line along the Mina rail alignment includes the construction right-of-way out to variable distances, depending on several analytical factors (ambient noise level, train speed, number of trains per day, and number of railcars). Similarly, the region of influence for the railroad construction and operations support facilities depends on the magnitude of noise that would be generated and ambient noise levels, which would affect how far away the noise might be heard.

The region of influence for the Mina rail alignment also includes the existing Union Pacific Railroad Hazen Branchline from Hazen to Wabuska and the existing Department of Defense Branchlines (North, through Schurz, and South) from Wabuska to Hawthorne. These existing rail lines are included in the region of influence because under the Proposed Action, rail traffic on these lines would increase substantially above existing levels. STB regulations at 49 CFR Part 1105.7(e)(6) require analysis of potential noise impacts where a proposed action would result in an increase in rail traffic of at least 100 percent (measured in gross ton miles annually).

In areas with low ambient noise conditions along the Mina rail alignment, project-related noise might be heard farther away. Therefore, the region of influence varies along the rail alignment. In addition, DOE has reviewed recent aerial photographs along the entire rail alignment to identify the locations of receptors in the region of influence that might be affected by noise, vibration, or both.

3.3.8.2 General Regional Characteristics for Noise and Vibration

The Mina rail alignment is primarily in a quiet desert environment where natural phenomena such as wind, rain, and wildlife account for most of the ambient noise. Manmade noise in some areas of the region of influence is caused by vehicles traveling along public highways and high altitude commercial jets. At present, there is train activity on the existing Union Pacific Railroad Hazen Branchline from Hazen to Wabuska and on the existing Department of Defense Branchline from Wabuska to Hawthorne. Baseline noise conditions vary somewhat along the rail alignment and are site-specific. Most of the region of influence for the Mina rail alignment is typical of other desert environments in which the DNL values range from 14 decibels on a calm day to 38 decibels on a windy day (DIRS 102224-Brattstrom and Bondello 1983, p. 170). Areas within the region of influence are sparsely populated and, in general, ambient noise levels are low. The noise level at a specific location depends on nearby and distant sources of noise. Noise levels in populated areas tend to be higher than in unpopulated areas because of human activity and higher levels of transportation noise (Figure 3-224).

50 dBA[a]	60 dBA	70 dBA	80 dBA
Small-town residential	Urban residential	Very noisy urban residential	Downtown city

a. dBA = A-weighted decibels.
b. Source: DIRS 101821-EPA 1974, p. 23.

Figure 3-224. Typical DNLs for residential areas.[b]

Ground-borne vibration occurs as a result of both natural phenomena (such as seismic activity) and manmade activities (such as construction and transportation activities). Human activities that can create perceptible levels of ground-borne vibration are important when sensitive sites, structures, or activities could be affected. Background vibration exists as a component of the overall effects of ground-borne vibration, higher in areas with more human activity, lower in areas more distant from human activities. Vibration levels in populated areas tend to be higher than in unpopulated areas because of human activity and higher levels of transportation vibration. Background levels of ground-borne vibration along the Mina rail alignment are low.

3.3.8.3 Existing Environments for Noise and Vibration at Four Measurement Locations along the Mina Rail Alignment

DOE evaluated existing noise and vibration conditions along the Mina rail alignment and compiled the detected ranges of noise and vibration levels at different locations under different conditions. Up to four trains per week travel on the existing track in Silver Springs and two trains per week in Schurz. Locomotive horns are currently sounded at three grade crossings in Silver Springs. Because existing rail traffic volume is low, DOE measured existing noise and vibration to represent existing conditions. Most of the region of influence for the rail alignment is sparsely populated and, in general, ambient noise levels are low and there are no detectable vibrations. DOE measured ambient noise and vibration levels from March 5 to March 6, 2007, at two locations along the Mina rail alignment (Silver Peak and Mina) and two locations along the existing Union Pacific Railroad Hazen Branchline and Department of Defense Branchlines (Schurz and Silver Springs). DOE had also taken ambient noise and vibration measurements at Goldfield on January 12, 2005. DOE selected these locations for ambient noise and vibration measurements because they are representative of the few populated areas within the region of influence. The ambient noise measurements at these representative locations along the rail alignment ranged from 34 to 48 DNL and ambient vibration levels were so low that they were essentially unmeasurable for Silver Springs, Schurz, Mina, and Silver Peak. The measured ambient vibration level in Goldfield was 25 VdB. Table 3-135 summarizes the measured ambient noise levels in Goldfield, Silver Peak, Mina, Schurz, and Silver Springs.

Table 3-135. Ambient noise measurements along the Mina rail alignment.

Location	DNL dBA[a]
Silver Springs	47
Schurz	48
Mina	44
Silver Peak	34
Goldfield	47

a. DNL dBA = day-night average noise level in A-weighted decibels.

3.3.8.3.1 Silver Peak

DOE took noise measurements for a 24-hour period in Silver Peak, Nevada, on March 5, 2007. The measured DNL was 34 dBA. Because there was almost no observable human activity in this area during the measurements, noise levels were very low. Measured noise levels at Silver Peak are substantially lower than the "small-town residential" category shown on Figure 3-224.

Figure 3-225 shows measured noise levels taken at Silver Peak over a 24-hour period. Hourly ***equivalent sound levels*** ranged from 17 to 39 dBA. There was little observable human activity during the measurements, except for very infrequent car passbys and occasional high-altitude commercial jet aircraft. Figure 3-226 shows the location where DOE took the ambient noise measurements in Silver Peak.

Equivalent sound level (Leq): A single value of sound level for any desired duration (such as 1 hour), which includes all of the time-varying sound energy in the measurement period. Leq correlates reasonably well with the effects of noise on people, even for wide variations in environmental sound levels and time patterns. It is used when only the durations and levels of sound, and not their times of occurrence (day or night), are relevant.

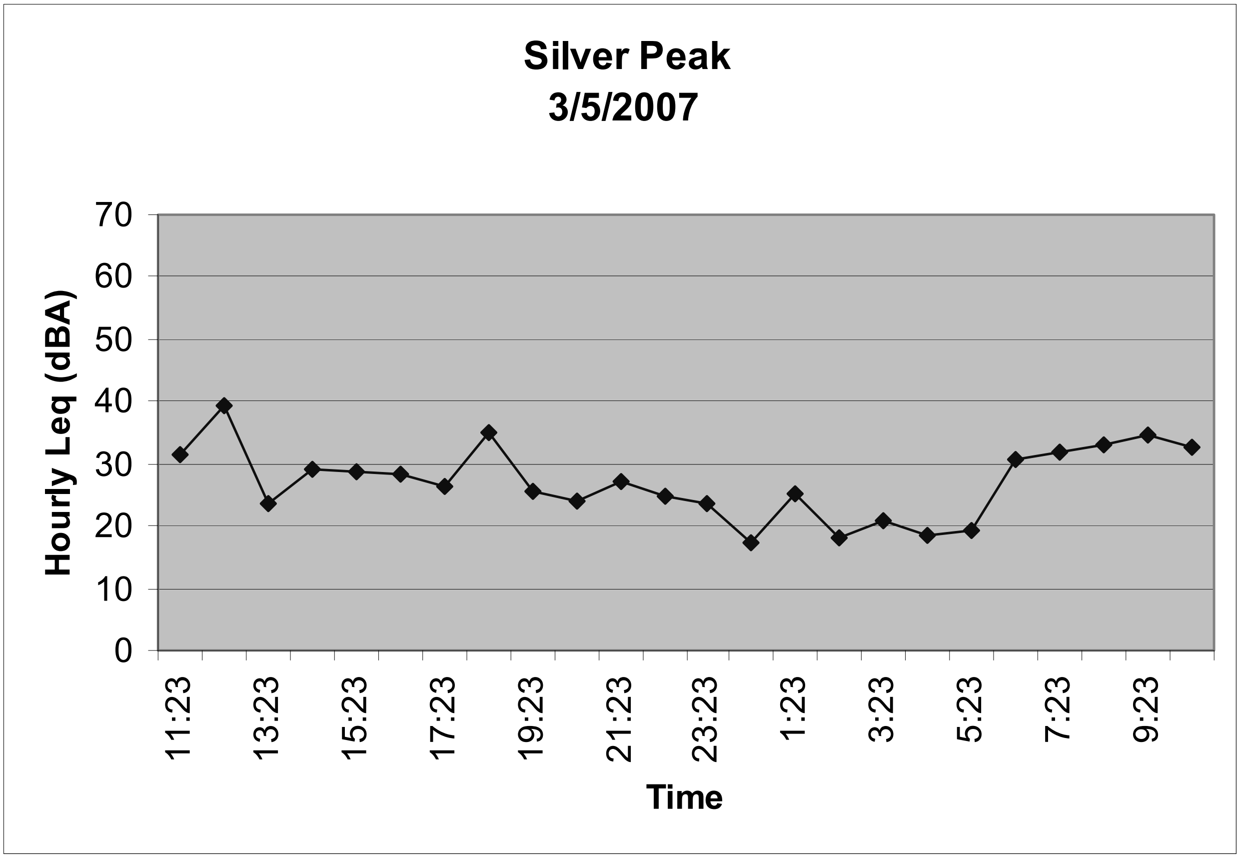


Figure 3-225. Measured noise levels over a 24-hour period in Silver Peak, Nevada.

DOE also took ambient ground-borne vibration measurements at Silver Peak on March 5, 2007. Ground-borne vibration was not measurable at this location because the vibration level was very low. Ambient vibration levels were very low at this location because of the lack of vibration-producing activities. Ambient vibration levels of this magnitude are lower than human perception levels.

3.3.8.3.2 Mina

DOE took noise measurements for 24 hours on March 6, 2007, in Mina, Nevada. Hourly equivalent sound level values ranged from 30 to 40 dBA, as shown on Figure 3-227. Noise sources included occasional traffic on U.S. Highway 95, which passes through Mina. Figure 3-228 shows where DOE took the ambient noise measurements in Mina. The measured DNL in Mina was 44 dBA, which is lower than the “small-town residential” category shown on Figure 3-224.

DOE also took ambient ground-borne vibration measurements at Mina on March 5, 2007. Ground-borne vibration was not measurable at this location because the vibration level was very low. Ambient vibration levels were very low at this location because of the lack of vibration producing activities. Ambient vibration levels of this magnitude are lower than human perception levels.

3.3.8.3.3 Schurz

DOE measured noise in Schurz near the existing Department of Defense Branchline on the Walker River Paiute Reservation for 24 hours on March 5, 2007. Hourly equivalent sound level values ranged from 32 to 56 dBA, as shown on Figure 3-229.

Figure 3-226. Ambient noise monitoring location at Silver Peak, Nevada.

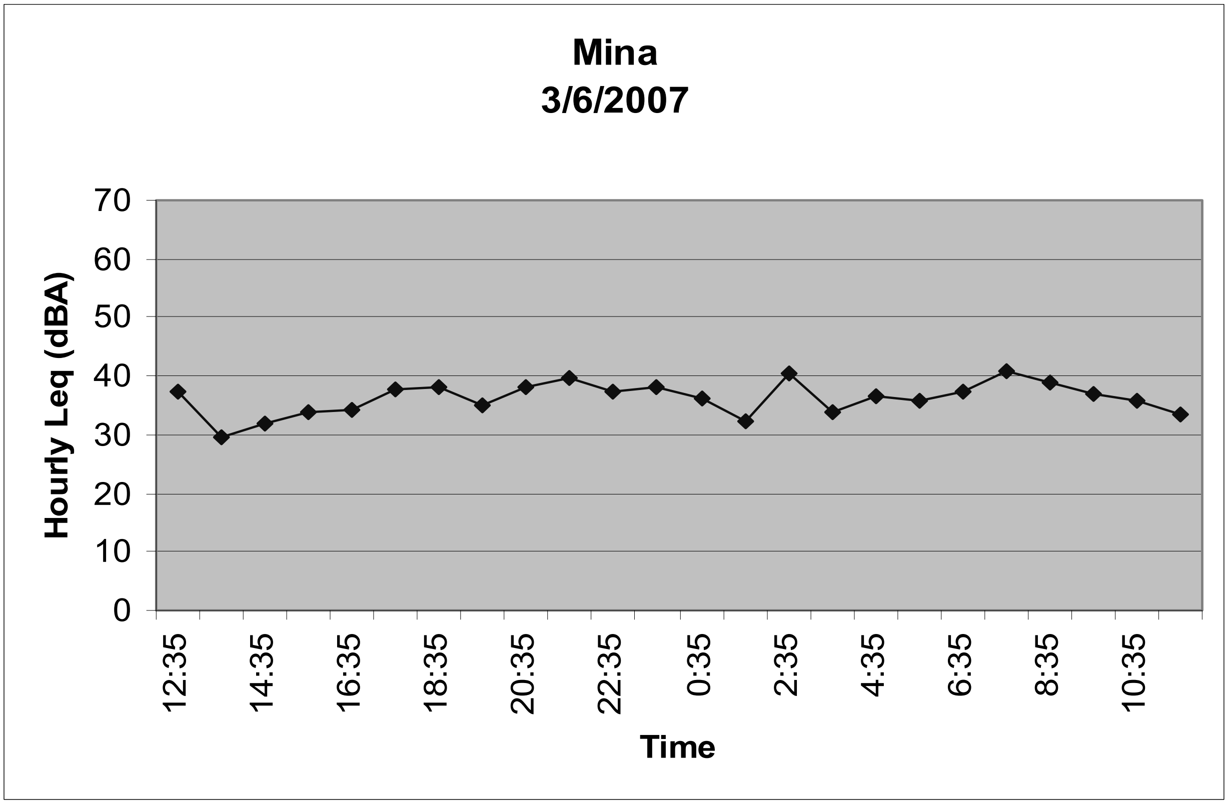


Figure 3-227. Measured noise levels over a 24-hour period in Mina, Nevada.

Noise sources included traffic on nearby local streets, and horses, dogs, and other animals on a nearby farm. Figure 3-230 shows where DOE took the ambient noise measurements in Schurz. The measured DNL in Schurz was 48 dBA, which is very close to the "small-town residential" category shown on Figure 3-224.

DOE also took ambient ground-borne vibration measurements at Schurz on March 5, 2007. Ground-borne vibration was not measurable at this location because the vibration level was very low. Ambient vibration levels were very low at this location because of the lack of vibration-producing activities. Ambient vibration levels of this magnitude are lower than human perception levels.

3.3.8.3.4 Silver Springs

DOE took noise measurements near the existing Union Pacific Railroad Hazen Branchline in Silver Springs for 24 hours on March 5, 2007. Hourly equivalent sound level values ranged from 23 to 60 dBA, as shown on Figure 3-231. Noise sources included traffic on local streets. Figure 3-232 shows where DOE took the ambient noise measurements in Silver Springs. The measured DNL in Silver Springs was 47 dBA, which is lower than the "small-town residential" category shown on Figure 3-224.

DOE also took ambient ground-borne vibration measurements at Silver Springs on March 5, 2007. Ground-borne vibration was not measurable at this location because the vibration level was very low. Ambient vibration levels were very low at this location because of the lack of vibration-producing activities. Ambient vibration levels of this magnitude are lower than human perception levels.

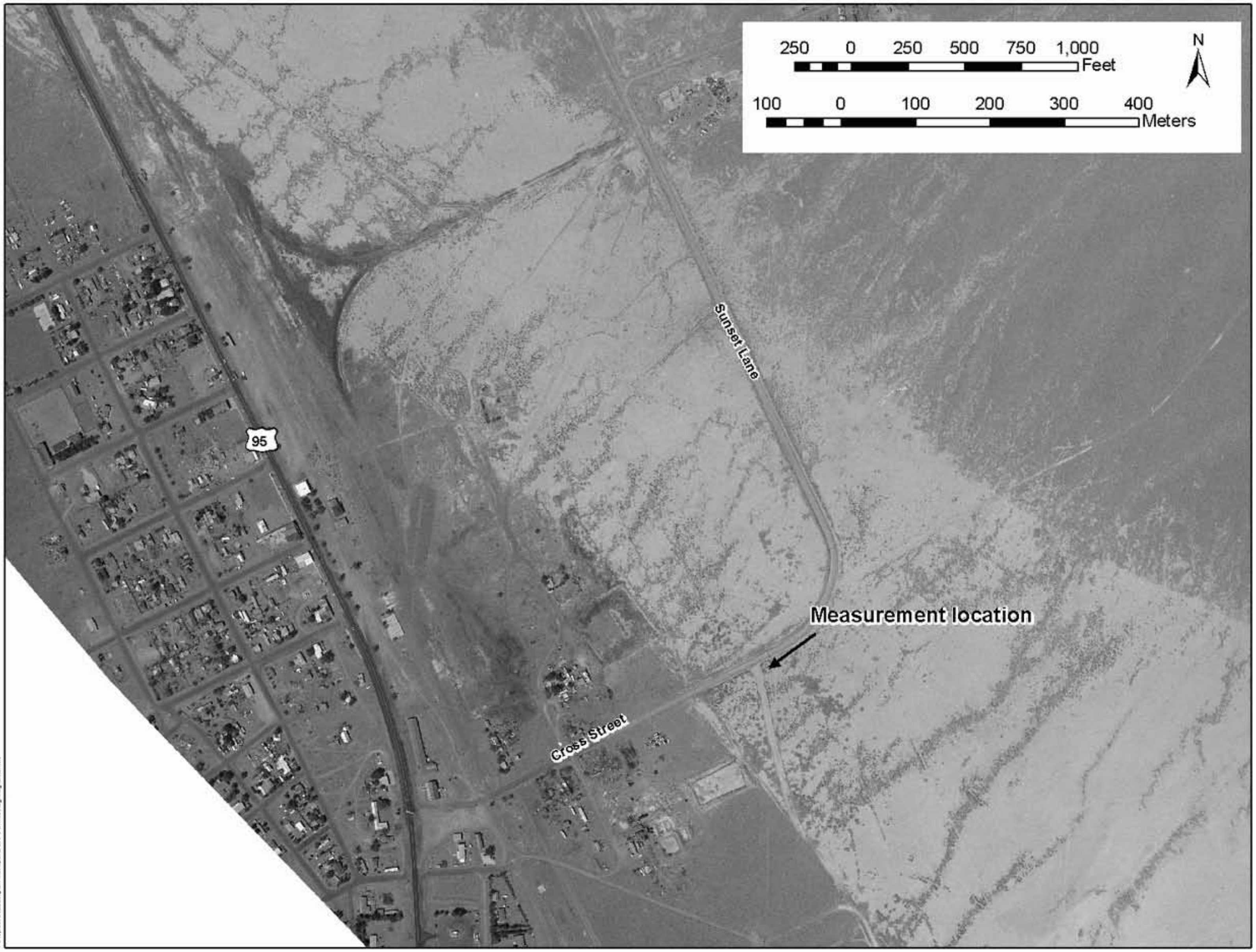


Figure 3-228. Ambient noise monitoring location at Mina, Nevada.

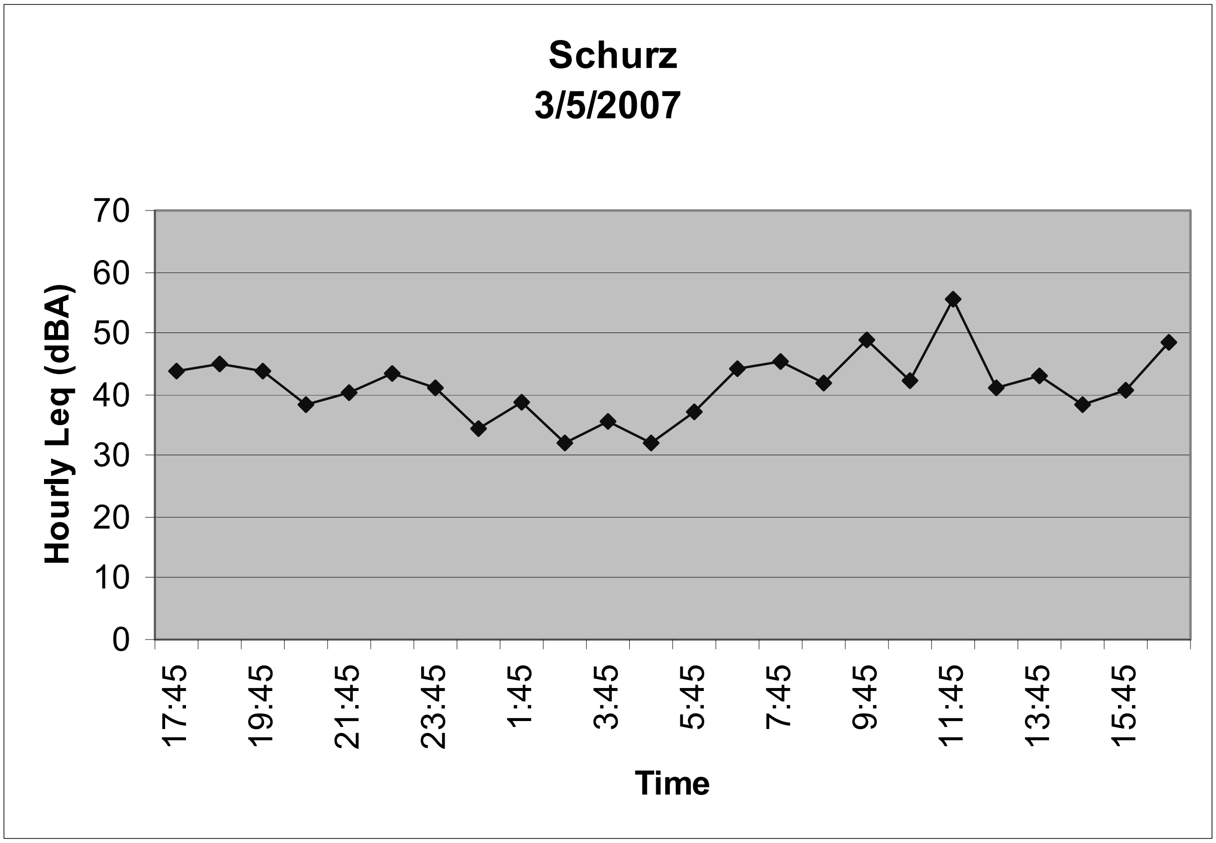


Figure 3-229. Measured noise levels over a 24-hour period in Schurz, Nevada.

3.3.8.3.5 Goldfield

DOE conducted noise measurements for 24 hours in Goldfield on January 12, 2005. Hourly equivalent sound level values ranged from 30 to 44 dBA, as shown on Figure 3-233. The DNL at this location measured 47 dBA. Noise sources included occasional vehicular traffic on U.S. Highway 93, barking dogs, wind, and occasional front-end-loader noise from the U.S. Department of Transportation maintenance station. Figure 3-234 shows where DOE took ambient noise measurements in the Goldfield area. Measured noise levels at Goldfield are lower than values associated with the "small-town residential" category, which is consistent with the low population density and desert environment. DOE also took ambient ground-borne vibration measurements at Goldfield on January 12, 2005. The ground-borne vibration measurement was 25 VdB. Ambient vibration levels are low because of low population density and the resulting lack of ***ground vibration***-producing activity. Ambient vibration levels of this magnitude are lower than human perception levels.

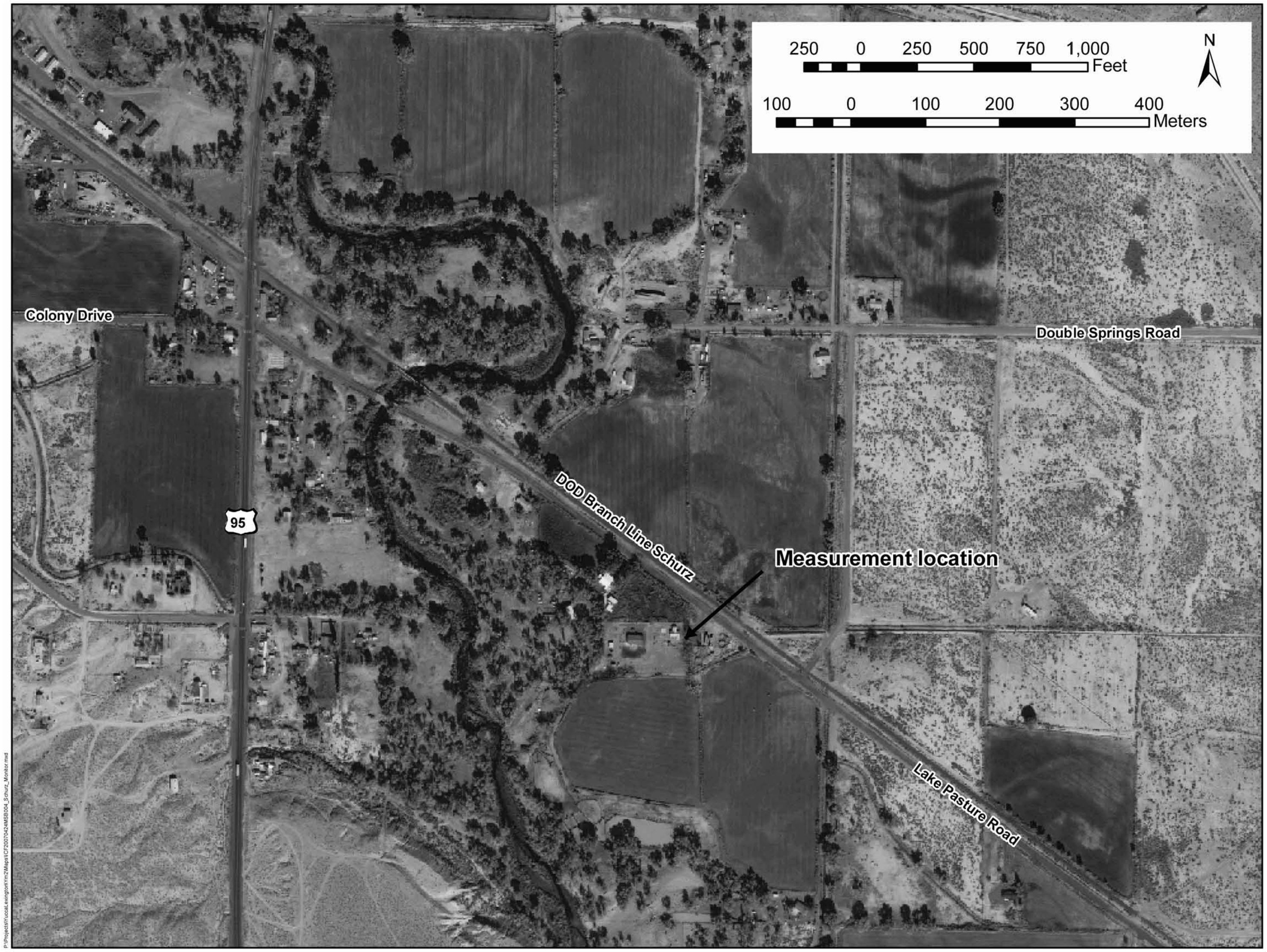


Figure 3-230. Ambient noise monitoring location at Schurz, Nevada.

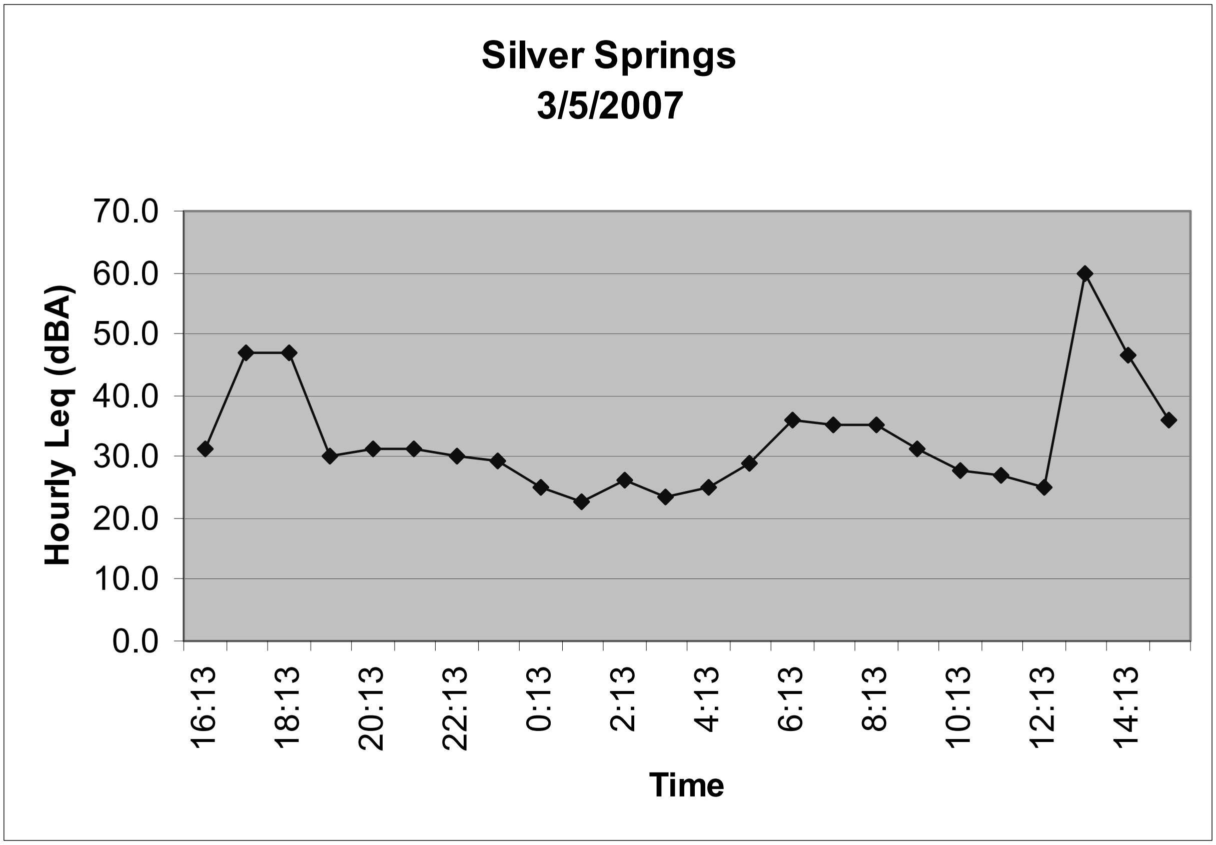


Figure 3-231. Measured noise levels over a 24-hour period in Silver Springs, Nevada.

Figure 3-232. Ambient noise monitoring location at Silver Springs, Nevada.

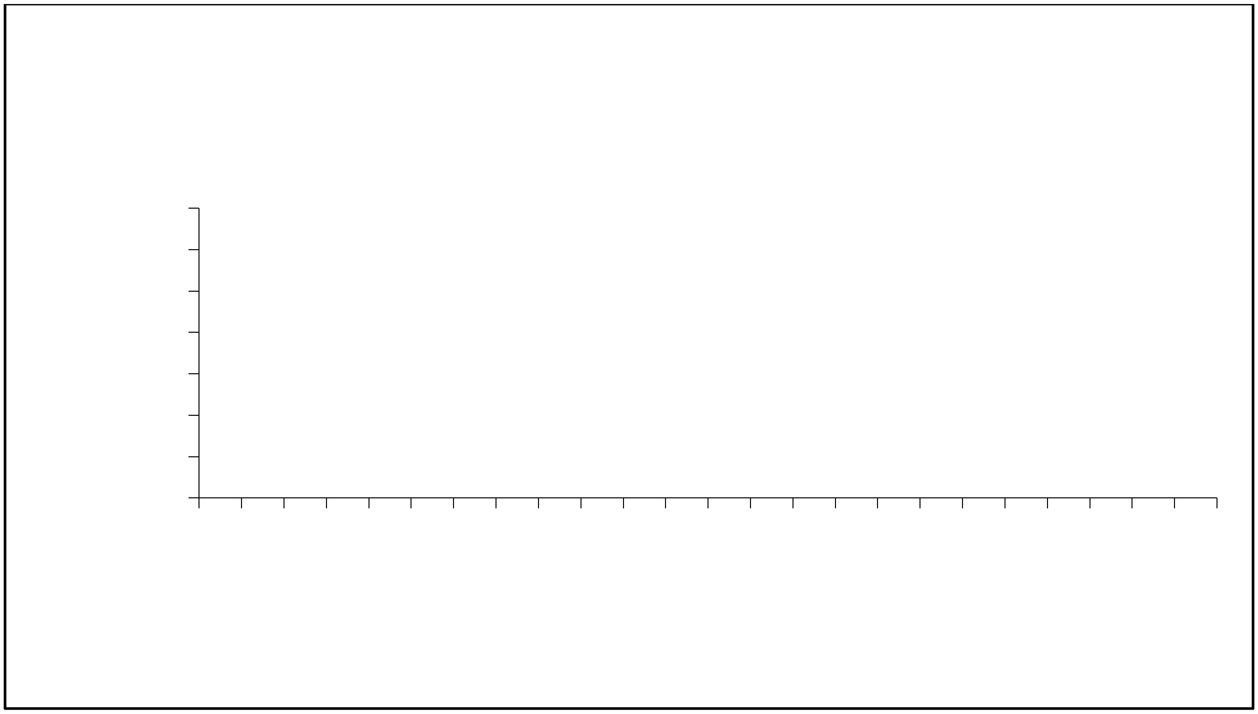


Figure 3-233. Measured noise levels over a 24-hour period in Goldfield, Nevada.

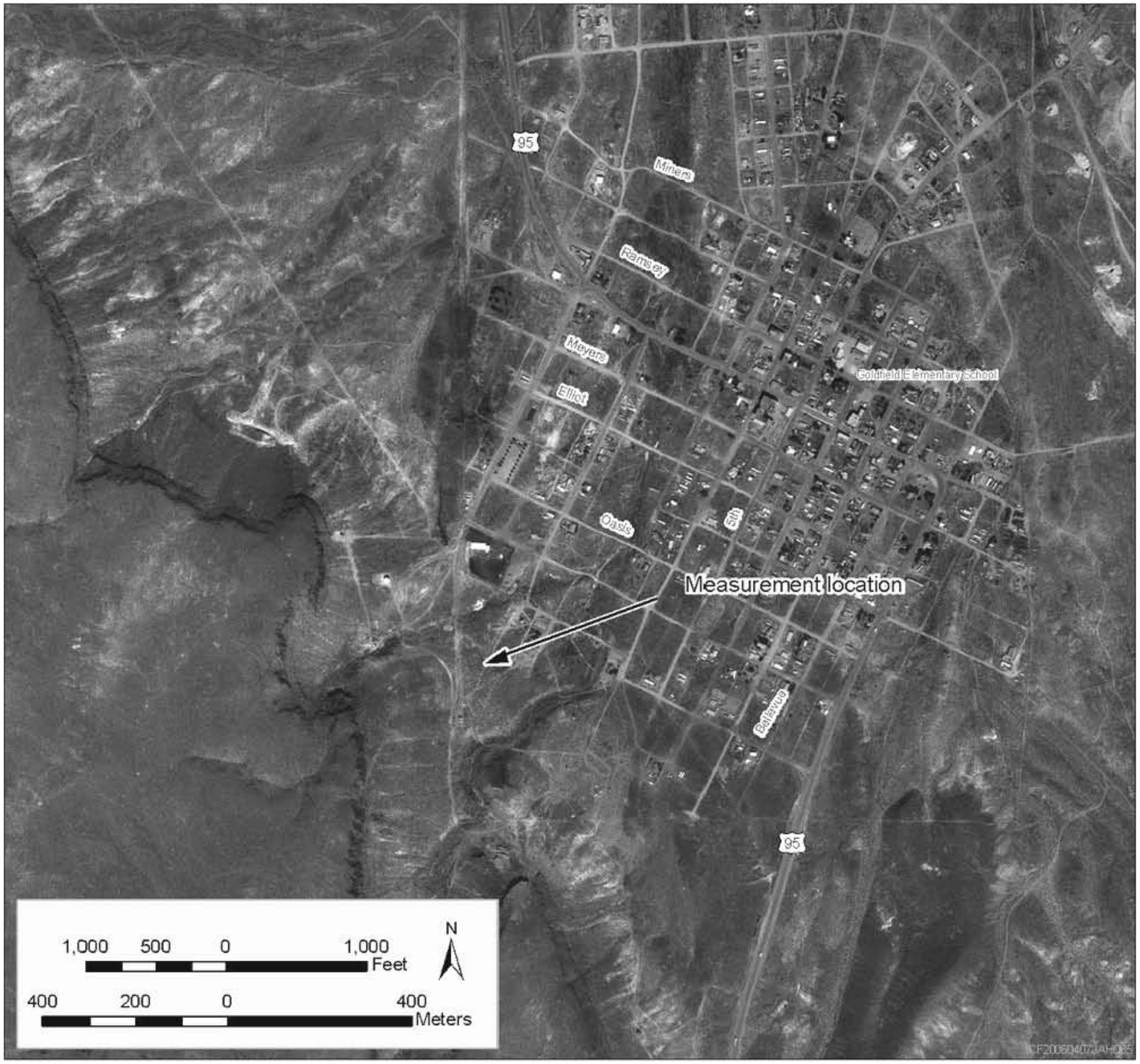


Figure 3-234. Ambient noise monitoring location on the southwestern edge of Goldfield, Nevada.

