

Congress Mine, Central Spring Mountains, Nye County, Nevada

Gregg Wilkerson, 2024
yosoygeologo@gmail.com

Acknowledgement and Disclaimer

The information in this paper is taken largely from published and public sources. I have reproduced this material and present it pretty much as we found it, not trying to harmonize discrepancies in mine or geologic descriptions. I have changed verb tenses for readability and have used some paraphrase. I have expanded abbreviations or special characters with full text (e.g. feet instead of ft., inches instead of ") Italics indicate quotations. Authors of the original information are indicated at the end of each paragraph. Paragraphs without a citation are our own materials. The maps in this report have been compiled and rectified from digital and paper copies of original sources that were made at different scales and in different geographic projections. Therefore, many of the maps had to be adjusted or stretched. They do not fit perfectly. Most are accurate to within 100 feet, but reproduction and projection errors can be as much as 300 feet for some maps. PLSS means Public Land Survey System. That survey data was obtained from the U.S. Bureau of Land Management website.

MRDS, 2011, Mineral Resources Data System, U.S. Geological Survey, <https://mrdata.usgs.gov/mrds/>. This database relies on records that, in many cases, are inaccurate or imprecise. For example, if a report describes a mine as being in "Section 9", with no other information, MRDS plots the mine location in the center of the section. If a mine is reported in "SW ¼" of a section, MRDS plots the mine in the center of that SW quarter-section. Where I could confidently adjust a MRDS location of a mineral deposit to features identifiable in aerial photographs or topographic maps, I did so.

Help me make this report better. If you have any photographs, memories or reports for this mine that you can share, please send them to yosoygeologo@gmail.com so that I can incorporate that information and material into this paper.

LOCATION (MRDS, 2011)

T.17S 53E Sec 20	36.46248	-116.0491	West mine
T.17S 53E Sec 21	36.46058	-116.0227	East prospect

The Congress Mine is part of the Johnnie District of Joseph Tingley (1998).

The Johnnie mining district is located on the north-west flank of the Spring Mountains, 3 miles northeast of Johnnie in T. 17 S., R. 53 E. It is the second largest gold-producing district in southern Nye County (Cornwall, 1972:38).

The Johnnie district extends from the north flank of Mount Sterling, on the northwest end of the Spring Mountains, southwest to the southwestern tip of Mount Montgomery. It

includes Mt. Schader, the town of Johnnie, and a small area on the northeast side of Mount Sterling sometimes considered to be the separate Mount Sterling district. Wheeler (1872) included the Johnnie area in his large Timber Mountain district which also included the Charleston district (Tingley, 1998).

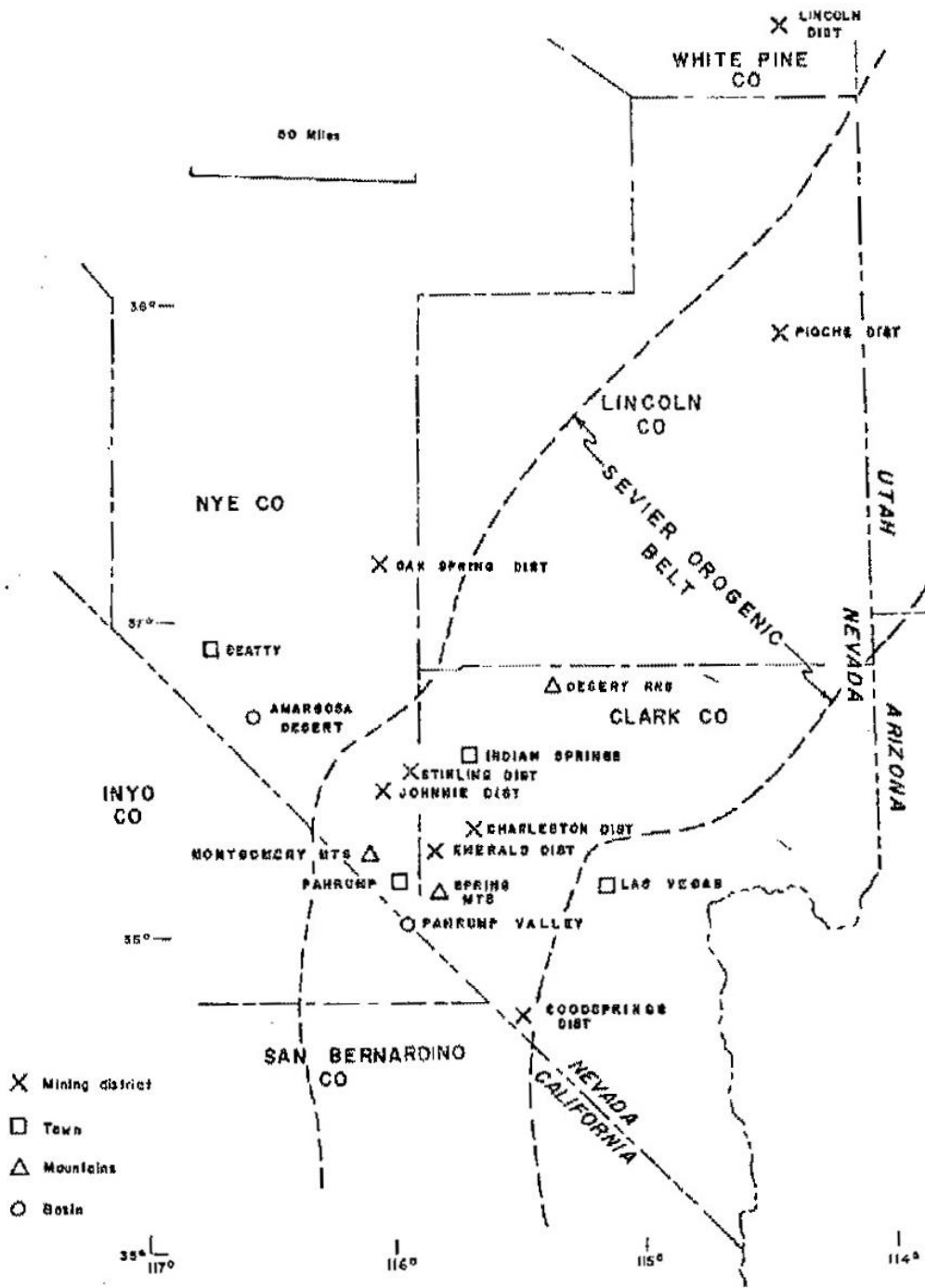


Figure 1. Index map of southern Nevada and adjacent areas showing locations of areas discussed in this report. Position of Sevier orogenic belt after Armstrong (1968) and Fleck (1970).

Figure 1. Location map of the mines in the Sevier Orogenic Belt. From Ivosivic, 1976, p. 2. Open source for educational purposes, no copyright.

PREVIOUS NAMES

Johnnie Snapper, Montgomery, Mount Sterling, Timber Mountain (MRDS, 2011, Tingley, 1998).

PREVIOUS WORK

Wheeler, 1872, p. 52; Hill, 1912, p. 222; Lincoln, 1923, p. 172; Stoddard, 1932, p. 68; Lotz, 1934, p. 22; Kral, 1951, p. 86; Averett, 1962, p. 71; Cornwall, 1972, p. 38 (Tingley, 1998).

HISTORY AND OWNERSHIP

1972

Cornwall (1972) said this about the Johnnie District:

The deposit is reported to have been discovered in 1890 (Cornwall, 1972:38) or 1905 (Tingley, 1998).

The gold occurs in prominent and persistent quartz veins along faults in sandstone, shale, and limestone of the Wood Canyon and Carrara Formations. The largest ore shoots are in the Johnnie mine, where the vein follows a fault between the two formations. The Overfield mine, adjoining the Johnnie mine on the southwest, has a vein that strikes N. 45 ° E., dips 60 ° SE., and may join or be a continuation of the Johnnie vein. This property has no recorded production. The Labbe mine is located 1 mile southwest of the Johnnie mine, also on a vein near or along the Carrara-Zabriskie contact but separated from the block containing the Johnnie mine by a cross fault with an apparent right-lateral horizontal displacement of more than half a mile. Kral (1951, p. 89) reports that no production has been recorded, but surface workings indicate much stoning (Cornwall, 1972:38).

***The Congress mine**, located about 1 mile southwest of Johnnie (T. 18 S., R. 52 E.), is included here in the Johnnie district. It is in a quartz vein along branching faults in quartzitic sandstone of the Wood Canyon Formation and along a fault between the Wood Canyon and Bonanza King Formations. Although no production is recorded, there are several thousand tons of tailings near a 10-ton stamp mill. C. H. Labbe states that most of the activity was between 1890 and 1895 and that the average grade was \$8 to \$16 from an ore vein 3 to 20 feet wide Formation and along a fault between the Wood Canyon and Bonanza King Formations (Cornwall, 1972:38).*

*The hillside and wash below the Johnnie and Overfield mines were placered for gold in 1949 (Kral, 1951, p. 87) and in the early 1960's by sluicing with high-pressure water passed through trommels and screens to concentrating tables. The amount of gold recovered is not known. **Placering on a small scale has also been done in the gulches below the Congress mine** (Cornwall, 1972:38).*

1976

Below is a history of the Johnnie Mine by Ivosevic (1976:176-178):

The Johnnie mine was located in 1891, by apparently the same Utah group (Los Angeles Mining Review, March 27, 1909) which leased the Congress mine in approximately 1899. They apparently worked the surface stapes southwest of the Johnnie shaft (pls. 4 and 5) possibly down to the present Second level, hauled selected ore directly to Salt Lake City, Utah (Los Angeles Mining Review, March 27, 1909), and milled other ore on the site with the Huntington mill (Labbe, 1960) which previously had been set up at the Horshutem Springs (Ivosevic, 1976:176).

The Utah group's involvement with the Johnnie mine apparently was supplanted by that of the Johnnie Consolidated Gold Mining Company, probably at the time in 1903 that Carl Anderson located the Johnnie Consolidated (pl. 2) and Tiger Consolidated (fig. 27) groups of claims. The Johnnie Consolidated Gold ~lining Company patented both groups in 1905, developed the Johnnie shaft to the Seventh level (pl. 5), and installed a Nissen ten-stamp mill and 85 ton per day amalgamation plant nearby in 1907 (The Arrowhead, July, 1907) or 1908 to replace the older Huntington mill and companion Chilean mill (Labbe, 1960) which they had been using earlier. During patent proceedings, the company also took title to the Minnie Mae mill site and to the April Fool mill site (pl. 1), near Horseshutem Springs in Sections. 27 and 34, T. 17 S., R. 53 E (Ivosevic, 1976:176-177).

The Johnnie Consolidated Gold Mining Company changed ownership at least once (The Arrowhead, July, 1907) and was taken over by the Johnnie Mining and Milling Company in 1909 (Los Angeles Mining Review, March 27, 1909). They operated the mine until 1915 when, the mine's most significant output having been achieved, they apparently sold out to O. T. Johnson. By then the mine had produced as much as a reported \$3 million (Ivosevic, 1976:177).

By some time between 1910 and 1925, the owners of the Johnnie Consolidated group of claims located the adjacent Battery, Buldosa, Flagstaff, Omaha, Oversight, Queen, and Teddy's Terrors nos. 2 and 3 claims. The Protection and Butterfly nos. 1, 2, and 3 claims were added later. None of the latter two groups were ever patented (See pl. 2.) (Ivosevic, 1976:177).

Johnson apparently operated the Johnnie mine until 1923, extending the shaft to the 11th level and connecting the Second level with the Overfield mine and to some workings on the Johnnie property which were near the Overfield mine. Johnson apparently leased the mine to various operators who performed Intermittent pocket mining until 1941 when about simultaneously Johnson died and War Production Board Order L-208, which terminated much U. S. gold mining, was issued (Labbe, 1960; Paher, 1970) (Ivosevic, 1976:177-178).

Apparently at this time, the Congress Mining Company acquired the Johnnie and Tiger consolidated groups of claims and the adjacent claims and appurtenant mill sites from the Johnson estate. The property has been leased to various small operators to present. Leo I. Bartlett is the current [1976] owner of the properties (Ivosevic, 1976:178).

REGIONAL GEOLOGY

The regional geology of the central Spring Mountains is described in the overview paper for this report series. It can be accessed at

http://www.greggwilkerson.com/uploads/1/0/6/5/106585235/geology_and_mining_history_of_the_central_spring_mountains.pdf

STRATIGRAPHY

Host rocks for the Congress Mine include:

Cambrian Carrara Formation (Cc).

Cambrian Bonanza King formation (Cb)

Lower Cambrian and Late Proterozoic Woods Canyon Formation (CZw)

Many of the rock units in the Johnnie District are tectonically thinned by as much as 50% (Ivosevic, 1976:22).

Ivosevic's 1976 stratigraphic tables for the Johnnie District are reproduced from the Nevada Bureau of Mines and Geology website below:

Table 1. Stratigraphic units present in the Johnnie district showing, in parentheses, subdivisions recognized by Stewart (1966, 1970).

Age	Name	Thickness (feet)	Character
Holocene	Alluvium	0-20 ± (0-6 m)	Colluvium, talus, stream bedloads
Late Pleistocene to Holocene	Younger fanglomerate	0-100 + (0-30 m)	Inactive alluvial fans of compact sand and gravel
Late Pliocene to Middle Pleistocene	Older fanglomerate	0-200 + (0-60 m)	Dissected, consolidated to caliche-cemented sandy gravel; includes a 50'-thick unit of volcanic sediments
	Megabreccia unit	300 ± (90 m)	Tabular body of slabs of upper unit of Wood Canyon Formation, quartz-veined Zabriskie Quartzite, and lower part of Carrara Formation
Middle Cambrian	Unconformity		
	Bonanza King Formation		
Middle Cambrian	Papoose Lake member	1,200 ± (365 m)	Massive dolomite with lamellar texture
Early and Middle Cambrian	Carrara Formation	700-1,300 (210-400 m)	Thin- to medium-bedded shaly rocks near base; thick-bedded limestone predominates near top
Early Cambrian	Zabriskie Quartzite	115-240 (35-73 m)	Medium-bedded to massive quartzite

Table 1. (continued)

Late Precambrian and Early Cambrian	Wood Canyon Formation	Dolomite bearing unit (upper member, in part)	175-310 (53-94 m)	Medium-bedded dolomite and thin-bedded quartzite and siltstone
		Lower unit (lower member; middle member; upper member, in part)	1,680 (510 m)	Medium-bedded quartzite and siltstone with some dolomite
		Upper unit (C member; D member; E member)	2,160 (659 m)	Medium-bedded quartzite and dolomitic quartzite; shale at base; thick, massive quartzite near top
Late Precambrian	Stirling Quartzite	Lower unit (A member; B member)	2,080 (634 m)	Medium-bedded to massive quartzite; thick, massive unit near base
		Upper unit (middle unit, in part; Rainstorm Member)	850-1,300 (260-395 m)	Thin- to medium-bedded shale and quartzite with several layers of brown-weathering dolomite and dolomitic quartzite
		Lower unit (lower unit; middle unit, in part) - base not exposed	2,900- 3,300 (800- 1002 m)	Medium- to thick-bedded shale and quartzite; layer of gray dolomite 650' below top
	Johnnie Formation			

REGIONAL GEOLOGY

Stanley Wayne Ivosevic's abstract for the Johnnie District is reproduced below:

The Johnnie district, in the northeastern Spring Mountains, Nye County, Nevada, may have produced a little under 100,000 troy oz of gold, since the discovery of the district in 1890 (Ivosevic, 1976, p. ii).

An approximately 13,000-ft-thick (4,000 m) section of east dipping upper Precambrian through Middle Cambrian miogeosynclinal clastic and carbonate rocks is exposed in the district. The strata are, in order of decreasing age, the Johnnie Formation, Stirling Quartzite, Wood Canyon Formation, Zabriskie Quartzite, and Carrara and Bonanza King Formations. These are overlain by Cenozoic units which include an older unit and a younger unit of fanglomerate, the older containing a megabreccia deposit, and Quaternary alluvium (Ivosevic, 1976, p. ii).

The rocks were deformed by the Late Cretaceous Sevier orogeny and by subsequent tectonic events, which include Basin-and-Range faulting, of Miocene age. The oldest structures, formed in conjunction with Sevier tectonism, are disharmonic folds in the Johnnie Formation, which folds underwent rotation by later (Sevier orogeny) eastward tilting of the district during larger scale folding. Simultaneously with the later folding, competent rocks were translated across less competent ones along zones of tectonic readjustment; the most notable zone is at the top of the Johnnie Formation in the western part of the district. High-angle fractures--in extension, conjugate, and pressure-release orientations--developed at about the same time and were the ancestors for most younger high-angle structures, including quartz veins (Ivosevic, 1976, p. ii,iii).

Longitudinal faulting occurred at the end of the Sevier orogeny; and concurrently, the related Congress low-angle normal fault developed. The district was dropped down to the west along the Grapevine fault system during Basin-and-Range normal faulting at the west face of the Spring Mountains. Throughout the structural development of the district, displacement occurred along transverse faults in secondary readjustment to displacement along other features and also low-angle faults transposed younger rocks across older ones (Ivosevic, 1976, p. iii).

Some of the tectonism caused local carbonatization of the Bonanza King Formation (Ivosevic, 1976, p. iii).

The district was eroded in a series of stages during Basin-and-Range faulting. Finally, sometime between latest Miocene to middle Pleistocene times, pediments developed at the edges of the resultant basins, then were buried by bajadas of older fanglomerate. Later, parts of the pediments were exhumed by erosion (Ivosevic, 1976, p. iii).

High-angle and concordant quartz-bearing structures were emplaced during hydrothermal activity, probably between the Paleocene and early Miocene epochs High-

*angle quartz veins, the average of which strikes ENE and dips north, dominate and are the hosts for most economic, mesothermal mineralization in the district. Three ore mineralogic suites are present: gold-chalcopyrite-pyrite, chalcopyrite-galena, and galena-calcite. Additionally, chalcopyrite occurs with specularite in stratabound quartz-poor lodes of apparent hydrothermal origin; these oxidize to low-grade malachite deposits. Placer gold deposits formed in the older fanglomerate during post Basin-and-Range faulting erosion of the district. The characteristic wall-rock alteration mineralogic suites in the hypogene deposits are sericite and pyrite in clastic rocks and also sericite, alone, in dolomite; the alteration minerals, chlorite, calcite, and specularite, occur locally. **The ore mineralogic suites define a district-wide pattern of hypogene mineralogic zonation about gold centers at the Johnnie and Congress mines, the main producers in the district** (Ivosevic, 1976, p. iii,iv).*

The fundamental control which admitted the hydrothermal fluids into the district is obscure. However, trains of quartz veins are concentrated within 2.5-mi-long (4 km), ENE-trending principal mineralized structures which lie astride an inferred 13-mile-long (21 km) N.-35°-E. trending major longitudinal structure, which may be a manifestation of the fundamental control. The gold mineralization is localized in the Zabriskie Quartzite and the dolomitic rocks near the top of the Wood Canyon Formation, in part, by the retention of hydrothermal fluids beneath a blanket of shaly rocks at the base of the Carrara Formation. The base of the dolomitic rocks is also the base of the Cambrian section, which is recognized as a favorable stratigraphic site for ore deposition at other places in the southern Great Basin (Ivosevic, 1976, p. iv).