(Source: Basemap derived from DIRS 174497-Keck Library 2004, filename 37117F21.sid.)

3.3.9 SOCIOECONOMICS

This section describes the existing socioeconomics conditions (population, housing, employment and income, public services, and transportation) along the Mina rail alignment. Section 3.3.9.1 defines the region of influence for socioeconomics; Section 3.3.9.2 summarizes the method DOE used to establish ***baseline*** socioeconomic conditions in the region of influence; and Section 3.3.9.3 describes general regional socioeconomic characteristics.

3.3.9.1 Region of Influence

The region of influence for the Mina rail alignment socioeconomics analysis is Lyon, Mineral, Nye, Esmeralda, and Clark Counties, the Walker River Paiute Reservation (Figure 3-235), and the Timbisha Shoshone Trust Lands. The *Final Legislative Environmental Impact Statement for the Timbisha Shoshone Homeland* (DIRS 154121-DOI 2000, all) stated that future development of the trust lands near Scottys Junction could include a service station/convenience store, a gift/souvenir shop, and single-family detached homes. No economic activity or growth has taken place on these lands, and there are no current residents; thus, while the Timbisha Shoshone Trust Lands are included in the region of influence (Figure 3-235), because of the lack of data, impacts cannot be quantified, nor can any meaningful qualitative conclusions be reached. Thus, impacts for the Timbisha Shoshone Trust Lands are not discussed in Section 4.3.9.

Construction and operation of a rail line along the Mina rail alignment could affect social and economic activities and public services in these areas. This section examines baseline socioeconomic conditions for the counties and selected communities in the counties that would likely be affected during construction and operation of the proposed rail line. This socioeconomics analysis does not include Churchill County, except for transportation effects, because DOE expects that Churchill County would not experience any other noticeable socioeconomic impacts during construction and operation of the proposed rail line. The main analysis presents some socioeconomics detail for Clark County because, even though the rail line would not cross Clark County, construction workers for construction of the rail and associated facilities (except those in Nye County) are assumed to come from Clark County. This is because Clark is the only county with a sufficient workforce. DOE assumes that 80 percent of construction and operations workers for facilities in Nye County would reside in Clark County and 20 percent would reside in Nye County, reflecting historical patterns.

DOE also considers an alternative analysis in which the Department assumes that half of the construction workers for the Mina rail alignment reside in the combined Washoe County-Carson City area, and the other half reside in Clark County. DOE considered this alternative analysis because Washoe County and Carson City might be more likely than Clark County to supply construction workers for the northern portions of the Mina rail alignment. Therefore, for the purposes of this alternative analysis this section presents some socioeconomic detail for Washoe County and Carson City.

Operations workers for facilities outside Nye County are assumed to reside in the county of the facility. Furthermore, Clark County medical facilities could receive medical cases from the construction camps and construction sites. The region of influence does not extend beyond these counties in Nevada because there is no indication of a regional or national socioeconomic effect from goods and services purchased outside the region of influence, and demand for goods and services would not be likely to adversely affect regional or national supplies. The Yucca Mountain FEIS examined the possibility that socioeconomic effects from purchasing construction materials could be felt beyond the region of influence and concluded that there would be little or no impact (DIRS 155970-DOE 2002, Section 4.1.11.2, p. 4-77).

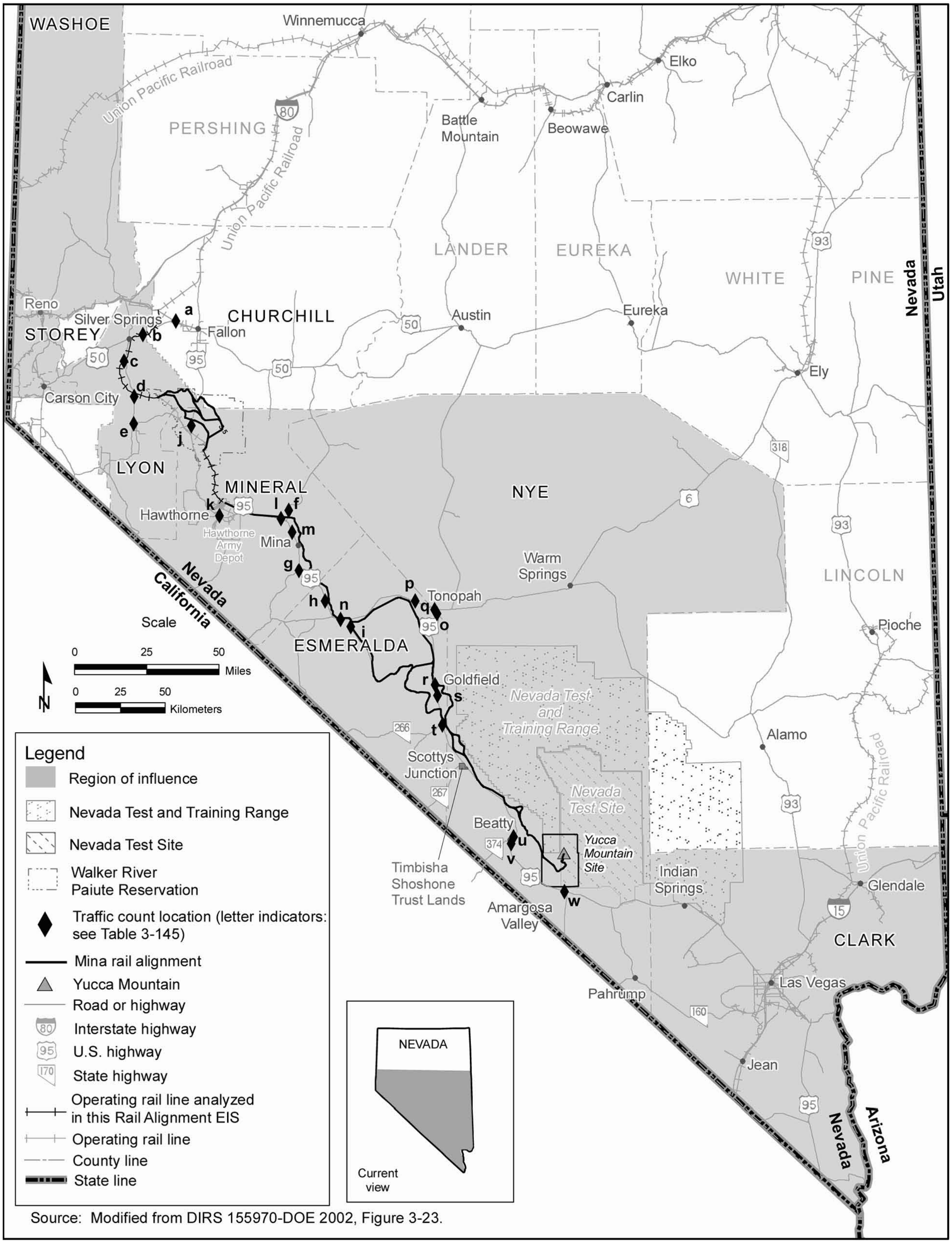


Figure 3-235. Mina rail alignment socioeconomics region of influence.

The region of influence for the analysis of transportation resources includes public roadways in the vicinity of the Mina rail alignment, and the rail alignment itself.

During rail line construction, new access roads to construction camps, quarries, and water wells would originate from nearby intersections with existing public roadways. Most of the rail alignment would be within Nevada Department of Transportation District 1, crossing Nye and Esmeralda Counties, with a portion in District 2 crossing Churchill County, Lyon County, and Mineral County northwest of Luning. There are two operating railroads along the Mina rail alignment: the Union Pacific Railroad Hazen Branchline and branchlines operated by the Department of Defense from near Wabuska to Hawthorne. Churchill County is included in the transportation region of influence because it has grade crossings that would be affected by the additional rail traffic along the existing Union Pacific Railroad Hazen and Department of Defense Branchlines from Hazen to Hawthorne.

3.3.9.2 Methodology for Determining Existing Socioeconomic Conditions

DOE characterized socioeconomic activities and resources in the region of influence with a particular emphasis on community-level resources, as appropriate.

For this analysis, DOE used the Yucca Mountain FEIS (DIRS 155970-DOE 2002, Chapter 3) as a basic source of data, and supplemented that data where possible with current community-level data for the Walker River Paiute Reservation and Lyon, Mineral, Nye, and Esmeralda Counties. DOE used an economic-demographic forecasting model known as *Policy Insight*, developed by Regional Economic Models, Inc. (DIRS 178610-Bland 2007, all), to generate employment, ***real disposable income***, and ***gross regional product*** data for Lyon, Mineral, Clark, Nye, Esmeralda and Washoe Counties and Carson City. *Policy Insight* is an eight-region model, six of the regions being Lyon, Mineral, Clark, Nye, Esmeralda Counties and Washoe County-Carson City. Due to a limitation in the structure of the model, Carson City and Washoe County are considered as a single economic entity. Therefore, the analysis presents the *Policy Insight* data for these areas as one combined result. The model forecast for Mineral County includes the Walker River Paiute Reservation. Due to data limitations, the model is unable to provide a forecast for the Walker River Paiute Reservation alone. Appendix J, Socioeconomics, contains the results of the *Policy Insight* model runs.

The description of existing economic conditions in the region of influence of the Mina rail alignment and the forecast values of populations, gross regional product, and real disposable income draw on data from version 9.0 of *Policy Insight* (DIRS 182251-REMI 2007, all). The description includes revenue from DOE's Payments Equal to Taxes program, described in detail in the Yucca Mountain FEIS (DIRS 155970-DOE 2002, p. 3-90), and the Repository SEIS. Revenue from this program is not described separately. Because the model is based on nationally collected data for which there is a lag between collection and issuance by the national agencies, and another lag before the data are incorporated into the *Policy Insight* model, there is always a gap of approximately 2 to 3 years between the current year and the last history year. The year 2004 is the last history year for the *Policy Insight* model (version 9.0) used in this baseline forecast. To compensate for this time lag, the model's employment update feature is specifically designed to accommodate new historical data provided by users, which update the model's growth-rate assumptions. *Policy Insight* version 9.0 uses an employment update module that relies on years 2004 to 2006 data from the Nevada Department of Education, Training, and Rehabilitation (DIRS 180712-NDETR 2006, all; DIRS 180740-DETR [n.d.], all; DIRS 180741-DETR 2005, all; DIRS 180742-DETR [n.d.], all). This version also incorporates information from the latest Clark County population projections prepared by the University of Nevada, Las Vegas (DIRS 178806-CBER 2006, all) and the latest population projections developed by the Nevada State Demographer (DIRS 178807-Hardcastle 2006, all).

Data for the affected environment (both those taken from the Yucca Mountain FEIS and supplemental information included here) come from various state, federal, community, and proprietary sources. Current and historical population data were drawn from a report prepared for the Nevada Small Business Development Center (DIRS 177656-Nevada State Demographer's Office 2006, all). The Department obtained housing data, including information on housing stock, vacancy rates, median housing values, and gross rents, from the Nevada Small Business Development Center, which compiled the information from U.S. Census Bureau data (DIRS 180476-Nevada Small Business Development Center [n.d.], all; DIRS 180475-Nevada Small Business Development Center [n.d.], all; DIRS 180477-Nevada Small Business Development Center [n.d.], all; DIRS 180478-Nevada Small Business Development Center 2003, all; DIRS 180479-Nevada Small Business Development Center [n.d.], all; DIRS 173564-Nevada Small Business Development Center 2003, all; DIRS 173566-Nevada Small Business Development Center 2003, all; DIRS 173567-Nevada Small Business Development Center 2003, all). DOE uses the U.S. Census Bureau housing data because county-collected housing data can be inconsistent across counties due to unique county assessment practices. In addition, the Census Bureau's housing data contain characteristics that county housing data sources do not, such as whether a property is a rental property or owner-occupied and whether a property is occupied or vacant.

Income, poverty, and unemployment data come from the U.S. Census Bureau (DIRS 176856-U.S. Census Bureau 2003, all). DOE obtained current values for employment, real disposable income, and gross regional product for Lyon, Mineral, Nye, Esmeralda, and Clark Counties from the *Policy Insight* model, as previously described. DOE compiled business-establishment data from the *Nevada Workforce Informer, Data Analysis* (DIRS 173545-Nevada Department of Employment, Training & Rehabilitation 2005, all; DIRS 173544-Nevada Department of Employment, Training & Rehabilitation 2005, all). DOE obtained data on public services mainly from interviews with county representatives in the region of influence and from the Yucca Mountain FEIS (DIRS 155970-DOE 2002, Chapter 3), augmented in some instances with information from other sources cited in the text herein. Yucca Mountain Oversight Office in Esmeralda County provided contact information for county agencies and suggested data sources for this section. The County Manager provided similar assistance for Nye County. DOE obtained health data from the Nevada State Health Division (DIRS 173560-State of Nevada [n.d.], all); education data from Nevada District Accountability Reports (DIRS 180463-Lyon County School District [n.d.], all; DIRS 180465-Mineral County School District [n.d.], all; DIRS 177759-Nye County School District [n.d.], all; DIRS 177760-Esmeralda County School District [n.d.], all); and law enforcement data from the Department of Public Safety (DIRS 173399-State of Nevada 2004, all; DIRS 177747-State of Nevada 2005, all; DIRS 177748-State of Nevada 2006, all).

DOE based the description of the affected transportation environment on existing traffic volumes on the roadways (measured as average daily traffic counts) and on the Union Pacific Railroad Hazen Branchline. The Department obtained traffic volumes for roads from the Nevada Department of Transportation traffic report for 2005 (DIRS 178749-NDOT [n.d.], all), and then estimated levels of service for the affected roadways using the Highway Capacity Manual guidelines (DIRS 176524-Transportation Research Board 2001, all). DOE based rail traffic estimates on personal communication with Union Pacific Railroad and U.S. Army representatives (DIRS 178017-Holder 2006, all). In response to a comment, DOE examined the Nevada Department of Transportation traffic report for 2006 to see if the updated report would provide new information that would require modification of the baseline or the analysis. DOE determined that changes from the 2005 report were very small. Sometimes the traffic counts were slightly higher, sometimes slightly lower, and often the traffic counts showed no change. As a result, DOE did not change its analysis.

3.3.9.3 General Regional Socioeconomic Characteristics

DOE examined baseline socioeconomic conditions for selected communities within the region of influence that would likely be affected by rail line construction and operations. These communities include Yerington in Lyon County; Hawthorne, Mina, and Luning in Mineral County; Schurz on the Walker River Paiute Reservation; Tonopah, Beatty, the Town of Amargosa Valley, and Pahrump in Nye County; and Goldfield in Esmeralda County. Baseline conditions for Clark County are presented at the county level, primarily in relation to economic measures and health-care capacity. DOE assumes that there would be an overall income effect on Clark County from the workers residing there and commuting to work on the proposed railroad project, but because of the large population of Clark County, the effect would be minimal. For the alternative analysis, baseline conditions for the combined area of Washow County-Carson City are presented.

3.3.9.3.1 Employment and Income

Due to the lack of data, DOE is unable to characterize the current local economy of the Walker River Paiute Reservation to the same extent as counties. Decennial Census data for the Walker River Paiute Reservation are presented in Tables 3-137, 3-138, 3-140, and 3-141.

Lyon County's economy is the fourth in size in the region of influence, with a total estimated employment count of 15,591 in 2007, according to the *Policy Insight* (DIRS 178610-Bland 2007, all) baseline projections listed in Table 3-136. As discussed in Section 3.3.9.2, these projections are from county and state baseline data sources, together with employment-trend information also taken from county and state sources. The three largest employment sectors in Lyon County are services (with 34 percent of the employed population), retail trade (16 percent), and state and local government (14 percent). Construction is also an important employment sector, with 12 percent of the employed population. According to *Policy Insight* baseline projections, the gross regional product of the county in 2007 is projected to be $840.1 million, and the real disposable income $1.04 billion. Large employers include Amazon.com, which employs between 1,000 and 1,499 people in the area, and local government agencies such as the Lyon County School District (DIRS 181908-DETR [n.d.], all).

Mineral County's economy is the fifth in size in the region of influence, with a total estimated employment count of 2,352 projected for 2007, according to the *Policy Insight* (DIRS 178610-Bland 2007, all) baseline projections listed in Table 3-136. The three largest employment sectors in Mineral County are services (with 42 percent of the employed population), state and local government (22 percent), and retail trade (10 percent). Major employers include the Day and Zimmerman Hawthorne Corporation, which employs between 400 and 499 people; El Capitan Casino, which employs between 100 and 199 people; and local government, such as the Mineral County School District (DIRS 181907-DETR [n.d.], all). According to *Policy Insight* baseline projections, the gross regional product of the county in 2007 was $131 million, and the real disposable income was $108.8 million.

Nye County has the third largest economy in the region of influence. Total estimated employment in Nye County in 2007 is projected to be 18,184 people (Table 3-136). The largest employment sectors are services (44 percent of the employed population), followed by retail trade (12 percent), and then transportation warehousing, information, and finance and insurance (11 percent collectively). State and local government and construction are also important sectors. The importance of construction reflects the county's population growth rates from 1990 to 2003 because new residents and businesses require construction materials and labor, and a range of services. Large employers include National Security Technologies, LLC (NSTec), the management and operating contractor for DOE at the Nevada Test Site, which employs between 1,000 and 1,500 people in the area, although many Nevada Test Site employees live in Clark County (DIRS 173544-Nevada Department of Employment, Training & Rehabilitation

Table 3-136. Lyon, Mineral, Esmeralda, Nye, and Clark County employment by industry, 2007.[a,b]

	County					
Industry sector	Lyon	Mineral	Nye	Esmeralda	Clark	Washoe-Carson City
Private						
Forestry and fisheries	53	6	67	3	306	320
Mining	249	150	1,094	84	1,420	2,607
Construction	1,814	61	1,793	32	124,771	27,805
Utilities	84	26	185	0	3,798	1,067
Manufacturing	582	18	342	1	28,737	17,997
Wholesale trade	722	37	186	12	26,567	12,843
Retail trade	2,439	237	2,140	30	121,883	32,992
Transportation and warehousing, information, and finance and insurance	1,304	210	1,975	23	158,506	45,084
Farm	717	16	283	67	312	599
Services	5,329	987	8,088	112	577,086	129,099
Public						
Federal Government–civilian	72	77	161	6	11,409	3,852
Federal Government–military	95	12	79	4	12,663	887
State and local government	2,132	515	1,792	101	83,135	33,470
Totals[c]	15,591	2,352	18,184	475	1,150,594	308,623

a. Source: DIRS 178610-Bland 2007, all.
b. Model does not discriminate non-county regions, such as the Walker River Paiute Reservation.
c. Totals might differ from sums of values due to rounding.

Table 3-137. County and place-level personal income, poverty, and unemployment[a] (page 1 of 2).

County, city/community	Median household income in 1999 (dollars)[b]	Poverty in 1999 (percent)[b]	Unemployment in 2000 (percent)[b]	Unemployment in 2005 (percent)[c]
Walker River Paiute Reservation	24,412	33	22.6	Not available
County				
Lyon	40,699	10	6.9	5.3
Mineral	32,891	15	12.9	5.9
Esmeralda	33,203	15	3.3	5.3
Nye	36,024	11	7.1	5.2
Clark	44,616	11	6.6	4.0
Washoe County	45,815	10	4.9	4.0
Carson City	41,809	10	4.6	4.7
City/community				
Schurz	24,265	27	15.8	Not available
Yerington	31,151	18	9.1	Not available
Hawthorne	34,413	11	11.1	Not available

Table 3-137. County and place-level personal income, poverty, and unemployment[a] (page 2 of 2).

County, city/community	Median household income in 1999 (dollars)[b]	Poverty in 1999 (percent)[b]	Unemployment in 2000 (percent)[b]	Unemployment in 2005 (percent)[c]
Tonopah	38,029	11	7.9	Not available
Pahrump	35,313	9	7.5	Not available
Goldfield	32,969	12	3.2	Not available
Amargosa Valley	34,432	15	3.2	Not available
Beatty	41,076	13	5.6	Not available

a. The U.S. Census Bureau defines poverty based on estimates of how much money families need to meet their nutritional needs for 1 year. Poverty thresholds and a more thorough definition of poverty are available from the U.S. Census Bureau at http://www.census.gov/acs/www/UseData/Def/Poverty.htm, all.
b. Source: DIRS 176856-U.S. Census Bureau 2003, Tables 7, 13, 15, 36, 37, and 40.
c. Source: DIRS 177755-BLS [n.d.], all.

Table 3-138. County and community populations, Mina rail alignment, 1990 to 2005.[a]

County	City/ community	1990 population[b]	2000 population	2005 population	1990 to 2000 change (percent)	2000 to 2005 change (percent)
Walker River Paiute Reservation		811	850	Not available	5	Not available
	Schurz	617	711[c]	Not available	15	Not available
Lyon		20,590	35,685	48,860	73	37
	Yerington	2,380	2,938	2,980	23	1
Mineral		6,470	5,071	4,629	-22	-9
	Hawthorne	4,162	3,134	2,956	-25	-6
	Mina	484	307	276	-37	-10
	Luning	Not available	86	87	Not available	1
Nye		18,190	32,978	41,302	81	25
	Tonopah	3,616	2,833	2,607	-23	-8
	Amargosa Valley	761	1,167	1,383	61	19
	Beatty	1,623	1,152	1,032	-31	-10
	Pahrump	7,424	24,235	33,241	226	37
Esmeralda		1,350	1,061	1,276	-21	20
	Goldfield	672	424	438	-37	3
	Silver Peak	Not available	161	126	Not available	-22
Clark		770,280	1,394,440	1,815,700	81	29
Washoe County		257,120	341,935	396,844	33	16
Carson City		40,950	53,208	57,104	30	7

a. Source: DIRS 177656-Nevada State Demographer's Office 2006, all.
b. 1990 estimates for Tonopah, Amargosa Valley, Beatty, Pahrump, and Goldfield were not available through the Nevada State Demographer's Office; therefore, subdivision-level data for these locations were taken from the U.S. Census DP-1 (DIRS 179132-Bureau of Census [n.d.], all). The Census data reflect a different time series than the Governor's Certified Estimates.
c. Schurz is on the Walker River Paiute Reservation. However, the Nevada State Demographer and the U.S. Census Bureau categorize the town's population within Mineral County.

2005, all). Local government agencies such as the Nye County School District and Nye County, and mining companies such as the Round Mountain Gold Corporation, are also major employers (DIRS 173544-Nevada Department of Employment, Training & Rehabilitation 2005, all).

Nye County employment rebounded after a 15-percent decrease between 1990 and 1995 (DIRS 155970-DOE 2002, p. 3-87). According to *Policy Insight* baseline projections, the gross regional product of Nye County in 2007 will be $1.16 billion, and the real disposable income will be $1.12 billion.

Esmeralda County has the smallest economy of the other counties in the region of influence. The county's three largest employment sectors are services, state and local government, and mining, which account for 24, 21, and 18 percent of the employed population, respectively (Table 3-136). Employers include government agencies such as the State of Nevada and the Esmeralda County School District, and mining companies such as the Chemetall Foote Corporation, which runs Silver Peak Mine and Lode Star Gold, Inc. (DIRS 173545-Nevada Department of Employment, Training & Rehabilitation 2005, all). According to *Policy Insight* baseline projections, the gross regional product of Esmeralda County in 2007 will be $25.7 million, and the real disposable income will be $29.3 million.

Clark County's economy dominates southern Nevada. The largest employment sectors are services (50 percent of the employed population; 46 percent of services employment is within the Accommodations and Food Services sectors); transportation warehousing, information, and finances and insurance (14 percent); construction (11 percent); and retail trade (11 percent). According to *Policy Insight* baseline projections, Clark County surpasses the other counties with a gross regional product of $95.4 billion, which is more than 80 times that of Nye County. According to *Policy Insight* baseline projections, Clark County residents had $60.7 billion in real disposable income in 2007.

Washoe County-Carson City's largest employment sectors are services; transportation and warehousing, information, and finance and insurance; and state and local government. These sectors account for 42, 15, and 11 percent of the employed population, respectively. According to *Policy Insight* baseline projections, the gross regional product of Washoe County-Carson City in 2007 will be $24.4 billion, and the real disposable income will be $16.8 billion.

3.3.9.3.1.1 Mining and Agriculture. This section describes existing conditions for mining and agricultural activities, because a railroad along the Mina rail alignment would be likely to affect these interests more than other economic activities.

Mining In 2007, the mining industry employed nearly 18 percent of the 475 workers in Esmeralda County and 6 percent of workers in Nye County. Mining also constitutes a large part of the total personal income generated in the region of influence counties. In Esmeralda County in 2002, almost 18 percent of personal income came from mining, making it the single largest source of personal income in the County (DIRS 173546-BEA 2004, Table CA05N). Almost 7 percent of personal income in Nye County came from the mining industry in 2002 (DIRS 173548-BEA 2005, Table CA05N).

Mined minerals in the study area include gold, silver, aggregate (consisting of crushed stone, natural sands, and gravel), salt, and a wide range of other nonmetallic minerals. Gold is central to Nevada's mining industry, and at $2.4 billion in revenue (DIRS 169127-Driesner and Coyner 2003, all; DIRS 173554-Price and Meeuwig 2003, all), it brings in more revenue than any other type of mining. Silver production is also important and was Nevada's fourth leading mineral commodity in 2002, valued at $62 million.

The Mina rail alignment would cross some mining areas and districts in Mineral, Nye, and Esmeralda Counties. Schurz alternative segment 1 would pass through the very southern portion of the Calico Hills Mining District. Schurz alternative segment 4 would pass through the Calico Hills, Double Springs Marsh, and Buckley Mining Districts. Schurz alternative segment 5 would pass through the Benway, Calico Hills, Double Springs Marsh, and Buckley Mining Districts. Schurz alternative segment 6 would pass through the Holy Cross, Double Springs Marsh, and Buckley Mining Districts.

Mina common segment 1 would pass through the Santa Fe, Rock Hill, and Coaldale Mining Districts. The construction right-of-way would also intersect the outermost boundaries of the Pilot Mountains, Rhodes Marsh, and Candelaria Mining Districts.

Montezuma alternative segment 1 would pass through the Silver Peak Marsh, Montezuma, and Cuprite Mining Districts. Montezuma alternative segment 2 would pass through the Goldfield and Stonewall Mining Districts. Montezuma alternative segment 3 would pass through the Montezuma and Cuprite Mining Districts.

Mina common segment 2, the Bonnie Claire alternative segments, common segment 5, and the Oasis Valley alternative segments would not cross any mining districts.

Common segment 6 would cross the northeastern portion of the Bare Mountain Mining District, although the vast majority of past mining activity occurred more than 3 kilometers (2 miles) south of this common segment. The district contains gold-bearing veins, and some veins contain silver. The district also contains a variety of minerals and semi-precious stones, including opal, malachite, galena, pyrite, hematite, fluorite, fluorspar, and gypsum.

Agriculture The primary agricultural activity that would be intersected by the Mina rail alignment would be grazing. As discussed in Section 3.3.2, Land Use and Ownership, there are 12 active grazing allotments, and three inactive allotments along the proposed rail alignment. In Section 3.3.2, Land Use and Ownership, Tables 3-84 and 3-85 list and describe these grazing allotments, and Figures 3-144 through 3-151 show the locations of the allotments.

The permitted grazing operations support employment and provide income for ranchers and their workers, and income for the respective counties. BLM-issued grazing permits authorize these operations, and specify the total number of animal unit months apportioned (an animal unit month represents enough dry forage for one mature cow for 1 month). For those allotments with information available (see Table 3-85), animal unit months range from 303 to 7,900, and land area ranges from 21 to 2,074 square kilometers (5,124 to 512,000 acres). The BLM established the property base for each allotment based on land or water rights.

In addition to grazing, farming is an important source of both income and employment for the counties in the region of influence. As discussed in Section 3.3.1.2.3, less than 1 percent of soils along the proposed rail alignment are classified as prime farmland. Less than 1 percent, or approximately 0.04 square kilometer (9.2 acres), of the entire Mina railroad construction right-of-way contains soils the Natural Resources Conservation Service considers prime farmland (see Section 3.3.1, Physical Setting, Figure 3-128). The prime farmland soils the proposed alignment would cross are concentrated on the Walker River Paiute Reservation, which has a total of 5.5 square kilometers (1,400 acres) of prime farmland soil.

3.3.9.3.1.2 Personal Income, Poverty, and Unemployment. As shown in Table 3-137, Washoe and Clark Counties have the highest median income in the region of influence, followed by Carson City, Lyon, Nye, Esmeralda, and Mineral Counties and the Walker River Paiute Reservation. While Washoe, Lyon, Nye, and Clark Counties and Carson City showed the highest incomes and the lowest percentage of residents in poverty in 1999 (see note on Table 3-137 for information on poverty thresholds), the unemployment rates in these counties were higher than Esmeralda County in 2000. The unemployment rates in Lyon, Mineral, Clark, Washoe, and Nye Counties decreased between 2000 and 2005, while Esmeralda County's unemployment rate increased over the same period. The Walker River Paiute Reservation had the highest unemployment rate in the region of influence in 2000.

At the community level, Beatty has the highest median income ($41,076), although its poverty rate (13 percent) is third highest after Yerington in Lyon County (18 percent) and the Town of Amargosa

Valley (15 percent). Schurz, on the Walker River Paiute Reservation, has the highest unemployment rate (15.8 percent) of all communities in the region of influence. Tonopah and Beatty in Nye County have higher median incomes, and lower poverty and unemployment rates, than Yerington in Lyon County.

3.3.9.3.2 Population

Table 3-138 lists the county and community populations in the Mina rail alignment region of influence in 1990, 2000, and 2005.

According to Census data from 2000, the Walker River Paiute Reservation had a population of 850. The Reservation's population increased by 5 percent between 1990 and 2000.

According to the Nevada State Demographer's Office Nevada 2000 census data (DIRS 180476-Nevada Small Business Development Center [n.d.], p. 1), Lyon County is approximately 50-percent rural. It has a population density of only 6.7 people per square kilometer (17.3 people per square mile). Yerington is the largest Lyon County town that is close to the Mina rail alignment. The population of Yerington in 2005 was 2,980.

Mineral County has the second smallest county in the region of influence. In 2005, Mineral County's population was 4,629. Mineral County has a population density of 0.54 people per square kilometer (1.4 people per square mile). Thirty-one percent of the population in Mineral County is considered rural, according to population estimates and rural figures from the Nevada State Demographer's Office.

The largest town in Mineral County is Hawthorne, with a 2005 population of 2,956, which accounts for more than 60 percent of the population in Mineral County. Mineral County also includes Schurz, Mina, and Luning, which are along the Mina rail alignment. Schurz, on the Walker River Paiute Reservation, is the most populated of these communities.

Nye County is the second most populous county in the region of influence. According to the U.S. Bureau of Census (DIRS 173530-Bureau of Census 2005, all), in 2005 the county had a population density of 0.69 people per square kilometer (1.8 people per square mile); according to population estimates and rural figures from the Nevada State Demographer's Office (DIRS 173564-Nevada Small Business Development Center 2003, p. 1), 55 percent of the population is considered rural. The largest town in Nye County is unincorporated Pahrump, which accounts for 80 percent of the county's population.

Although Pahrump is not in the immediate vicinity of the Mina rail alignment, it is reasonably foreseeable that some construction and operations workers would live in Pahrump, based on historical and current patterns of workers at the Nevada Test Site and the Yucca Mountain Site. Nye County also includes the communities of Tonopah, Beatty, and the Town of Amargosa Valley, all of which are near the Mina rail alignment. Tonopah is the most populated of these communities.

Esmeralda County is the least populated of the counties in the Mina rail alignment region of influence. Esmeralda is also the least densely populated county, with a density of 0.11 people per square kilometer (0.3 people per square mile) (DIRS 173534-Bureau of Census 2005, all) and a 100-percent rural population (DIRS 173566-Nevada Small Business Development Center 2003, p. 1). The community of Goldfield is close to the Mina rail alignment, and its population accounts for more than one-third of Esmeralda County's population.

Clark County, which includes Las Vegas, is the most populated county in Nevada. It has a population density of 67 people per square kilometer (173.9 people per square mile) (DIRS 173533-Bureau of Census 2005, all), and a rural population of only 2 percent (DIRS 173567-Nevada Small Business Development Center 2003, p. 1). No part of the Mina rail alignment is in or near Clark County; the closest part of the alignment would be common segment 6, 48 kilometers (30 miles) west of the Clark County boundary, in Nye County. However, a substantial proportion of the rail line construction workforce would probably come from Clark County.

In terms of population change, southern Nevada has been and continues to be among the fastest-growing areas in the United States (DIRS 155970-DOE 2002, p. 3-84). In the region of influence, Lyon and Nye Counties both experienced population increases from 1990 to 2000, with Nye County's growth of 81 percent being similar to Lyon County's growth of 73 percent. The populations of Esmeralda and Mineral Counties decreased between 1990 and 2000 by 21 and 22 percent, respectively. The growth and overall population count of Clark County is substantial, with an increase of 81 percent during the same years.

Communities within these counties have also been undergoing population changes, though these shifts have not necessarily been in the same direction as the respective county. For example, Nye County experienced a substantial population increase of 8,324 people (25 percent) between 2000 and 2005. The increase was largely fueled by population growth in Pahrump, while Tonopah's population declined by 226 people (8 percent), and Beatty's declined by 120 people (10 percent) during the same period. The population of Goldfield in Esmeralda County increased by 14 people (3 percent) between 2000 and 2005, which is consistent with the county's increase in population of 215 people (20 percent).

According to *Policy Insight* model baseline projections shown in Table 3-139, most of the counties in the region of influence are expected to grow through 2067, independent of potential project-related effects. These projections assume that current trends continue and incorporate county and state (Nevada State Demographer's Office) demographic and economic data sources. Population projections for Lyon, Mineral, Nye, and Esmeralda Counties through 2026 are from the Nevada State Demographer's Office (DIRS 178807-Hardcastle 2006, all); population projections for these areas after 2026 assume constant growth at 2026 rates. Clark County projections to 2035 are from the University of Nevada Las Vegas Center for Business and Economic Research projections (DIRS 178806-CBER 2006, all), and projections to 2067 assume constant growth at 2035 rates. Because these projections assume a constant rate of growth over the period, rather than a growth rate that increases at a decreasing rate (which would be expected for population projections for Clark and Nye Counties), the projected populations are high estimates.

This is a conservative assumption when analyzing for total radiological ***dose*** to resident populations, which is another use of the projections by the Yucca Mountain Project. By 2067, the population of Nye County is projected to increase to 131,074 people (187 percent over 2007 levels). Lyon County's population is also projected to increase during the same period, to 172,376 people (220-percent increase over 2007 levels). Esmeralda County's population is projected to decline to 1,083 people by 2067 (11-percent decrease from 2007 levels). Mineral County's population is expected to decrease to 3,715 people (20-percent decrease from 2007 levels). Clark County is projected to increase to approximately 5 million people (151-percent increase over 2007 levels). Washoe County-Carson City's combined population is expected to increase by approximately 625,737 people (132-percent increase over 2007 levels).