Although this report develops a theme in which the hydrothermal fluids were introduced from a remote source below the district, as the broad concepts of ore genesis change with time, it may become accepted that many of the constituents of the hydrothermal fluid were derived from local, syngenetic sources (Ivosevic, 1976, p. iv).

MINE GEOLOGY

[In the Johnnie District] The gold occurs in prominent and persistent quartz veins along faults in sandstone, shale, and limestone of the Wood Canyon and Carrara Formations. The largest ore shoots are in the Johnnie mine, where the vein follows a fault between the two formations (Corwall, 1972:38).

Mapping by Workman and others (2002, Figure 17 this report) shows the Johnnie, Overfield north and Overfield south mines as lying along a fault that marks a bedding plane between the Cambrian Bonanza King Formation (Cb) and Proterozoic and Lower Cambrian Woods Canyon Formation (CZw).

At the Congress Mine, mineralization is along the Congress Fault. Veins occur at the contact of the Congress Fault with Zabriskie Quartzite where it is a brecciated bedding plain fault with the Bonanza King, Wood Canyon and Carrara formations.

MAPPING

1:250,000

Workman and others (2002) mapped the area of the Congress mine as being along a fault that places of Lower Cambrian and Late Proterozoic Woods Canyon Formation (€Zw) to the southeast and Cambrian Bonanza King formation (€b) to the northwest. The fault trends southwest to northeast.

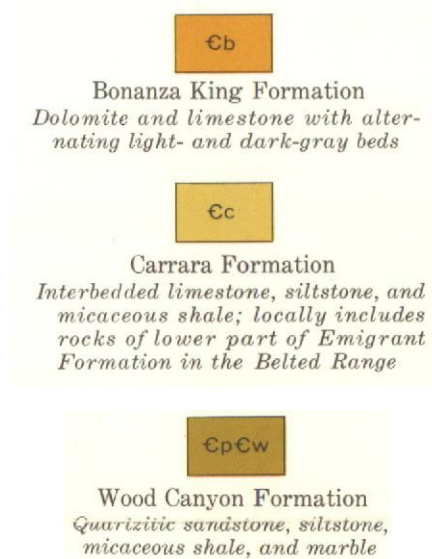
€b Bonanza King Formation (Upper and Middle Cambrian)

€Zw Wood Canyon Formation (Lower Cambrian and Late Proterozoic)

1:100,000

Cornwall (1972) mapped the area of the

Congress mine as being in a block of Cambrian and Proterozoic Wood Canyon Formation (€p€w). This block is bounded on the east by a fault which separates it from the Cambrian Bonanza King (€b). The mine occurs at or near a fault contact with a narrow band of Cambrian Carrara Formations (€c).



STRUCTURE

Ivosevic's 1976 structural maps and cross sections for the Johnnie District are reproduced from the Nevada Bureau of Mines and Geology website below:

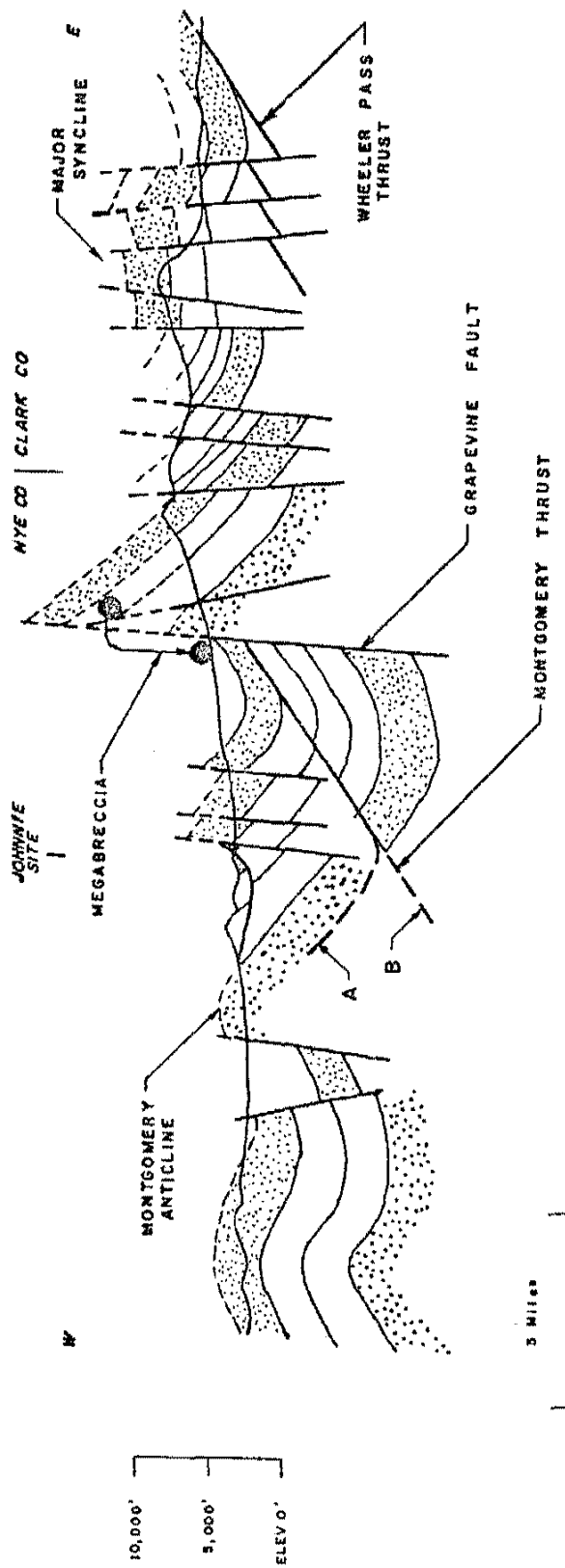


Figure 3. Geologic section - locally diagrammatic - through northwestern Spring Mountains along 18th parallel S., M. D. B. & M. showing large-scale folding, some possible thrust relations (A and B) beneath the Johnnie district, and probable origin of megabreccia deposit. Heavy stipple -- Johnnie Formation; light stipple -- Bonanza King Formation and younger Cambrian rocks. Compiled from Longwell and others (1965), Hamil (1966), Cornwall (1972), and mapping, this report.

Figure 2. Diagrammatic geologic cross section. Open source for educational purposes, no copyright.

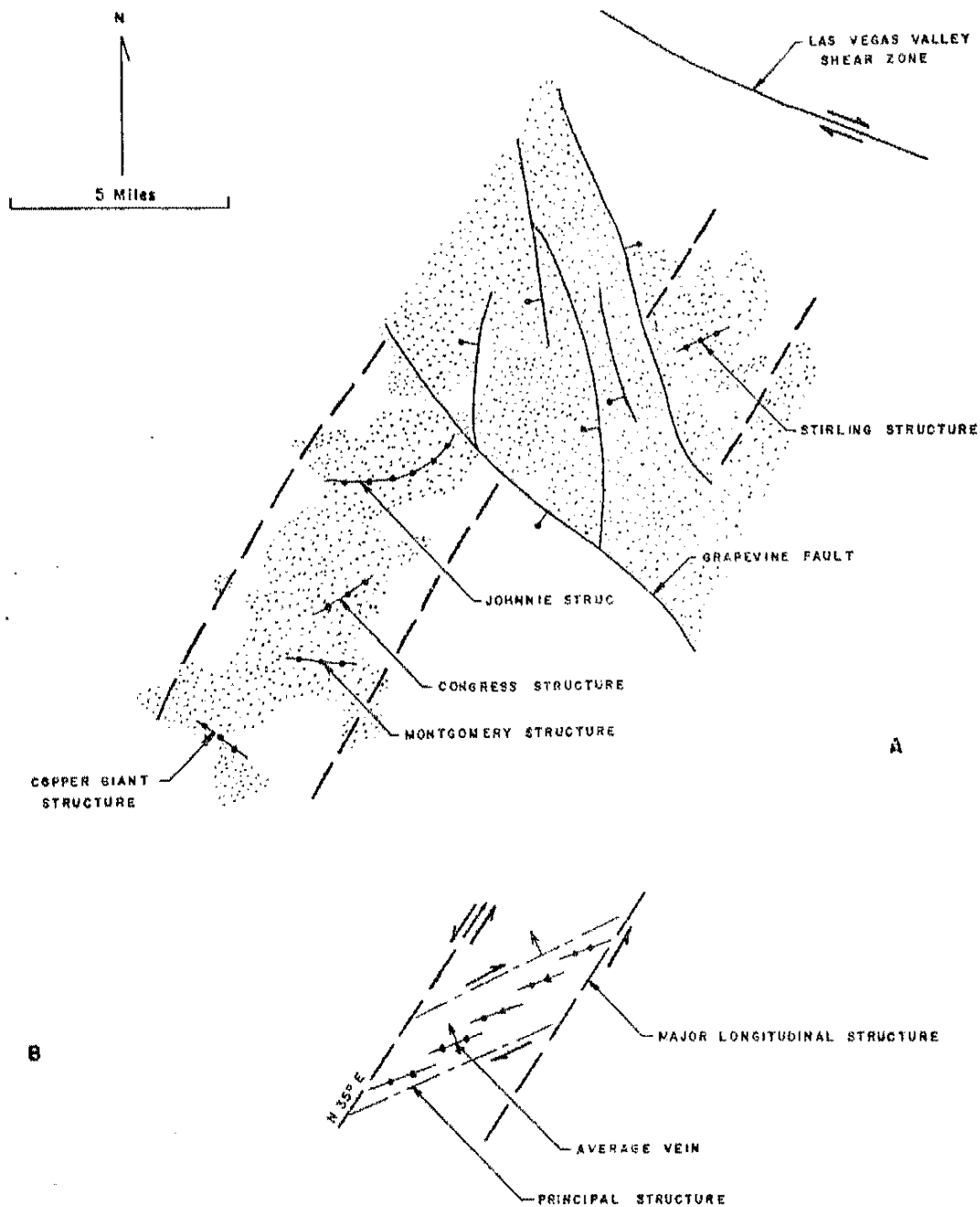


Figure 20. (A) Map of principal structures, showing inferred offset of major longitudinal structure (broken line). Faults from Cornwall (1972, pl. 1); ball on downthrown side. (B) Diagram illustrating relations among mineral localizing structures, showing inferred directions of strike separation.

Outcrop areas in (A) stippled.

Figure 3. Principal structures in the Johnnie Mining District. Open source for educational purposes, no copyright.

Hydrothermal activity was distributed in all or parts of each of the following geologic features:

- (1) The Johnnie, Congress, and Montgomery structures.
- (2) The Zabriskie Quartzite and rocks immediately below.
- (3) The contact of the Johnnie Formation and Stirling Quartzite. and the sole. of the Congress low-angle normal fault.
- (4) Moderate to profuse, usually sub-map-scale quartz veinlets occur in all exposures of the Johnnie Formation in the Johnnie district. They are localized along bedding-related structures, particularly in fissile rocks, and in high-angle joints and small fractures.

When considered in three dimension this distribution was a consequence of the hypogene plumbing (Ivosevic, 1976:123).

CONGRESS FAULT AND ASSOCIATED TECTONIC FEATURES

This is an arcuate system of high-angle faults of apparent dip slip displacement. It extends from the low hills in the alluviated [sic] area south of the Labbe mine to the area immediately west of the site of Johnnie where it diverges about a horst-like structure; thence, the Congress fault system proceeds southwest, and an apparent group of transverse faults trends southeastward toward Route 16 (pls. 1 and 3). This arcuate system may extend northward along the Labbe and adjacent faults up the south face of Mt. Schader. The system, as a whole, follows the longitudinal fault trend but is composed of individual longitudinal and transverse segments (Ivosevic, 1976:57).

The Congress fault, itself (cross section D-D', pl. 1), is a low angle normal fault analogous to those described by Longwell (1945) in the northward equivalents of the Spring Mountains in northern Clark County. It is a linear, steeply dipping structure northwest and southeast of the Congress mine but flattens with depth northwestward to emerge sub horizontally in places along the bluff overlooking the Amargosa Desert. A number of smaller, complementary, step like, convex features which also flatten at depth occur in the footwall of the fault southwest of the Congress mine (Ivosevic, 1976:57-58).

The toe of the Congress fault apparently is deflected upward by the massive basal unit of the Stirling Quartzite which, in turn, is somewhat flattened there to produce the bend present in its contact with the underlying Johnnie Formation. The north and south ends of the toe emerge at the surface but the center of the toe dies out below the surface before it can emerge. The morphology of the flat portion of the fault displays a complex relation between transverse tear faults in the upper and lower plates and transverse faults which cut both plates (Ivosevic, 1976:58).

As a low-angle normal fault, the Congress fault lies in an expectable position on the flank of the Montgomery anticline. It is in the correct position in the Sevier orogenic belt to be a feature which developed by the relaxation of east-oriented compression with the

close of folding. Deformation in the toe of the fault resembles and seems to grade into that at the top of the Johnnie Formation discussed previously plates (Ivosevic, 1976:58).

The implied kinship of deformation at the Johnnie-Stirling contact to the Congress fault indicates that the Congress fault is an older feature within the geochronologic framework of the Johnnie district. In addition: (1) elements of the Congress fault system host quartz veins; (2) other elements of the system localize dolomitization (see Tectonic Alteration in the Bonanza King Formation), which probably precedes quartz veining; and (3) minor folding and offsetting of beds caused by Congress-fault deformation give the impression of having taken place, in part, under conditions approaching ductile flow. This type of deformation probably could have occurred only under the tectonic load present earlier in the geologic history of the Johnnie district (Ivosevic, 1976:58-59).

Considering the relationship between the Congress fault and the Montgomery anticline and considering its old age, the fault is taken to be a low-angle normal fault formed during relaxation of stress at the close of the Sevier orogeny. The origin and significance of the incompletely exposed remainder of the arcuate fault system is unclear, but it is probably related. A stress relaxation origin is also inferred for the normal, longitudinal faults near the crests of folds in the Johnnie Formation along the edge of the Amargosa Desert (Ivosevic, 1976:59).

Elements of the Congress fault system, or transverse faults divergent therefrom, in the vicinity of the Congress mine are the sites of limited amounts (not portrayed on maps herein) of dolomitization or recrystallization of more limy parts of the Bonanza King Formation. Carbonatization is most common there along fault contacts with the Carrara Formation. Longwell and others (1965) note that such alteration commonly occurred sometime after thrust faulting and before Basin-and-Range normal faulting in the Spring Mountains and adjacent areas. Hewett (1931) makes the same observation in the southern Spring Mountains and places the time of dolomitization somewhat closer to the episode of thrust faulting and distinctly before mineralization. therefore, by analogy with these authors' conclusions, dolomitization near the Congress mine is of comparable age (Ivosevic, 1976:65).

MINERALOGY

[In the Johnnie District] three ore mineralogic suites are present: gold-chalcopryrite-pyrite, chalcopryrite-galena, and galena-calcite. Additionally, chalcopryrite occurs with specularite in stratabound quartz-poor lodes of apparent hydrothermal origin; these oxidize to low-grade malachite deposits. Placer gold deposits formed in the older fanglomerate during post Basin-and-Range faulting erosion of the district (Ivosevic, 1976, p. iii).

Ivosevic identified replacement of dolomite and brecciation as primary textures related to hydrothermal mineralization in the Johnnie District:

*The product of replacement of dolomitic rocks by quartz adjacent to fissure fillings of vein quartz becomes part of the vein. **This is very common in the Congress vein,** particularly in the hanging wall where thicknesses up to 5 ft (1.5 m) are added (pl. 10); and it occurs locally in the veins at the Johnnie and Overfield mines (Ivosevic, 1976:91).*

Microscopically, replacement of dolomite occurs by invasion of vein quartz along fractures and between breccia fragments and involves embayment by the dissolution of dolomite along highly irregular boundaries. With advanced replacement dolomite appears to migrate toward the replacement front, evident because residual detrital quartz veins in quartzitic dolomite become more numerous toward the front. With continued replacement: these residual quartz grains anneal at points of contact in partially replaced rock; or the grains are engulfed by vein quartz and incorporated into its structure in completely replaced dolomitic rock (Ivosevic, 1976:91).

*The resultant vein quartz contains numerous inclusions of apparent iron oxide less than 2.5 microns in diameter and also contains larger inclusions of unreplaced dolomite. **These inclusions impart the characteristic red color to the ore from the Congress mine** (Ivosevic, 1976:91).*

There is a gold-producing center of hypogene mineralogical zonation which encompasses the Johnnie, Overfield, Broadway, and Doris mines (Ivosevic, 1976:97 and Figure 19, page 114)

Ivosevic's mineralogical paragenesis interpretation for the Johnnie District is reproduced below:

EVENT	MINERAL	SEQUENCE OF DEPOSITION
WALL-ROCK ALTERATION	Sericite Pyrite (cubic) Specularite Chlorite Calcite	
QUARTZ VEINING	Quartz	
METALLIZATION	Chalcopyrite Galena Pyrite (pyrit- ohedral) Gold	

Figure 15. Paragenesis of hypogene ore deposits in the Johnnie district.

Figure 4. From Ivosevic, 1976, p. 84. Open source for educational purposes, no copyright.

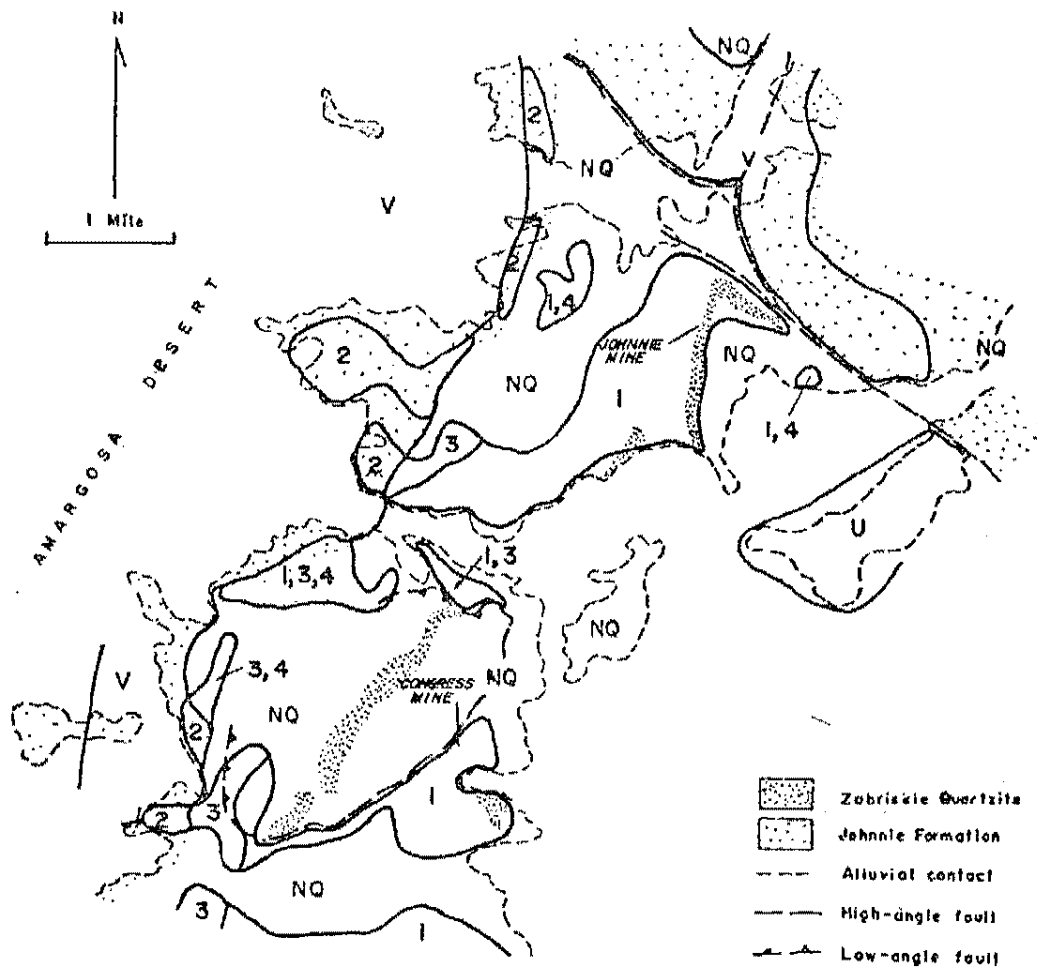


Figure 16. Map showing areas of hydrothermal activity and distribution of types of quartz-bearing structures in the Johnnie district.