3.3.9.3.3 Housing

Table 3-140 lists housing characteristics in the Mina rail alignment region of influence in 2000. The housing stock in Lyon County is 14,279 units, consisting mostly of single-family homes. In Yerington, single-family, multiple-family, and mobile (manufactured) homes make up 65 percent, 22 percent, and 14 percent of the total housing units, respectively. More than 10 percent of the housing in Yerington is vacant.

Compared to Lyon County, Mineral County has a much smaller housing stock at 2,866 units (DIRS 180477-Nevada Small Business Development Center [n.d.], p. 55). Most of these units are single-family

Table 3-139. Projected values for population, employment, and economic variables, 2010 to 2067[a,b] (page 1 of 3).

Economic parameter	Year													
	2007	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065	2067
Population														
Lyon County	53,832	60,939	71,795	80,930	88,548	95,811	103,724	112,292	121,567	131,609	142,480	154,249	166,990	172,376
Mineral County	4,626	4,667	4,759	4,566	4,398	4,309	4,224	4,140	4,058	3,977	3,898	3,898	3,744	3,715
Nye County	45,737	51,971	60,803	67,707	73,155	78,364	84,005	90,053	96,535	103,484	110,933	118,919	127,480	131,074
Clark County	1,990,481	2,258,748	2,652,070	2,946,350	3,169,797	3,358,455	3,544,362	3,739,880	3,946,181	4,163,863	4,393,553	4,635,913	4,891,642	4,997,841
Esmeralda County	1,215	1,147	1,069	1,012	997	1,007	1,016	1,027	1,038	1,048	1,058	1,068	1,079	1,083
Washoe County-Carson City	475,172	508,629	565,044	615,124	657,701	698,856	743,091	790,139	840,182	893,410	950,008	1,010,192	1,074,189	1,100,909
All of Nevada	2,745,469	3,064,179	3,539,284	3,902,058	4,185,507	4,431,901	4,680,591	4,943,171	5,221,096	5,515,255	5,826,285	6,155,203	6,503,050	6,647,735
Employment														
Lyon County	15,591	16,697	18,273	19,411	20,435	21,490	22,739	24,323	26,040	28,087	30,407	32,919	35,638	36,787
Mineral County	2,352	2,407	2,460	2,339	2,295	2,267	2,253	2,256	2,254	2,259	2,214	2,170	2,127	2,110
Nye County	18,184	19,194	20,585	21,683	22,628	23,706	24,923	26,310	27,732	29,274	31,381	33,640	36,062	37,079
Clark County	1,150,594	1,239,364	1,325,133	1,391,701	1,453,024	1,524,248	1,601,285	1,692,833	1,778,852	1,860,856	1,963,506	2,071,818	2,186,105	2,233,566
Esmeralda County	475	466	451	442	436	434	432	435	438	443	447	452	456	458
Washoe County-Carson City	315,776	332,279	356,087	370,019	382,854	397,125	412,807	432,986	452,149	472,506	502,440	534,270	568,116	582,248
All of Nevada	1,609,884	1,719,682	1,834,877	1,918,883	1,996,005	2,085,078	2,182,024	2,299,188	2,409,726	2,518,704	2,659,417	2,808,145	2,965,352	3,030,717

Table 3-139. Projected values for population, employment, and economic variables, 2010 to 2067[a,b] (page 2 of 3).

Economic parameter	Year													
	2007	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065	2067
Gross regional product[b,c,d]														
Lyon County	0.840	0.956	1.165	1.358	1.557	1.775	2.026	2.328	2.672	3.081	3.335	3.611	3.909	4.034
Mineral County	0.131	0.140	0.159	0.163	0.176	0.191	0.208	0.228	0.249	0.271	0.266	0.261	0.256	0.254
Nye County	1.164	1.302	1.550	1.798	2.052	2.340	2.664	3.037	3.447	3.903	4.184	4.485	4.808	4.943
Clark County	95.392	109.494	131.517	151.836	172.974	197.204	224.494	256.596	291.013	327.876	345.963	365.047	385.184	393.546
Esmeralda County	0.026	0.027	0.029	0.032	0.035	0.039	0.042	0.046	0.050	0.056	0.057	0.057	0.058	0.058
Washoe County-Carson City	24.39	27.70	33.94	39.29	44.82	50.97	57.79	65.77	74.26	83.59	88.89	94.52	100.51	103.01
All of Nevada	129.036	147.283	177.133	204.369	232.647	264.813	300.888	343.229	388.550	437.450	461.921	487.785	515.120	526.484
Government spending[c,d]														
Lyon County	0.208	0.242	0.303	0.355	0.398	0.443	0.490	0.544	0.598	0.652	0.706	0.764	0.827	0.854
Mineral County	0.037	0.039	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.040	0.039	0.039	0.038
Nye County	0.174	0.202	0.252	0.291	0.323	0.356	0.390	0.427	0.466	0.503	0.539	0.578	0.620	0.637
Clark County	7.269	8.460	10.543	12.146	13.427	14.617	15.780	17.043	18.266	19.411	20.482	21.612	22.804	23.299
Esmeralda County	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
Washoe County-Carson City	1.98	2.17	2.56	2.89	3.17	3.46	3.77	4.10	4.43	4.74	5.04	5.36	5.70	5.85
All of Nevada	10.592	12.085	14.762	16.841	18.541	20.159	21.769	23.523	25.226	26.830	28.335	29.925	31.607	32.307

Table 3-139. Projected values for population, employment, and economic variables, 2010 to 2067[a,b] (page 3 of 3).

Economic parameter	Year													
	2007	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065	2067
Real disposable income[b,c,d]														
Lyon County	1.040	1.169	1.367	1.547	1.737	1.938	2.177	2.465	2.788	3.194	3.458	3.744	4.053	4.184
Mineral County	0.109	0.116	0.122	0.119	0.122	0.125	0.128	0.132	0.136	0.144	0.141	0.138	0.135	0.134
Nye County	1.117	1.250	1.439	1.605	1.775	1.969	2.203	2.466	2.768	3.132	3.358	3.599	3.858	3.967
Clark County	60.731	68.974	79.836	89.500	99.788	111.517	124.864	140.518	156.612	173.027	182.571	192.642	203.269	207.682
Esmeralda County	0.029	0.030	0.033	0.035	0.037	0.041	0.043	0.047	0.050	0.054	0.054	0.055	0.055	0.056
Washoe County-Carson City	16.81	18.52	21.29	23.64	26.19	28.84	31.70	35.13	38.60	42.43	45.12	47.98	51.02	52.29
All of Nevada	85.032	95.636	110.205	123.098	136.861	152.183	169.418	189.600	210.290	232.015	245.035	258.799	273.350	279.400

a. Sources: DIRS 178610-Bland 2007, all; DIRS 178806-CBER 2006, all; DIRS 178807-Hardcastle 2006, all.
b. Model does not discriminate non-county regions, such as the Walker River Paiute Reservation.
c. Values from *Policy Insight* (DIRS 182251-REMI 2007, all), converted to 2006 dollars using the ratio of the 2000 annual Consumer Price Index (CPI) and the annual CPI from 2006.
d. 2006 dollars in billions.

Table 3-140. Housing characteristics in the Mina rail alignment region of influence, 2000.[a]

Geographic area	Total housing units	Single-family homes	Multiple-family homes	Mobile homes	Occupied housing units	Vacant housing units	Vacancy rate (percent)	
							Homeowner	Rental
Walker River Paiute Reservation[b]	348	308	6	34	304	44	NA[c]	NA
Schurz Census Designated Place[d]	320	280	6	34	276	44	0.5	6.7
Lyon County[e]	14,279	8,046	1,161	5,072	13,007	1,272	3.0	11.5
Yerington City[f]	1,328	861	286	181	1,182	146	2.3	14.0
Mineral County[g]	2,866	1,803	307	756	2,197	669	3.6	28.1
Hawthorne Census Designated Place[h]	1,813	1,177	219	417	1,470	343	3.8	28.6
Nye County[i]	15,934	6,383	1,014	8,537	13,309	2,625	3.4	17.9
Tonopah Census County Division[j]	1,608	766	385	457	1,152	456	3.6	32.3
Beatty Census County Division[j]	746	181	97	468	548	198	2.6	33.0
Amargosa Census County Division[j]	536	73	7	456	422	114	2.4	17.9
Pahrump[j]	8,206	3,660	479	4,067	7,234	972	3.2	11.8
Esmeralda County[k]	833	269	121	443	455	378	4.4	40.5
Goldfield Census County Division[j]	429	162	61	206	224	205	5.7	43.8
Clark County[l]	559,799	321,801	203,411	34,587	512,253	47,546	2.6	9.7
Washoe County	143,908	84,327	46,735	12,386	132,084	11,824	NA	NA
Carson City	21,283	12,872	5,364	2,985	20,171	1,112	NA	NA

a. Total Housing Units, Occupied Housing Units, and Vacant Housing Units counts were taken from Summary File 1 U.S. Census Bureau data, and Single Family Homes, Multiple Family Homes, and Mobile Homes counts were taken from Summary File 3 U.S. Census data. Because Summary File 1 data are collected from all households, while Summary File 3 data are compiled from a sample of approximately 19 million housing units (approximately 1 in 6 households), total housing counts differ slightly from the sum of "Single Family Homes, Multiple Family Homes, and Mobile Homes."
b. Source: DIRS 176856-U.S. Census Bureau 2003, Tables 41 and 43.
c. NA = not available.
d. Source: DIRS 180475-Nevada Small Business Development Center [n.d.], p. 55.
e. Source: DIRS 180476-Nevada Small Business Development Center [n.d.], p. 55.
f. Source: DIRS 180479-Nevada Small Business Development Center [n.d.], p. 55.
g. Source: DIRS 180477-Nevada Small Business Development Center [n.d.], p. 55.
h. Source: DIRS 180478-Nevada Small Business Development Center 2003, p. 55.
i. Source: DIRS 173564-Nevada Small Business Development Center 2003, p. 55.
j. Source: DIRS 173535-Bureau of Census 2000, all.
k. Source: DIRS 173566-Nevada Small Business Development Center 2003, p. 55.
l. Source: DIRS 173567-Nevada Small Business Development Center 2003, p. 55.

homes (63 percent). The Hawthorne Census Designated Place consists of 1,813 housing units with single-family homes, multiple-family homes, and mobile (manufactured) homes totaling 65 percent, 12 percent, and 23 percent of the housing stock, respectively. The Schurz Census Designated Place has 320 housing units that are predominantly single-family homes. The Walker River Paiute Reservation's housing stock is nearly identical to Schurz. In Hawthorne, nearly 30 percent of the rental units are vacant.

Nye County has similar housing stock to Lyon County, with 15,934 units, as indicated by Census 2000 data (DIRS 173564-Nevada Small Business Development Center 2003, all). Most of these units are mobile homes; the housing stock in the Beatty Census County Division and the Amargosa Census County Division consists of 63 percent and 85 percent mobile homes, respectively (DIRS 173564-Nevada Small Business Development Center 2003, all). In Tonopah, almost one-third of the housing units are vacant, particularly in the rental segment.

Esmeralda County has the smallest housing stock. More than half of the county's 833 units are in Goldfield, where 48 percent are mobile homes, and 49 percent of all units were vacant in 2000. The housing stock of Clark County in 2000 was 559,799, which reflects an increase of slightly more than 75 percent over the 1990 count (DIRS 173531-Bureau of Census 2000, Table DP-5 STF3). This increase is accounted for by the large population and employment growth in Clark County, which has spurred housing construction. Vacancy rates in both the homeowner and rental segments in Clark County tend to be lower than the rates in the other counties in the region of influence.

The housing stock in Washoe County in 2000 was 143,908. Only 8 percent of these housing units are vacant. Similarly, the occupancy rate in Carson City's housing stock is relatively low. Only 1,112 housing units are vacant, or just over 5 percent. As shown in Table 3-141, the median values of housing on the Walker River Paiute Reservation ($57,300), in Mineral County ($59,500), and Esmeralda County ($75,600), as listed by the U.S. Census Bureau in 2000, were considerably below the median values in Lyon County ($119,200), Nye County ($122,100), Carson City ($136,300), Clark County ($139,500), and Washoe County ($149,500). Similarly, rent levels in Mineral and Esmeralda Counties were approximately half those for Clark County and approximately two-thirds those of Nye County. Additionally, housing values in all of Southern Nevada rose rapidly since the 2000 Census. A Las Vegas-based housing research firm, Home Builders Research Inc., reported that the median price of the recorded new homes in the area in November 2005 was $301,519, which was a 5.9-percent annual increase. Omitting apartment conversions, the median price for new homes was $336,645, or an 18.2-percent annual increase (DIRS 176007-Home Builders Research 2005, all).

There are lodging options along U.S. Highway 95 in and around Yerington, Hawthorne, Walker Lake, Mina, Goldfield, Beatty, and Town of Amargosa Valley. In Yerington, there are four hotels with 118 total rooms and four recreational vehicle parks with 109 total spaces.

Visitors to Hawthorne may stay at any of the eight hotels (which have a total of 243 rooms). In addition, Hawthorne has two recreational vehicle parks with a total of 46 spaces. Walker Lake, Nevada, has one hotel with 20 rooms, while Mina has one recreational vehicle park with 26 spaces. Visitors to Goldfield can stay in the Goldfield recreational vehicle park, which has 20 spaces (DIRS 182379-Nevada Commission on Tourism 2004, all). Beatty has a much higher accommodation capacity. The town has six motels with a total 275 rooms, and three recreational vehicle parks with a total 63 spaces (DIRS 182381-Nevada Commission on Tourism 2004, all; DIRS 182384-Nevada Commission on Tourism 2004, all).

Town of Amargosa Valley features a combined 60-room hotel and 51-space recreational vehicle park, one additional motel (17 rooms), and one additional recreational vehicle park (97 spaces) (DIRS 182380-Nevada Commission on Tourism 2004, all; DIRS 182383-Nevada Commission on Tourism 2004, all).

Table 3-141. Median housing values and gross rents in the Mina rail alignment region of influence, 2000.[a]

Geographic area	Median value (dollars)[b]	Median monthly gross rent (dollars)
Walker River Paiute Reservation	57,300	200
Schurz Census Designated Place	56,800	200
Lyon County	119,200	591
Yerington City	99,200	436
Mineral County	59,500	398
Hawthorne County Designated Place	58,700	426
Nye County	122,100	541
Tonopah Census County Division	78,200	478
Beatty Census County Division	93,700	368
Amargosa Valley Census County Division	80,800	380
Pahrump	135,100	614
Esmeralda County	75,600	381
Goldfield Census County division	71,300	389
Clark County	139,500	716
Washoe County	149,500	675
Carson City	136,300	650

a. Source: DIRS 176856-U.S. Census Bureau 2003, Tables 25, 29, 45, and 47.
b. Median value applies to owner-occupied units.

3.3.9.3.4 Public Services

This section summarizes conditions for health care, education, fire protection, and law enforcement. Section 3.3.11, Utilities, Energy, and Materials, describes utilities-related public services.

3.3.9.3.4.1 Health Care. While Lyon, Mineral, Nye, and Esmeralda Counties have some health care facilities, all four counties are federally designated as health professional shortage areas for primary, dental, and mental health care (DIRS 180466-State of Nevada 2005, all; DIRS 180467-State of Nevada 2005, all; DIRS 173559-State of Nevada [n.d.], all; and DIRS 173560-State of Nevada [n.d.], all). Health care services in the region of influence are concentrated in Clark County, particularly in the Las Vegas area.

There is a public health clinic on the Walker River Paiute Reservation in Schurz. This clinic is staffed full time with a doctor and a nurse (DIRS 180118-Gormsen and Merritt 2007, all). This facility also has emergency medical services and emergency medical technicians (DIRS 180118-Gormsen and Merritt 2007, all).

Lyon County is served by four rural community health offices (DIRS 180153-Gormsen 2007, all). One of the health offices is in Yerington and has full-time public health services, such as family planning, sexually transmitted disease clinics, and immunization clinics. Yerington's community health office is the only provider of immunizations in the Smith Valley and Mason Valley region (DIRS 180153-Gormsen 2007, all).

Lyon County is also served by the South Lyon Medical Center in Yerington. The facility has 63 hospital beds and a 24-hour emergency room (DIRS 178100-State of Nevada 2006, p. v).

Mineral County has a community health nurse who provides immunizations, conducts general health checks (such as checking blood pressure), and examines ears, eyes, noses, and throats when those services are within the community health nurse's scope of practice (DIRS 180118-Gormsen and Merritt 2007, all). The community health nurse visits a Senior Care and Share center in Mina once a month to provide these public health services. Mina also has emergency medical team services available (DIRS 180118-Gormsen and Merritt 2007, all).

Mineral County is also served by Mount Grant Hospital in Hawthorne. This 35-bed facility offers a wide range of services, including acute, long-term, and emergency care (DIRS 180692-Mineral County Nuclear Projects Office 2004, p. 21). The hospital has a surgical suite for minor elective surgery (orthopedic, podiatry, and ophthalmology) (DIRS 180692-Mineral County Nuclear Projects Office 2004, p. 22).

According to a Nye County assessment, emergency service (county-wide medical and Pahrump's fire protection) personnel are currently overextended (DIRS 174548-Abaris Group 2004, pp. 2 and 3). Nye County medical services are distributed widely and consist of a mixture of public and private clinics. The communities of Beatty, Pahrump, and Town of Amargosa Valley all have access to ambulance service, and are served by preventative care clinics staffed by physician assistants or community health nurses. These clinics focus on women's health and immunizations. They are funded in part by the State Rural Health Division (DIRS 174736-Arcaya 2005, all). Pahrump has a pediatric physician who runs a separate clinic in the community, a Veterans Administration clinic, and several private dermatologists, dentists, and chiropractors (DIRS 174736-Arcaya 2005, all; DIRS 174972-Arcaya 2005, all).

Additionally, Desert View Regional Medical Center (DVRMC), Pahrump's first hospital, opened in April 2006. The hospital has 24 beds and a 24-hour emergency room. The facility has a maternity ward, full-service lab and radiology services, as well as physical therapy services (DIRS 181897-Desert View Regional Medical Center [n.d.], all).

Nye County is also served by the Nye Regional Medical Center, a small, private hospital in Tonopah that has ambulance services. The center has 44 beds, 26 of which are long-term-care beds reserved for the hospital's nursing-home wing. Two full-time-equivalent physicians provide coverage for both the 24-hour emergency room and all other patients. The hospital's nursing home maintains 24-hour coverage consisting of one registered nurse and one certified nursing assistant. The Nye Regional Medical Center is able to perform diagnostic imagery and to provide services from its on-site laboratory, pharmacy, and outpatient clinic. However, the facility is not licensed for surgery. Nye County patients in need of more advanced care than can be provided at Tonopah's hospital are transported by helicopter to Reno or Las Vegas by Flight for Life, a medical air service (DIRS 174732-Arcaya 2005, all).

Although Nye County continues to be a medically underserved area and a health professional shortage area, Table 3-142 shows that the capacity of the health care system in Nye County improved between 1995 and 2000, with increases in the average number of beds and the number of beds per 1,000 residents.

Esmeralda County had no practicing doctors or dentists in 2005 (DIRS 177749-Nevada State Board of Medical Examiners [n.d.], p. 7). The U.S. Health Resources and Services Administration designated Esmeralda County as both a health professional shortage area and a medically underserved population for primary health, dental, and mental-health care for 2004 (DIRS 173560-State of Nevada [n.d.], all). Because Esmeralda County has no health-care facilities, the county has submitted a proposal to fund a new facility (DIRS 175507-McCorkel et al. 2005, all).

Table 3-142. Hospital use in Nye County.[a]

County	1995	1998	2000
Average number of beds	21	10	44
Beds per 1,000 residents	0.86	0.33	1.3
Patient days	1,900	560	No data available

a. Source: DIRS 174732-Arcaya 2005, all.

Clark County has 13 general acute care medical centers with a combined total of 3,439 beds (1.9 beds per 1,000 residents) and 2,729 active, licensed physicians practicing throughout the county in 2005 (DIRS 178100-State of Nevada 2006, p. v; DIRS 177749-Nevada State Board of Medical Examiners [n.d.], p. 7). Sunrise Hospital and Medical Center, in Las Vegas, is the largest hospital in Nevada with 701 beds (DIRS 178100-State of Nevada 2006, p. v). It is also capable of providing all medical services and staffs a 24-hour emergency room. Of the remaining 12 hospitals in Clark County, eight (Desert Springs Hospital, Mountain View Hospital, North Vista Hospital, Southern Hills Hospital and Medical Center, Spring Valley Hospital Medical Center, Summerlin Hospital and Medical Center, University Medical Center, and Valley Hospital and Medical Center) are in Las Vegas, two (Saint Rose Dominican Hospital and Saint Rose Siena Campus) are in Henderson, one (Boulder City Hospital) is in Boulder City, and one (Mesa View Regional Hospital) is in Mesquite (DIRS 178100-State of Nevada 2006, p. v).
Washoe County has five general acute care hospitals with a combined total of 1,066 beds and 952 active, licensed physicians practicing throughout the county in 2005 (DIRS 178100-State of Nevada 2006, p. v; DIRS 177749-Nevada State Board of Medical Examiners [n.d.], p. 7). According to 2005 data, Carson City has one general acute care hospital with 144 beds and 143 active, licensed physicians (DIRS 178100-State of Nevada 2006, p. v; DIRS 177749-Nevada State Board of Medical Examiners [n.d.], p. 7).

3.3.9.3.4.2 Education. Lyon County has a total of 16 elementary, middle, and high school facilities. During the 2005 to 2006 school year, Lyon County schools had a total enrollment of 8,688 students and a graduation rate for the class of 2005 of 83 percent (DIRS 180463-Lyon County School District [n.d.], pp. 2 and 10). The average student-to-teacher ratio for kindergarten through eighth grades is 21 to 1 (DIRS 180463-Lyon County School District [n.d.], p. 9). This is slightly higher than the 2003 national average student-to-teacher ratio of 16 to 1 across elementary and secondary grade levels (DIRS 177757-Snyder, Tan, and Hoffman 2006, Table 62). Lyon County is the fastest growing school district in Nevada (DIRS 180463-Lyon County School District [n.d.], p. 1). The school district hired more than 100 teachers for the 2005-2006 school year and will open new elementary schools in Fernley and Dayton for the 2006-07 and 2007-08 school years, respectively (DIRS 180463-Lyon County School District [n.d.], p. 1).

Mineral County has a total of three elementary, middle, and high school facilities. During the 2005 to 2006 school year, Mineral County schools had a total enrollment of 624 students and a graduation rate for the class of 2005 of 73 percent (DIRS 180465-Mineral County School District [n.d.], pp. 2 and 7). The average student-to-teacher ratio for kindergarten through eighth grades is 16 to 1 (DIRS 180465-Mineral County School District [n.d.], p. 6). This is consistent with the 2003 national average student-to-teacher ratio of 16 to 1 across elementary and secondary grade levels (DIRS 177757-Snyder, Tan and Hoffman 2006, Table 62).

During the 2005 to 2006 school year, Nye County had approximately 6,088 students. The county's 2005 graduation rate was approximately 60 percent (DIRS 177759- Nye County School District [n.d.], p. 11).

The average student-to-teacher ratio for kindergarten through fifth grades is 20 to 1 (DIRS 177759-Nye County School District [n.d.], p. 10). Tonopah has elementary, middle, and high school facilities.

Nye County's school system saw an approximate 10-percent increase in enrollment in the 2004-2005 school year over the previous year. Most of this growth was due to increases in Pahrump's population. Pahrump is home to four elementary schools, one middle school, and one high school. Table 3-143 lists enrollment for each school. All of these schools are functioning at or above maximum design capacity

(that is, they are all serving as many or more students than they were originally built to accommodate). To alleviate overcrowding, all six schools were scheduled to receive modular units over the summer of 2005 that would each hold two additional classes. A bond for a new elementary school is also under consideration for the area, with a timeline of roughly 18 months for discussion and a decision on the

Table 3-143. Enrollment in Pahrump-area schools, 2004-2005.[a]

School Name	Type	2004-2005 Enrollment
Pahrump Valley	High school	987
Rosemary Clark	Middle school	1,122
Hafen	Elementary school	560
JG Johnson	Elementary school	555
Mt. Charleston	Elementary school	574
Manse	Elementary school	478

a. Source: DIRS 174737-Arcaya 2005, all.

bond. The new elementary school would likely be designed to hold between 400 and 600 students, making it roughly equal in size to the four existing elementary schools (DIRS 174737-Arcaya 2005, all).

In Nye County, the Pahrump Valley Branch Campus of Great Basin College provides postsecondary school education. The nearest major university to southern Nye County is the University of Nevada, Las Vegas, 105 kilometers (65 miles) from Pahrump. The University of Nevada, Reno, is the closest major university to northern Nye County. In addition, the University of Nevada, Reno, has Cooperative Extension Centers in Pahrump and Tonopah.

In Esmeralda County, 86 students were enrolled in school during the 2005-2006 school year (DIRS 177760-Esmeralda County School District [n.d.], p. 3). Three schools in the county serve kindergarten through eighth grade students. These schools are in Dire, Silver Peak, and Goldfield. The average student-to-teacher ratio is 12 to 1 (DIRS 177760-Esmeralda County School District [n.d.], p. 7). The county employs seven certified teachers and one certified literacy coordinator (DIRS 174970-Arcaya 2005, all). There is no high school in Esmeralda County; high school students from Esmeralda County attend school in Tonopah, Nye County (DIRS 155970-DOE 2002, p. 3-156).

3.3.9.3.4.3 Fire Protection. Lyon County is divided into four fire districts to meet fire suppression needs: North Lyon County Fire District, Central Lyon County Fire District, Mason Valley Fire District, and Smith Valley Fire District. In total, there are 31 career firefighters and 117 volunteer firefighters spread across these fire districts (DIRS 180693-Gormsen 2007, all). The Central Lyon, Mason Valley, and Smith Valley Fire Districts are part of a quad-county partnership with Douglas County, Storey County, and Carson City. These fire districts are weapons-of-mass-destruction and hazardous-materials certified, and will provide assistance to events in any of the four partner counties. All four of the fire districts have received at least one Fire Act grant in the last 3 years. In addition, the county receives sporadic grants from state agencies (DIRS 180693-Gormsen 2007, all).

Mineral County has four fire departments: Hawthorne Volunteer Fire Department, Mina Volunteer Fire Department, Luning Volunteer Fire Department, and Walker Lake Volunteer Fire Department. Among these four departments, the county has a total of 43 volunteer and three career firefighters. Hawthorne Volunteer Fire Department uses three Type 1 fire apparatuses, and the other three departments use one Type 1 apparatus each.

Nye County has 11 volunteer fire departments, including one in Beatty and one in Town of Amargosa Valley. The only paid fire department within the county is located in Pahrump. The county recently spent $2.5 million to upgrade its fire trucks and has adequate fire protection in all areas of the county except for Pahrump, which is overextended (DIRS 174731-Arcaya 2005, all). A 2004 audit of the Pahrump Valley Fire-Rescue Service commissioned by the Pahrump Town Board found that "the community is currently underserved by fire suppression and emergency medical services operational staff" and suggested that staff be added to the service, specifically an additional daily three-person team (DIRS 174548-Abaris Group 2004, p. 3). The audit also noted that Pahrump has no overall fire suppression and emergency medical services master plan, and recommended that one be developed.

Currently, the Nevada Test Site provides fire protection services to the Yucca Mountain Site. The Nevada Test Site has two active fire departments that operate 24 hours a day, 7 days a week. One of the fire departments is in Mercury, Nevada (Area 23), and the other is in Area 6 on the Nevada Test Site. The Yucca Mountain Site has two paramedics, a small medical facility, and an ambulance for emergency response. The site also has two fully trained underground rescue teams available any time underground work is underway (DIRS 177762-Gormsen 2006, all).

The BLM Las Vegas and Battle Mountain Field Offices supplement Nye County's fire-protection resources by providing wildfire suppression services to all the public lands within Nye County that are managed by the BLM and the U.S. Forest Service (DIRS 177867-Gormsen 2006, all; DIRS 177925-Gormsen 2006, all). The Las Vegas Field Office provides fire suppression resources for wildfires during peak fire season, which is generally from April through October. The Battle Mountain Field Office provides fire suppression support from three locations in northern Nye County: Austin, Eureka, and Battle Mountain. In addition to firefighters, the fire suppression resources available through these locations include Type-4 and Type-3 wildfire engines, a Type-3 helicopter, Type-3 incident commanders, and single engine air tanker and air attack bases (DIRS 177867-Gormsen 2006, all; DIRS 177925-Gormsen 2006, all).

In Esmeralda County, Goldfield has nine volunteer firefighters and three fire trucks; Gold Point has eight volunteer firefighters and three fire trucks; Silver Peak has six volunteer firefighters and three fire trucks; and Fish Lake Valley has 16 volunteer firefighters and three fire trucks (DIRS 180977-Gormsen 2007, all). The community fire departments have access to the county's road department vehicles, if needed.

3.3.9.3.4.4 Law Enforcement. The Walker River Paiute Reservation has a police department with four law enforcement officers (DIRS 181594- Zuber, 2007). This yields a ratio of 3.4 officers per 1,000 residents.

The Lyon County Sheriff's Office has 78 sworn officers, 13 of whom are assigned to the detention facility. This yields a ratio of 1.6 sworn personnel per 1,000 residents (DIRS 180693-Gormsen 2007, all).

The Mineral County Sheriff's Office is currently staffed with 18 sworn officers to provide administrative, communications, detention, and patrol services in the county (DIRS 180221-Gormsen and Merritt 2007, all). This yields a ratio of 3.9 sworn officers per 1,000 residents.

The Nye County Sheriff's Office has 105 sworn officers, 85 who conduct street patrols, and 20 who are corrections and detention officers (DIRS 174974-Arcaya 2005, all). This yields a ratio of 2.2 patrol officers per 1,000 residents. The Nye County Sheriff's Office receives some funding in the form of occasional grants from state and federal agencies (DIRS 177756-Gormsen 2006, all).

The Esmeralda County Sheriff's Office has 14 employees: six officers who handle patrol (one sheriff, one sergeant, two resident deputies, and two full-time street deputies), three corrections officers, four full-time dispatchers, and one part-time civilian dispatcher (DIRS 174753-Arcaya 2005, all). This yields a ratio of 5 officers per 1,000 residents in Esmeralda County. By comparison, the national officer-to-population ratio is 2.4 officers per 1,000 residents (DIRS 155970-DOE 2002, p. 3-92). The Esmeralda County Sheriff's Office receives limited state and federal support in the form of occasional equipment grants (DIRS 178094-Arcaya 2006, all). The county does not receive ongoing grant support or training administered by state or federal agencies.

As Table 3-144 shows, crime rates for Lyon, Mineral, Nye, Esmeralda Counties and Carson City are below the national average, and, with the exception of Mineral County, have decreased or stayed constant between 2003 and 2005.

Table 3-144. Crime rates in the Mina rail alignment region of influence, 2003 to 2005.

Area	Crime rate[a]		
	2003[b]	2004[c]	2005[d]
Lyon County	23	22	21
Mineral County	12	13	16
Nye County	35	35	31
Esmeralda County	13	10	7
Clark County	51	51	51
Washoe County	51	47	46
Carson City	38	35	31
National	45	44	Not available

a. The crime rate is based on the occurrence of an offense per 1,000 residents.
b. Sources: DIRS 173399-State of Nevada 2004, all; DIRS 177747-State of Nevada 2005, all; DIRS 177748-State of Nevada 2006, all.

3.3.9.3.5 Transportation Infrastructure

This section describes the public roadways and mainline railroads in the area around the Mina rail alignment.

3.3.9.3.5.1 Public Roadways. Because the Mina rail alignment region of influence for transportation resources is primarily in remote and rural areas, the rail line would cross paved highways and roads with low traffic, and low-usage unpaved roads, including county roads, private roads, and off-road vehicle trails. While many of the unpaved roads are important to the daily activities of landowners and ranchers in the area, these roads are not heavily traveled. The exception is the existing Union Pacific Railroad Hazen Branchline between Hazen and Wabuska, which crosses public roads with moderate traffic (such as U.S. Highway 50 in Silver Springs and U.S. Highway 95A in Churchill and Wabuska). Section 4.3.10, Occupational and Public Health and Safety, describes safety issues concerning rail line crossings of public roads, and road traffic related to construction and operation of the proposed railroad.

In addition to the state and federal roads discussed below, there are three paved roads with rail-public highway crossings on the Union Pacific Railroad Hazen Branchline: First Avenue, Fifth Street, and Ninth Street in Silver Springs. There are also three paved roads the Mina rail alignment would intersect and would require rail-highway crossings: Silver Peak Road in Silver Peak and two Nevada Test and Training Range access roads (one approximately 19 kilometers [12 miles] east of Tonopah off U.S. Highway 6 and the other off U.S. Highway 95 between Scottys Junction and Beatty).

Generally, the main roads within the region of influence are two-lane highways with very little daily traffic. Table 3-145 lists annual average daily traffic volumes along primary roads in the region of influence, which DOE obtained from the Nevada Department of Transportation’s 2005 annual traffic report (DIRS 178749-NDOT [n.d.], all). These traffic volumes indicate that roadways near the Mina rail alignment are not congested.

All references to ***levels of service*** of roads shown in Table 3-145 are defined by the Highway Capacity Manual 2000, which is an industry standard for traffic engineering published by the Transportation Research Board (DIRS 176524-Transportation Research Board 2001, all). This manual defines six levels of service that reflect the level of traffic congestion and qualify the operating conditions of a roadway. The six levels are given letter designations ranging from A to F, with A representing the best operating conditions (free flow, little delay) and F the worst (congestion, long delays) (DIRS 176524-Transportation Research Board 2001, all). Various factors that influence the operation of a roadway or

Table 3-145. Annual average daily traffic counts in southern and western Nevada (2005).[a]

Roadway and location of traffic count station	Legend in Figure 3-235	Vehicles per day[b]	Level of service
U.S. Highway 50A			
0.8 kilometer (0.5 mile) west of the junction of U.S. Highway 50 (Churchill County)	a	7,900	C
U.S. Highway 50			
2.4 kilometers (1.5 miles) east of U.S. Highway 95A (Lyon County)	b	2,200	B
U.S. Highway 95A			
13 kilometers (8 miles) south of Silver Springs (Lyon County)	c	NA[c]	NA
1 kilometer (0.6 mile) south of the railroad crossing at Wabuska (Lyon County)	d	2,850	B
0.16 kilometer (0.1 mile) east of Miley Road (Lyon County)	e	1,800	B
State Route 361 (Gabbs Valley Road)			
32 kilometer (0.2 mile) north of U.S. Highway 95 in Luning (Mineral County)	f	120	A
State Route 360 (Mina-Basalt Cutoff Road)			
0.4 kilometer (0.25 mile) west of U.S. Highway 95 south of Sodaville (Mineral County)	g	690	A
U.S. Highway 6 and U.S. Highway 95			
76.2 meters (250 feet) west of State Route 265 to Silver Peak (Esmeralda County)	n	2,000	B
State Route 265 (Silver Peak Road)			
0.16 kilometer (0.1 mile) south of U.S. Highway 6 and U.S. Highway 95 (Esmeralda County)	i	90	A
U.S. Highway 95			
61 meters (200 feet) north of railroad grade crossing in Schurz (Mineral County)	j	2,550	B
0.40 kilometer (0.25 mile) south of State Route 362 (Hawthorne Truck Bypass Road) (Mineral County)	k	2,850	B
0.40 kilometer (0.25 mile) north of State Route 361 to Gabbs (Mineral County)	l	2,300	B
6.6 kilometers (4.1 miles) north of Mina (Mineral County)	m	2,300	B
1 kilometer (0.6 mile) north of U.S. Highway 6 (Esmeralda County)	h	1,700	B
0.3 kilometer (0.2 mile) south of U.S. Highway 6 in Tonopah (Nye County)	q	5,550	C
20.3 kilometers (12.6 miles) west of the Nye-Esmeralda county line (Esmeralda County)	p	2,050	B
At the Nye-Esmeralda county line south of Tonopah (Esmeralda County)	o	2,100	B
Just south of the town of Goldfield (Esmeralda County)	r	1,950	B
South of Goldfield at mp ES-8.8 (Esmeralda County)	s	200	A
0.16 kilometer (0.1 mile) south of State Route 266 at Lida Junction (Esmeralda County)	t	2,150	B
1.6 kilometers (1 mile) north of State Route 374 (Death Valley Road) (Nye County)	u	2,400	B
0.2 kilometer (0.1 mile) south of State Route 374 (Death Valley Road) (Nye County)	v	3,400	B
0.3 kilometer (0.2 mile) north of State Route 373 (Nye County)	w	2,600	B

a. Source: DIRS 178749-NDOT [n.d.], all.
b. See Figure 3-235 for location of traffic counts.
c. NA = not available; not collected in 2005.

intersection include speed, delay, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety. The Highway Capacity Manual describes the levels of service as follows:

- Level of service A describes completely free-flow conditions. Individual drivers are virtually unaffected by the presence of other vehicles in the traffic stream.
- Level of service B also indicates free flow, but the presence of other vehicles becomes more noticeable. Freedom to select desired speeds is relatively unaffected, but there is a slight decline in the freedom to maneuver within the traffic stream from level of service A.

- Level of service C is in the range of stable flow, but marks the beginning of the range of flow in which operation of individual drivers becomes significantly affected by interactions with others in the traffic stream. The selection of speed is now affected by others and maneuvering requires substantial vigilance on the part of the driver.
- Level of service D represents high density but stable flow. Speed and freedom to maneuver are severely restricted, and the driver experiences a generally poor level of comfort and convenience.
- Level of service E represents operating conditions at or near capacity. All speeds are reduced to a low, but relatively uniform, value.
- Level of service F is used to define breakdown of traffic flow or stop-and-go traffic. This condition exists wherever the amount of traffic approaching a point exceeds the amount that can cross the point. Queues form behind such locations. Operations within the queue are characterized by stop and-go waves, and they are extremely unstable.

Levels of service A, B, and C are typically considered good operating conditions in which motorists experience minor or tolerable delays of service. Based on the traffic counts listed in Table 3-145, State Routes 361, 360, and 265 are operating at a level of service A. Most of U.S. Highway 95 and 95A within the region of influence are operating at a level of service B, except for a portion that is operating at a level of A, and another at level C. The section of U.S. Highway 50 within the region of influence operates at a level of service B, while U.S. Highway 50A operates at a level of service C. Sections 3.3.10 and 4.3.10, Occupational and Public Health and Safety, discuss highway accidents and fatalities.

3.3.9.3.5.2 Mainline Railroads. Two major freight railroads, both Class I, serve Nevada: the Union Pacific Railroad and the Burlington Northern and Santa Fe Railway. Union Pacific is the dominant carrier of the two in terms of tonnage of freight hauled and miles of track. The Union Pacific Railroad mainlines consist of two northern routes and one southern route that cross Nevada east to west. The region of influence for rail transportation includes the Union Pacific Railroad Hazen Branchline, and the Department of Defense Branchlines from near Wabuska to Hawthorne.

Union Pacific Railroad Hazen Branchline shipments totaled 1,419 railcars in 2005 (DIRS 178017-Holder 2006, all), which can generate from one to five trains per week. Of the 1,419 railcars, 98 railcars were shipped to the Hawthorne Army Depot. For purposes of analysis in this Rail Alignment EIS, DOE assumes that the existing rail traffic on the Union Pacific Railroad Hazen Branchline consists of an average of four trains per week (two Union Pacific trains plus two U.S. Army trains). Since the Union Pacific Railroad trains only operate as far as the end of the Union Pacific Railroad Hazen Branchline near Wabuska, DOE assumes that the existing rail traffic on the Department of Defense Branchlines averages two trains per week.

Sections 3.3.10 and 4.3.10, Occupational and Public Health and Safety, discuss rail transportation in relation to public safety.

3.3.10 OCCUPATIONAL AND PUBLIC HEALTH AND SAFETY

This section describes the affected environment for occupational and public health and safety related to construction and operation of a railroad along the Mina rail alignment. Section 3.3.10.1 describes the nonradiological, radiological, and transportation regions of influence; Section 3.3.10.2 describes the nonradiological health and safety environment considered in estimating potential nonradiological health and safety impacts, excluding transportation impacts; Section 3.3.10.3 describes the environment considered in estimating potential radiological health and safety impacts related to operation of the railroad, including transportation; Section 3.3.10.4 describes ***background radiation*** in the vicinity of the Yucca Mountain Site; and Section 3.3.10.5 describes the environment considered in estimating potential nonradiological health and safety environment impacts from transportation accidents.

The discussion of the radiological health and safety environment is related to the potential impacts to workers from occupational ***exposure to radiation*** during operation of the railroad, and potential impacts to workers and the public from ***incident-free transportation*** of spent nuclear fuel and high-level waste and under accident scenarios and acts of sabotage or terrorism.

The discussion of the nonradiological health and safety environment is related to potential impacts to workers during construction and operation of the railroad from workplace physical hazards, exposure to nonradiological ***hazardous chemicals***, and exposure to other nonradiological hazards such as biological hazards.

The discussion of the nonradiological transportation health and safety environment relates to the nonradiological transportation impact analysis, which includes potential impacts to workers and the public from roadway and railway transportation ***accidents*** that do not involve releases of ***radiation***.

3.3.10.1 Region of Influence

3.3.10.1.1 Nonradiological Region of Influence

The nonradiological region of influence is the environment considered in estimating the potential for occupational nonradiological impacts to workers from the construction and operation of the railroad. (Because the public would not be involved in the construction and operation of the railroad, the public is not considered in delineating this region of influence.) The nonradiological region of influence includes:

- The nominal width of the Mina rail alignment construction right-of-way between Wabuska and the Rail Equipment Maintenance Yard. There would be no new construction along the existing Union Pacific Railroad Branchline between Hazen and Wabuska; the region of influence for the existing rail line between Hazen and Wabuska applies only to the operations phase, not to the construction phase.
- The operations right-of-way of the existing Union Pacific Railroad Hazen Branchline between Hazen and Wabuska and the operations right-of-way of the Mina rail alignment between Wabuska and the Rail Equipment Maintenance Yard.
- Public roads in Washoe, Carson City, Douglas, Storey, Churchill, Mineral, Lyon, Nye, and Esmeralda Counties and the Walker River Paiute Reservation that the railroad workforce would use during railroad construction and operations.
- The railroad construction and operations support facilities including access roads, water wells, and quarries where workers would perform construction, operations, or maintenance activities. Railroad operations support facilities within the region of influence include the following:
  - Staging Yard (including interchange tracks) at Hawthorne
  - Maintenance-of-Way Facility

- Rail Equipment Maintenance Yard
- Cask Maintenance Facility
- ***Nevada Railroad Control Center*** and National Transportation Operations Center

- Construction support facilities include the following:
  - Quarries
  - Concrete batch plant
  - Construction camps
  - Water wells

The region of influence for potential occupational nonradiological impacts to workers includes the rail line right-of-way and construction and operations support facilities where the proposed workforce would work.

3.3.10.1.2 Radiological Region of Influence

The region of influence for potential occupational radiological impacts to workers includes during incident-free operation of the railroad includes the physical boundaries of railroad operations support facilities, where workers would perform activities involving the inspection, handling, and transportation of ***spent nuclear fuel*** and ***high-level radioactive waste***. Railroad operations support facilities within the radiological region of influence include only the Staging Yard, the Rail Equipment Maintenance Yard, and the Cask Maintenance Facility because DOE anticipates that the potential for workers to be exposed to ***ionizing radiation*** from ***radioactive*** materials will occur only at those facilities. Radioactive materials would not be handled at the Nevada Railroad Control Center and National Transportation Operations Center, or the Maintenance-of-Way Facility.

The region of influence for potential radiological impacts to members of the public during incident-free transportation involves the area 0.8 kilometer (0.5 mile) on either side of the centerline of the Mina rail alignment, which, for purposes of analysis, includes operation of cask trains and repository construction and supplies trains from Caliente or Eccles to the Rail Equipment Maintenance Yard. The members of the public assumed to be present in this region of influence are residents and other people located within the region of influence of the Mina rail alignment, including people who live within 0.8 kilometer of either side of the centerline of the Union Pacific Railroad Hazen Branchline, from the Staging Yard to the Rail Equipment Maintenance Yard. For the public radiological impact analysis, DOE evaluated four specific alignments: the alignment with the highest population within the region of influence, the shortest alignment, the longest alignment, and the alignment with the lowest population within the region of influence (Table 3-146). Affected populations for the four alignments would include:

- Populations of the public within 0.8 kilometer of either side of the centerline of the rail alignment. These populations are based on 2000 Census data.
- Populations of Tribal members within 0.8 kilometer of either side of the centerline of the rail alignment. These populations are also based on 2000 Census data.
- Populations within 0.8 kilometer of the Staging Yard. Based on the location of the Staging Yard at Hawthorne and 2000 Census data, DOE anticipates that there would be no members of the public within 0.8 kilometer of the Staging Yard footprint.
- Individuals at locations such as residences or businesses located near the rail alignment.
- Populations within the region of influence for radiological impacts for potential public exposure related to accidents and sabotage. This includes the area 80 kilometers (50 miles) on either side of the centerline of the rail line. These populations are based on 2000 Census data.

Table 3-146. Mina rail alignments evaluated for radiological impacts to members of the public.[a]

Alignment with the largest population	Alignment with the smallest population	Longest alignment	Shortest alignment
941 people	878 people	901 people	904 people
339 miles	347 miles	354 miles	323 miles
Union Pacific Railroad Hazen Branchline[b]	Union Pacific Railroad Hazen Branchline[b]	Union Pacific Railroad Hazen Branchline[b]	Union Pacific Railroad Hazen Branchline[b]
Department of Defense Branchline North	Department of Defense Branchline North	Department of Defense Branchline North	Department of Defense Branchline North
Schurz alternative segment 5	Schurz alternative segment 4	Schurz alternative segment 6	Schurz alternative segment 1
Department of Defense Branchline South	Department of Defense Branchline South	Department of Defense Branchline South	Department of Defense Branchline South
Mina common segment 1	Mina common segment 1	Mina common segment 1	Mina common segment 1
Montezuma alternative segment 2	Montezuma alternative segment 3	Montezuma alternative segment 3	Montezuma alternative segment 1
Mina common segment 2	Mina common segment 2	Mina common segment 2	Mina common segment 2
Bonnie Claire alternative segment 2	Bonnie Claire alternative segment 3	Bonnie Claire alternative segment 2	Bonnie Claire alternative segment 2
Common segment 5	Common segment 5	Common segment 5	Common segment 5
Oasis Valley alternative segment 3	Oasis Valley alternative segment 1	Oasis Valley alternative segment 3	Oasis Valley alternative segment 5
Common segment 6	Common segment 6	Common segment 6	Common segment 6

a. Populations based on 2000 Census data.

b. The Union Pacific Railroad Hazen Branchline is part of the region of influence only for the purposes of the radiological impact assessment; the Union Pacific Railroad Hazen Branchline is not part of the Mina rail alignment.

The region of influence for radiological impacts to workers and the public from radiological accidents and sabotage or terrorism includes the area within 80 kilometers (50 miles) on either side of the centerline of the proposed rail alignment. The populations assumed to be present in this area are based on 2000 Census data. This region of influence is the same as the region of influence in the Repository SEIS.

DOE used the radiological region of influence to conduct the radiological impact analysis and to identify the population potentially affected by exposure to radiation from routine operation of the railroad and in the event of an accident. The 0.8-kilometer (0.5-mile) distance DOE applied in this Rail Alignment EIS to estimate the potentially affected population for incident-free transportation of spent nuclear fuel casks (see Appendix K, Section K.2.1.1) and the 80-kilometer (50-mile) distance to estimate the potentially affected population for accident analyses (see Appendix K, Section K.2.4) are standard distances the Department has used in radiological transportation risk assessments (DIRS 185281-AEC 1972, pp. 94 and 110).

3.3.10.1.3 Nonradiological Transportation Region of Influence

The region of influence for the analysis of potential nonradiological roadway and railway transportation accidents includes public roadways in the vicinity of the Mina rail alignment upon which workers and materials associated with the construction and operation of the rail line and facilities would be transported, and the Mina rail line right-of-way and the rail alignment itself, upon which spent nuclear fuel, high level radioactive waste, and other materials would be transported. The region of influence for transportation is primarily in remote and rural areas, and there are two operating railroads between Hazen and Thorne. The existing Union Pacific Railroad Hazen Branchline from Hazen to Wabuska, and the Department of Defense Branchline from Wabuska to Thorne both carry very low rail volumes, with an average of two trains per week on the Union Pacific Railroad Hazen Branchline and two trains per week on the Department of Defense Branchline. Although the existing Union Pacific Railroad Mainline that services west-central Nevada is used as a point of comparison in Section 4.3.10, this Rail Alignment EIS does not assess impacts to the Union Pacific Railroad Mainline.

During railroad construction, new access roads to construction camps, quarries, and water wells would originate from nearby intersections with existing public roadways. The Mina rail alignment would be within Nevada Department of Transportation Districts 1 and 2, and the rail alignment would cross Churchill, Lyon, Mineral, Nye, and Esmeralda Counties and the Walker River Paiute Reservation. The region of influence focuses on the vicinity of the Mina rail alignment, but also includes other public roadways that DOE could use to supply materials, equipment, and workers during the construction phase. During construction, completed segments of the rail line could be used to transport goods and services to construction sites and camps.

3.3.10.2 Nonradiological Health and Safety Environment

Nonradiological occupational health and safety considers potential recordable incidents, lost-time accidents, and worker fatalities resulting from potential exposure of workers to physical hazards and nonradiological hazardous chemicals in their work environment during railroad construction and operations. The affected environment for nonradiological occupational health and safety also includes potential occupational health effects from exposure to exhaust emissions from vehicles and heavy equipment, including, for example, earth-moving equipment.

Nonradiological public health and safety addresses potential exposure of members of the public to nonradiological chemical hazards and vehicle emissions that would result from railroad construction and operations. Section 3.3.4, Air Quality and Climate, and Section 3.3.8, Noise and Vibration, describe the affected environments for potential public exposure to criteria and nonradiological ***hazardous air***

pollutants, including vehicle emissions, and potential exposure to noise and vibration generated from construction and operation of the proposed railroad.

The types of potential nonradiological health and safety hazards to construction workers and operations and maintenance workers under the Proposed Action include:

- Incidents resulting from physical hazards, including occupational injuries and illnesses resulting in total recordable cases, lost workday cases, and fatalities. Fatalities could occur on or off the work site as a result of an incident or illness experienced on the work site. Physical hazards could include the potential for falls, excavation and confined-space entry hazards, mechanical hazards, electrical hazards, ergonomic hazards, heavy construction equipment (not passenger vehicles) hazards, and illnesses related to workplace exposure to chemical hazards.
- Off-site vehicle emissions-related health effects, including health effects related to off-site vehicular emissions from transportation of construction workers, equipment, and materials and wastes to and from the construction sites.
- On-site vehicle and heavy equipment-related health effects, including effects related to diesel engine exhaust emissions from vehicles and heavy equipment operated by construction workers on the construction sites. These health effects encompass workers who could be exposed to vehicular and heavy equipment emissions.
- Incidents resulting from other nonradiological chemical hazards, including occupational exposure to chemicals (such as solvents and lubricants), dust (such as silica dust), and other nonradiological substances from railroad construction and operations. The U.S. Department of Labor Bureau of Labor Statistics incident rates include occupational illnesses and fatalities that could result from nonradiological chemical exposure. However, the Bureau of Labor Statistics incident rates do not include a breakdown by incident type (DIRS 179129-BLS 2007, all; DIRS 179131-BLS 2006, all).
- Unexploded ordnance hazards, including potential encounters by rail line construction workers with unexploded ordnance. The U.S. Army has identified and mapped an area of potential unexploded ordnance along the existing Department of Defense Branchline right-of-way south of Schurz. This area is bordered by the southeastern shoreline of Walker Lake, the existing Department of Defense Branchline, and the Hawthorne Army Depot.
- Noise hazards, including short-term or long-term occupational exposure to noise that could impair hearing.
- Biological hazards that workers could encounter, such as venomous animals, West Nile Virus, Valley Fever, Hantavirus, and rabies.

3.3.10.3 Radiological Health and Safety Environment

There are ambient levels of radiation in the vicinity of the Mina rail alignment, just as there are around the world. All people are inevitably exposed to the three sources of ionizing radiation: sources of natural origin unaffected by human activities, sources of natural origin but affected by human activities (called enhanced natural sources), and manmade sources. Natural sources (natural background radiation) include ***cosmic radiation*** from space, ***cosmogenic radionuclides*** produced when cosmic radiation interacts with matter in the atmosphere or ground, and naturally occurring, long-lived ***primordial radionuclides*** in the Earth's mantle. Enhanced natural sources include those that can increase exposure as a result of human actions, deliberate or otherwise. For example, a mill tailings pile from a uranium extraction process probably would contain concentrated levels of naturally occurring ***radionuclides***. A variety of radiation exposures, generally smaller than those caused by natural sources, result from manmade sources including nuclear medicine, medical X-rays, and consumer products.

Sources of Radiation Exposure

Nationwide, on average, members of the public are exposed to approximately 360 millirem per year from natural and manmade sources. The relative contributions by radiation source to people living in the United States are (DIRS 155970-DOE 2002, p. F-4):

- Radon in homes and buildings: 200 millirem per year
- Medical radiation: 53 millirem per year
- Internal radiation from food and water: 40 millirem per year
- Terrestrial (external radiation from rocks and soil): 28 millirem per year
- Cosmic (external radiation from outer space): 27 millirem per year
- Consumer products: 10 millirem per year
- Other sources: Less than 1 millirem per year

Natural background radiation is the largest contributor to the average radiation dose of individuals. The natural occurrence of cosmic radiation, cosmogenic radionuclides, and primordial radionuclides varies throughout the world depending on such factors as altitude and geology. External radiation comes from all three of these natural sources, but cosmic radiation and radiation from primordial radionuclides are the largest contributors to dose. Cosmic radiation consists of charged particles (primarily protons from extraterrestrial sources) that have sufficiently high energies to generate secondary particles that have direct and indirect ionizing properties. The three main primordial radionuclide contributors to external terrestrial gamma radiation are potassium-40 and the members of the thorium and uranium ***decay series***. Most external terrestrial gamma radiation comes from the top 20 centimeters (8 inches) of soil, with a small contribution from airborne radon ***decay*** products.

Internal radiation dose from natural sources comes primarily from the primordial radionuclides and their ***decay products***. The largest individual source of internal dose comes from the inhalation of radon-222 and its decay products, which are all members of the uranium-238 decay series. This exposure comes mainly from inhalation of these radionuclides in indoor air, coming from the soil underneath

Radiation: Radiation is energy traveling through space. Radiation can be non-ionizing, like radio waves, ultraviolet radiation, or visible light, or ionizing, depending on its effect on atomic matter. In this Rail Alignment EIS, the word "radiation" refers to ionizing radiation. Ionizing radiation has enough energy to ionize atoms or molecules while non-ionizing radiation does not. Radioactive material is a physical material that emits ionizing radiation.

Cosmic radiation: A variety of high-energy particles including protons that bombard the Earth from outer space. They are more intense at higher altitudes than at sea level where the Earth's atmosphere is most dense and provides the greatest protection.

Cosmogenic radionuclides: Radioactive nuclides generated when the upper atmosphere interacts with many of the cosmic radiations. Despite their short half-lives, they are found in nature because their supply is always being replenished.

Decay product: A nuclide resulting from the radioactive decay of a parent isotope or precursor nuclide. The decay product might be stable or it might decay to form a decay product of its own.

Decay series: The succession of elements initiated in the radioactive decay of a parent, as thorium or uranium, each of which decays into the next until a stable element, usually lead, is produced.

Effective dose equivalent: Often referred to simply as dose, it is an expression of the radiation dose received by an individual from external radiation and from radionuclides internally deposited in the body.

Half-life: The time in which half the atoms of a radioactive substance decay to another nuclear form. Half-lives range from millionths of a second to billions of years depending on the stability of the nuclei.

Primordial radionuclides originate mainly from the interiors of stars and are still present because their half-lives are so long that they have not yet completely decayed.

buildings. All of the primordial radionuclides are in the body in various concentrations, incorporated by ingesting or inhaling these radionuclides in air, water, and all types of food products. Although of smaller importance to natural internal dose than the other mechanisms, four cosmogenic radionuclides, tritium (hydrogen-3), beryllium-7, sodium-22, and carbon-14, produce quantifiable internal doses.

Table 3-147 lists estimated radiation doses to individuals from natural sources in the region of influence and other locations in the United States. The radiation doses shown in the table are in terms of ***effective dose equivalent***, which is an expression of the radiation dose received by an individual from external radiation and from radionuclides internally deposited in the body. Effective ***dose equivalent*** has units of ***rem***.

Table 3-147. Radiation exposure from natural sources.

	Annual dose in millirem (effective dose equivalent)							
Source[a]	National	Tonopah	Las Vegas	Reno	Beatty	Amargosa Valley	Goldfield	Yucca Mountain
Cosmic and terrestrial	55	143	88[b]	131[b]	150[b]	107[b]	130[b]	160[b]
Radon in homes (inhaled)[c]	200	200	200	200	200	200	200	200
Naturally occurring radiation In body	39	39	39	39	39	39	39	39
Totals[d]	300	382	327	370	389	346	369	399

a. Sources: DIRS 100473-National Research Council 1990, Table 1-3, p. 18; DIRS 181387-University of Nevada-Reno 2006, p. B-8, Table B4-1; DIRS 179137-CEMP 2006, all; DIRS 179138-CEMP 2006, all; DIRS 179139-CEMP 2006, all; DIRS 179140-CEMP 2006, all; DIRS 179141-CEMP 2006, all; DIRS 179142-CEMP 2006, all.

b. Combined cosmic and terrestrial radiation sources.

c. Value for radon is an average for the United States.

d. Totals might differ from sums of values due to rounding.

Table 3-147 lists background radiation results for Tonopah, Las Vegas, Goldfield, Beatty, Reno, and Town of Amargosa Valley. DOE obtained cosmic and terrestrial background radiation for these Nevada locations based on radiological monitoring data from September 1999 through 2006 from the Desert Research Institute Community Environmental Monitoring Program (DIRS 179137-CEMP 2006, all; DIRS 179138-CEMP 2006, all; DIRS 179139-CEMP 2006, all; DIRS 179140-CEMP 2006, all; DIRS 179141-CEMP 2006, all; DIRS 179142-CEMP 2006, all). DOE obtained background radiation data for Reno from the Environmental Health and Safety University of Nevada, Reno 2006 Annual Report (DIRS 181387-University of Nevada, Reno 2006, Page B-8, Table B4-1). The average background radiation for the United States, including terrestrial and cosmic radiation, radon exposure, and natural radiation in the body, is 300 millirem per year, with radon exposure comprising 200 millirem per year, cosmic and terrestrial radiation comprising 55 millirem per year, and natural body radiation comprising 39 millirem per year (DIRS 100473-National Research Council 1990). The background radiation for Las Vegas (the closest large city to the Mina rail alignment region of influence) is 327 millirem per year, with cosmic and terrestrial radiation doses resulting in a slightly higher total annual dose than the average for the United States (DIRS 179142-CEMP 2006, all). The background radiation for the reported locations within the region of influence range from 327 millirem per year to 399 millirem per year. Background data include background radiation resulting from fallout.

3.3.10.4 Background Radiation at the Yucca Mountain Site

Ambient radiation levels from cosmic and terrestrial sources in the Yucca Mountain region are higher than the United States average. The higher elevation at Yucca Mountain results in higher levels of cosmic radiation because there is less ***shielding*** by the atmosphere. The United States average for cosmic and terrestrial radiation exposures is 55 millirem per year (DIRS 100473-National Research Council 1990, Table 1-3, p. 18). The exposures at the Yucca Mountain ridge and Yucca Mountain surface facilities are about 160 and 150 millirem per year, respectively. Moreover, there are higher amounts of naturally occurring radionuclides in the soil and parent rock of this region than in some other regions of the United States, which also results in higher radiation doses.

The Yucca Mountain FEIS includes a detailed discussion (DIRS 155970-DOE 2002, pp. 3-95 to 3-101) of the natural radiation levels, mineral-related radiation risks, and historical activities in the Yucca Mountain region that might have resulted in radiation effects to workers and the public.

3.3.10.5 Transportation Health and Safety Environment

3.3.10.5.1 Public Roadways

Because the region of influence includes public roads primarily located in remote and rural areas, the Mina rail alignment would cross areas with relatively low traffic volumes. The exception is the existing Union Pacific Railroad Hazen Branchline, which crosses public roads with moderate traffic (such as U.S. Highway 50 in Silver Springs and Alternate U.S. Highway 95 in Churchill and Wabuska). Section 3.3.9, Socioeconomics, describes the public road infrastructure and baseline traffic conditions along the Mina rail alignment in more detail. In summary, the Mina rail alignment would cross paved highways with low to moderate traffic volumes and unpaved roads with low traffic volumes. While many of the unpaved roads are important to the daily activities of landowners and ranchers in the area, these unpaved roads are not heavily traveled.

Table 3-148 lists the paved highways and the Union Pacific Railroad Hazen Branchline the Mina rail alignment would cross. Figure 2-12 shows the locations of these crossings (DIRS 180872-Nevada Rail Partners 2007, Table C-1). Additionally, the primary paved highways in the project vicinity are Alternate U.S. Highway 50, U.S. Highways 50 and 95, and Alternate U.S. Highway 95 in the northern portion; State Routes 359, 360, and 361 and U.S. Highway 95 in the central portion; and U.S. Highways 6 and 95 and State Routes 265, 266, and 267 in the southern portion.

Table 3-148. Potential rail line crossings of main highways.

Segment	Highway	County/Reservation
Union Pacific Railroad Hazen Branchline[a]	U.S. Highway 50	Lyon
Union Pacific Railroad Hazen Branchline[a]	Alt. U.S. Highway 95 (at two locations)	Lyon
Schurz alternative segment 1	U.S. Highway 95	Walker River Paiute Reservation
Schurz alternative segment 4	U.S. Highway 95	Walker River Paiute Reservation
Schurz alternative segment 5	U.S. Highway 95	Walker River Paiute Reservation
Schurz alternative segment 6	U.S. Highway 95	Walker River Paiute Reservation
Mina common segment 1	State Route 361	Mineral
Mina common segment 1	U.S. Highway 6 / 95	Esmeralda
Montezuma alternative segment 1	U.S. Highway 95	Esmeralda
Montezuma alternative segment 2	U.S. Highway 95	Esmeralda
Montezuma alternative segment 3	U.S. Highway 95	Esmeralda

a. The Union Pacific Railroad Hazen Branchline is part of the region of influence for the purposes of the transportation impact assessment, but is not part of the Mina rail alignment.

Overall highway safety statistics for Nevada show that the fatality rate per 100 million vehicle-miles traveled is approximately 1.28 (1.65 in rural areas). The national average is approximately 40 percentlower at 0.91 fatalities per 100 million vehicle-miles traveled (1.42 in rural areas) (DIRS 180484-FHWA 2006, p. 1, Section V, Tables FI-20 and VM-2).

3.3.10.5.2 Railroad Accidents

This section describes the general characteristics of railroad accidents in the United States and in the State of Nevada. DOE commissioned a railroad study – *The Nevada Railroad System: Physical, Operational, and Accident Characteristics* (the Nevada railroad study), which covers the period between 1979 and 1988 (DIRS 104735-YMP 1991, all). Because the number of annual rail-related accidents and incidents in Nevada is very small, it is difficult to draw conclusions about how the safety of rail operations in Nevada has changed since 1988. However, the study is the most comprehensive and relevant rail-accident study to date regarding the State of Nevada and it provides some insights into the general characteristics of rail accidents in Nevada and the United States. The study presented information on types, causes, and frequency of railroad accidents; accident locations; and some of the more significant accidents from 1979 through 1988. The important findings of the Nevada railroad study were:

- Numbers and types of accidents. During the study period, the numbers of reported rail accidents in Nevada and the entire United States were 208 and 48,256, respectively. The most common accident types for Nevada and the rest of the United States were derailment and rail–highway crossing collision.
- Causes of rail accidents. Track/roadbed conditions caused proportionately more accidents in the rest of the United States than in Nevada, and mechanical/electrical failure caused proportionately more accidents in Nevada than in the rest of the United States. Nevada showed a higher proportion of its reported accidents in the higher speed ranges than did the rest of the Nation.
- Speeds at times of accidents. In general, most rail accidents happened at very low speeds. Approximately half of all reported accidents in Nevada occurred at speeds of 16 kilometers (10 miles) per hour or less, and 40 percent of all accidents in Nevada were at 8 kilometers (5 miles) per hour or less. Nationally, 73 percent of all accidents occurred at 16 kilometers per hour or less, and 53 percent of all rail accidents occurred at 8 kilometers per hour or less.
- Elapsed time on duty. The Nevada railroad study showed that about 45 percent of all accidents occurred within the first 4 hours on duty, approximately 41 percent occurred between 4 to 8 hours on duty, and approximately 14 percent occurred after 8 hours on duty.
- Weather and time of day. In Nevada, approximately 73 percent of all accidents reported occurred in clear weather, while approximately 9 percent occurred in cloudy weather. Rain, fog, and snow accounted for lower proportions. In Nevada, approximately half (49 percent) of all rail accidents occurred at night. Nationally, approximately 42 percent of all accidents occurred at night.
- Locations of accidents. The Nevada railroad study revealed that accidents occur at slightly higher rates at switchyard tracks.
- Rail–highway at-grade crossing accidents. Excluding the switching and handling incidents, rail accidents seemed to occur at random locations. The notable exception was rail–highway at-grade crossings. In the United States, rail–highway at-grade crossings in general were a higher accident location.
- Fatal rail accidents. Fewer accidents occurred at the higher speeds, but the chance that an accident, once it did occur, produced a fatality increased as speed increased. Comparing the total number of accidents at each speed interval to the total number of fatal accidents at each speed interval revealed that an accident occurring at more than 97 kilometers (60 miles) per hour was 31 times more likely to cause a fatality than an accident occurring at 8 kilometers (5 miles) per hour or less.

With the exception of accident causes, the Nevada railroad study (DIRS 104735-YMP 1991, all) found that rail-accident characteristics in Nevada were not markedly different from rail-accident characteristics in the rest of the United States. The most apparent differences related to the relatively large proportion of Nevada rail lines that were in open country where higher operating speeds are maintained, compared to the United States as a whole. Most rail accidents, both in Nevada and in the rest of the United States, occurred at very low speeds. Nevada showed a slightly higher number of high-speed accidents compared to the national average. The Nevada railroad study also showed that Nevada had a larger percentage of accidents caused by equipment failure and human factors. The Nevada railroad study also found that for accidents involving only rail equipment, there were no classical "high" accident locations as there typically are with highway transport. Instead, minor accidents tended to occur in rail yards and during switching operations. More severe accidents, occurring at higher speeds on open track, seemed to happen at random.

Railroads are required by law to submit accident/incident reports within 30 days after the month to which they pertain. The Federal Railroad Administration annually publishes *Railroad Safety Statistics*, which contains statistical data, tables, and charts based on railroad accident reporting requirements. In this publication, the terms "accidents" and "incidents" are used to describe the entire list of reportable events, which includes collisions, derailments, and other events involving the operation of on-track equipment and causing reportable damage above an established threshold; impacts between railroad on-track equipment and highway users at crossings; and all other incidents or exposures that cause a fatality or injury to any person, or an occupational illness to a railroad employee. As defined in *Railroad Safety Statistics*, accidents/incidents are divided into three major groups for reporting purposes:

- Train accident. A safety-related event involving on-track rail equipment (both standing and moving), causing monetary damage to the rail equipment and track above a prescribed amount.
- Highway–rail grade crossing incident. Any impact between a rail and highway user (both motor vehicles and other users of the crossing) at a designated crossing site, including walkways, sidewalks, and the like, associated with the crossing.
- Other incident. Any death, injury, or occupational illness of a railroad employee that is not the result of a train accident or highway-rail incident.

Table 3-149 summarizes rail accident data from the *Railroad Safety Statistics – Annual Report 2004* for the five-year period 2000 through 2004 (DIRS 178016-DOT 2005, pp. 13 and 17). Accident and incident rates are not available for Nevada because train-mile data is only available on a nationwide basis.

The data listed in Table 3-149 reflect rail operations involving general freight service. ***Dedicated train*** service, which would be used to move cask railcars to the Yucca Mountain Repository, would follow stringent safety regulations. Additionally, dedicated train service has increased control and command capabilities, because shorter trains allow better visual monitoring from the locomotive and the escort car. Therefore, accident and incident rates for dedicated train service are expected to be lower than the ones listed in Table 3-149.

3.3.10.5.3 Transportation of Munitions

The U.S. Army currently transports munitions to and from the Hawthorne Army Depot by rail. Munitions ***shipments*** pass to and from the Depot through the town of Schurz along the existing Department of Defense Branchline. The Army assesses hazards associated with transportation of munitions using a risk assessment code matrix evaluation of the potential accident probability and potential hazard severity, as illustrated in Table 3-150 (DIRS 181032-Dillingham 2007, all).

Table 3-149. Rail accidents in Nevada and the United States (2000 through 2004).[a]

	2000	2001	2002	2003	2004
Train accidents (excluding highway–rail crossing incidents)					
Nevada	12	14	9	8	17
United States	2,983	3,023	2,738	2,997	3,296
Train accidents rate (accidents per train-mile) (excluding highway–rail crossing incidents)					
Nevada	NA[b]	NA	NA	NA	NA
United States	4.1×10^{-06}	4.2×10^{-06}	3.8×10^{-06}	4.0×10^{-06}	4.3×10^{-06}
Total highway–rail incidents at public crossings[c]					
Nevada	1	2	1	1	2
United States	3,032	2,843	2,709	2,610	2,644
Total highway–rail incident rates (incidents per train-mile) at public crossings[c]					
Nevada	NA	NA	NA	NA	NA
United States	4.2×10^{-06}	4.0×10^{-06}	3.7×10^{-06}	3.5×10^{-06}	3.4×10^{-06}

a. Source: DIRS 178016-DOT 2005, pp. 13 and 17.

b. NA = not applicable.

c. Any impact, regardless of severity, between railroad on-track equipment and any user of a public or private crossing site must be reported to the U.S. Department of Transportation, Federal Railroad Administration, on Form F 6180.57. The crossing site includes sidewalks and pathways at, or associated with, the crossing. Counts of fatalities and injuries include motor vehicle occupants, people not in vehicles or on the trains, and people on the train or railroad equipment.

The overall rating of a transportation route using the Army methodology is the combination of B-1 (Hazard Severity) and B-2 (Accident Probability) in the matrix. According to Department of Defense guidelines, a 1 rating or a 2 rating is not acceptable for shipment of munitions. A rating of 3 is acceptable for shipment of munitions only after higher-level review and approval from the military headquarters. Final ratings of 4 or 5, after controls are implemented, are acceptable for shipment of munitions. After application of controls, the Army has rated the existing ***rail route*** through the town of Schurz as 5 (corresponding to Risk Assessment Matrix Code 1-E) (DIRS 181032-Dillingham 2007, all).

The Army also uses quantity-distance calculations to provide an assessment of the Distance to Public Traffic Routes and Distance to Inhabited Buildings for storage or transportation of munitions. Public traffic route distances give consideration to the transient nature of the exposure and are calculated as 60 percent of the Inhabited Building Distance (DIRS 181032-Dillingham 2007, all).

According to Table 5-1 of Department of the Army Pamphlet 385-64, a Distance to Public Traffic Route of 725 meters (2,380 feet) or a Distance to Inhabited Building of 1,210 meters (3,970 feet) apply to munitions shipments of the types that may be made along the existing rail line. This methodology indicates that there should be an easement of at least 725 meters on either side of the tracks (no building) along the entire route. This is based on 60 percent of Inhabited Building Distance (IBD) of 1,210 meters (DIRS 181032-Dillingham 2007, p. 1). However, there are inhabited buildings within this distance for the existing Department of Defense Branchline through Schurz. Also, as shown in the Figure 3-236, there are nine grade crossings within the town of Schurz along the Department of Defense Branchline.