1-4, outcrop areas of quartz-bearing structures: (1) high-angle quartz veins; (2) concordant quartz veins; (3) concordant quartz stringer lodes; (4) concordant quartz-poor lodes.

V, area of small outcrops containing numerous quartz veinlets.

U, allochthonous megabreccia deposit; type of quartz-bearing structure not classified.

NQ, areas essentially devoid of quartz-bearing structures.

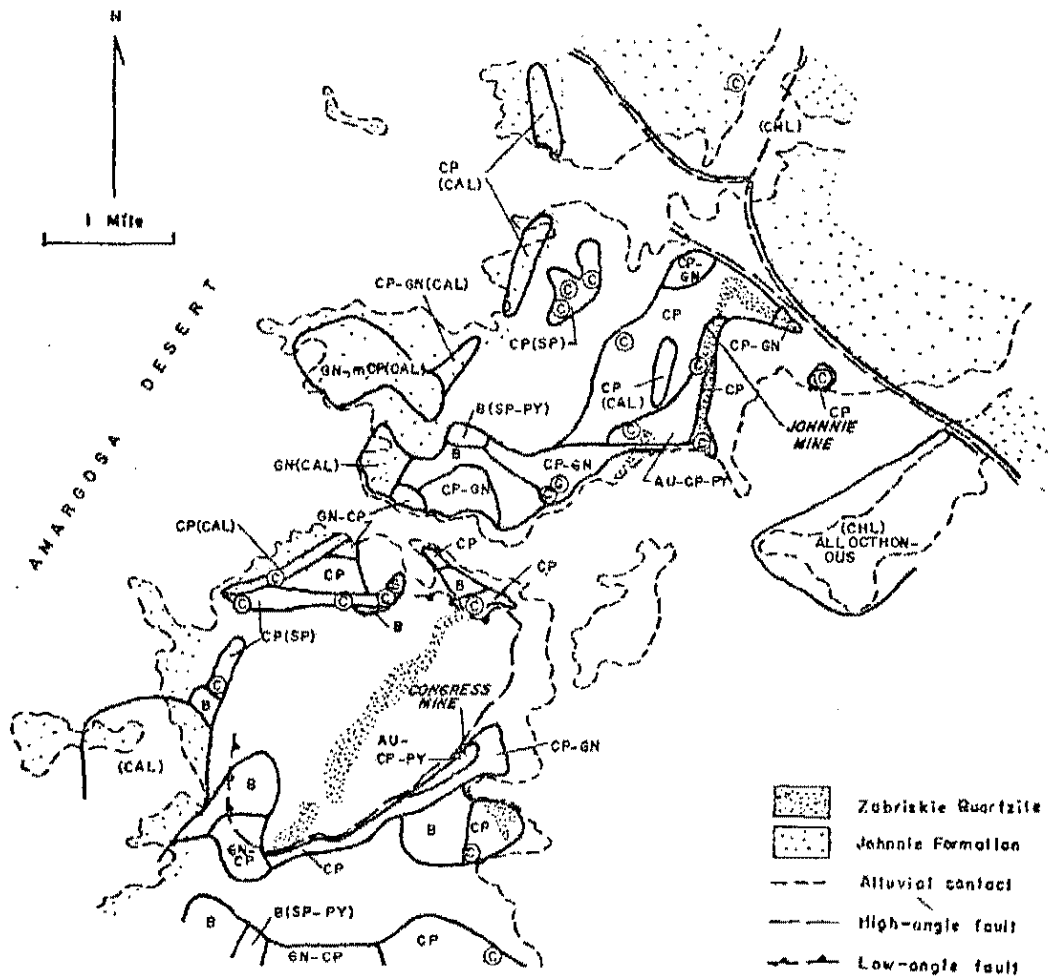


Figure 17. Map showing distribution of hydrothermal minerals in the Johnnie district, literally portraying areas in which ore minerals occur and locally showing general regions in which some gangue minerals occur (chlorite east of Grapevine fault; calcite in southwest part of district). Sub-zones with characteristic gangue minerals shown in parentheses.

Au-Cp-Py, gold-chalcopryrite-pyrite; Cp, chalcopryrite; Cp-Gn, chalcopryrite with subordinate galena; Gn-Cp, galena with subordinate chalcopryrite; Gn-mCp, galena with minor chalcopryrite; Gn, galena; Sp, specularite; Py, pyrite; Cal, calcite; Chl, chlorite; B, area of barren quartz veins.

(C), malachite deposit or group of closely spaced malachite deposits.

Based upon data from approximately 210 locations.

Figure 6. From Ivosevic, 1976, p. 93. Open source for educational purposes, no copyright.

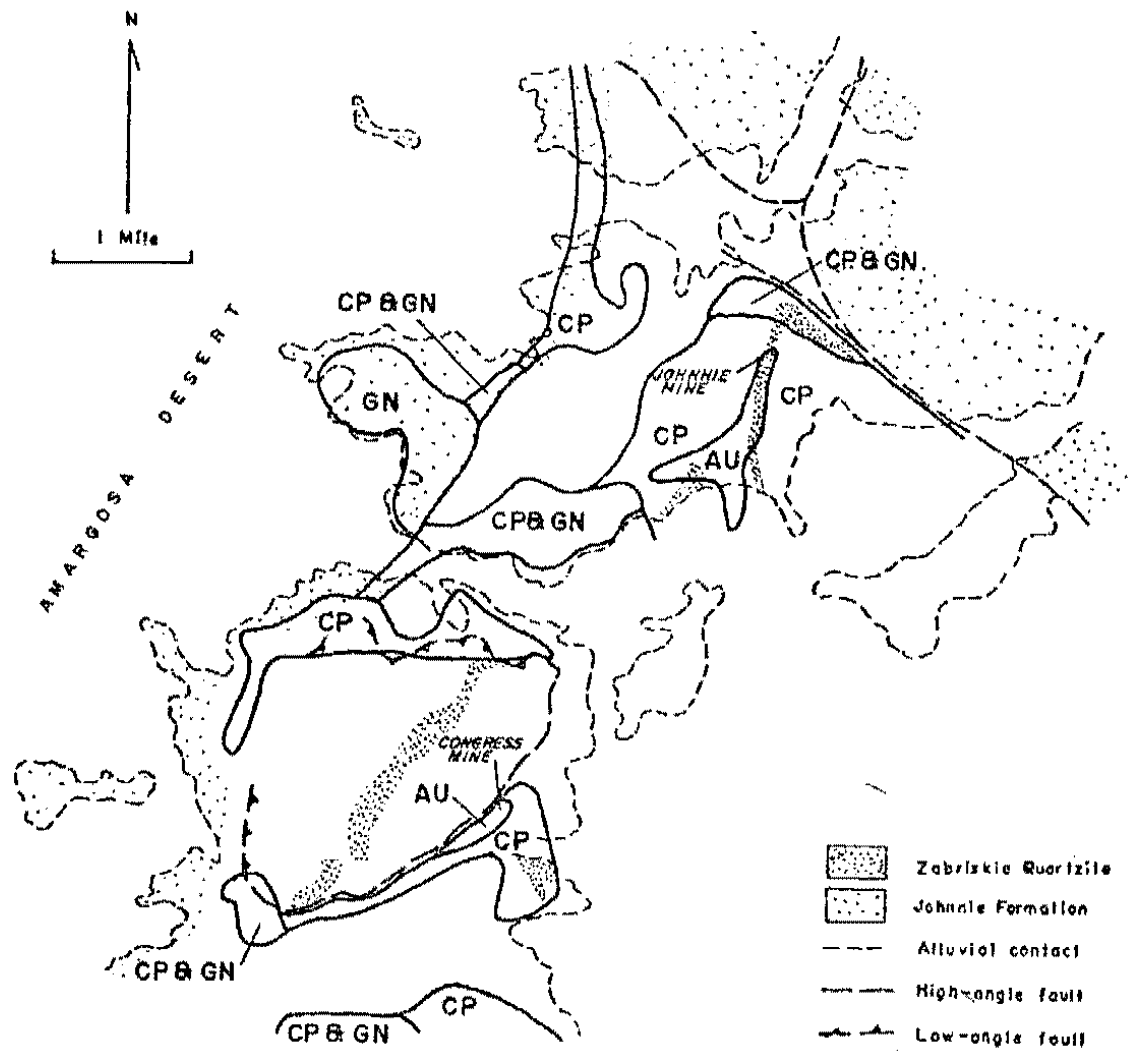


Figure 18. Map showing restricted interpretation of hypogene mineralogic zonation in the Johnnie district.