Table 3-150. Risk assessment code matrix.[a]

Hazard severity	Accident probability				
	A	B	C	D	E
I	1	1	2	3	5
II	1	2	3	4	5
III	2	3	4	5	5
IV	3	4	5	5	5

a. Source: DIRS 181032-Dillingham 2007, all.

B-1. Hazard Severity: Category Description

I Catastrophic - Death or permanent disability or major property damage

II Critical - Permanent partial disability or extensive property damage

III Marginal - Lost workday due to injury or minor property damage

IV Negligible - First aid injury or minimal property damage

B-2. Accident Probability:

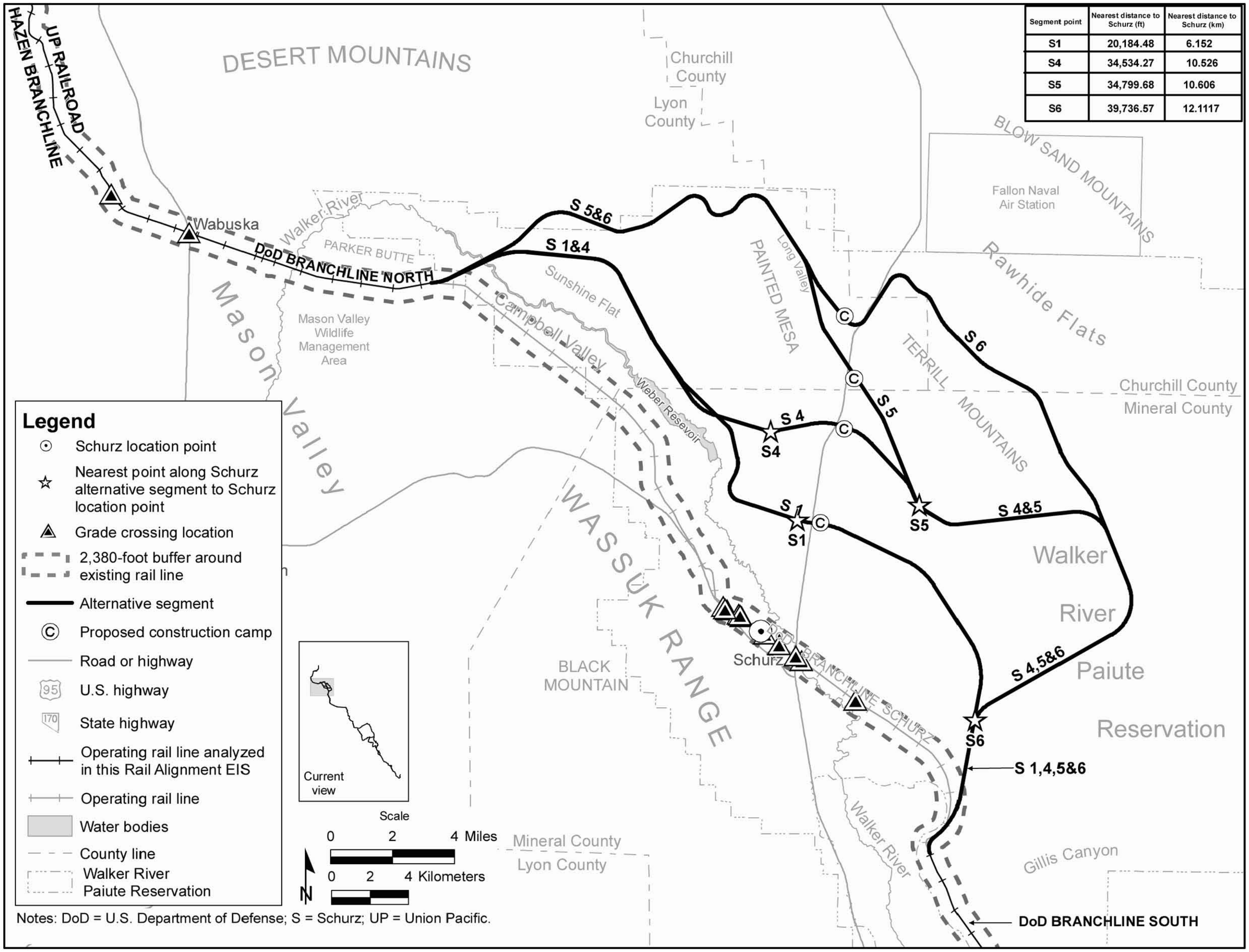
A Frequent - Occurs very often, continuously experienced

B Likely - Occurs several times

C Occasional - Occurs sporadically

D Seldom - Remotely possible; could occur at some time

E Unlikely - Can assume will not occur, but not impossible



Segment point	Nearest distance to Schurz (ft)	Nearest distance to Schurz (km)
S1	20,184.48	6.152
S4	34,534.27	10.526
S5	34,799.68	10.606
S6	39,736.57	12.1117

Figure 3-236. Inhabited building distance for existing Department of Defense Branchline.

3.3.11 UTILITIES, ENERGY, AND MATERIALS

This section describes the affected environment for public-service utilities (water, wastewater treatment, telecommunications, and electricity), energy (fossil fuels), and construction materials within the Mina rail alignment region of influence.

Section 3.3.11.1 describes the regions of influence for utilities, energy resources, and construction materials; Section 3.3.11.2 describes public-service utilities in the region of influence; Section 3.3.11.3 describes energy resources (not related to public-service utilities) in the region of influence; and Section 3.3.11.4 describes resources for construction materials in their regions of influence.

3.3.11.1 Regions of Influence

3.3.11.1.1 Regions of Influence for Utilities

The regions of influence for public water systems, wastewater treatment, telecommunications, and electricity differ and are described below.

- Public water systems: The region of influence for public water systems is Lyon, Mineral, Esmeralda, and Nye Counties, communities within those counties, and the Walker River Paiute Reservation, the bulk of which lies within Mineral County with smaller portions in Lyon and Churchill Counties.
- Wastewater treatment: The region of influence for wastewater transported offsite for treatment and disposal is the existing permitted treatment facilities in Lyon, Mineral, Esmeralda, and Nye Counties and communities within those counties, and the Walker River Paiute Reservation, the bulk of which lies within Mineral County with smaller portions in Lyon and Churchill Counties. (Note: For wastewater treated using other methods [for example, on-site portable wastewater-treatment facilities], treated wastewater would be recycled, and there is no associated region of influence.)
- Telecommunications: The region of influence for telephone and fiber-optic telecommunications is the southern Nevada region serviced by Nevada Bell Telephone Company (AT&T Nevada), Citizens Telecommunications Company of Nevada, and Verizon.
- Electricity: The region of influence for electric-power resources includes areas serviced by the southern Nevada electrical grid operated by Nevada Power Company, Sierra Pacific Power Company, and Valley Electric Association, Inc.

3.3.11.1.2 Region of Influence for Energy Resources (Fossil Fuels)

The description of the affected environment for energy resources focuses on consumption of fossil fuels. For purposes of this analysis, the region of influence for fossil fuels is limited to regional suppliers within the State of Nevada.

3.3.11.1.3 Regions of Influence for Construction Materials

Construction materials include concrete, ballast, subballast, steel, steel rail, and general building materials. The region of influence for each material is defined by the distribution networks and suppliers of that material to the general project area.

The region of influence for cast-in-place concrete and subballast is limited to the State of Nevada. Subballast, sand, and gravel would be generated from available sources within the rail roadbed earthwork area, overburden at quarries, and borrow sites near the rail alignment. DOE forecasts that no surplus sand and gravel would be available for roadbed construction from excavation cuts along the rail line. Therefore, DOE plans to obtain sand and gravel from gravel pits along the alignment or nearby U.S.

Highway 95, using existing pits, new pits sited nearby, or elsewhere. DOE would determine the exact locations of gravel pits during final design and construction planning. DOE would use some of the natural sand and gravel excavated from cuts and crushed rock from the quarries to make concrete aggregate (DIRS 183643-Shannon & Wilson 2007, pp. 24 to 26).

DOE would obtain ballast rock from potential quarry sites close to the rail line construction right-of-way during the construction phase and from commercial quarry sites in southern Utah and in California during the operations phase. Therefore, the region of influence for obtaining ballast rock would encompass the State of Nevada during the construction phase, and Utah and California during the operations phase.

Other materials, including steel, steel rail, general building materials, concrete ties, and other precast concrete could be procured and shipped on a national level. Therefore, the region of influence for these materials is national.

3.3.11.2 Utilities

3.3.11.2.1 Utility Corridors and Rights-of-Way

Section 3.3.2, Land Use and Ownership, describes the major utilities and utility corridor networks in the Mina rail alignment region of influence.

3.3.11.2.2 Public Water Systems

Figure 3-237 shows the locations of ***public water systems*** in Lyon, Mineral, Esmeralda, and Nye Counties and on the Walker River Paiute Reservation. There are 140 regulated public water systems in these counties and on the Walker River Paiute Reservation (which lies primarily in Mineral County), including the 46 ***community water systems*** listed in Table 3-151.

Public water system: A water system that provides water for human consumption for an average of at least 25 persons per day (or 15 or more service connections) and is in use for at least 60 days each year.

Community water system: A public water system that serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.

Non-transient, non-community water system: A public water system that is not a community water system and that regularly serves at least 25 of the same persons over 6 months per year.

Source: 40 CFR 141.2.

Within the Mina rail alignment region of influence, public water systems are generally located in or near Hawthorne, Mina, and the unincorporated towns of Beatty, Pahrump, and Town of Amargosa Valley. In addition, although not a community water system, the Yucca Mountain Site has a regulated public water system (NV0000867). This system is classified as a ***non-transient, non-community public water system***.

3.3.11.2.3 Wastewater-Treatment Facilities

DOE would treat wastewater using municipal wastewater-treatment facilities, on-site portable wastewater-treatment facilities (***package plants***), or a combination of the two.

Municipalities with wastewater-treatment facilities include Mason, Yerington, Hawthorne, Schurz, Goldfield, Beatty, Gabbs, Tonopah, and Round Mountain. Table 3-152 lists the capacity of each system and the existing load.

In Hawthorne in Mineral County, a future design capacity of 1,700,000 liters (450,000 gallons) per day is specified.

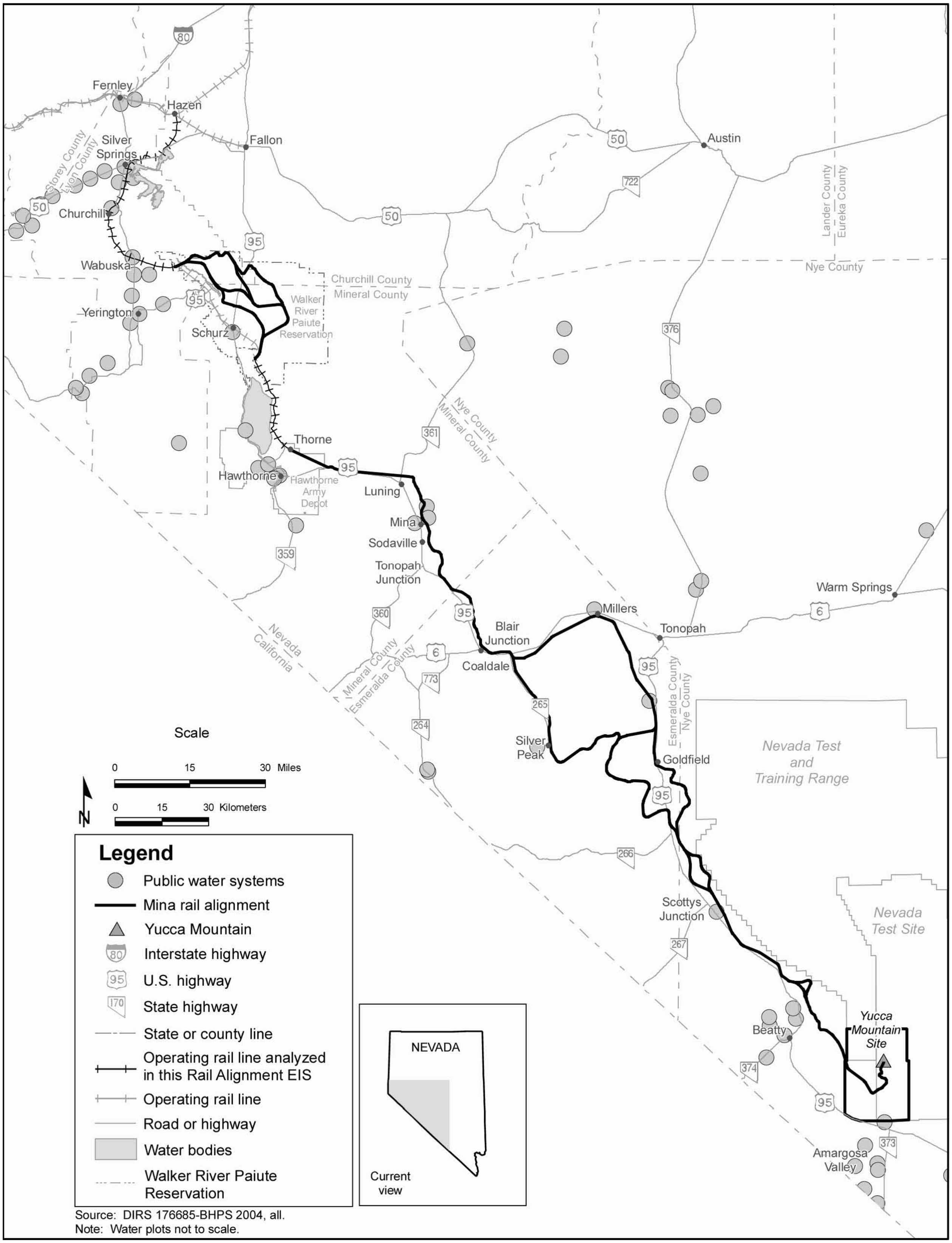


Figure 3-237. Public water systems in Lyon, Mineral, Esmeralda, and Nye Counties.

Table 3-151. Community water systems in Lyon, Mineral, Esmeralda, and Nye Counties[a] (page 1 of 2).

County	Public water supply identification number	Name
Lyon	NV0000813	Churchill Ranchos Estates
	NV0000361	Crystal Clear Water Company
	NV0000032	Dayton Town Utilities
	NV0000366	Dayton Valley Estates Water
	NV0000033	Dayton Valley Mobile Home Park
	NV0000062	Fernley Public Works
	NV0002516	Five Star Mobile Home Park
	NV0000838	Moundhouse Water System
	NV0000029	Rosepeak Water System
	NV0000267	Silver Springs Mobile Home Park
	NV0000223	Silver Springs Mutual Water Company
	NV0000224	Stagecoach General Improvement District
	NV0000242	Weed Heights Development
	NV0000256	Willowcreek General Improvement District
	NV0000255	Yerington, City of
Mineral	NV0000357	Hawthorne Army Depot
	NV0000073	Hawthorne Utilities
	NV0000074	Mina Luning Water System
	NV0000302	Walker Lake Apartments
	NV0000268	Walker Lake General Improvement District
Esmeralda	NV0000072	Goldfield Town Water
	NV0000363	Silver Peak Water System
Nye	NV0002558	Amargosa Valley Water Association
	NV0005033	Anchor Inn Mobile Home Park
	NV0000009	Beatty Water and Sanitation District
	NV0000362	Big Five Parks
	NV0000369	Big Valley Mobile Home Park
	NV0002538	C Valley Mobile Home Park
	NV0002589	Calvada North, Utilities Inc. of Central Nevada
	NV0000218	Carver's Smoky Valley Recreational Vehicle and Mobile Home Park
	NV0005032	Country View Estates, Utilities Inc. of Central Nevada
	NV0000831	Desert Mirage Home Owners Association

Table 3-151. Community water systems in Lyon, Mineral, Esmeralda, and Nye Counties[a] (page 2 of 2).

County	Public water supply identification number	Name
Nye (continued)	NV0000300	Desert Utilities
	NV0002552	Escapee Co-Op of Nevada
	NV0000063	Gabbs Water System
	NV0004074	Hadley Subdivision
	NV0000926	Hafen Ranch Estates
	NV0000175	Manhatten Town Water
	NV0000920	Mountain Falls Water System
	NV0005067	Mountain View Mobile Home Park, Utilities Inc. of Central Nevada
	NV0000183	Pahrump Mobile Home Park
	NV0005028	Shoshone Estates Water Company
	NV0000359	Shoshone Water Company
	NV0005066	Sunset Mobile Home Park
	NV0000237	Tonopah Public Utilities
	NV0000270	Utilities Inc. of Central Nevada

a. Source: DIRS 176686-BHPS 2004, all.

Table 3-152. Municipal wastewater-treatment facilities in the Mina rail alignment region of influence.

Location	Capacity (gallons per day)[a]	Existing load (gallons per day)
Mason, Lyon County	60,000[b]	50,000[b]
Yerington, Lyon County	540,000[b]	320,000[b]
Hawthorne, Mineral County	410,000[b]	390,000[b]
Schurz, Mineral County	50,000[b]	20,000[b]
Goldfield, Esmeralda County	20,000[b]	30,000[b]
Beatty, Nye County	150,000[b]	110,000[b]
Gabbs, Nye County	50,000[b]	50,000[b]
Tonopah, Nye County	1,000,000[b]	420,000[b]
Round Mountain (Hadley Subdivision), Nye County	160,000[c]	70,000[c]

a. To convert gallons to liters, multiply by 3.78533.
b. Source: DIRS 178590-EPA 1999, all.
c. Source: DIRS 178697-Kaminski 2003, all.

In Esmeralda County, Goldfield's sewage collection system was built in the 1940s and 1950s, and some of the system's original terra-cotta pipes are deteriorating. There are two lagoons, each 4,000 square meters (1 acre) in area, and a rapid infiltration system 1.6 kilometers (1 mile) north of Goldfield. The community has recently been awarded a $3 million grant under the Water Resource Development Act of 2000 (114 Stat. 2472) to renovate and upgrade the system. These renovations will allow Esmeralda County to increase the number of users served by its sewer system (DIRS 174751-Arcaya 2005, all).

Most communities in southern Nye County rely primarily on individual dwelling or small communal wastewater-treatment systems, with the exception of Beatty, which has municipal sewer service. For example, Pahrump has no community-wide wastewater-treatment system. Several wastewater-treatment units serve parts of the town, such as the dairy and the jail, but most households have septic tank and drainage-field systems, which are likely to be typical of the small communities in southern Nye County.

3.3.11.2.4 Telecommunications Services

Local telephone service in the Mina rail alignment region of influence is provided by Verizon (Lyon County), Nevada Bell Telephone Company (AT&T Nevada) (Mineral County, part of Esmeralda County, and Nye County), and Citizens Telecommunications Company of Nevada (part of Esmeralda County) (DIRS 173401-Nevada Telecommunications Association 2005, all). One or more broadband providers (such as Comcast Cable and Bandwidth T1) serve Schurz, Mina, Silver Peak, Tonopah, Goldfield, and Town of Amargosa Valley (DIRS 176453-FCC 2005, pp. 348 to 350).

Wireless communication (cellular phones) is an increasingly important element in telecommunications. Among the national providers, only Verizon identifies much of the area containing the Mina alignment as within its coverage area. The Verizon coverage area follows the U.S. Highway 95 corridor. Actual signal strength between towns is variable and there may not be an available signal. Of the other national carriers, Cellular One identifies the U.S. Highway 95 corridor as not a primary coverage area but one where roaming charges may not apply for their national subscribers. Other national carriers identify the Mina alignment area as having no coverage (Sprint) or areas where roaming may apply (Cingular and T-Mobile).

3.3.11.2.5 Electrical Services

Nevada Power Company is the electric utility serving most customers in Southern Nevada, covering a territory of 12,000 square kilometers (4,600 square miles). Its customer base includes approximately 730,000 residential customers. The utility has 3,500 megawatts of generating capacity and purchases additional power to meet peak load demands of 6,300 megawatts. Nevada Power Company forecasts a 2.1 percent average annual rate of growth in peak-load demand through 2026. Total electricity sales in 2007 were expected to be 23 million megawatt-hours (DIRS 185100-Nevada State Office of Energy 2007, pp. 33 to 34).

Sierra Pacific Power Company serves 310,000 residential electricity customers in a 130,000-square-kilometer (50,000-square-mile) territory that encompasses Carson City, Reno, Winnemucca, Elko, and Tonopah in Nevada, as well as the Lake Tahoe area in northeastern California. The utility has 1,000 megawatts of generating capacity and purchases additional power to meet peak load demands of 1,800 megawatts. Sierra Pacific Power Company forecasts a 2.1 percent average annual rate of growth in peak-load demand through 2026. Total electricity sales in 2007 were expected to be 8.6 million megawatt-hours (DIRS 185100-Nevada State Office of Energy 2007, pp. 14 to 16). Both Nevada Power Company and Sierra Pacific Power Company are wholly owned subsidiaries of Sierra Pacific Resources.

Valley Electric Association, Inc., distributes power to southern Nye County, including the Pahrump Valley, Amargosa Valley, Beatty, and the Nevada Test Site. The Western Area Power Administration allocates a portion of the lower-cost hydroelectric power from the Colorado River dams to Valley Electric Association, Inc. The private power market supplies the supplemental power necessary to meet the needs of the members. Valley Electric Association, Inc., sells about 400,000 megawatt-hours to more than 19,000 members (DIRS 181273-VEA 2005, p. 3).

3.3.11.3 Energy

Existing fossil-fuel supplies in the Mina rail alignment region of influence are available from nearby communities, mainly from relatively highly populated towns such as Hawthorne and Tonopah, and along

Table 3-153. Sales of distillate fuel oils in Nevada, 1997 through 2004.

Year	Annual sales of distillate fuel oils (millions of gallons)[a]
1997	434[b]
1998	404[b]
1999	418
2000	428[c]
2001	410[d]
2002	418[d]
2003	400[e]
2004	478[e]

a. To convert gallons to liters, multiply by 3.78533.
b. Source: DIRS 178588-EIA 1999, Table 4
c. Source: DIRS 178609-EIA 2001, Table 4.
d. Source: DIRS 173384-EIA 2003, Table 4.
e. Source: DIRS 176397-EIA 2005, Table 4.

the well-traveled U.S. Highway 95 connecting the metropolitan areas of Reno and Las Vegas. The regional supply system can respond flexibly to demand. Table 3-153 lists sales of distillate fuel oils (diesel fuel) in Nevada from 1997 through 2004. Fuel consumption remained fairly constant through 2003. The recent upward trend reflects current population growth in southern Nevada as a key determinant of total energy consumption closely linked to rising demand for housing, services, and travel.

3.3.11.4 Construction Materials

Most of the Mina rail alignment would be along the U.S. Highway 95 corridor and would be within the southern Nevada supply chain for construction materials.

The region of influence for cast-in-place concrete is the State of Nevada, where annual production in 2004 equaled approximately 16 million metric tons (18 million tons) (DIRS 173400-NRMCA 2004, p. 2).

Precast concrete is available nationally, and the annual national production in 2003 equaled approximately 15 million metric tons (17 million tons) (DIRS 173392-van Oss 2003, Table 15). Annual national production of precast concrete railway ties was about 720,000 ties in 2004 and is projected to grow to about 1,180,000 ties by 2007 (DIRS 173573-Gauntt 2004, p. 17).

Ballast for rail roadbed construction is generally obtained locally because of the costs associated with transporting large volumes of these materials. Within the region of influence, there are large areas of public lands that contain materials suitable for use as ballast. DOE has identified five potential quarry sites near the Mina rail alignment for use during the construction phase (see Chapter 2, Table 2-16). Following construction, the DOE-developed quarries would be closed. During the operations phase, DOE would obtain ballast for track maintenance commercially. The nearest active quarries to the region of influence are at Oroville, California, approximately 320 kilometers (200 miles) west-northwest of Mina, and at Milford, Utah, approximately 500 kilometers (310 miles) east of Mina. The Milford Quarry is on the Union Pacific Railroad route that travels from Salt Lake City, Utah, to Los Angeles, California, and processes much of the high-quality ballast for the Union Pacific Railroad lines throughout the southwest. Suitable sands and gravels would likely be available along cuts for the proposed rail line and from overburden at potential quarry rock and borrow sites. If needed, DOE could also establish sand and gravel borrow sites at various points along the Mina rail alignment, possibly adjacent to existing Nevada Department of Transportation gravel pits. Approximately 55 surplus pit locations are available adjacent to Nevada Department of Transportation materials sources and additional nearby sites could be developed (DIRS 180857-California Department of Finance 2007, Section 3.1.2).

The steel market is worldwide in scope, but the region of influence DOE considered for steel supply is national. Raw production of carbon steel in the United States in 2003 equaled 86 million metric tons (95 million tons) (DIRS 173387-Fenton 2003, Table 1). Steel rail production equaled 540,000 metric tons (600,000 tons) in 2002 and 520,000 metric tons (570,000 tons) in 2003 (DIRS 173387-Fenton 2003, Table 3).

3.3.12 HAZARDOUS MATERIALS AND WASTE

This section describes existing facilities in Nevada that could receive and dispose of ***hazardous waste*** derived from hazardous materials, ***low-level radioactive wastes,*** and nonhazardous waste associated with constructing and operating the proposed railroad along the Mina rail alignment. Section 3.3.12.1 describes the region of influence for hazardous materials and wastes. Section 3.3.12.2 describes landfills for the disposal of nonhazardous, nonrecyclable, nonreusable wastes; Section 3.3.12.3 describes disposal facilities for hazardous wastes; and Section 3.3.12.4 describes the disposal of low-level radioactive wastes. Hazardous materials DOE might use during construction and operation of the proposed railroad are described throughout Section 4.3.12.

Hazardous waste: Waste designated as hazardous by U.S. Environmental Protection Agency or State of Nevada regulations. Hazardous waste, defined under the Resource Conservation and Recovery Act of 1976 (42 U.S.C. 6901 *et seq.*), is waste that poses a potential hazard to human health or the environment when improperly treated, stored, or disposed of. Hazardous wastes appear on special Environmental Protection Agency lists or possess at least one of the following characteristics: ignitability, corrosivity, toxicity, or reactivity.

Low-level radioactive waste: Radioactive waste that is not classified as high-level radioactive waste, transuranic waste, or byproduct tailings containing uranium or thorium from processed ore. Usually generated by hospitals, research laboratories, and certain industries (42 U.S.C. 108).

3.3.12.1 Region of Influence

The region of influence for the use of hazardous materials and the generation of hazardous and nonhazardous wastes includes the nominal width of the rail line construction right-of-way, and the locations of railroad construction and operations support facilities.

The region of influence for the disposal of hazardous wastes includes the entire continental United States because commercial hazardous waste disposal vendors could utilize facilities throughout the country.

The region of influence for the disposal of nonhazardous waste includes the disposal facilities in Mineral, Nye, Esmeralda, and Clark Counties in Nevada.

The region of influence for the disposal of low-level radioactive wastes includes DOE low-level waste disposal sites, sites in Agreement States, and U.S. Nuclear Regulatory Commission-licensed sites.

3.3.12.2 Nonhazardous Waste Disposal

Industrial and special wastes: Construction debris and other ***solid waste***, such as tires, that have specific management requirements for permitted landfill disposal.

Solid waste: For purposes of this analysis, defined as nonhazardous general household waste.

DOE would dispose of nonhazardous, nonrecyclable, nonreusable wastes in municipal landfills in Nevada. Nevada has 20 operating municipal landfills that combined accept more than 17,000 metric tons (19,000 tons) of waste per day (DIRS 184969-Nevada Division of Environmental Protection 2007, Appendix 3). According to the *Solid Waste Management Plan* (DIRS 184969-Nevada Division of Environmental Protection 2007, p. 7), Nevada municipalities have landfill capacity well into the future. Table 3-154 lists the capacities the Nevada Division of Environmental Protection reported in 2007 (DIRS 184969-Nevada Division of Environmental Protection 2007, Appendices 2 and 3) for the active landfills in Mineral, Nye, Esmeralda, and Clark Counties. All of these landfills have permits to accept ***industrial and special wastes***.

DOE would utilize a contractor for the disposition of recyclable materials.

Table 3-154. Capacities of active landfills in Mineral, Nye, Esmeralda, and Clark Counties.[a]

County	Facility name[b]	Operator	Capacity (cubic yards)[c]	Per day disposal rate (tons)[d]	Projected closure (year)
Mineral	Hawthorne Class I	Mineral County	1,670,000	26	2031
Nye	Round Mountain Class II	Nye County	700,000	15	2043
	Tonopah Class II	Nye County	290,000	21	2013
Esmeralda	Goldfield Class II	Esmeralda County	280,000	4	2123
Clark	Apex Regional Class I	Republic Silver State	865,000,000	11,650	2150
	Laughlin Class I	Republic Services	62,550,000	100	2022
	Wells Cargo Class III	Wells Cargo	40,880,000	1,330	2050
Totals			971,370,000	13,146	

a. Source: DIRS 184969-Nevada Division of Environmental Protection 2007, Appendices 2 and 3.
b. Class I landfills receive 20 tons or more of waste per day; Class II landfills receive less than 20 tons of waste per day; and Class III landfills receive only industrial waste. Each of these landfills accepts solid and industrial and special wastes.
c. To convert cubic yards to cubic meters, multiply by 0.76456.
d. To convert tons to metric tons, multiply by 0.90718.

3.3.12.3 Hazardous Waste Disposal

The U.S. Ecology Treatment and Disposal Site in Beatty, Nevada, is a Nevada-permitted hazardous waste disposal site (DIRS 173918-American Ecology Corporation 2005, all). This facility treats and disposes of hazardous wastes and nonhazardous industrial wastes. Safety-Kleen Systems, Inc., operates a hazardous waste-permitted treatment, storage, and disposal facility in North Las Vegas, Nevada, and Philip Services Corporation operates a similar facility in Fernley, Nevada (DIRS 177662-NDEP 2006, all). Hazardous waste disposal capacity in western states has been estimated to be 50 times the demand for landfills and 7 times the demand for incineration until at least 2013 (DIRS 103245-EPA 1996, pp. 32, 33, 36, 46, 47, and 50).

3.3.12.4 Low-Level Radioactive Waste Disposal

Low-level radioactive wastes would be generated during operation of the Cask Maintenance Facility. Site-generated, low-level radioactive waste would be controlled and disposed of in a DOE low-level radioactive waste disposal site, in an Agreement State site, or in a U.S. Nuclear Regulatory Commission-licensed site subject to the completion of the appropriate review pursuant to the National Environmental Policy Act. Disposal in an Agreement State site or in a U.S. Nuclear Regulatory Commission-licensed site would be in accordance with applicable portions of 10 CFR Part 20. The Nevada Test Site accepts low-level radioactive waste for disposal and has an estimated disposal capacity of 3.7 million cubic meters (130 million cubic feet). DOE has estimated that approximately 1.1 million cubic meters (39 million cubic feet) of low-level radioactive wastes will be disposed of at the Nevada Test Site by 2070 from all potential sources, but not including Cask Maintenance Facility-generated wastes (DIRS 155970-DOE 2002, Section 3.1.12.4).

Commercial disposal capacity for low-level radioactive wastes is currently available in the United States. In addition to the Nevada Test Site, there are three existing commercial low-level radioactive waste disposal facilities in the United States: EnergySolutions Barnwell Operations in Barnwell, South

Carolina; U.S. Ecology in Richland, Washington; and EnergySolutions Clive Operations in Clive, Utah. These facilities are in Agreement States and accept waste from all or parts of the Nation. The Nuclear Regulatory Commission evaluates Agreement State programs every 2 to 4 years to ensure consistency in the Nation's materials and safety programs. There are current or anticipated limitations associated with these three commercial disposal sites. EnergySolutions Barnwell Operations is scheduled to be closed to out-of-state waste in 2008; U.S. Ecology generally accepts waste only from sites in the regional compact that includes the State of Washington; and EnergySolutions Clive Operations is licensed to accept only Class A wastes. The regional compact that includes Washington has a contract for receiving low-level waste from the regional compact that includes Nevada but, if Barnwell closes, the U.S. Ecology facility would be the only licensed commercial facility available for disposal of Class B and C low-level waste.

3.3.13 CULTURAL RESOURCES

Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470), as amended, requires federal agencies to take into account the effects of their undertakings on historic properties. The procedures established by the Advisory Council on Historic Preservation, described in 36 CFR Part 800, define how federal agencies meet these statutory responsibilities. The section 106 process seeks to accommodate historic preservation concerns with the needs of federal undertakings through consultation between the agency official and other parties with an interest in the effects of the undertaking on historic properties, commencing at the early stages of project planning. The goal of consultation is to identify historic properties potentially affected by the undertaking, assess its effects, and seek ways to avoid, minimize, or mitigate any adverse effects on historic properties.

Identification of sites eligible for listing on the *National Register of Historic Places* is a primary component of historical preservation work. The evaluation of both historic and archeological sites, to determine eligibility for National Register listing, is accomplished through the application of eligibility criteria as identified in 36 CFR Part 60.4, as follows:

> The quality of significance in American history, architecture, archeology, and culture is present in districts, sites, buildings, structures, and objects of state and local importance that possess integrity of location, design, setting, material, workmanship, feeling and association and
>
> (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> (b) that are associated with the lives of persons significant in our past; or
>
> (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> (d) that have yielded, or may be likely to yield, information important in prehistory or history.

Prehistoric archaeological sites are most often found eligible under criterion (d), while archaeological sites containing historical deposits and some prehistoric sites are also often considered under other criteria. For example, ordinarily, cemeteries, birthplaces or graves of historical figures, properties owned by religious institutions or used for religious purposes, structures that have been moved from their original locations, reconstructed historic buildings, properties primarily commemorative in nature, and properties that have achieved significance within the past 50 years shall not be considered eligible for the National Register. However, such properties will qualify if they are integral parts of districts that do meet the criteria or if they fall within the following categories: (a) a religious property deriving primary significance from architectural or artistic distinction or historical importance; (b) a building or structure removed from its original location but which is significant primarily for architectural value, or which is the surviving structure most importantly associated with an historic person or event; (c) a birthplace or grave of an historical figure of outstanding importance if there is no appropriate site or building directly associated with his productive life; (d) a cemetery that derives its primary significance from graves of persons of transcendent importance, from age, from distinctive design features, or from association with historic events; (e) a reconstructed building when accurately executed in a suitable environment and presented in a dignified manner as part of a restoration master plan, and when no other building or structure with the same association has survived; (f) a property primarily commemorative in intent if design, age, tradition, or symbolic value has invested it with its own exceptional significance; or (g) a property achieving significance within the past 50 years if it is of exceptional importance.

Likewise, historic structures (as opposed to archaeological sites) are assessed under a variety of National Register criteria.

While nearly all sites have the potential to yield information useful in addressing a limited number of research questions, this limited potential is not considered sufficient to qualify a site for inclusion on the National Register under criterion (d). By establishing guidelines, agencies have clearly set the precedent that not all information is important, and thus, not all sites are important. Federal guidelines encourage the use of a set of research questions that are generally recognized as important research goals as a means of evaluating significance. If a site contains information that is demonstrably useful in answering such questions, it can be considered an important site. National Register evaluation guidelines state that a site must retain integrity to be considered eligible under one or more of the criteria.

The *National Register of Historic Places* describes historic resources as standing or collapsed buildings, structures, objects, sites, and districts that are at least 50 years old, or have achieved significance within the past 50 years. Archaeological resources are prehistoric or historic remains of human lifeways or activities that are at least 50 years old, and include artifact concentrations or scatters, whole or fragmentary tools, rock carvings or paintings, and buildings or structures. Resources that incorporate geographic areas, including both cultural and natural features, and that are associated with historic events or other cultural values include ***traditional cultural properties***, cultural landscapes (DIRS 174501-Birnbaum 1994, all), ***ethnographic landscapes*** (DIRS 155897-Parker and King 2002, all), rural historic landscapes (DIRS 155896-McClelland et al. 1990, all), and historic mining landscapes (DIRS 175489-Noble and Spude 1997, all).

For purposes of analysis in this Rail Alignment EIS, DOE has completed a sample inventory of the Mina rail alignment alternative segments and common segments, which provides a thorough characterization of the nature and distribution of resources along the rail alignment. The Department would perform an intensive cultural resource inventory before starting construction of any specific alternative segment or common segment, and would compile a data recovery plan that would include prudent and feasible practices and measures to avoid or reduce potential adverse impacts to archaeological and historical resources.