Au, gold zone; Cp, chalcopyrite zone; Cp and Gn, chalcopyrite-galena zone; Gn, galena zone.

Figure 7. From Ivosevic, 1976, p. 112. Open source for educational purposes, no copyright.

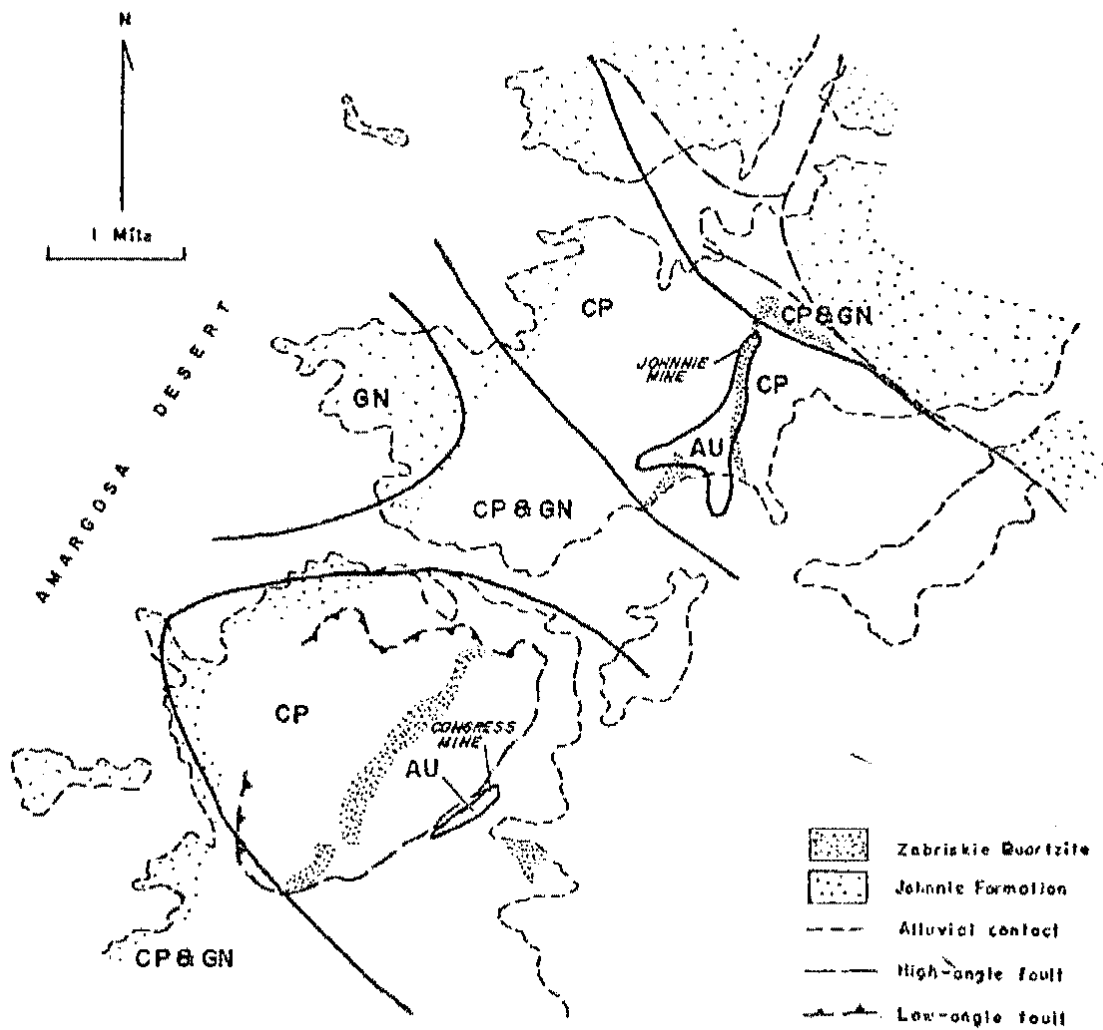


Figure 19. Map showing broad interpretation of hypogene mineralogic zonation in the Johnnie district.

Au, gold zone; Cp, chalcopryrite zone; Cp and Gn, chalcopryrite-galena zone; Gn, galena zone.

Figure 8. From Ivosevic, 1976, p. 114. Open source for educational purposes, no copyright.

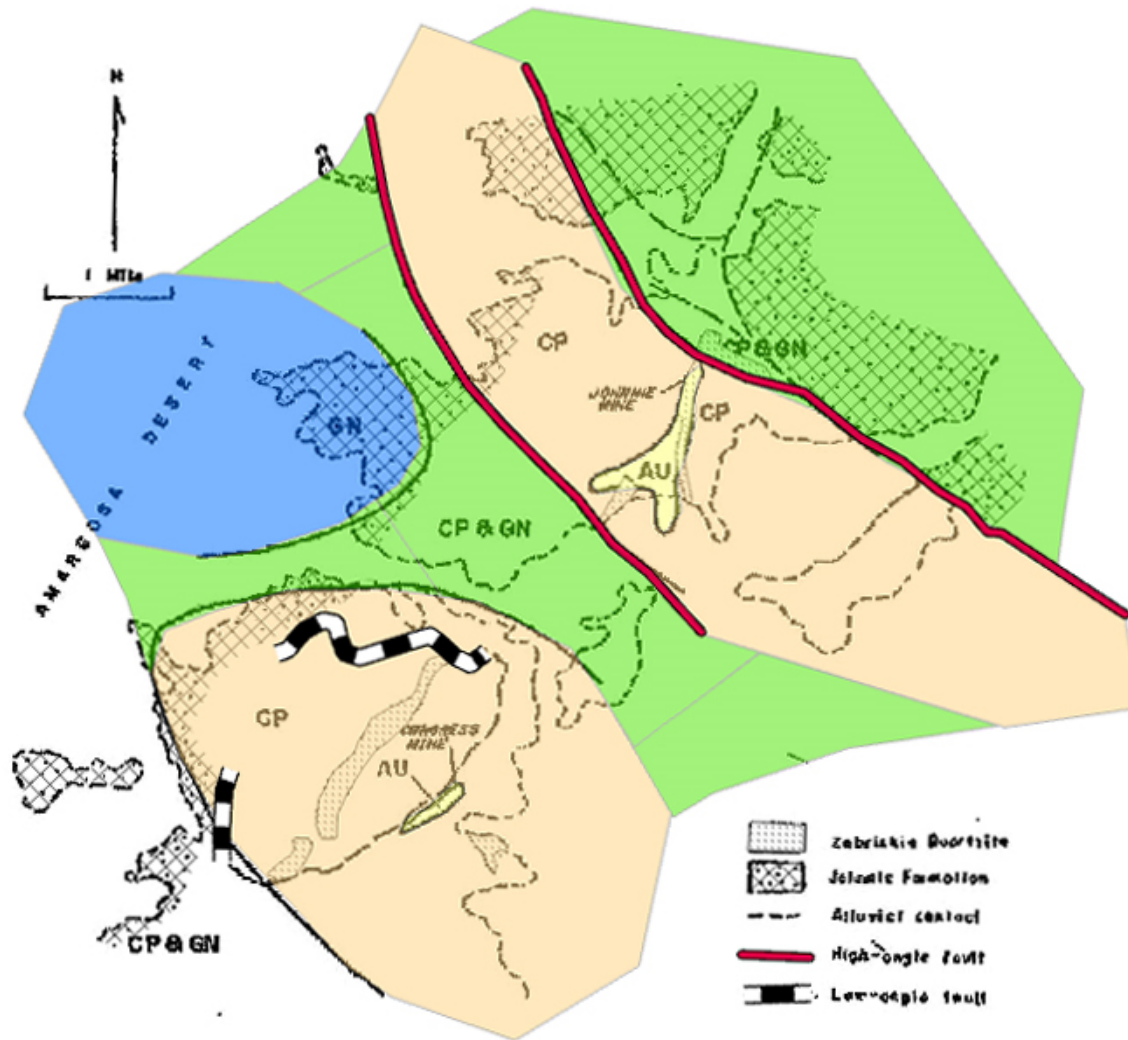


Figure 19. Map showing broad interpretation of hypogene mineralogic zonation in the Johnnie district.

Au, gold zone; Cp, chalcopyrite zone; Cp and Gn, chalcopyrite-galena zone; Gn, galena zone.

Figure 9. Modified from Ivosevic, 1976, p. 114. This map shows that high grade gold mineralization is associated with chalcopyrite. Modified from open source for educational purposes, no copyright.

ALTERATION

The main wall-rock alteration products are widely distributed sericite and pyrite. Locally, specularite, chlorite, and calcite occur as alteration products or as cogenetic gangue minerals in uncommon host rocks whose original mineralogies [sic] furnished the

reactants necessary to produce these three products. This permits the further subdivision of the hypogene mineralogic zones on the basis of gangue mineralogy. Thus, the chalcopyritic lodes, apparently inherent to the ferruginous parts of the Stirling Quartzite, include specularite.; and the major galena-quartz veins, simultaneously falling in the galena zone and the dolomitic upper part of the Johnnie Formation, characteristically contain calcite (Ivosevic, 1976:71).

Wall-rock alteration, at temperatures below 200°C, added hydrogen, potassium, aluminum, iron, and sulfur to the rocks; and CO₂, sodium, magnesium, and calcium were released to the hydrothermal fluid. Quartz veining removed silica from the fluid; and metallization, at temperatures around 250°C, required the addition of gold, copper, lead, iron, and sulfur, from the hydrothermal fluid (Ivosevic, 1976:72).