This section focuses on cultural resources in the Mina rail alignment region of influence, including those associated with the American Indian culture. Section 3.4 further identifies and discusses American Indian interests in the region. This section summarizes information obtained through a review of available data from federal, state, and local agencies, and findings of data-gathering efforts and field investigations.

Section 3.3.13.1 describes the region of influence for cultural resources along the Mina rail alignment; Section 3.3.13.2 describes the methodology DOE used to identify such sources; Section 3.3.13.3 is a general description of the cultural resources setting and characteristics; Section 3.3.13.4 describes site-specific cultural resources; and Section 3.3.13.5 describes cultural resources for each Mina alternative segment and common segment, including those associated with American Indian culture.

3.3.13.1 Region of Influence

The region of influence for the cultural resources analysis includes two levels of coverage that incorporate areas where construction or other land disturbances could directly or indirectly affect cultural resources:

- Level I – The first level of coverage is the nominal width of the construction right-of-way, the area where ground disturbance could have direct or ***indirect impacts*** on cultural resources. Under Section 106 of the National Historic Preservation Act, the Level I region of influence would comprise the project's Area of Potential Effect.
- Level II – The second level of coverage is a 3.2-kilometer (2-mile)-wide area centered on the rail alignment, and includes the area of potential disturbances that could have indirect impacts on cultural resources. Unless otherwise noted, references in the text that follow refer to the Level II region of

influence. For example, impacts could extend beyond this area where railroad operations and maintenance activities could have an aesthetic, auditory, or visual impact on a potentially significant historic or ethnographic vista.

3.3.13.2 Methodology

DOE prepared cultural resource documents to support the description of the affected environment and the impacts assessments for the Mina rail alignment. For this analysis, the Department used the following methods to evaluate known and potential resources in the Mina rail alignment region of influence:

- ***Class I inventory***. Reviewing existing cultural resource files, examining the literature, and interviewing knowledgeable people to identify potentially significant resources within the Level II region of influence of the alternative segments and common segments. DOE compiled the results into an historic context baseline report on cultural resources (DIRS 174688-AGEISS 2005, all; DIRS 182774-Kellyard Stegner 2007, all) that establishes the basis for the analytical methodology and the results of the site-file and literature reviews. This report also lists all published and unpublished documents and archival sources DOE consulted during the analysis. The Desert Research Institute provided a supplementary Class I update in April 2007.
- ***Class II inventory***. Conducting a statistical sample field survey (DIRS 174691-BLM 1990, all) of the Level I region of influence for the common segments and alternative segments. The Class II inventory involved intensive inspection of 103 sample units that measured 120 meters (400 feet) by 800 meters (2,600 feet), centered on the rail alignment. This inventory was guided by a research design prepared in consultation with the BLM and State Historic Preservation Office and was designed to provide a 20-percent sample of the length of common segments and alternative segments. The results of this effort provide a predictive view of the possible types of cultural resources that might be expected to occur along the common segments and alternative segments and an evaluation of the possible significance of potential historic properties. The Class II survey report summarizes the results of this effort.
- Consultation with American Indians with regional ties. Interactions with American Indian tribes and organizations that have traditional ties to the region to identify traditional cultural places within the Level I and II regions of influence that are important to American Indian cultural and religious values and beliefs, and to identify other resources, such as plants and animals, that might have historic or current uses.

As previously noted, DOE prepared cultural resource reports to support the description of the affected environment and the impacts assessments for this Rail Alignment EIS. The reports include detailed information about the methods and investigative approaches DOE utilized and about evaluation of the findings. Preparation of the baseline resource reports involved consulting and citing a large number of published and unpublished sources, and contacting knowledgeable people, institutions, and offices holding relevant data.

DOE is using a phased cultural resource identification and evaluation approach, as described in 36 CFR 800.4(b)2, to identify specific cultural resources along a final alignment. Under this approach, DOE has completed Class I and Class II inventories of Mina rail alignment alternative and common segments. The Department would perform final field surveys (BLM Class III intensive inventories) of the actual right-of-way and centerline, as provided in the programmatic agreement between DOE, the BLM, the STB, and the Nevada State Historic Preservation Office (DIRS 176912-Wenker et al. 2006, p. 15). In the interim, 20-percent Class II inventories have provided information to characterize the nature and distribution of cultural resources along the Mina rail alignment common segments and alternative segments. Before starting any ground-disturbing activities that could affect cultural resources, the Department would perform the intensive ***Class III inventory*** of the selected segments, site evaluations, impacts assessments, and implement impact reduction or prevention measures, as appropriate.

3.3.13.3 General Environmental Setting and Characteristics

Sections 3.3.13.3.1 through 3.3.13.3.4 summarize the prehistoric, American Indian, and Euroamerican cultural history of southern Nevada. Additional detail, including sources and references, is presented in the historic context report prepared to support this Rail Alignment EIS. (DIRS 174688-AGEISS 2005, all; DIRS 182291-Desert Research Institute 2007, all).

3.3.13.3.1 Prehistoric Period

Native people inhabited the region that encompasses the Mina rail alignment for thousands of years and left artifacts and traces of their settlement and subsistence patterns and religious beliefs. The prehistoric archaeological record in the vicinity of the Mina rail alignment is subdivided into the following three cultural periods:

- Pre-Archaic (11,500 to 7,500 years before present). The Pre-Archaic cultural period is marked by relatively few people, who traveled in small bands hunting game and gathering food. Archaeological sites dating to this period are commonly preserved on gravel bars and other landforms associated with ***pluvial*** lakes, marshes, and riparian zones. These sites and their artifacts indicate a reliance on wetlands, with an emphasis on hunting large game. Isolated finds of distinctive fluted points associated with the Clovis and Folsom groups of people have a wide but sporadic distribution throughout the region.
- Early to Middle Archaic (7,500 to 1,500 years before present). During the Early to Middle Archaic cultural period, a shift occurred to a wider use of the environment, including sites near springs, perennial streams, caves, and rockshelters. A gradual increase in populations was marked by the use of plant seeds and nuts, along with hunting small game. Twelve rockshelters dating to this period and the Late Archaic period have been investigated in the vicinity of the Mina rail alignment.
- Late Archaic (1,500 to 150 years before present). Hallmarks of the Late Archaic cultural period include ceramics and small projectile points, along with the bow and arrow. Settlement patterns and subsistence practices continued from the earlier period, with sites in a variety of settings but clustered around permanent springs and riparian settings.

3.3.13.3.2 American Indian Historic Period

The Mina rail alignment would cross lands historically occupied by two indigenous ethnic groups, the Northern Paiute and the Western Shoshone. Other neighboring groups, such as the Owens Valley Paiute and Shoshones from adjacent regions, had strong kinship ties and occasionally visited the region.

Both the Northern Paiute and the Western Shoshone were characterized by local subgroups, defined by slight language or dialectical differences, traditional centers of residential occupation, more or less regular home ranges or districts, and closeness of kin ties. Local subgroups clustered around small oases scattered throughout the desert where springs and flowing streams could be found. Mountains and surrounding valleys were important resource collection areas, but seasonal changes in food availability prevented areas from being occupied year-round. Figure 3-238 shows areas occupied by these groups.

The Mina rail alignment would cross or be adjacent to the territories of several American Indian subgroups. Northern Shoshone areas include the *Agá idökadö* District north and east of Walker Lake and the *Pakwidökadö* District south of Walker Lake. Western Shoshone subgroups include bands based in the Lida-Goldfield area.

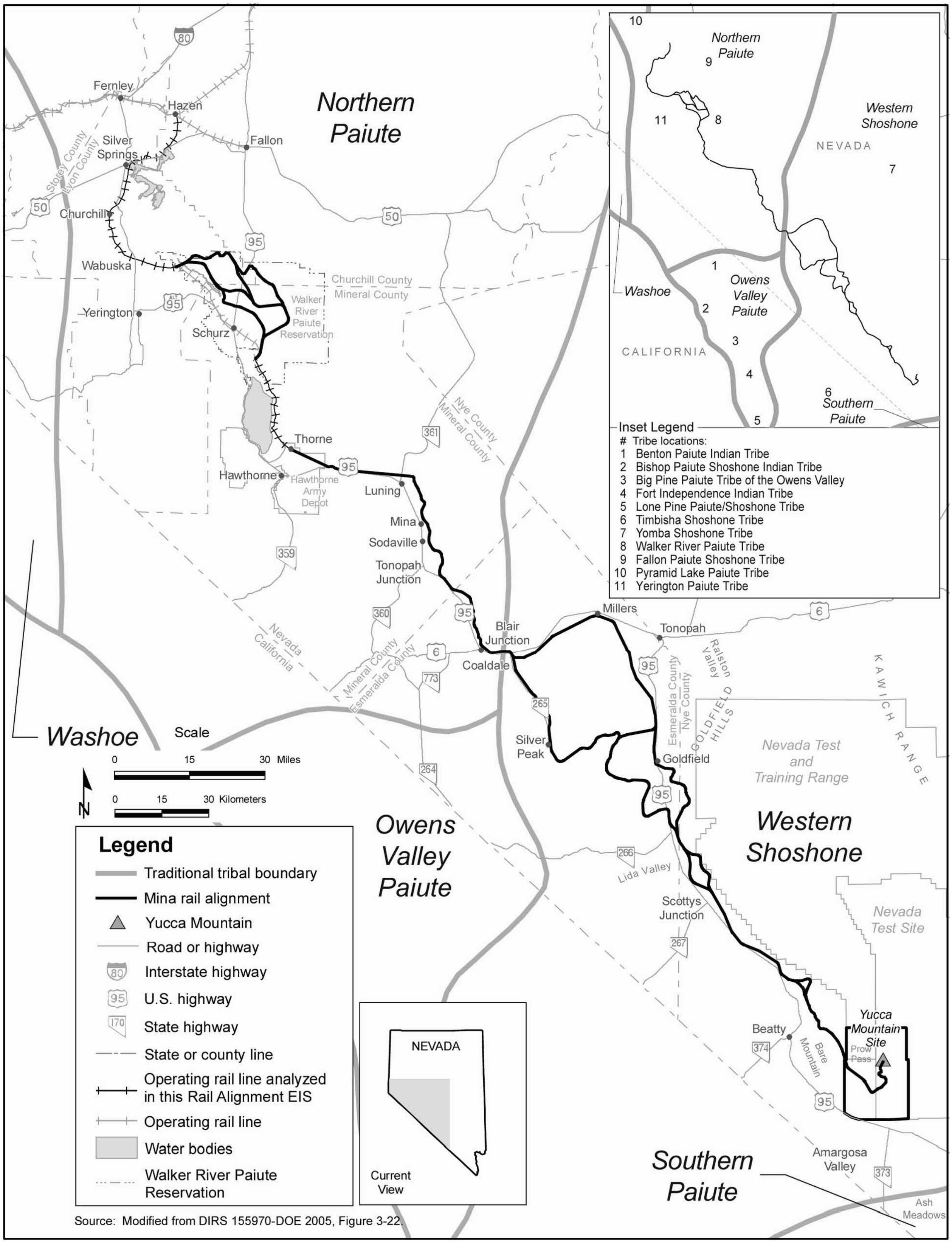


Figure 3-238. Traditional boundaries and locations of federally recognized tribes.

Following initial contact by European Americans in the early to middle 1800s, native people in central and southern Nevada began to adapt to changing conditions as settlement and development by miners, prospectors, and ranchers rapidly encroached on the landscape. As their essential resources were being lost to the Euroamerican expansion, both the Western Shoshone and the Northern Paiute were forced to confine their activities to selected reservations carved out of small portions of their traditional lands. Given the difficulties of making a living on these restricted areas, many responded by providing labor and other services to mining and ranching ventures, often living in mining towns or at ranches. In the vicinity of the region of influence, American Indian encampments are known to have been present at mining communities in the Goldfield and Tonopah areas.

3.3.13.3.3 Euroamerican Historic Period

Euroamerican incursion into the Great Basin was considerably slower than in other regions of North America. Consequently, American Indian groups in the intermontane West were able to survive early contact better than many other tribes and bands. During the first decades of contact, they were able to develop responses to the pressures exerted by Euroamericans on American Indian culture. By the reservation period of the 1860s, they had adopted means of resistance and acculturation that permitted the survival of much of their traditional lifeways.

Present-day Nevada remained largely unexplored by Euroamericans prior to 1826, at which time American and British trapping and trading parties began entering the Great Basin from the east and the northwest. Foremost among these was Peter Skene Ogden, who led a series of four expeditions into the northern Basin and Snake River plateau between 1826 and 1830, locating the Humboldt River and Humboldt Sink, as well as traveling south to Walker Lake and the Owens Valley. Specifically, on his 1829-1830 expedition, Ogden and his party retraced their steps of the previous year from the Columbia River to the Humboldt Sink, continued south to the Carson Sink and on to the Walker River, which they followed down to Walker Lake. Continuing south and southwest past the location of present Hawthorne, Nevada, the party eventually reached the Owens River and Lake, following the Owens Valley south to the Mojave Desert. In 1833, an American party under the leadership of Joseph Reddeford Walker followed the Humboldt River and crossed the Sierra Nevada, returning the next year via the Owens Valley, Walker Lake, and the Walker River. On both trips, Walker and his men clashed with Northern Paiute in the vicinity of the Humboldt Sink.

The trails established by trappers and traders across the Great Basin eventually became heavily traveled overland routes to the Pacific coast. Explorers, migrants, and eventually the transcontinental railroad all made their way across the Basin. Two of the earliest groups, the Bidwell-Bartleson party of 1841 and the Walker-Chiles party of 1843, in part followed the trail established along the Walker River to the vicinity of Walker Lake before continuing on to California.

The surge of travelers along the Overland Trail corridor peaked after the discovery of gold in California in 1848, placing increasing pressure on resources along the Humboldt River, all of which were heavily relied upon by American Indian inhabitants. In the face of these destructive forces, many native inhabitants were forced to withdraw from former habitations along the river.

The United States officially acquired the territory of the Great Basin as a result of the Treaty of Guadalupe Hidalgo in 1848, which concluded the Mexican-American War. The first Euroamericans to settle in the Basin were the Mormons, who sought refuge in the Salt Lake Valley in 1847, then a remote part of Mexican territory. The Mormons were the first to arrive in the Great Basin with the intent of settlement and quickly established a number of missions throughout the territory. Among the first of these was Mormon Station, later renamed Genoa, located on the Humboldt River trail from Salt Lake City to Sacramento via Carson Pass, about 60 miles south of present-day Reno, settled in 1851.

Following in the footsteps of the Mormons, small farms and ranches began appearing in some of the more well-watered portions of the Great Basin. But it was the discovery of silver at the Comstock Lode that spurred major migration to western Nevada in the 1850s and 1860s.

As the population in the Virginia City and Carson Valley areas expanded, conflicts with native inhabitants also increased, as American Indian populations were forced out of traditional homelands and the already scarce resources upon which their livelihood depended were exhausted. Settlers demanded protection, and in 1860, the U.S. Army established Fort Churchill on the Carson River. Eventually, American Indian peoples were forced to confine their activities to selected reservations carved out of small portions of their traditional lands.

In addition to a military presence, the discovery and extraction of various ores and minerals in western Nevada, primarily gold and silver, necessitated the construction of new transportation operations. In 1880, the Carson and Colorado (C&C) Railroad Company was formed. Construction of the C&C rail line began in 1880 and ran from Carson City south along the east side of Walker Lake and extended south to Keeler, California, near the northern shore of Owens Lake. By 1900 the gold mining boom had waned in the Carson City area, but shortly thereafter gold deposits in Tonopah were discovered and the rail line continued to deliver supplies from Owens Valley to the Nevada mining operations.

To the north, in Nye, Lincoln, and Esmeralda Counties, mining remained the major economic interest. By 1870, a number of mining districts and communities were established throughout south-central Nevada. Precious metals were discovered in Tonopah in 1900 and Goldfield in 1902, and companies were formed to develop railroads and improve transportation to and from these economic centers. In 1905 a narrow gauge rail line was constructed to run from borax mines near Gold Center, Nevada, south through the Mojave Desert to Ludlow, California. The new railroad, operated under the name Tonopah and Tidewater Railroad Company, ran as both a passenger train and supply train from 1905 to 1940.

3.3.13.3.4 Cultural Landscapes

Based on the literature review of the cultural history of the region of influence, DOE identified several examples of potential cultural landscapes reflecting significant ethnographic, mining, and railroading activities within the Level II region of influence that might be eligible for listing on the *National Register of Historic Places* (DIRS 174688-AGEISS 2005, all). These include:

- Ethnographic historic period Northern Paiute settlements in the Walker River and Lake area, and Western Shoshone villages and surrounding use areas in Oasis Valley and the Goldfield area.
- Several historic mining districts, including the Santa Fe Mining District on the west slope of the Gabbs Valley Range east of Luning; the Mina or Silver Star Mining District in the Excelsior Mountains southwest of Mina; the Sodaville Mining District in the south end of the Pilot Range east of Sodaville; the Silver Peak Mining District in the Clayton Valley area; and the Goldfield area.
- Historic railroad activities in the Luning, Mina, Sodaville, Silver Peak, and Goldfield areas.

3.3.13.4 Site-Specific Cultural Resources

The corridor through which the rail alignment would pass demonstrates a history of diverse prehistoric and historic land-use patterns. Native peoples occupied this area for many thousands of years, as exhibited by the archaeological sites identified in the area. These sites include campsites, rockshelters, ***lithic scatters***, quarries, rock rings and alignments, and rock-art sites. Euroamerican presence in the area is largely limited to the past 150 years or so, and is characterized by diverse activities represented at a wide variety of site types. Recorded and anticipated sites include early transportation features such as wagon and stage roads; railroads and railroad camps and sidings; homesteads; and mines, mills, and mining camps (Figure 3-239). Isolated features and artifacts related to all of these activities can also be anticipated. This section presents data on both previously recorded cultural resources and known, but unrecorded, properties along the Mina rail alignment. This section first presents the results of the Class I site-file search of the Level II region of influence and the Class II inventory (field survey) of the Level I region of influence for the entire alignment, including alternative segments. The results are followed by a segment-by-segment discussion for each of the common segments and alternative segments. DOE based individual segment analyses on three data sources: (1) the known-site file search and literature review (DIRS 182290-Desert Research Institute 2007, all); (2) the Class II inventory; and (3) information from the American Indian Resource Document (DIRS 174205-Kane et al. 2005, all). All references consulted or used in the different analyses can be found in those reports.prehistoric components, there are 42 multi-component sites containing both prehistoric and historic components; these are listed in Table 3-156. There are no prehistoric sites within the project area that are listed on the *National Register of Historic Places*. Resources that might be eligible for listing on the National Register have been identified as being either within or adjacent to the Mina rail alignment Level II region of influence. These include three toolstone procurement sites; 19 lithic scatters and/or camps; three sites characterized by rock art, including two ***petroglyph*** sites; and six rockshelter or cave habitation sites.

3.3.13.4.1 Previously Recorded Prehistoric Resources

A Class I site-file search for archaeological sites within the Level II region of influence identified 426 prehistoric recorded sites and ***isolates*** (Table 3-155). Of this total, 85 (20 percent) are isolated artifacts that were previously assigned archaeological site numbers. Although isolates are generally considered not eligible for listing on the *National Register of Historic Places*, they indicate, along with other types of sites, the presence of prehistoric people in the region of influence. In addition to the sites containing only

Table 3-155. Previously recorded prehistoric archaeological sites in the Level II region of influence.[a]

Site type	Number of sites and isolates	Eligible[b]	Not eligible	Unevaluated
Rockshelters	13	4	0	9
Specialized activity areas (campsites)	9	6	0	3
Specialized activity areas (lithic scatters)	289	10	221	58
Rock-art sites	5	2	0	3
Toolstone sources and quarry sites	15	2	8	5
Isolates[c]	85	0	84	1
Other:				
Rock ring	4	0	3	1
Rock features	5	0	2	3
Tinaja (water storage feature)	1	0	1	0
Totals	426	24	319	83

a. Source: Data from a site-file search conducted by Desert Research Institute (DIRS 182290-Desert Research Institute 2007, all).
b. Eligibility determinations taken from archaeological site forms on file, as evaluated against significance criteria for potential eligibility for the *National Register of Historic Places*.
c. Isolates include artifact occurrences that have been given a site number in the Nevada statewide archaeological recording system. Isolates are generally considered ineligible for listing on the *National Register of Historic Places*.

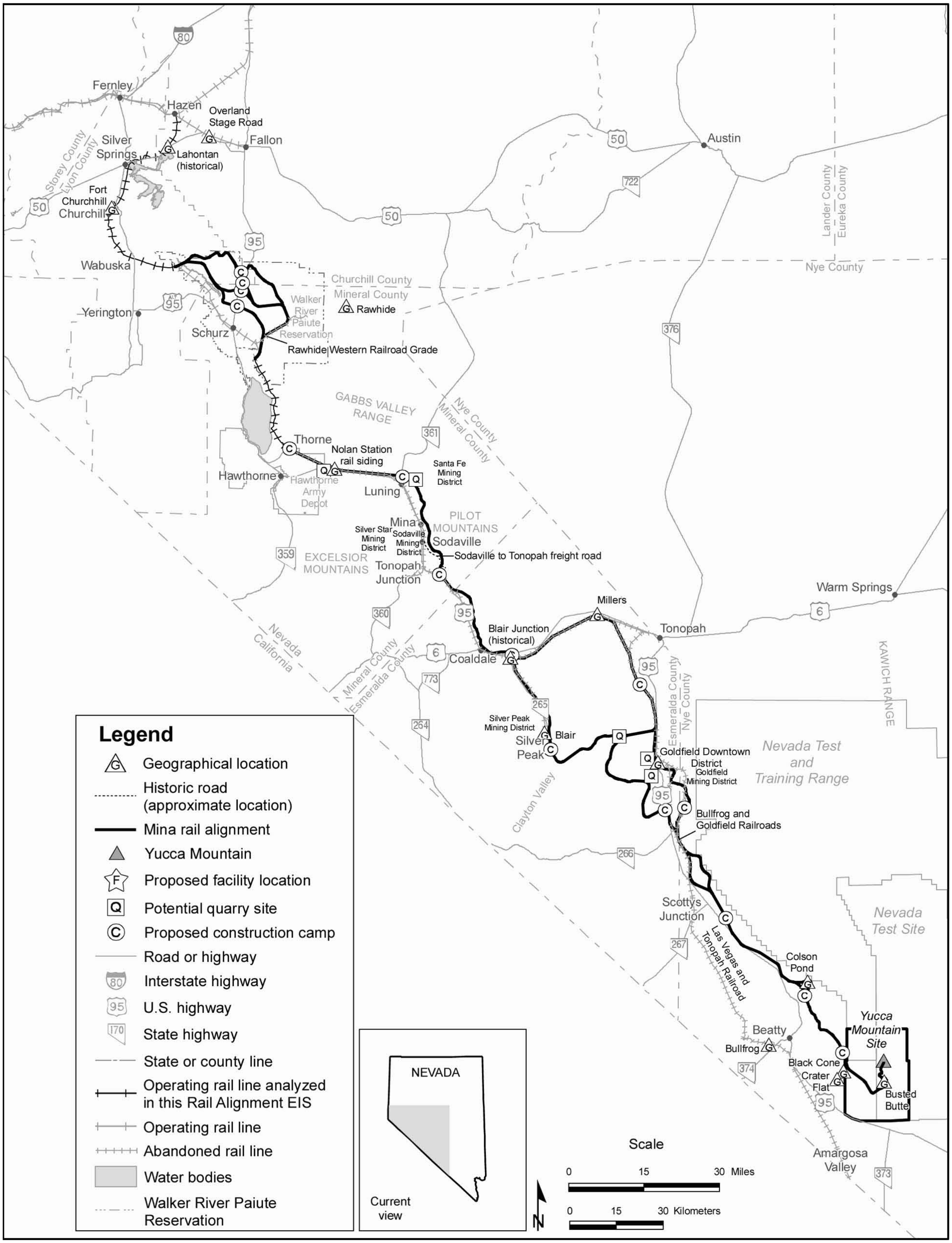


Figure 3-239. Major historic and geographical locations along the Mina rail alignment.

Table 3-156. Previously recorded historic Euroamerican sites in the Level II region of influence.[a]

Site type	Number of sites	Eligible[b]	Not eligible	Unevaluated
Historic ranching sites	0	0	0	0
Historic debris scatters (other)	46	2	40	4
Historic cemetery/graves	5	0	2	3
Historic railways	27	12	8	7
Campsite (mining or ranching, military, railroad)	3	2	1	0
Historic mining sites	31	8	15	8
Historic ranching sites (habitation)	1	1		0
Historic town sites	8	5 Goldfield downtown district listed on the *National Register of Historic Places*	1	2
Historic roads	4	1	0	3
Isolates[c]	7	0	6	1
Prehistoric/historic	42	5	28	9
Other	5	1	0	4
Unknown	2			2
Totals	181	37	101	43

a. Source: Data from site-file search conducted by Desert Research Institute (DIRS 182290-Desert Research Institute 2007, all).
b. Eligibility determinations taken from archaeological site forms on file, as evaluated against significance criteria for potential eligibility for the *National Register of Historic Places*.
c. Isolates include artifact occurrences that have been given a site number in the Nevada statewide archaeological recording system.

Site-type terminology reflects the site classification system employed in the BLM Draft Ely District Resource Management Plan (DIRS 174518-BLM 2005, Section 3.9).

3.3.13.4.2 Previously Recorded Historic Euroamerican Resources

A Class I site-file and literature search identified previously recorded historical Euroamerican sites within the Level II region of influence (see Table 3-156). One of these, the Goldfield downtown district, is listed on the *National Register of Historic Places*. Other historic resources that might be eligible for listing on the National Register have been identified as being either within or adjacent to the Mina rail alignment Level II region of influence. These resources include the following:

- Oasis Valley. Beatty Cattle Company Ranch and Colson Ranch, with associated Western Shoshone villages, both within the proposed rail alignment region of influence.
- Historic railroads, including segments of the Carson and Colorado, Las Vegas and Tonopah, Tonopah and Goldfield, and Southern Pacific railroads. The proposed rail line would follow various lengths of some of these lines between Hawthorne and Tonopah Junction, south toward Silver Peak, and intersect or follow many segments of the Las Vegas and Tonopah line along the 12 kilometers (7.2 miles) of Mina common segment 2, south of Goldfield. In these locations, DOE would refurbish the historic rail beds for use with the proposed rail line. Eligible or unevaluated resources associated with the railroads include stations, abandoned grades, construction-related features, and workers'

encampments, and resources associated with Luning, Mina, Coaldale, and other towns established along the rail lines.

- Goldfield. The downtown district of Goldfield is listed on the National Register of Historic Places. The town dump and a cemetery (evaluated as eligible for listing on the National Register) would be within the Montezuma alternative segment 2 region of influence. There are also potential contributing features and sites within the region of influence for this alternative segment.
- Historic roads. Segments of the Sodaville to Tonopah freight road and of the Overland Stage Road have been identified.

3.3.13.4.3 Known American Indian Resources

Previous American Indian studies and consultations associated with the Yucca Mountain Project, the Nevada Test Site, the Nevada Test and Training Range, and other projects have yielded significant information on the concerns of modern-day American Indians regarding traditional and cultural values. These concerns include evidence of their ancestors' occupation and use of traditional homelands, and their feelings about natural resources and geologic formations in the region, such as plants, animals, and natural landforms that mark important locations. Opportunities for the identification of traditional cultural properties and additional places of concern to American Indians will remain open through the consultation process.

Based on past studies and research for this Rail Alignment EIS, DOE has obtained information regarding the following potentially eligible historic properties that could be of cultural value for American Indians:

- Medicine rock sites, Walker River Paiute Reservation.
- Rabbit Spring rockshelter camp near Goldfield. Within the Level II region of influence.
- Winter village, probable site of a Western Shoshone village named Matsum in the Willow Springs vicinity. Within the Level II region of influence.
- Beatty area petroglyphs. Within the Level II region of influence.
- Western Shoshone Ogwe'pi District, a cluster of winter villages along the upper Oasis Valley and the headwaters of the Amargosa River, including two probable villages. Within the Level II region of influence.
- Black Cone site, a place of religious significance near Crater Flat. Within the Level II region of influence.
- Significant crossroad where numerous traditional American Indian trails came together near Fortymile Wash. Within the ***Yucca Mountain Site boundary***.
- Rock art near Busted Butte. Within the Yucca Mountain Site boundary.
- Prow Pass. Within the Yucca Mountain land withdrawal area.
- Cot Cave. Within the Yucca Mountain land withdrawal area.

3.3.13.5 Cultural Resources by Alternative Segments and Common Segments

Sections 3.3.13.5.1 through 3.3.13.5.11 describe the cultural resources for each of the Mina rail alignment common segments and alternative segments, including data from the previously recorded Class I site-file and literature search (DIRS 182290-Desert Research Institute 2007, all), the results of the Class II inventory, and associated American Indian consultations (DIRS 174205-Kane et al. 2005, all).

3.3.13.5.1 Union Pacific Railroad Hazen Branchline

The Class I site-file search revealed that 21 cultural resources have been recorded within the Level I region of influence of the existing Union Pacific Railroad Hazen Branchline. These resources include seven prehistoric sites, 10 historic sites, one site with both prehistoric and historic components, and three unknown site types. Six of the cultural properties are considered eligible or potentially eligible for the *National Register of Historic Places*, including several that are part of the National Register-listed Lahontan Dam historic district (DIRS 182290-Desert Research Institute 2007, all). Eligible or potentially eligible resources include a large prehistoric residential base camp, a portion of the Overland Stage Road, the Newlands Waterworks at Lahontan City, a Lahontan City construction townsite and railroad station, a railroad ***berm*** and debris scatter, and a multi-component site with eligible historic elements including a telephone line and debris scatter. In addition, the existing rail line passes through Fort Churchill State Historic Park, site of an important 1860-1869 U.S. Army post.

3.3.13.5.2 Department of Defense Branchline North

Department of Defense Branchline North is an existing rail line that begins east of Wabuska. It trends east through a valley just south of Parker Butte and north of the Mason Valley Wildlife Management Area. In total, Department of Defense Branchline North is about 8 kilometers (5 miles) long.

The Class I site-file search did not identify any cultural resources recorded within the Level I region of influence. No Class II inventory has been conducted.

3.3.13.5.3 Schurz Alternative Segments

At present, the Department of Defense operates a branch rail line that runs south from the end of the Union Pacific Railroad Hazen Branchline at Wabuska, directly through Schurz on the Walker River Paiute Reservation, to the Hawthorne Army Depot. DOE is considering four alternative segments to bypass Schurz to the east and connect the proposed rail line to existing Department of Defense Branchline North east of Wabuska. These four alternative segments are referred to as Schurz 1, 4, 5, and 6.

Schurz alternative segment 1 would begin at the end of the existing Department of Defense Branchline North, would cross the Walker River, and would trend east and then southeast, roughly parallel to the Walker River for approximately 10 kilometers (6 miles). From the Walker River, Schurz alternative segment 1 would continue in a southeasterly and then easterly direction for approximately 6 kilometers (4 miles). It would trend to the south through Sunshine Flat for approximately 19 kilometers (12 miles). After crossing U.S. Highway 95 with a grade-separated crossing, the rail line would pass south of the Calico Hills. Schurz alternative segment 1 would continue south for another 6 kilometers before joining the existing Department of Defense Branchline South. Schurz alternative segment 1 would be about 52 kilometers (32 miles) long.

The Class I site-file search revealed that five cultural resources have been recorded along Schurz alternative segment 1, including two within the Level I region of influence and three within the Level II region of influence. Previously recorded sites include one prehistoric site, three historic sites, and one multi-component prehistoric and historic site. None of the five resources has been evaluated for eligibility to the *National Register of Historic Places*.

DOE surveyed 15 sample units during the Class II effort, a total of 12 kilometers (7.5 miles). Eight resources were recorded, including five prehistoric sites, all characterized by lithic scatters, and three historic sites, including two railroads and one trash deposit. One prehistoric lithic scatter and one historic railroad are potentially eligible for listing on the *National Register of Historic Places*. The other six resources appear ineligible for listing.

Schurz alternative segment 4 would begin at the end of the existing Department of Defense Branchline North, would cross the Walker River, and would trend east and then southeast, roughly parallel to the Walker River for approximately 10 kilometers (6 miles). From the Walker River, the rail line would trend generally southeast and east for about approximately 12 kilometers (7.5 miles) and would cross U.S. Highway 95 with a grade-separated crossing. Between the Terrill Mountains and Calico Hills, it would run due east for about 11 kilometers (7 miles). It would then trend southwest for approximately 16 kilometers (10 miles) and would continue in a roughly southern direction for about 6 kilometers (4 miles) before joining the existing Department of Defense Branchline South. Schurz alternative segment 4 would be about 64 kilometers (40 miles) long.

The Class I site-file search revealed that one historic cultural resource, the Rawhide Western Railroad grade, has been recorded along Schurz alternative segment 4, within the Level I region of influence. National Register-eligibility of this resource has not been determined.

DOE surveyed four sample units during the Class II effort, totaling 3.2 kilometers (2 miles). Eight prehistoric resources were recorded, including lithic and groundstone scatters, and a quarry. Three of the sites are considered potentially eligible for listing on the *National Register of Historic Places*, two are considered not eligible, and three of the sites have not been evaluated.

Schurz alternative segment 5 would begin at the end of the existing Department of Defense Branchline North, would cross the Walker River, and would run east for approximately 14 kilometers (9 miles). This alternative segment would briefly cross into Churchill County before turning southeast and traveling through Long Valley across U.S. Highway 95 with a grade-separated crossing. Between the Terrill Mountains and Calico Hills, it would run due east for about 11 kilometers (7 miles). It would then trend southwest for approximately 16 kilometers (10 miles). It would continue in a roughly southern direction for about 6 kilometers (4 miles) before joining the existing Department of Defense Branchline South. Schurz alternative segment 5 would be about 71 kilometers (44 miles) long.

The Class I site-file search revealed that four cultural resources have been recorded along Schurz alternative segment 5, including two within the Level I region of influence and two within the Level II region of influence. These include three historic sites and one multi-component prehistoric and historic site. The multi-component site, Double Spring, is considered eligible for listing on the *National Register of Historic Places* and is located in the Level II region of influence; the historic sites have not been evaluated.

DOE surveyed 10 sample units during the Class II effort, totaling 8 kilometers (5 miles). Four resources were recorded, including three prehistoric lithic scatters, all unevaluated for eligibility, and one historic site, a trash deposit that is recommended not eligible for listing on the National Register.

Schurz alternative segment 6 would begin at the end of existing Department of Defense Branchline North, cross the Walker River, and would run east for approximately 14 kilometers (9 miles). This alternative segment would briefly cross into Churchill County before turning southeast and traveling through Long Valley before turning sharply northeast and crossing U.S. Highway 95. After following U.S. Highway 95 for about 4 kilometers (2.5 miles), the rail line would then turn southeast and run along the eastern edge of the Terrill Mountains for approximately 16 kilometers (10 miles). It would then trend southwest for approximately 16 kilometers. The rail line would continue south for about 6 kilometers (4 miles) before joining the existing Department of Defense Branchline South. Schurz alternative segment 6 would be about 72 kilometers (45 miles) long.

The Class I site-file search revealed that nine cultural resources have been recorded along Schurz alternative segment 6, including five within the Level I region of influence and four within the Level II region of influence. Of these nine, seven are prehistoric or have a prehistoric component, and two are historic resources. Prehistoric resources include one isolate, two lithic scatters, one rock alignment with possible burials, one petroglyph site, and one site considered eligible for listing on the National Register that has a medicine rock, cairns, hunting blinds, and petroglyphs. The isolate and one of the lithic scatters are considered not eligible; eligibility status of the remaining prehistoric sites has not been determined. The sites within the Level I region of influence include a lithic scatter, the isolate, and the rock alignment. The two historic sites falling along Schurz alternative segment 6 are found within the Level I region of influence and include the Rawhide Western Railroad grade and the Reese River Road stage route. Eligibility status of these resources has not been determined.

DOE surveyed two sample units during the Class II effort, totaling 1.6 kilometers (1 mile). One resource, a prehistoric lithic scatter, was recorded. This site has not been evaluated for listing on the *National Register of Historic Places*.