ORIGIN

The main gold-chalcopyrite-pyrite-quartz veins and most other prominent veins in the [Johnnie] district are localized in the Zabriskie Quartzite and underlying dolomitic rocks near the top of the Wood Canyon Formation. This was caused by a combination of mechanical and chemical qualities intrinsic to these rocks and by ponding of hydrothermal fluids beneath an impermeable blanket of sericitized shale gouge at the base of the Carrara Formation above the Zabriskie Quartzite. Significantly, correlative rocks, at the presently recognized base of the Cambrian section, host important ore deposits in other mining districts in the southern Great Basin (Ivosevic, 1976:71-72).

Quartz veins and most other quartz-bearing structures in the Johnnie district are in trains within ENE-trending, north-dipping principal mineralized structures into which were funneled, through a series of other structures, hydrothermal fluids ascending from depth. These principal mineralized structures, four--or possibly five--in number, are aligned within a 15-mi-long (24 km) inferred major longitudinal structure, which trends N. 35° E. and also dips north. The major longitudinal structure, if real, is probably the surface .. expression of the fundamental control which guided heat and, maybe, metal-bearing hydrothermal fluids into the area to localize the Johnnie district (Ivosevic, 1976:72).

The hydrothermal fluids may have originated from lower crust or upper mantle sources or were derived from interstitial connate brines in the miogeosynclinal rocks in or below the district. In either case, the metals in the fluids then could have been leached from the miogeosynclinal rocks transgressed by the fluids (Ivosevic, 1976:72).

The term "fissure" is used hereforward as a convenience in discussing various aspects of quartz-bearing structures. I do not believe that open voids, as such, existed at any time. Widening of the fissures, by means such as those described in Vein Configuration and Localization of Ore Shoots, was accompanied simultaneously by filling by quartz (Ivosevic, 1976:72).

The chalcopyritic precursors of the malachite deposits developed in concordant quartz-poor lodes in porous host rocks in areas where quartz veins are thin and sparsely distributed and possibly were under compression at the time of chalcopyrite mineralization. This deprived the copper-bearing hydrothermal fluids of established conduits of migration and of dilatant fractures in quartz veins for the precipitation of chalcopyrite. The relatively porous coarser grained, lightcolored (hence, pure) quartzites in both the Stirling Quartzite and the Wood Canyon Formation offered suitable alternative conduits for the passage of hydrothermal fluids, favoring formation of quartz-poor lodes rather than quartz veins. These quartzites are porous because they contain many interstitial spaces incompletely filled with diagenetic quartz overgrowths and lack closely packed shaly matrix minerals (Ivosevic, 1976:104).

Therefore, quartz-poor chalcopyritic lodes developed in preference to the chalcopyrite-quartz veins which are the characteristic hosts for copper mineralization in the rest of the Johnnie district. The chalcopyritic lodes in the area south of Route 16 facing the Amargosa Desert are transitional northward along strike into the more typical quartz vein type of deposit (Ivosevic, 1976:104).

The most prominent malachite deposits occur in beds within the B member of the Stirling Quartzite throughout an interval which also contains most of the specularite-quartz veins in the district. The deposition of the specularite, as well as sericite, as wall-rock alteration products were doubtlessly triggered by the passage of the hydrothermal fluid through local iron-rich, dark-colored shaly quartzite beds in the B member. Analyses show that these rocks normally contain an average of 3 percent iron, 100 times more than do the light-colored quartzites nearby (Ivosevic, 1976:104-105).

Significant amounts of pyrite are lacking from the areas where malachite lodes occur; but, pyrite is present as a wall-rock alteration product in the specularite-bearing quartz stringer lodes and quartz veins in two areas where chalcopyrite is absent (fig. 17).... Consequently malachite was precipitated near its hypogene source; because, during supergene leaching, the absence of pyrite in the chalcopyrite lodes inhibited the production of excess sulfuric acid required to disperse the dissolved copper (Ivosevic, 1976:105).

The role of sericite in malachite precipitation was not clarified during this study. The sericite-filled fractures in the host rocks of the malachite lodes in the Stirling Quartzite provided porous conduits for the migration of supergene solutions and may have provided free surfaces for the deposition of malachite. In 'addition, possible reaction of the copper laden supergene solutions with the surfaces of the sericite grains may have facilitated the nucleation of malachite crystals there in preference to the apparently less reactive surfaces of quartz grains. A reaction on the surfaces of minerals of sericitic affinity is suggested in the apparent preferential deposition of malachite on shaly rocks elsewhere in the stratigraphic section (Ivosevic, 1976:105).

These deposits are intriguing, because three observations suggest that they are syngenetic, bedded copper deposits rather than being epigenetic as has been implied

so far: (1) the deposits are concordant; (2) most are apparently confined to a single stratigraphic interval within the basal clastic series of a stratigraphic assemblage; and (3) they are widespread laterally throughout that interval. From personal observations and discussion, I know or infer that similar deposits are situated on the Copper Giant property (Appendix D; fig. 2), in the Stirling district (figs. 1 and 2), and maybe elsewhere in the region. At least some of the similar deposits are in the same stratigraphic Interval (Ivosevic, 1976:106).

Bedded copper sulfide deposits with affiliated iron oxides occur in Idaho, Montana, and British Columbia (Wedow, 1975) in the Belt-Purcell Supergroup (McGill, 1970) of younger Precambrian age (Obradovich and Peterman, 1968). The Belt-Purcell Supergroup is a lowest or, pre-, miogeosynclinal sequence of sedimentary rocks, which is stratigraphically equivalent to the pre-Johnnie Formation sedimentary rocks in southern Nevada and southern California (Crittenden and others, 1971) (Ivosevic , 1976:106).

The syngenetic appearance of the chalcopyritic lodes in the Johnnie district may be misleading. The stratigraphic restriction of these may have resulted from the presence of iron required for the hydrothermal formation of the specularite which is allied with the chalcopyrite and from the presence of the apparently unique local imbalance between fracture dilatancy and rock porosity, which imbalance was conducive to the formation of quartz-poor lodes. The diverse mineralogic and morphologic types of ore deposits in the Johnnie district are united by their mutual commonality of origin. To ascribe a syngenetic, hence uncommon, origin to a particular type of deposit is a departure from the rationale of unity, which departure further argues against there being syngenetic deposits here (Ivosevic, 1976:106-107).

The possibility is broached in later sections that the ore deposits in the Johnnie district originated by a combination of syngenetic and epigenetic events. So, it may be that the chalcopyritic lodes are syngenetic deposits modified by later hydrothermal activity (Ivosevic, 1976:107).

Summary of Ore Genesis

Hydrothermal activity and attendant ore deposition occurred in the Johnnie district during early to middle Tertiary times after the structural preparation of the area by the Late Cretaceous Sevier orogeny and subsequent tectonism of lesser magnitude. The subsequent tectonism included inception of movement on the ancestral Grapevine fault system. After hydrothermal activity, the district was disturbed by Basin-and- Range normal faulting which offset some veins and thoroughly fractured the quartz in all of them. Although some erosion probably preceded hydrothermal activity, the remainder, most after Basin-and-Range faulting, exposed the district at its present level in a series of geomorphologic events culminating in the deposition of gold placers. (Ivosevic, 1976:155).

The sources of the heat, water, and contained elements in the hydrothermal system were not established by this study; but they probably came from some combination of remote and local sources. (Ivosevic, 1976:155).

The Basin and Range province is an area of high heat flow which was considerably higher in the Miocene (DeAngelo, 1922). This high flow of 6 degrees per hundred feet (25°C/km) can create hydrothermal fluids without volcanism in hydrological systems only a few thousand feet deep. There are not many volcanic or plutonic rocks in the central Spring Mountains.

Hydrothermal activity occurred at estimated temperatures of 150°C, later having risen to 250°C, and pressures of approximately 1,000 atm. The depth of burial corresponding to this is 15,000 ft (4,600 m) (Ivosevic, 1976:150).

This hydrothermal event occurred in Paleocene to early Miocene time (Ivosevic, 1976:156).

The hydrothermal fluid may have been derived from a remote source in the upper mantle or lower crust or from a pluton (considered remote for discussion purposes) emplaced at depth below the district. Alternatively, the source could have been local: connate water expelled from the miogeosynclinal rocks in or below the district during or after diagenesis; groundwater transported downward along the ancestral Grapevine fault system; or water in wet surficial or near surface materials overridden by the upper plate of the Montgomery thrust (Ivosevic, 1976:155).

The heat, only, of the hydrothermal system may have been derived from remote sources or the heat was generated locally by the geothermal gradient. In either case, hydrothermal convection of local fluids, if such was their source, would have resulted (Ivosevic, 1976:155-156).

The hydrothermal fluid, with its metals and silica, could have originated from a remote source or, the metals and silica originated by the leaching action of a hydrothermal fluid, from any source, migrating through the miogeosynclinal rocks in or below the district. If the fluid was a connate brine it would have provided the halogens considered necessary to enter into the complexes required to transport some of the metals, or the halogens came from evaporite units, since removed by leaching, in the miogeosynclinal stratigraphic section (Ivosevic, 1976:156).

The hydrothermal fluid probably ascended along a gravity-controlled pressure gradient within a tabular, vertical dilatant zone now manifest as the inferred major longitudinal structure and/or the principal mineralized structures. The fluid either entered this zone by migrating directly from a remote upper mantle, lower crust, or plutonic source or by migrating essentially laterally from a local source. Fluid from a remote source may have migrated directly along the major longitudinal structure, if it is the upward propagation of a basement ligament; or the fluids from a remote source migrated from depth along a poorly defined front until they were collected and canalized along the Montgomery thrust

or Grapevine fault system to ultimately enter the major longitudinal structure or principal mineralized structures (Ivosevic, 1976:156).