3.3.13.5.4 Department of Defense Branchline South

Department of Defense Branchline South is existing track that starts where the Schurz alternative segments would end, about 13 kilometers (8 miles) south of Schurz. The rail line trends generally south for 10 kilometers (6 miles) before leaving the Walker River Paiute Reservation, and continues generally south for another 24 kilometers (15 miles) on the east side of Walker Lake. Department of Defense Branchline South ends near Hawthorne, where it would join Mina common segment 1. Department of Defense Branchline South is approximately 35 kilometers (22 miles) long.

The Class I site-file search revealed that three cultural resources have been recorded within 0.15 kilometer (500 feet) of the existing rail line, including an historic pier piling, the historic Nolan Station rail siding, and a boulder containing cupule-style rock art (DIRS 182290-Desert Research Institute 2007, all). The historic pier piling is considered not eligible, and the other two sites have not been evaluated for eligibility. Because this line passes through or is adjacent to the Hawthorne Army Depot, first established as a U.S. Navy ammunition storage facility in 1928, historic structures associated with the depot might lie within the region of influence. No such structures were identified during Class I or Class II inventories. Any structures identified within the Level I region of influence during future studies, however, would require recordation and evaluation.

3.3.13.5.5 Mina Common Segment 1 (Soda Spring Valley Area)

Mina common segment 1 would begin north of the city of Hawthorne and would trend southeast before turning east at U.S. Highway 95. It would trend east along U.S. Highway 95 through Soda Springs Valley for approximately 40 kilometers (25 miles). Continuing to parallel U.S. Highway 95, the rail line would cross State Route 391 and turn south for approximately 64 kilometers (40 miles). It would pass the communities of Luning and Mina, which are along U.S. Highway 95 and would be approximately 1.5 to 3 kilometers (1 to 2 miles) to the east of the rail alignment. The rail line would then turn east before crossing U.S. Highway 95 with a grade-separated crossing in the area of Blair Junction and continuing for about 1.5 kilometers (1 mile) before joining the selected Montezuma alternative segment. Mina common segment 1 would be approximately 120 kilometers (72 miles) long.

The Class I site-file search revealed that 56 cultural resources have been recorded along Mina common segment 1, including 18 within the Level I region of influence and 38 within the Level II region of influence. Within the Level I region of influence, previously recorded resources include two prehistoric lithic scatters (one site is considered not eligible, one site has not been evaluated), 14 historic sites (five sites are considered eligible, two sites are considered not eligible, and seven sites have not been evaluated), and two multi-component sites (one site is not eligible, one site has not been evaluated). Types of eligible resources falling within the Level I region of influence include the Sodaville to Tonopah Freight Road, railroad workers' camps, and a railroad grade. Within the Level II region of influence, there are 24 prehistoric sites (15 sites are considered not eligible, and nine have not been evaluated), and 14 historic sites (four are considered eligible, six are considered not eligible, and four have not been evaluated). The prehistoric sites consist of a rockshelter, lithic scatters, and isolates. Most of the historic sites are associated with railroad construction and operation, including camps, stations, and grades. Mining sites and the townsites of Redlich and Mina also fall within the region of influence of Mina common segment 1.

DOE surveyed 29 sample units during the Class II effort, totaling 23.3 kilometers (14.5 miles). A total of 19 resources were recorded, including 14 prehistoric sites (13 lithic scatters and one quarry), three historic trash deposits, and two historic railroads. One historic railroad and the prehistoric quarry site are both considered eligible for listing on the *National Register of Historic Places*. Seven of the prehistoric lithic scatters are considered not eligible, and six have not been evaluated for eligibility. The three historic trash deposits and the additional historic railroad are considered not eligible.

3.3.13.5.6 Montezuma Alternative Segments

DOE is considering three alternative segments in the Montezuma area, referred to as Montezuma alternative segments 1, 2 and 3. Montezuma alternative segment 1 would depart Mina common segment 1 just southeast of Blair Junction. It would trend roughly southeast along State Route 265 through part of the Big Smoky Valley and west of the Weepah Hills for approximately 37 kilometers (23 miles), passing to the east of the Silver Peak in Clayton Valley. It would then turn to the northwest through Clayton Valley and run through a pass between Clayton Ridge and Paymaster Ridge close to Silver Peak Road. It would then trend south for the next 11 kilometers (7 miles) between Clayton Ridge on the west and Montezuma Peak on the east before turning east for about the next 13 kilometers (8 miles), passing to the south of Montezuma Peak. The rail alignment would again turn roughly south for approximately 11 kilometers, traveling to the west of the Goldfield Hills. It would then travel northwest, cross U.S. Highway 95, and turn south before joining Mina common segment 2 near Lida Junction. Montezuma alternative segment 1 would be approximately 120 kilometers (73 miles) long.

3.3.13.5.6.1 Montezuma Alternative Segment 1. The Class I site-file search revealed that 43 cultural resources have been recorded along Montezuma alternative segment 1, including five within the Level I region of influence and 38 within the Level II region of influence. Within the Level I region of influence, two prehistoric sites, including a quarry site of unknown eligibility status and a small lithic scatter that is considered not eligible, and three historic sites (two sites, a railroad grade and telephone line, are considered eligible and one site, a trash dump, has not been evaluated) are present.

Within the Level II region of influence, previously recorded resources include 27 prehistoric sites (one site is considered eligible, 17 sites are considered not eligible, and nine have not been evaluated), 10 historic sites (three are considered eligible, four are considered not eligible, and three have not been evaluated), and one multi-component site that is considered not eligible. The majority of the prehistoric sites consist of lithic scatters and isolates, though cave and quarry sites are also present; historic sites include railroad grades, a dump, a wagon road, mining sites, and the townsite of Blair.

DOE surveyed 25 sample units during the Class II effort, totaling 20.1 kilometers (12.5 miles). Twenty resources were recorded, including 17 prehistoric lithic scatters, two historic trash deposits, and one historic mining site. One lithic scatter is considered eligible for listing on the *National Register of Historic Places*; three scatters are considered not eligible, and the remaining 13 prehistoric sites have not been evaluated for eligibility. Of the historic sites, one trash deposit and the mining site are considered not eligible; the other trash deposit has not been evaluated.

3.3.13.5.6.2 Montezuma Alternative Segment 2. Montezuma alternative segment 2 would depart Mina common segment 1 just southeast of Blair Junction. It would trend northeast for about 35 kilometers (22 miles) just south of U.S. Highway 95. Northeast of Lone Mountain, it would turn south into Montezuma Valley and run south for 49 kilometers (31 miles) before turning east and crossing U.S. Highway 95 south of Goldfield. It would then trend south for about 37 kilometers (23 miles) before joining Mina common segment 2 near Lida Junction. Montezuma alternative segment 2 would be approximately 120 kilometers (74 miles) long.

The Class I site-file search revealed that 226 cultural resources have been recorded along Montezuma alternative segment 2, including 39 within the Level I region of influence and 187 within the Level II region of influence. Within the Level I region of influence, previously recorded resources include 11 prehistoric sites (10 are considered not eligible, one has not been evaluated), 17 historic sites (one site, the townsite of Goldfield, is listed on the *National Register of Historic Places*, nine sites are considered eligible, and seven are considered not eligible), and 11 multi-component sites (one site is considered eligible, nine are considered not eligible, and one has not been evaluated). Eligible site types include railroad grades, Millers townsite, a mining camp and miner's cabin, the Goldfield Junction Station and Goldfield Dump, a feed lot with corrals, and a multi-component site with mining structures and rock art. An unrecorded American Indian settlement is also reported within the Montezuma alternative segment 2.

Within the Level II region of influence, recorded resources include 112 prehistoric sites (four sites are considered eligible, 73 are considered not eligible, and 35 have not been evaluated), 58 historic sites (14 sites are considered eligible, 42 are considered not eligible, and two have not been evaluated), and 17 multi-component sites (14 are considered not eligible, and three have not been evaluated). The majority of the prehistoric sites consist of small lithic scatters and isolates; a variety of historic sites is found, primarily associated with mining and railroad activities. Historic sites also include the townsite of Millers, cemeteries, historic dumps, and military encampments, as well as sites and features potentially contributing to the National Register-listed Goldfield townsite.

DOE surveyed 24 sample units during the Class II effort, totaling 19 kilometers (12 miles). A total of 39 resources were recorded, including 28 prehistoric lithic scatters and one quarry, four historic trash deposits, three historic railroad sites, one historic homestead site, one historic mining site, and one multi-component site.

Two of the lithic scatters are considered eligible for listing on the *National Register of Historic Places*, and seven are considered not eligible; 19 lithic scatters and the quarry have not been evaluated for eligibility. The four historic trash deposits, two of the railroads, and the mining site are considered not eligible; one railroad, the homestead, and the multi-component site have not been evaluated.

3.3.13.5.6.3 Montezuma Alternative Segment 3. Montezuma alternative segment 3 would depart Mina common segment 1 just southeast of Blair Junction. It would trend northeast for about 35 kilometers (22 miles) just south of U.S. Highway 95. Northeast of Lone Mountain, it would turn south into Montezuma Valley and trend south for 37 kilometers (23 miles). North of Goldfield, it would turn west and trend along the northern portion of the Montezuma Range for 12 kilometers (7.5 miles). It would then trend south for the next 11 kilometers (7 miles) between Clayton Ridge on the west and Montezuma Peak on the east before turning east for about the next 13 kilometers (8 miles), passing to the south of Montezuma Peak. The rail alignment would again turn roughly south for approximately 11 kilometers, traveling to the west of the Goldfield Hills. It would then travel northwest, cross U.S. Highway 95, and turn south before joining Mina common segment 2 near Lida Junction. Montezuma alternative segment 3 would be approximately 140 kilometers (88 miles) long.

The Class I site-file search revealed that 84 cultural resources have been recorded along Montezuma alternative segment 3, including eight within the Level I region of influence and 76 within the Level II region of influence. Within the Level I region of influence, there is one prehistoric site (considered not eligible) and seven historic sites (six are considered eligible, and one is considered not eligible). The eligible resources include two railroad grades, Millers townsite, the Goldfield Junction Station, a mining camp, and a feed lot with corrals.

Within the Level II region of influence, previously recorded resources include 55 prehistoric sites (35 sites are considered not eligible, and 20 have not been evaluated), 18 historic sites (four sites are considered eligible, 12 are considered not eligible, and two have not been evaluated), and three multi-component sites that are considered not eligible. The majority of the prehistoric sites consist of small lithic scatters and isolates; a rockshelter is also present. Historic sites are primarily associated with mining and railroad activities, and include camps, dumps, mining features, and railroad grades and stations.

DOE surveyed 30 sample units during the Class II effort, totaling 24 kilometers (15 miles). A total of 46 resources were recorded, including 36 prehistoric lithic scatters and one quarry, three historic trash deposits, three historic railroad sites, one historic homestead site, one historic mining site, and one multi-component site.

Two of the lithic scatters are considered eligible for listing on the *National Register of Historic Places*, and eight are considered not eligible; 26 lithic scatters and the quarry have not been evaluated for eligibility. The three historic trash deposits, two of the railroads, and the mining site are considered not eligible; one railroad, the homestead, and the multi-component site have not been evaluated.

3.3.13.5.7 Mina Common Segment 2 (Lida Junction Area)

Mina common segment 2 would begin at the end of the Montezuma alternative segments and run roughly southeast for about 3.4 kilometers (2.1 miles) before joining one of the Bonnie Claire alternative segments.

The Class I site-file search revealed that one prehistoric cultural resource, the Twin Buttes Rockshelters, is recorded along Mina common segment 2 within the Level II region of influence. This site has not been formally evaluated for eligibility, but is likely to be considered eligible. No cultural resources have been previously identified within the Level I region of influence.

No Class II effort has been conducted along this short segment.

3.3.13.5.8 Bonnie Claire Alternative Segments

DOE is considering two alternative segments in the area north of Scottys Junction – Bonnie Claire alternative segments 2 and 3.

3.3.13.5.8.1 Bonnie Claire Alternative Segment 2. Bonnie Claire alternative segment 2 would depart Mina common segment 2 as the easternmost alternative segment where it skirts the western border of the Nevada Test and Training Range. The Class I site-file search identified one cultural resource along Bonnie Claire alternative segment 2. The site includes both prehistoric and historic components (a lithic scatter and mining prospects and debris). The prehistoric component was evaluated as being eligible for listing on the *National Register of Historic Places*.

The Class II survey examined five sample units, a total of 4 kilometers (2.5 miles). Two sites and five isolates were recorded. The sites include a prehistoric campsite with a lithic and ground stone scatter, evaluated as being eligible for listing on the *National Register of Historic Places*, and a lithic scatter for which eligibility is under review. The American Indian Resource Document (DIRS 174205-Kane et al. 2005, all) does not identify any known areas of importance to American Indians along this alternative segment.

3.3.13.5.8.2 Bonnie Claire Alternative Segment 3. Bonnie Claire alternative segment 3 would run west of Bonnie Claire alternative segment 2, closer to U.S. Highway 95, and generally follow an abandoned rail line grade for part of its length. The Class I site-file search revealed four previously recorded but unevaluated prehistoric sites. One of these is a rockshelter, and the other three are extractive sites located in areas of obsidian cobble occurrences. The Class II survey inspected four sample units along this segment, a total of 3.2 kilometers (2 miles). One site and 24 isolates were recorded. The site is an historic rail line construction camp along the abandoned combined Bullfrog and Goldfield/Las Vegas and Tonopah rail bed, recommended as eligible for listing on the *National Register of Historic Places*. The American Indian Resource Document (DIRS 174205-Kane et al. 2005, all) does not identify specific resources for this alternative segment.

3.3.13.5.9 Common Segment 5 (Sarcobatus Flat Area)

Common segment 5 would begin 4 kilometers (2.5 miles) north of Scottys Junction and trend generally southeast through the Sarcobatus Flat area, approximately 100 meters (330 feet) east of U.S. Highway 95 at its closest point. Common segment 5 would end approximately 6 kilometers (4 miles) north of Springdale, where it would connect to one of the Oasis Valley alternative segments. Common segment 5 would be about 40 kilometers (25 miles) long (DIRS 176165-Nevada Rail Partners 2006, p. E-13).

The Class I site-file search identified 33 cultural resources within common segment 5. These resources include 20 prehistoric sites (14 lithic scatters and six quarry extractive sites), four historic sites (a Tolicha mining district campsite, two debris scatters, and a railroad segment), seven isolates, and two unknown sites. Of these sites, one lithic scatter has been recommended as eligible for listing on the *National Register of Historic Places*; 11 are not eligible, and 14 remain unevaluated.

DOE surveyed 10 sample units along this segment for the Class II effort, a total of 8 kilometers (5 miles). Four prehistoric sites (three lithic scatters and one campsite) and 33 isolates were recorded. Of these sites, the campsite was recommended as eligible for listing on the *National Register of Historic Places*, and the tree lithic scatters are not eligible.

3.3.13.5.10 Oasis Valley Alternative Segments

The Class I site-file search identified three cultural resources along Oasis Valley alternative segments 1 and 3. These resources include one prehistoric campsite (recommended as eligible for nomination to the *National Register of Historic Places)* and two sites with both prehistoric and historic components (unevaluated ethnographic village sites).

3.3.13.5.10.1 Oasis Valley Alternative Segment 1. The Class II survey looked at three sample units along Oasis Valley 1, totaling 2.4 kilometers (1.5 miles). Two prehistoric sites (lithic scatters) and one historic mine site were recorded.

Oasis Valley alternative segment 1 would pass to the east of the historic ranch known today as the Beatty Cattle Company Ranch. In addition to being an unrecorded historic ranch, the area adjacent to the ranch is known to be the location of an early historic Western Shoshone winter camp. This camp has been partially recorded but has not been evaluated.

The American Indian Resource Document notes the presence of the early Western Shoshone camp and also states that, because of its abundant water supply and large variety of culturally important plants and animals, American Indian people extensively used the entire valley (DIRS 174205-Kane et al. 2005, Section 2.3). Recent ethnographic studies on the nearby Nevada Test and Training Range revealed cultural links to Oasis Valley. The Oasis Valley area is both a potential ethnographic and historic ranching cultural landscape. In later historic times, these landscapes overlapped, as American Indian people collocated with and supplied labor for the ranches.

3.3.13.5.10.2 Oasis Valley Alternative Segment 3. Oasis Valley alternative segment 3 would cross Oasis Valley farther to the east than Oasis Valley 1, but because of proximity, much of the discussion for Oasis Valley 1 applies to this alternative segment. During the Class II survey, DOE inspected four sample units, a total of 3.2 kilometers (2 miles); five sites and 28 isolates were recorded. These resources include five prehistoric sites (four lithic scatters and one campsite with a lithic scatter and cleared rock rings). The campsite has been determined eligible for listing on the *National Register of Historic Places.*

Oasis Valley 3 would also be near a historic ranch (noted as the Colson Ranch or Indian Camp on some maps). Similar to the Beatty Cattle Company Ranch, the Colson Ranch is an unrecorded historic property that has been identified as a Western Shoshone winter camp.

3.3.13.5.11 Common Segment 6 (Yucca Mountain Approach)

The Yucca Mountain area has been heavily analyzed in conjunction with repository site characterization studies. Intensive cultural resource studies related to the development of the repository site have been completed; consequently, a large number of archaeological sites are known to exist along common segment 6. This is due more to the intensive nature of past studies than actual site density characteristics.

A Class I site-file search identified a total of 204 cultural resources along common segment 6. These resources include 152 prehistoric sites, three historic sites, one site with both prehistoric and historic components, and 49 isolates. Prehistoric sites include eight rockshelters (four eligible), two eligible rock-art sites, 13 campsites (five eligible), six quarry sites (two eligible), four rock features and two rock rings, and 117 lithic scatters (one eligible). Historic sites include two debris scatters and one rail segment.

The Class II survey for common segment 6 did not extend inside the Yucca Mountain Site boundary. DOE inspected thirteen sample units, a total of 11 kilometers (7 miles). Seven sites (two prehistoric lithic scatters, four eligible sites with both prehistoric and historic components, and one historic debris scatter) and 52 isolates were recorded.

To provide additional information on cultural resources along common segment 6, Desert Research Institute conducted a Class III supplementary field survey along the section of proposed rail alignment inside the Yucca Mountain Site boundary. This survey investigated a 150-meter (500-foot)-wide corridor centered on the rail alignment for an approximate length of 5.9 kilometers (3.7 miles). This land comprised acreage that had not been previously surveyed during repository site characterization activities. Desert Research Institute identified eight cultural resources (two prehistoric sites, five isolates, and one historic site) during the Class III survey. All were evaluated as ineligible for National Register listing.

Based primarily on previous ethnographic studies, the American Indian Resource Document (DIRS 174205-Kane et al. 2005, Section 2.3) identifies several areas of cultural significance for American Indians along this segment. Several of these fall within the Yucca Mountain Site boundary, including the Busted Butte rock-art site, Fortymile Wash, and Alice Hill. The American Indian Writers Subgroup also notes the cultural importance of the Beatty Wash rock-art site and Crater Flat, specifically the Black Cone geological feature in Crater Flat, which would be within 0.8 kilometer (0.5 mile) of common segment 6.

3.3.14 PALEONTOLOGICAL RESOURCES

Paleontology is a science that uses ***fossil*** remains to study life in past geological periods. DOE, the BLM, and other federal agencies recognize paleontological resources as a fragile and nonrenewable scientific record of the history of life on earth and consider them a critical component of America's natural heritage. Once such resources are damaged, destroyed, or improperly collected, their scientific and educational value could be greatly reduced or forever lost.

> **Fossil**: Fossils include the body remains, traces, and imprints of plants or animals that have been preserved in the Earth's crust since some past geologic or prehistoric time. Generally, to be considered a fossil, the remains must be older than recent in age (older than 10,000 years). Fossils are found in ***sedimentary rock***.
>
> **Sedimentary rock**: Rock formed from material deposited by water, wind, or glaciers.

The BLM manages and protects paleontological resources under the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 *et seq.*), and in accordance with 43 CFR 8365 and 43 CFR 3622. The BLM has developed policies and management actions to protect and manage paleontological resource areas of high scientific value consistent with the *Carson City Field Office Consolidated Resource Management Plan* (DIRS 179560-BLM 2001, all) and the *Tonopah Resource Management Plan and Record of Decision* (DIRS 173224-BLM 1997, all), while allowing casual and academic collecting of invertebrate (animals without backbones) fossils within the regulatory framework. Because of their relative rarity and scientific importance, vertebrate (animals with backbones) fossils may only be collected with a BLM permit and remain the property of all Americans in museums or other public institutions (DIRS 180122-BLM [n.d.], all).

Section 3.3.14.1 describes the region of influence for paleontological resources along the Mina rail alignment, and Section 3.3.14.2 describes the paleontological resources within the region of influence, including the identification of previously recorded important fossil resources and the approaches for managing those resources.

3.3.14.1 Region of Influence

The region of influence for paleontological resources along the Mina rail alignment is the nominal width of the rail line construction right-of-way, and the footprints of railroad construction and operations support facilities.

3.3.14.2 Affected Environment

The BLM has established a classification system to rank areas according to their potential to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils (*Paleontological Resource Management* and *General Procedural Guidance for Paleontological Resource Management*). The BLM uses these rankings (called ***Condition 1***, ***Condition 2***, and ***Condition 3***) in land-use planning and to identify areas that might warrant special management or special designation (DIRS 176085-BLM 1998, all; DIRS 176084-BLM 1998, all).

> BLM ranking of areas for their potential to contain paleontological resources (DIRS 176084-BLM 1998, pp. II-2 and II-3):
>
> **Condition 1** - Areas that are known to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils.
>
> **Condition 2** - Areas with exposures of geological units or settings that have high potential to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils.
>
> **Condition 3** - Areas that are very unlikely to produce vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils.

To determine the affected environment for paleontological resources along the Mina rail alignment, DOE consulted the BLM and reviewed existing documentation of paleontological resources, including applicable BLM resource management plans and the National Science Foundation's website *The Paleontology Portal*.

The Mina rail alignment would cross large areas of volcanic rock and granite, alternating with basins filled with deposits from erosion of the mountains. North of the Montezuma Range, there are some exposures of sedimentary rock in alluvial fans and playa areas. Fossils are likely found in sedimentary rock; however, there are no known occurrences of paleontological resources within the Mina rail alignment region of influence.

Although the proposed rail alignment would not cross any known fossil-rich rock outcrops, the possibility exists that beds containing fossils could be uncovered during construction of the proposed railroad.

3.3.15 ENVIRONMENTAL JUSTICE

To support the assessment of the potential for ***disproportionately high and adverse impacts*** on minority and low-income communities, this section provides the information on ***minority*** and ***low-income populations*** and communities in the Mina rail alignment region of influence. Section 3.3.15.1 describes the region of influence, Section 3.3.15.2 describes the methodology DOE used to determine population groups, and Section 3.3.15.3 describes regional population characteristics for environmental justice considerations.

Minority individuals are members of the following population groups: American Indian or Alaskan Native, Asian or Pacific Islander, Black, and Hispanic.

A **low-income** household is one for which the household income is below the U.S. Census Bureau poverty thresholds.

Source: DIRS 155970-DOE 2002, Section 3.1.13.1.

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs federal agencies to make achieving environmental justice part of their missions by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations, and provide access to public information on, and an opportunity for public participation in, matters relating to human health or the environment. Executive Order 12898 also directs agencies to provide opportunities for public input on the incorporation of environmental justice principles into federal agency programs or policies. Executive Order 12898, and associated implementing guidance, establishes the framework for characterizing existing conditions related to environmental justice. For this analysis, DOE uses the terms minority and low income in the context of environmental justice as described in the Yucca Mountain FEIS (DIRS 155970-DOE 2002, Section 3.1.13.1) and *Poverty Thresholds* (DIRS 174625-Bureau of Census 2005, all).

3.3.15.1 Region of Influence

The Mina rail alignment region of influence for environmental justice encompasses the regions of influence for all other resource areas because impacts in other resource areas could result in environmental justice impacts. Section 3.3 describes the regions of influence for the ***environmental resource areas*** analyzed in this Rail Alignment EIS. For some resource areas, the relevant region of influence is an area extending a given distance from the centerline of the rail alignment. For others, the relevant region of influence is not so precisely definable, but generally includes the landscape the rail line would cross. However, the widest region of influence is that defined for hazardous materials and waste (see Section 3.3.12), which considers a nationwide region of influence.

In addition to the regions of influence delineated via direct physical proximity to the Mina rail alignment, the environmental justice region of influence includes populations that could be affected by the project that have cultural or religious ties in the area, even though the population may not have a physical presence. For a discussion of American Indian populations, and resulting cultural region of influence, see Section 3.4, American Indian Interests in the Proposed Action.

3.3.15.2 Methodology

For the Yucca Mountain FEIS, DOE followed the Council on Environmental Quality guidance (DIRS 177702-CEQ 1997, all) and the then-existing methodology of the U.S. Nuclear Regulatory Commission to identify low-income and minority communities (also called low-income and minority populations). However, since that time the U.S. Nuclear Regulatory Commission methodology used in the Yucca Mountain FEIS has been revised, and for this Rail Alignment EIS, DOE used the revised methodology to identify low-income and minority communities (69 *FR* 52048). The revised methodology is, in part:

> Under current NRC [Nuclear Regulatory Commission] staff guidance, a minority or low-income community is identified by comparing the percentage of the minority or low-income population in the impacted area to the percentage of the minority or low-income population in the County (or Parish) and the State. If the percentage in the impacted area significantly exceeds that of the State or the County percentage for either the minority or low-income population then EJ [environmental justice] will be considered in greater detail. 'Significantly' is defined by staff guidance to be 20 percentage points. Alternatively, if either the minority or low-income population percentage in the impacted area exceeds 50 percent, EJ matters are considered in greater detail.

In Nevada, the percentage of people below the poverty threshold, as characterized by the U.S. Bureau of the Census (DIRS 174625-Bureau of Census 2005, all), was approximately 11 percent at the last Decennial Census (DIRS 176856-U.S. Census Bureau 2003, Table 15). Thus, applying the U.S. Nuclear Regulatory Commission guidance, DOE identified low-income communities as those affected areas (by census block groups) where the percentage of people characterized as below the poverty threshold exceeded 31 percent.

Because the percentage of minorities in Nevada is approximately 34 percent (DIRS 173533-Bureau of Census 2005, all), adding 20 percentage points would provide a threshold of 54 percent to identify minority communities. Instead, DOE identified minority communities as those affected areas (by census blocks) where the minority population exceeded 50 percent.

DOE followed the Council on Environmental Quality guidance to use the annual statistical poverty thresholds from the U.S. Census Bureau to identify low-income populations (DIRS 177702-CEQ 1997, p. 25). DOE used U.S. Census Bureau data for census block groups. The census block group, which typically consists of between 600 and 3,000 people with an optimum size of 1,500 people, is the smallest census unit for which the Census Bureau releases income data (to protect confidentiality). Block groups on American Indian reservations, off-reservation trust lands, and special places must contain a minimum of 300 people. (Special places include correctional institutions, military installations, college campuses, workers' dormitories, hospitals, nursing homes, and group homes.) To identify minority populations, DOE used U.S. Census Bureau data for census blocks. The census block is the smallest census unit for which the Census Bureau collects 100-percent data. The Department assessed the population within 3 kilometers (1.8 miles) on either side of the centerline of the Mina rail alignment, to be consistent with the Yucca Mountain FEIS.

A **census block** is a subdivision of a census tract (or, prior to 2000, a block numbering area). A block is the smallest geographic unit for which the Census Bureau tabulates 100-percent data.

A **census county division (CCD)** is a subdivision of a county that is a relatively permanent statistical area established cooperatively by the Census Bureau and state and local government authorities. It is used for presenting decennial census statistics in those states that do not have well-defined and stable minor civil divisions that serve as local governments.

A **census block group** is a subdivision of a census tract (or, prior to 2000, a block numbering area). A block group is the smallest geographic unit for which the Census Bureau tabulates sample data. A block group consists of all the blocks within a census tract with the same beginning number.

A **census tract** is a small, relatively permanent statistical subdivision of a county delineated by a local committee of census data users for the purpose of presenting data. Designed to be relatively homogeneous units with respect to population characteristics, economic status, and living conditions at the time of establishment, census tracts average about 4,000 inhabitants.

Sources: DIRS 181904-U.S. Census Bureau 2007, all; DIRS 181905-U.S. Census Bureau [n.d], all.

DOE developed these analyses by creating Geographic Information System (GIS) representations of the Mina rail alignment alternative segments and common segments and creating a computer program to extract specific census data based on the 3-kilometer (1.8-mile) buffer distance.

The specific census data required to develop the analyses included:

- Total population and number of minority people by census block
- Total population and number of individuals below the poverty level by census block group

For Census 2000, the Census Bureau used two forms, one short and one long. The Bureau sent the short form to every household, and sent the long form, containing the seven 100-percent questions plus the sample questions, to only a limited number of households. Generally, about one in every six households nationwide received the long form. The rate varied from one in two households in some smaller areas, to one in eight households for more densely populated areas. The long form requests information on the numbers and ages of members of each household and income received during the previous full year. From this information, the Census Bureau makes a determination of the poverty status of the individuals living in the household. The Census Bureau additionally uses school districts, child protective services, and social services to supplement the census data to develop estimates that more fully represent actual poverty status among all populations.

3.3.15.3 Regional Characteristics

3.3.15.3.1 Minority and Low-Income Populations

The Mina rail alignment would affect portions of five counties in Nevada (Churchill, Lyon, Mineral, Esmeralda, and Nye). Table 3-157 summarizes Census 2000 data on minority and low-income populations within these general areas. The table includes specific county subdivisions and small population centers within or near the Mina rail alignment. For comparison, the table includes statewide and county-wide minority and poverty data.

Based on the data in Table 3-157, seven of the county subdivisions and small population centers that would encompass the Mina rail alignment have a higher proportion of minority residents than the associated county-wide proportion of minority residents. The Schurz population center and the Walker River ***Census County Division***, both in Mineral County, have the widest percentage difference, 89-percent and 80-percent minority populations, respectively, compared to a 30-percent minority population for Mineral County as a whole. These two areas exceed the 50-percent threshold described in Section 3.3.15.2. The Walker River Census County Division primarily consists of the Walker River Paiute Reservation, which is shown in Table 3-157.

As shown in Table 3-157, poverty rates in the affected county subdivisions tend to be higher than the associated county-wide poverty percentages, except in the following county subdivisions:

- Hawthorne subdivision, where the poverty rate is lower than the Mineral County percentage
- Goldfield subdivision, where the poverty rate is lower than the Esmeralda County percentage (DIRS 176856-U.S. Census Bureau 2003, all)

In all cases, poverty rates in the county subdivisions are higher than the statewide figure of 11 percent.

Population centers are often assessed in relation to the county in which they are located. As shown in Table 3-157, compared to Nye County, Beatty has a lower minority population rate but a higher poverty rate. With 89 percent, Schurz has a higher minority population rate than the established 50-percent threshold and a higher poverty rate (26 percent), although it is below the established threshold of 20 percent above the state average (11 percent), which combined is a threshold of 31 percent.

To illustrate minority concentrations, Figure 3-240 shows the distribution of census block groups with minority population percentages that exceed the 50-percent threshold identified in Section 3.3.15.2. It also includes federally recognized American Indian lands, because American Indians are included in the definition of minority populations. Based on Census 2000 estimates, the population living within 3 kilometers (1.8 miles) on either side of the Mina rail alignment is 5,907 (DIRS 174625-Bureau of Census 2005, all). Of that population, approximately 1,100 (19 percent) are minority populations. Two block groups in Lyon County, block groups 1 and 2 of census tract 9602, comprise approximately half of the minority populations in the region of influence for environmental justice.

To illustrate low-income concentrations, Figure 3-241 shows the distribution of census block groups with low-income rates that exceed the 31-percent threshold identified in Section 3.315.2. Based on Census 2000 estimates, the population within 3 kilometers (1.8 miles) on either side of the centerline of the Mina rail alignment for whom poverty status is determined is 3,600. Of these, 530, or 15 percent, are living below the poverty level. This percentage is higher than the percent of the population living in poverty for the State of Nevada as a whole (11 percent) and is generally similar to the population living in poverty in the counties along the Mina rail alignment (8.6 percent to 15 percent) (see Table 3-157). There is one census county division with a poverty rate of more than 20 percent above the state average of 11, the Walker River Census County Division, with a 32-percent poverty rate.

3.3.15.3.2 American Indian Perspectives

Section 3.4 describes American Indian perspectives related to the Proposed Action. Section 3.4.2.4 provides a discussion of American Indian environmental justice concerns.

Table 3-157. Minority and low-income populations in the jurisdictions and nearby areas potentially affected by construction and operation of the proposed rail line – Mina rail alignment.[a]

Areas	Population	Percent minority	Percent low income
State of Nevada	2,000,000[b]	35	11
Walker River Paiute Reservation	850	86	32
Counties			
Churchill County	24,000	18	9
Lyon County	32,500	13	10
Mineral County	5,070	30	15
Nye County	33,000	15	11
Esmeralda County	970	19	15
County subdivisions			
Silver Springs Census County Division, Lyon County, Nevada	6,700	8	13
Hawthorne Census County Division, Mineral County, Nevada	4,000	16	11
Mina Census County Division, Mineral County, Nevada	240	0.1	22
Walker River Census County Division, Mineral County, Nevada[c]	870	80	32
Amargosa Valley Census County Division, Nye County, Nevada	1,100	28	15
Beatty Census County Division, Nye County, Nevada	1,090	11	13
Tonopah Census County Division, Nye County, Nevada	2,900	18	11
Goldfield Census County Division, Esmeralda County, Nevada	450	3	12
Silverpeak Census County Division, Esmeralda County, Nevada	520	22	18
Small population centers			
Schurz (Mineral County)[c]	710	89	26
Beatty (Nye County)	1,090	11	13
Within 3 kilometers (1.8 miles) of the rail alignment centerline	5,907	19	15

a. Source: DIRS 176856-U.S. Census Bureau 2003, all.
b. The state population was rounded to 2 million for consistent analysis.
c. Encompasses the Walker River Paiute Tribe.

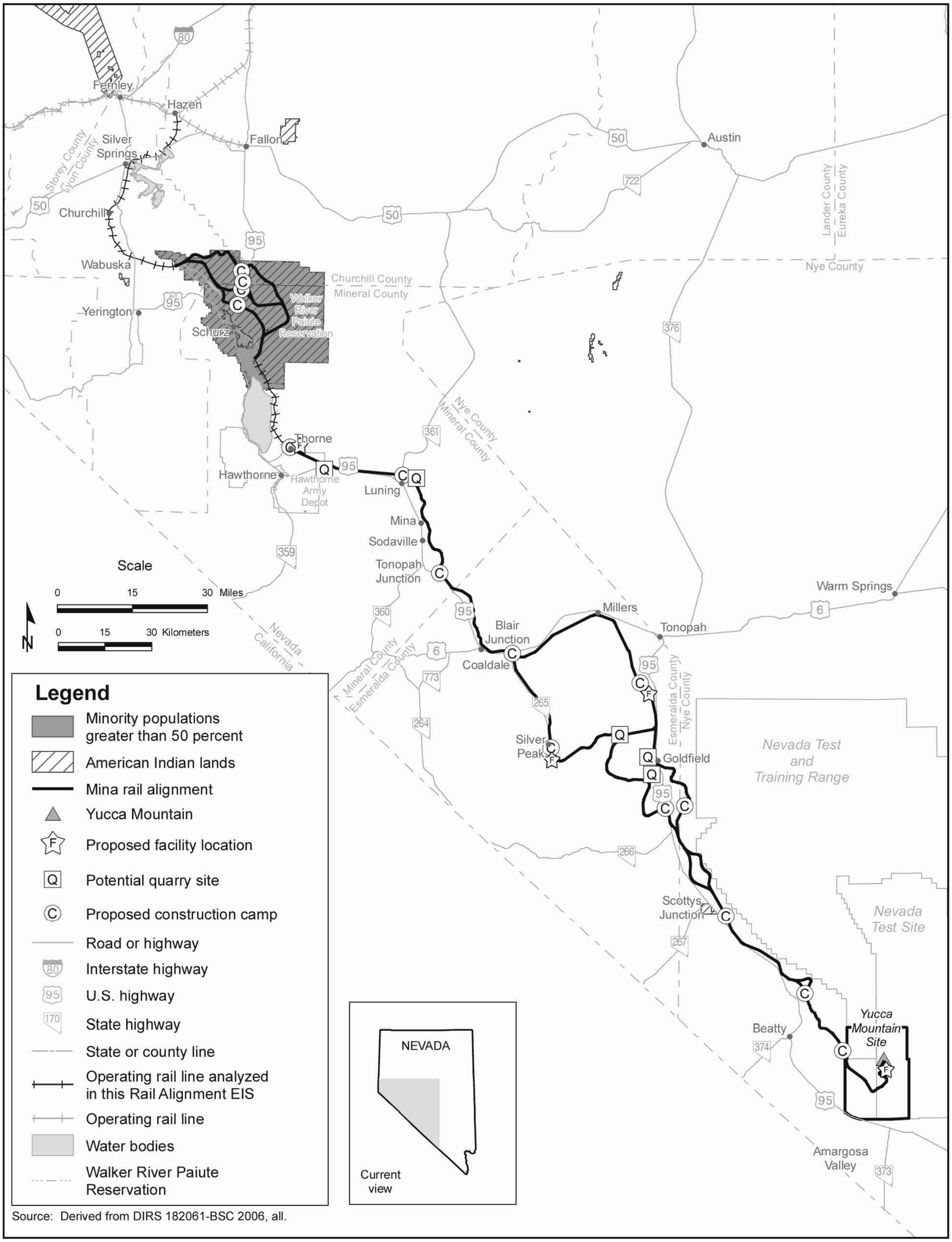


Figure 3-240. Minority populations greater than 50 percent along the Mina rail alignment.

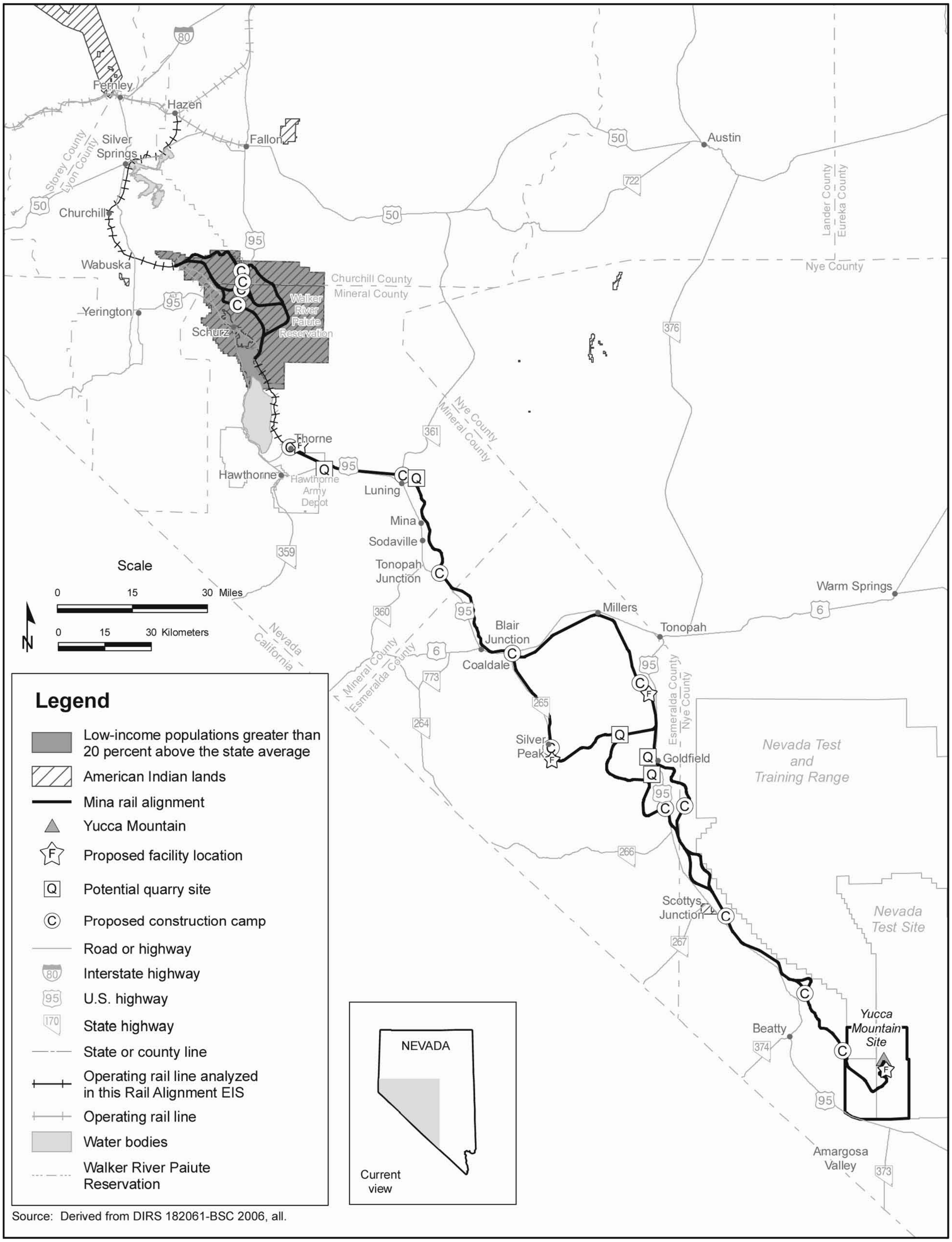


Figure 3-241. Low-income populations greater than 20 percent above the state average along the Mina rail alignment.

3.4 American Indian Interests in the Proposed Action

This section summarizes the interests and concerns expressed by various American Indian tribes and organizations within or near the Caliente and Mina rail alignments regions of influence. Sections 3.2.13 and 3.3.13, Cultural Resources, provide additional information on American Indian cultural resources.

American Indian interests regarding environmental resources are not limited to archaeological or historical sites, but include natural resources and geological formations present throughout the region. Natural resources constitute critical components of American Indian daily life and religious beliefs, while plants and animals are sources of food, raw materials, and medicines, and are components of ritual practices. Natural landforms mark locations that are significant for keeping the historic memory of American Indian people alive and for teaching children about their culture and history (DIRS 174205-Kane et al. 2005, p. 9).

In 1987, DOE initiated the Native American Interaction Program to solicit input from tribes and organizations on the characterization of the Yucca Mountain Site and the possible construction and operation of a repository for spent nuclear fuel and high-level radioactive waste. These tribes and organizations – Southern Paiute; Western Shoshone; and Owens Valley Paiute and Shoshone people from Arizona, California, Nevada, and Utah – have declared traditional ties to the Yucca Mountain area and to portions of the larger region that includes the Caliente and Mina rail alignments. As part of the scoping process for this Rail Alignment EIS, DOE held a Yucca Mountain tribal interactions meeting in June 2004 to take comments from tribal representatives about the proposed rail line along the Caliente rail alignment. In October 2004, a small group of designated tribal representatives participated in a field reconnaissance trip along the alignment, followed by a meeting of the larger consolidated group in late November 2004. Based on these efforts, the American Indian Writers Subgroup prepared a resource document, *American Indian Perspectives on the Proposed Rail Alignment Environmental Impact Statement for the U.S. Department of Energy's Yucca Mountain Project* (the American Indian Resource Document) (DIRS 174205-Kane et al. 2005, all), that provides insight into American Indian interests along the Caliente rail alignment. The Native American Interaction Program is part of DOE's implementation of CEQ Guidance on Environmental Justice that "agencies should recognize the interrelated cultural, social, occupational, historical, or economic factors that may amplify the natural and physical environmental effects of the proposed agency action" (DIRS 177702-CEQ 1997).

At the time of these discussions, the Mina rail alignment was not under consideration as an ***implementing alternative***, and Northern Paiute peoples who traditionally occupied lands north of Goldfield and Tonopah did not participate in preparation of the American Indian Resource Document. As a consequence, the document does not present an American Indian perspective on the area from Blair Junction north to Hazen, along the Mina rail alignment. DOE obtained some information on Northern Paiute views during discussions with the Walker River Paiute Tribe, including a meeting with the Tribe in November 2006 to discuss the Mina rail alignment, but the Tribe did not complete the full environmental review process. Therefore, this section of this Rail Alignment EIS is based largely on the American Indian Resource Document prepared for the Caliente rail alignment.

The DOE Native American Interaction Program concentrates on the protection of cultural resources at Yucca Mountain and contributes to government-to-government interactions with the American Indian tribes and organizations. The program helps DOE comply with various federal laws and regulations, including the American Indian Religious Freedom Act (42 United States Code [U.S.C.] 1996 *et seq.*); the Archaeological Resources Protection Act of 1979 (16 U.S.C. 470aa *et seq.*); the National Historic Preservation Act (16 U.S.C. 470 *et seq*.); the Native American Graves Protection and Repatriation Act (25 U.S.C. 3001 *et seq*.); DOE Order 1230.2, *American Indian Tribal Government Policy*; Executive Order 13007, *Indian Sacred Sites*; Executive Order 13175, *Consultation and Coordination with Indian*

Tribal Governments; and the *DOE Office of Congressional Affairs, American Indian and Alaska Natives Tribal Government Policy, January 2006* (DIRS 176994-Bodman 2006, all). These laws, Executive Orders, and the DOE policy mandate the protection of archaeological sites and cultural items and require agencies to include American Indians and federally recognized tribes in discussions and interactions on major federal actions. Additional guidance is provided in DOE information brief DOE/EH-41-0019/1204, *Consultation with Native Americans.*

Of the 17 tribal groups who participate in the Native American Interaction Program, 15 are federally recognized. The Pahrump Paiute Indian Tribe, which consists of a group of Southern Paiutes living in Pahrump, Nevada, is not a federally recognized tribe. In addition, the Las Vegas Indian Center is also not a federally recognized tribe, but DOE has included it in the Native American Interaction Program because the Center represents the urban American Indian population of the City of Las Vegas and of Clark County, Nevada (DIRS 103465-Stoffle et al. 1990, p. 7).

The 17 tribes and organizations have formed the Consolidated Group of Tribes and Organizations, which is a forum consisting of tribally approved representatives who are responsible for presenting their respective tribal concerns and perspectives to DOE. The Consolidated Group of Tribes and Organizations has provided DOE with valuable insights into American Indian cultural and religious values and beliefs. These interactions have produced several reports that record the history of American Indian people and the interpretation of American Indian cultural resources in the Yucca Mountain region (DIRS 104958-DOE 1989, pp. 30 to 74; DIRS 103465-Stoffle et al. 1990, pp. 11 to 25; DIRS 104959-DOE 1990, pp. 23 to 49). DOE is committed to continued interaction and consultation with the tribes and organizations throughout the environmental review process.

3.4.1 REGION OF INFLUENCE

The region of influence for American Indian interests along the Caliente and Mina rail alignments is the area to which American Indians have historic ties.

Initial DOE studies of the region identified three tribal groups – the Southern Paiute, the Western Shoshone, and the Owens Valley Paiute and Shoshone – whose cultural heritage includes the Yucca Mountain region. Additional ethnographic efforts eventually identified 17 American Indian tribes and organizations with tribal resources in the region. Figures 3-242 and 3-243 show the traditional boundaries and locations of federally recognized tribes and their relationships to the Caliente and Mina rail alignments.

3.4.2 AMERICAN INDIAN VIEWS ON THE AFFECTED ENVIRONMENT

American Indians believe that they have inhabited their traditional homelands since the beginning of time. Archaeological surveys have found evidence that American Indians used the lands through which the Caliente rail alignment would pass on a temporary or seasonal basis (DIRS 103465-Stoffle et al. 1990, p. 29). American Indians emphasize that a lack of abundant artifacts and archaeological remains does not mean that their people did not use an area or that the land is not an integral part of their cultural ecosystem. American Indians assign meanings to places involved with their creation as a people, with religious stories, burials, and important secular events. The traditional stories of the Southern Paiute, Western Shoshone, and Owens Valley Paiute and Shoshone peoples identify such places.

The following paragraphs, excerpted from the American Indian Resource Document (DIRS 174205-Kane et al. 2005, pp. 9 and 10), are representative of the American Indian interests in and attachment to the area

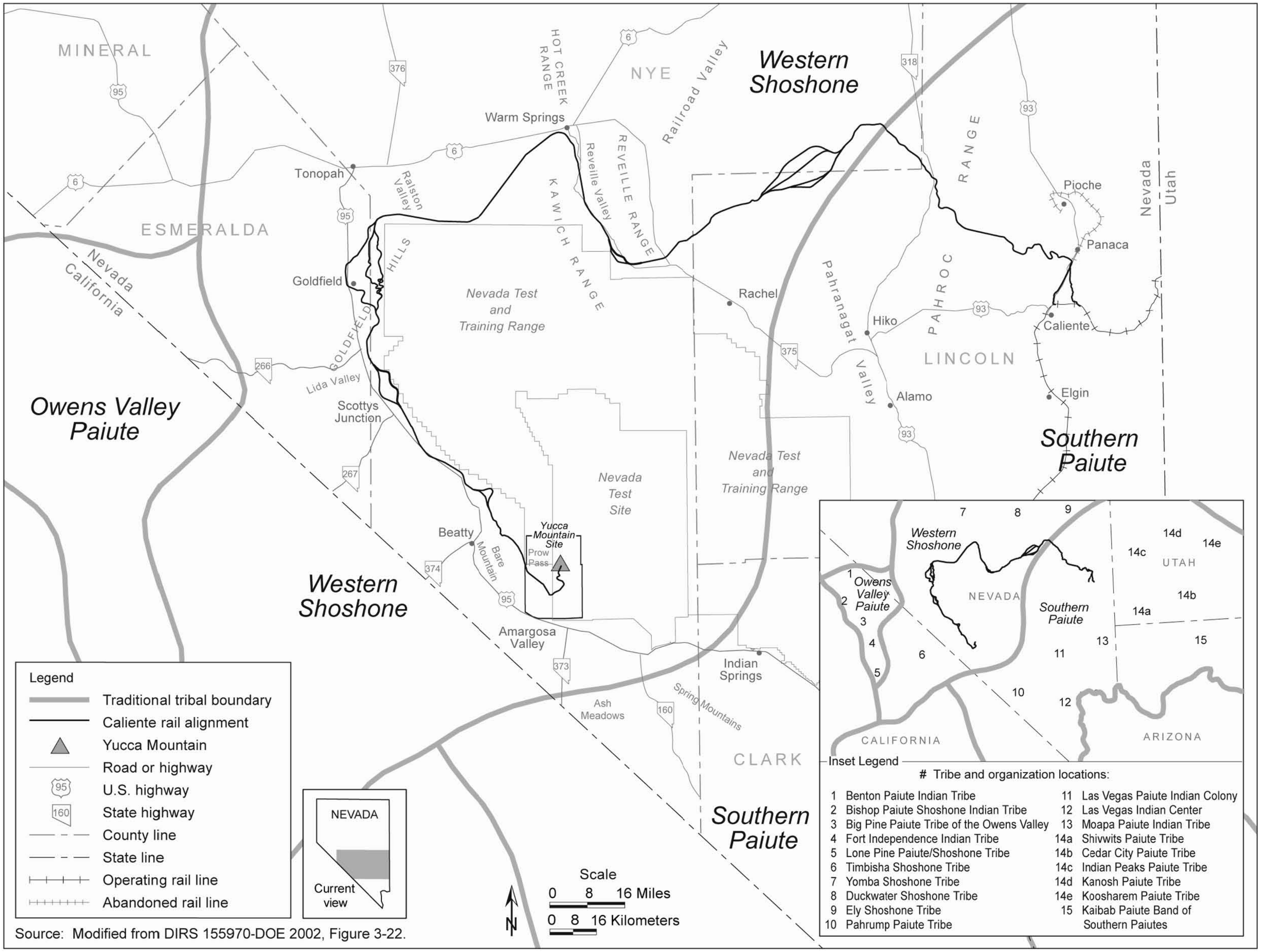


Figure 3-242. Traditional boundaries and locations of federally recognized tribes in the Caliente rail alignment region of influence.

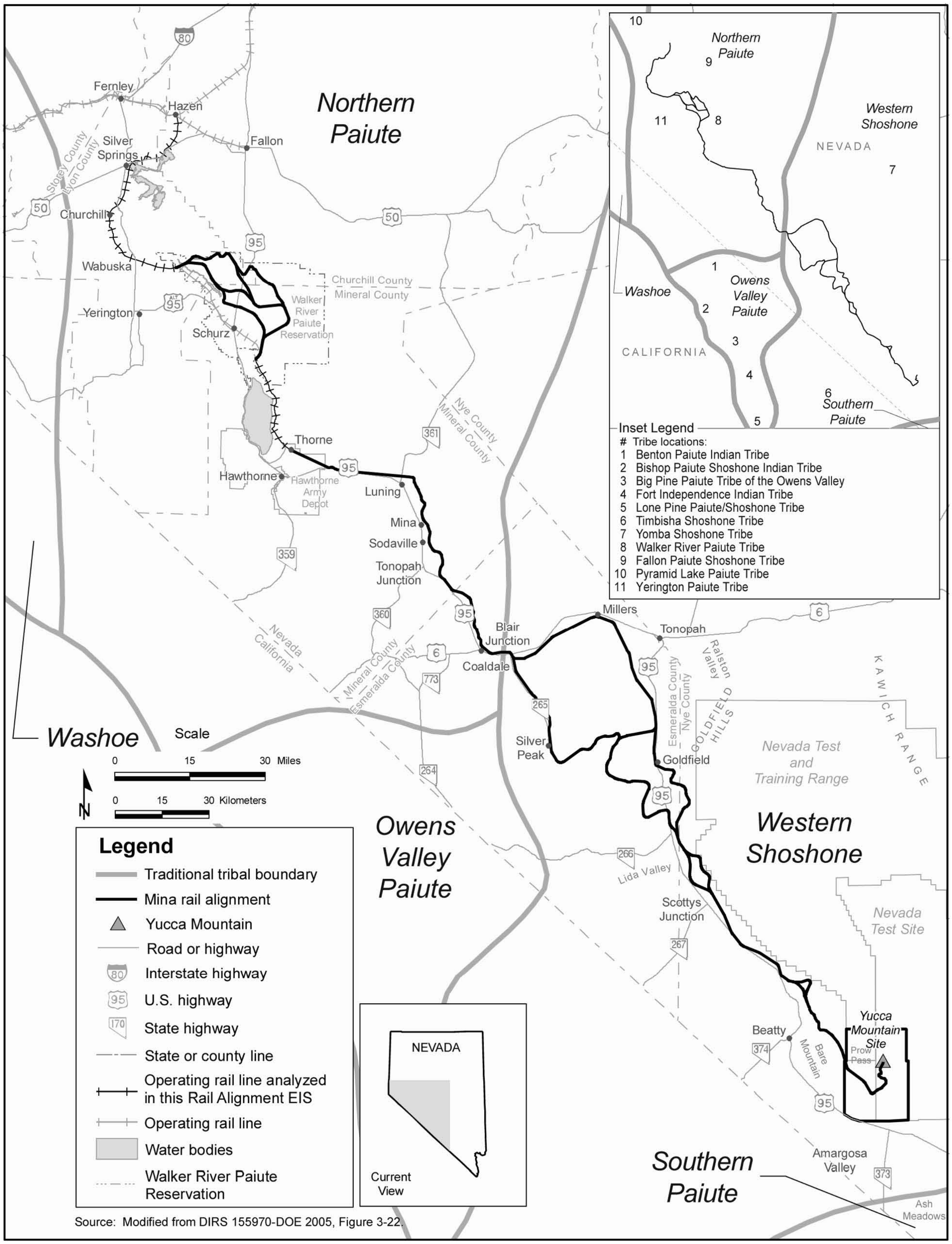


Figure 3-243. Traditional boundaries and locations of federally recognized tribes in the Mina rail alignment region of influence.

that would be affected by construction and operation of the proposed railroad along the Caliente rail alignment:

> For many centuries the YMP [Yucca Mountain Project] study area and the proposed rail corridor lands have been important to the lives of American Indians. These lands contain traditional gathering, ceremonial, and recreational areas for Indian people. From antiquity to contemporarytimes, this area has been used continuously by many tribes. It contains numerous ceremonial resources and power places that are crucial for the continuation of American Indian culture, religion, and society. Until the mid-1900s, traditional festivals involving religious and secular activities attracted Indian people to the area from as far away as San Bernardino, California. Similarly, groups came to the area from a broad region during the hunting season and used animal and plant resources that were crucial for their survival and cultural practices. Many non-Indian people hold a different view of these lands. For example, the federal government has maintained the perception that the YMP is located in a remote area with a very low population density and other characteristics that make it ideal for the siting of a potential repository to be accessed by a newly constructed rail system. Because of this 'wasteland perception,' YMP lands were withdrawn by the federal government for the Atomic Energy Commission's nuclear testing site. The federal agency was renamed the DOE who named the land the NTS [Nevada Test Site]; a portion of the land was later designated for the YMP and the potential repository site.
>
> Despite the loss of some traditional lands to destruction and reduced access, Indian people have neither lost their ancestral ties to, nor have forgotten the abundant cultural resources in the YMP area, or along the proposed rail corridor. Indian people have cared for the resources in these areas and will continue to do so. These strong beliefs and the presence of resources confirm the continuity in the American Indian use of and broad cultural ties to the YMP and the proposed rail alignment area.
>
> Indian people believe that the proposed rail alignment falls within a cultural landscape and corresponding viewshed that extends many miles in all directions. Because this land is a part and not the whole, it is essential that determinations of cultural affiliation, ancestral ties, and impacts from YMP actions and programs on traditional Indian culture, religion, and society be made according to the broad regional use of lands linked around Yucca Mountain.
>
> The extensive information compiled through long-term research involving the CGTO [Consolidated Group of Tribes and Organizations] demonstrates that American Indian cultural resources are not limited to archaeological or historical remains of native ancestors, but include all natural resources, as well as geological formations contained throughout the region. Natural resources constitute critical components of American Indian daily life and religious beliefs. Plants and animals are a source of food, raw materials, and medicine. Ritual practices cannot be properly carried out without plants and animals. Similarly, natural landforms mark locations that are significant for keeping the historic memory of American Indian people alive and for teaching children about their culture and history.
>
> This land and its resources are well-known by American Indian people, who consider the YMP and the proposed rail corridor areas as central parts of their cultural landscape. This knowledge has allowed them to be self-sufficient and to transfer all their cultural values and practices to future generations to this day.

Based on the collective knowledge of American Indian culture and previous American Indian studies in the region, the American Indian Resource Document identifies a number of resources that are important to historical and traditional use in the region through which the proposed rail line would pass. These include several categories of resources, including biological (both plant and animal), geological (including stone tools sources and mineral resources employed in the production of pigments and paints), hydrological, and what non-American Indian investigators commonly refer to as archaeological and historical sites (DIRS 174205-Kane et al. 2005, p. 13).

> American Indians believe that they have the responsibility to protect with care, and teach the young, the relationship of the existence of a non-destructive life on Mother Earth. This belief is the foundation of our holistic view of cultural resources, i.e., water, animals, plants, air, geology, sacred sites, TCPs [traditional cultural properties], and artifacts. Everything is considered to be interrelated and dependent on each other to sustain existence. Indian people believe that through proper respect and understanding, this complex relationship can be better understood and allow for existing and future generations to be better prepared for the care of these things.

Sections 3.4.2.1 through 3.4.2.4 briefly describe American Indian views on some of the existing resources; for more detailed information refer to the American Indian Resource Document (DIRS 174205-Kane et al. 2005, all) and *American Indian Perspectives on the Yucca Mountain Site Characterization Project and the Repository Environmental Impact Statement* (DIRS 102043-AIWS 1998, all).

3.4.2.1 Plants and Animals

Past studies by American Indians have identified about 107 medicinal and food plants, 46 species of mammals, and 35 species of birds that occur in the region and have either traditional use or importance. *Native Plants of Southern Nevada: An Ethnobotany* presents a detailed discussion of plants important to American Indian inhabitants of southern Nevada.

3.4.2.2 Water Resources

The American Indian Resource Document (DIRS 174205-Kane et al. 2005, p. 11) observes that American Indians are concerned about all water sources along the proposed rail alignment. Surface water exists in areas along the rail alignment (see Sections 3.2.5.1 and 3.3.5.1) and is found at springs, seeps, the Amargosa River (an ephemeral stream), and in temporary collection basins ("Pohs" or "tinajas"), which are important for storing water for everyday or ceremonial use and for wildlife (see sections 3.2.5 and 3.3.5, Surface-Water Resources). Other locations, known as hydrological areas, contain a wide range of important cultural resources including plants, animals, archaeological sites, minerals, traditional cultural places such as "power places," sacred sites, and intellectual properties. The American Indian perspective is that water sources, including those along the proposed rail alignment, are the homes of supernatural beings who live in the area and protect the springs and water resources.

3.4.2.3 Archaeological and Historical Places

Although not considered all-inclusive, the American Indian Resource Document (DIRS 174205-Kane et al. 2005, Section 2.3) identifies 24 known locations of archaeological resources that fall within or near one or more of the Caliente and Mina rail alignments alternative segments and common segments. Four of these, however, including Bare Mountain, Prow Pass, Ash Meadows, and the Spring Mountains, are well outside the Caliente and Mina rail alignments regions of influence. Section 3.2.13, Cultural Resources, describes the others.

3.4.2.4 Environmental Justice

American Indians have identified environmental justice issues in the vicinity of Yucca Mountain, and in association with development of both the Yucca Mountain Repository and the proposed railroad. In 2005, the American Indian Writers Subgroup expressed the following concerns (DIRS 174205-Kane et al. 2005, pp. 29 and 30):

Holy Land Violations

American Indian people that belong to the CGTO [Consolidated Group of Tribes and Organizations] consider that much of the land along the proposed rail corridor to be as central in their lives today as these lands have been since the creation of these people. The proposed impact area(s) are a part of the traditional holy lands of Western Shoshone, Southern Paiute and Owens Valley Paiute and Shoshone peoples. These holy lands and their resources have been subjected to exorbitant amounts of damage by long-term nuclear testing activities involving the NTS [Nevada Test Site] and site characterization activities associated with the YMP [Yucca Mountain Project]. The CGTO believes that the past, present, and future pollution of these holy lands constitutes both Environmental Justice and equity violations. No other people have had their holy lands impacted by YMP-related activities.

Cultural Survival-Access Violations

One of the most detrimental consequences of YMP operations on the survival of American Indian culture, religion, and society has been the denial of free access to their traditional lands and resources. Loss of access to traditional foodstuffs and medicine has greatly contributed to undermining the cultural well being of Indian people. These Indian people have experienced, and will continue to experience, breakdowns in the process of cultural transmission due to lack of access to YMP lands and resources. The construction and use of the proposed rail corridor will add to such impacts to the land and the perpetuation of Indian culture. No other people have experienced or been subjected to similar cultural survival impacts attributed to access limitations within the YMP area.

3.4.2.5 Indian Trust Assets

Indian Trust Assets (ITAs) are legal interests held in trust by the United States for American Indian tribes or individual American Indians. Assets are anything owned that have monetary value and can include any type of property interest, such as a lease or right of use. Assets can be real property, physical assets, or intangible property rights. The United States has an Indian trust responsibility to protect and maintain rights reserved by or granted to American Indian tribes or individuals by treaties, statutes, and Executive Orders, which rights are further interpreted through court decisions and regulations. The trust responsibility requires that all federal agencies take all actions reasonably necessary to protect trust assets. Trust assets include, but are not limited to, land resources, water rights, minerals, and hunting and fishing rights.

A review of legal documents was conducted to identify ITAs relevant to this Rail Alignment EIS. Documents subject to review included valid treaties, declarations by the U.S. Congress for Indian Trust lands, and reservations. This review identified two ITAs that could potentially be affected by the alternatives: the Walker River Paiute Reservation and the Timbisha Shoshone Trust Lands, indicated in Figures 2-10 and 2-13. The Mina alignment would pass through Walker River Paiute Reservation land but would not alter the Reservation ITA. The closest the alignments approach the Timbisha Shoshone Trust Lands is approximately 3 kilometers (2 miles) for common segment 5. The water rights of the Walker River Paiute Tribe are a potential ITA, but these rights are currently being litigated and are as yet unresolved.

3.4.3 AMERICAN INDIAN TREATY ISSUE

Of special concern to the Western Shoshone people is the Ruby Valley Treaty of 1863. The Western Shoshone people maintain that the treaty gives them rights to 97,000 square kilometers (24 million acres) in Nevada, including the Yucca Mountain region (DIRS 102216-*Western Shoshone National Council v. United States of America*, 1998, all). The legal dispute over the land began in 1946 when the Indian Claims Commission Act (60 Stat. 1049) gave tribes the right to sue the Federal Government for treaty promises that are not kept. If a tribe were to win a claim against the government, the Indian Claims Commission Act specifies that the tribe could receive only a monetary award and not land or other remunerations.

The Western Shoshone people filed a claim in the early 1950s alleging that the government had taken their land. The Indian Claims Commission found that Western Shoshone title to the Nevada lands had gradually been extinguished and set a monetary award as payment for the land. In 1976, the Commission entered its final award to the Western Shoshone people, who dispute the findings of the Commission and have not accepted the monetary award for the lands in question (the U.S. Treasury has been holding these monies in an interest-bearing account). The Western Shoshone people maintain that a settlement has not been reached. In 1985, the U.S. Supreme Court ruled that even though the money has not been distributed, the United States has met its obligations with the Commission's final award and the payment of the award into an interest-bearing trust account in the United States Treasury (DIRS 148197-*United States v. Dann et al.*, 1985, all).

On February 6, 2003, the Western Shoshone National Council sent a letter to members of the U.S. House of Representatives Resources Committee and the Senate Indian Affairs Committee, expressing opposition to any attempt to re-introduce legislation aimed at forcing a distribution of monies from Docket 326-K of the Indian Claims Commission to the Western Shoshone. The Council letter enclosed a report, *Failure of the United States Indian Claims Commission to File a Report with Congress in the Western Shoshone Case* (Docket 326-K), prepared by the Indigenous Law Institute on behalf of the Council, which asserted that the U.S. Indian Claims Commission never completed its action in Docket 326-K. The Council therefore asserted that there is no legal basis for a distribution bill and reiterated its position that negotiations between the Western Shoshone and the United States are the preferred way to resolve this ongoing conflict. On February 25, 2003, Representative Jim Gibbons (Nevada) introduced H.R. 884, a bill "to provide for the use and distribution of the funds awarded to the Western Shoshone identifiable group under Indian Claims Commission Docket Numbers 326-A-1, 326-A-3, and 326-K, and for other purposes." The bill became Public Law 108-270 in July 2004.

On March 4, 2005, the Western Shoshone National Council filed a lawsuit against the United States, DOE, and the U.S. Department of the Interior in federal district court in Las Vegas, Nevada. The complaint sought an injunction to stop federal plans for the use of Yucca Mountain as a repository based on the five established uses of the land within the boundaries of the 1863 Ruby Valley Treaty. On May 17, 2005, the U.S. District Court rejected a request from the Western Shoshone National Council for a preliminary injunction to stop DOE from applying for a license for the Yucca Mountain Project.

Although this American Indian treaty issue involves land along the Caliente and Mina rail alignments, none of the alternative segments or common segments would encroach on federally recognized American Indian lands.

3.4.4 AMERICAN INDIAN VIEWS ON CONSTRUCTING AND OPERATING THE PROPOSED RAILROAD

Previous studies (DIRS 102043-AIWS 1998, all; DIRS 174205-Kane et al. 2005, all; DIRS 103465-Stoffle et al. 1990, all) have delineated American Indian sites, areas, resources, and other interests within or adjacent to the Caliente rail alignment region of influence (DIRS 102043-AIWS 1998, Chapter 2; DIRS 174205-Kane et al. 2005, Chapter 2). Comparable studies have not been completed for the Mina rail alignment region of influence, but similar views can be anticipated. The Consolidated Group of Tribes and Organizations has consistently opposed the siting and operation of a repository at Yucca Mountain and transportation of spent nuclear fuel and high-level radioactive waste to such a repository. *American Indian Perspectives on the Proposed Rail Alignment Environmental Impact Statement for the*

U.S. Department of Energy's Yucca Mountain Project (the Native American Resource Document) (DIRS 174205-Kane et al. 2005, pp. 33 and 34) summarizes the views and concerns of the Consolidated Group of Tribes and Organizations. The "*CGTO has continually stated its opposition to the siting and transportation of spent nuclear fuel and high-level waste to a repository at Yucca Mountain*" and strongly believes that "*any disturbance to cultural, biological, botanical, geological, and hydrological resources, including viewscapes, songscapes, storyscapes, and traditional cultural properties will cause adverse impacts*" (DIRS 174205-Kane et al. 2005, p. 33). Some of the American Indian views expressed in the American Indian Resource Document regarding potential impacts under the Proposed Action include the following (DIRS 174205-Kane et al. 2005, p. 9):

> Despite the loss of some traditional lands to destruction and reduced access, Indian people have neither lost their ancestral ties to, nor have forgotten the abundant cultural resources in the YMP [Yucca Mountain Project] area, or along the proposed rail corridor. Indian people have cared for the resources in these areas and will continue to do so. These strong beliefs and the presence of resources confirm the continuity in the American Indian use of and broad cultural ties to the YMP and the proposed rail alignment area.
>
> Indian people believe that the proposed rail alignment falls within a cultural landscape and corresponding viewshed that extends many miles in all directions. Because this land is a part and not the whole, it is essential that determinations of cultural affiliation, ancestral ties, and impacts from YMP actions and programs on traditional Indian culture, religion, and society be made according to the broad regional use of lands linked around Yucca Mountain.

The Consolidated Group of Tribes and Organizations has stated that no systematic evaluations of traditional sacred sites or places along the Caliente rail alignment have been made by American Indian people that allowed for an opportunity for all members of the American Indian Writers Subgroup to fully evaluate the proposed rail alignment. Without proper studies and consultation, no specific statements about impacts to particular locations can be provided by the tribal representatives. Furthermore, establishment of the Yucca Mountain protected area boundaries and construction of the proposed repository and rail line would continue to restrict the free access of American Indians to these areas (DIRS 174205-Kane et al. 2005, p. 30).

There would be a potential for indirect impacts to American Indian interests from construction activities and the presence of additional workers, particularly impacts to the physical evidence of past use of the cultural landscape (artifacts, cultural features, archaeological sites, etc.) important to American Indian people.

Shared-Use Options would involve ground-disturbing activities for the construction of commercial access sidings for access to the rail line. In all likelihood, any shared-use projects would result in potential impacts to American Indian interests similar to those under the Proposed Action without shared-use. American Indians would also view the operation of a shared-use rail line as having adverse effects on American Indian interests and tribal resources.

3.4.5 SUMMARY

Perceptions about the types and magnitudes of potential impacts along the Caliente and Mina rail alignments vary among the various stakeholders with interests in the proposed railroad because of different beliefs, goals, responsibilities, and values. American Indians are concerned that the proposed railroad could cause substantial and high adverse impacts to a number of American Indian interests within and adjacent to the Caliente and Mina rail alignments regions of influence.

The Proposed Action includes best management practices that would avoid, minimize, or otherwise reduce impacts to American Indian interests to the greatest extent practicable. DOE would also consider mitigation measures for any remaining impacts to American Indian interests. Relevant best management practices and potential measures to mitigate impacts include:

- Continue to solicit input from American Indians to identify the potential to impact American Indian cultural resources, discuss potential solutions, and avoid adverse impacts.
- Provide for direct tribal involvement in cultural resources field survey and monitoring activities.
- Comply with all regulatory requirements that protect American Indian interests (Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*).
- Consult with American Indian tribes and protect current access to public lands that contain American Indian cultural resources (American Indian Religious Freedom Act of 1978; Executive Order 13007, *Indian Sacred Sites*). Management of such access to public lands would be primarily a function of the BLM because it is the land-management agency for most lands that would be crossed by the rail alignment and related facilities.
- Conduct a systematic ethnographic evaluation of the rail alignment to be integrated with cultural resources survey efforts.