Whether the major longitudinal structure exists or not, once the hydrothermal fluid entered the mineralized area it was canalized at the base of the Stirling Quartzite, by the sole of the Congress low-angle normal fault, and possibly canalized by the Grapevine fault system and Montgomery thrust. From those sites, the fluid was diverted into the principal mineralized structures, which were the loci of fractures and faults made dilatant, by shear, under the influence of the local stress system in effect at the time. Finally in the fractures and faults, the hydrothermal fluids caused--sequentially--wall-rock alteration overlapped by quartz veining, and--after minor fracturing of the quartz-- metallization (Ivosevic, 1976:156-157).

A Fanciful Hypothesis for Ore Genesis

I am fascinated by the possibility that the hydrothermal ore deposits in the Johnnie district originated from syngenetic materials in the vicinity (Ivosevic, 1976:157).

Concepts of ore genesis change with time. The once popular belief that all of the components of ore fluids originate' from magmatic sources has been modified greatly, in the last decade, by studies demonstrating that the aqueous phase of the fluids can arise from a variety of non-magmatic sources (for example, Gross, 1975; Guy, 1975; Skall, 1975). Another trend, which has roots in the same studies, points to examples (such as Carpenter and others, 1974; Gross, 1975) of the enrichment of metals in potentially hydrothermal subsurface waters in which the metals have been concentrated by solution of trace elements from country rock. As this trend takes conceptual form in terms of ore genesis, it will not be unreasonable to interpret the origins of deposits, such as those in the Johnnie district where there is no obvious magmatic source, in terms of lateral secretion (Ivosevic, 1976:157).

Among other phenomena, the apparent affinity of some metals for certain stratigraphic horizons in the Johnnie district may be more than a series of coincidences; the affinities are galena in the upper unit of the Johnnie Formation, chalcopyrite in the B member of the Stirling Quartzite, gold in the Zabriskie Quartzite, and the affinity of concordant quartz stringer lodes for particular stratigraphic horizons. The lack of an obvious magmatic source for the hydrothermal system and lack of obvious relations between the ore deposits and deeper structures cause one to seek alternate interpretations for their origins (Ivosevic, 1976:157-158).

Perhaps unimaginatively, this report explains these features on structural and lithologic grounds in light of currently prevailing concepts of ore genesis. However, if contradicting details of current concepts of ore genesis--which concepts are, in part, the outgrowth of contemporary geologic prejudices--are ignored, a case could be made for a syngenetic method of origin modified by lateral secretion processes (Ivosevic, 1976:158).

This report demonstrates...that, although not necessarily true, most of the constituents of the hydrothermal fluid could have been derived from local sources. Perhaps the profusion of quartz veinlets in the Johnnie Formation does not represent the paths of hydrothermal fluids ascending across a broad front, from below, before canalization into overlying structures to form quartz veins; perhaps the profuse veinlets are a system of collectors of hydrothermal fluids migrating laterally from adjacent rocks (Ivosevic, 1976:158).

Then all that is required for a lateral secretion origin is a lateral temperature and pressure differential to initiate hydrothermal activity and concentrate it along the controlling structures. The requisite heat could have been generated by the geothermal gradient, and the necessary low pressure conditions would have prevailed along the controlling structures at the time of the dilatancy which permitted the ingress of hydrothermal fluids (Ivosevic, 1976:158-159).

The following speculation, one of a number possible, is appealing because it unites a lot of observations. If, conveniently, the Johnnie district is above a narrow, longitudinal basin or basinal sequence of younger Precambrian sedimentary rocks below the base of the Paleozoic miogeosynclinal section, as suggested earlier in this report, several aspects of the district can be accounted for: (1) the ore deposits would lie within an elongate, northerly trending area; (2) ignoring the ramifications of thrust faulting for simplicity, the geothermal gradient might have been higher than in adjacent rocks, localizing hydrothermal convection and negating the requirement for a magmatic source; (3) high lithostatic pressures (Secor, 1962, 1965) -would have localized hydraulic fracturing and the simultaneous collection of connate fluids within these fractures, thus making it, at least in part, a case of lateral secretion (Ivosevic, 1976:159).

Additional isotope studies are necessary to: determine the source of the aqueous phase and other components of the hydrothermal fluid in the Johnnie district; and to define the temperature and age of ore deposition, which incidentally permits the deduction of depth and pressure. These studies, along with ones meant to prove or disprove the regionality--suggested here--of possible syngenetic copper deposits, would contribute greatly to assessing the validity of this fanciful hypothesis in the district and might give new direction to mineral exploration in the region (Ivosevic, 1976:159).

DEVELOPMENT

[For the Johnnie District] Bonham (1967a) estimates production at between 10,000 and 100,000 oz. of gold. Kral (1951, p. 86) reports a recorded production through 1913 of \$382,681 from 64,582 tons and quotes C. H. Labbe as stating that between 1910 and 1913 the Johnnie mine itself produced more than \$1 million from 120,000 tons (Cornwall, 1972:38)

Table 3. Analyses of ore samples from gold-producing zone in North mining area, showing estimated original volume percentages of metallic minerals contained therein* and showing informative metal ratios.

<u>Sample</u>	<u>Johnnie mine**</u>		<u>Buldosa mine</u>	<u>Near Doris mine</u>
	<u>With visible gold</u>	<u>Without visible gold</u>		
Weight (lb)	0.62	0.69	3.97	1.76
Gold (oz/T)	1.13	0.95	0.25	0.15
Silver (oz/T)	0.89	0.60	0.53	0.57
Copper (%)	0.35	0.5	0.49	0.47
Lead (%)	0.4	0.36	7.02	3.34
Zinc (%)	0.02	0.02	0.14	0.80
Ag/(10Au+Pb)	0.08	0.06	0.06	0.12
Zn/Pb	0.05	0.06	0.02	0.24
Gold (volume %)	<0.001	<0.001	<0.001	<0.001
Chalcopyrite (vol. %)	15	10	2	1
Pyrite (volume %)	15	10	?	1
Galena (volume %)	<1	<1	2	1

*Estimated from examination of limonite etc. in leached specimens

**From pocket at surface near Johnnie shaft

Figure 10. From Ivosevic, 1976, p. 97. Open source for educational purposes, no copyright.

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MAPS

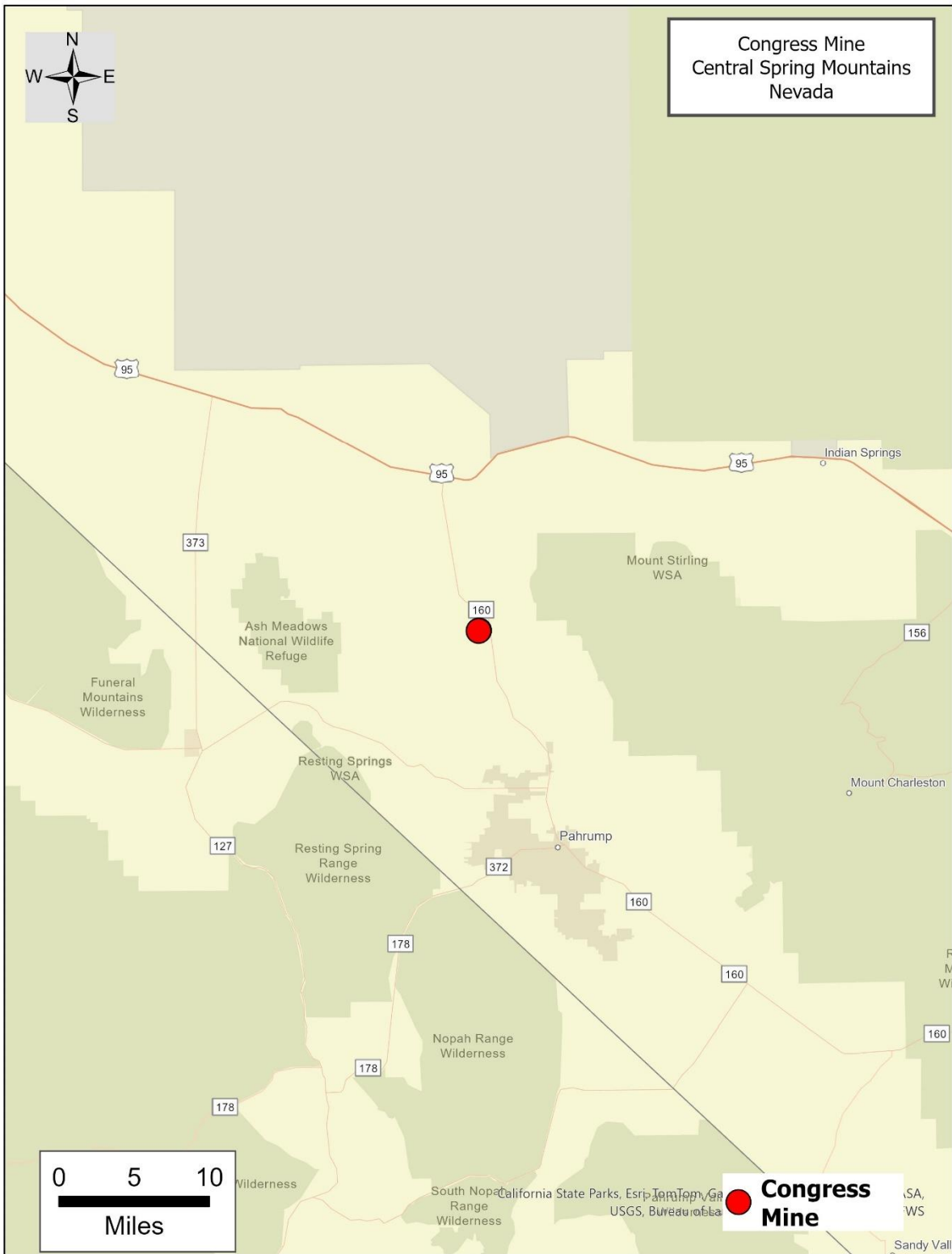


Figure 11. Location map for the Congress Mine. Opens source for educational purposes, no copyright.

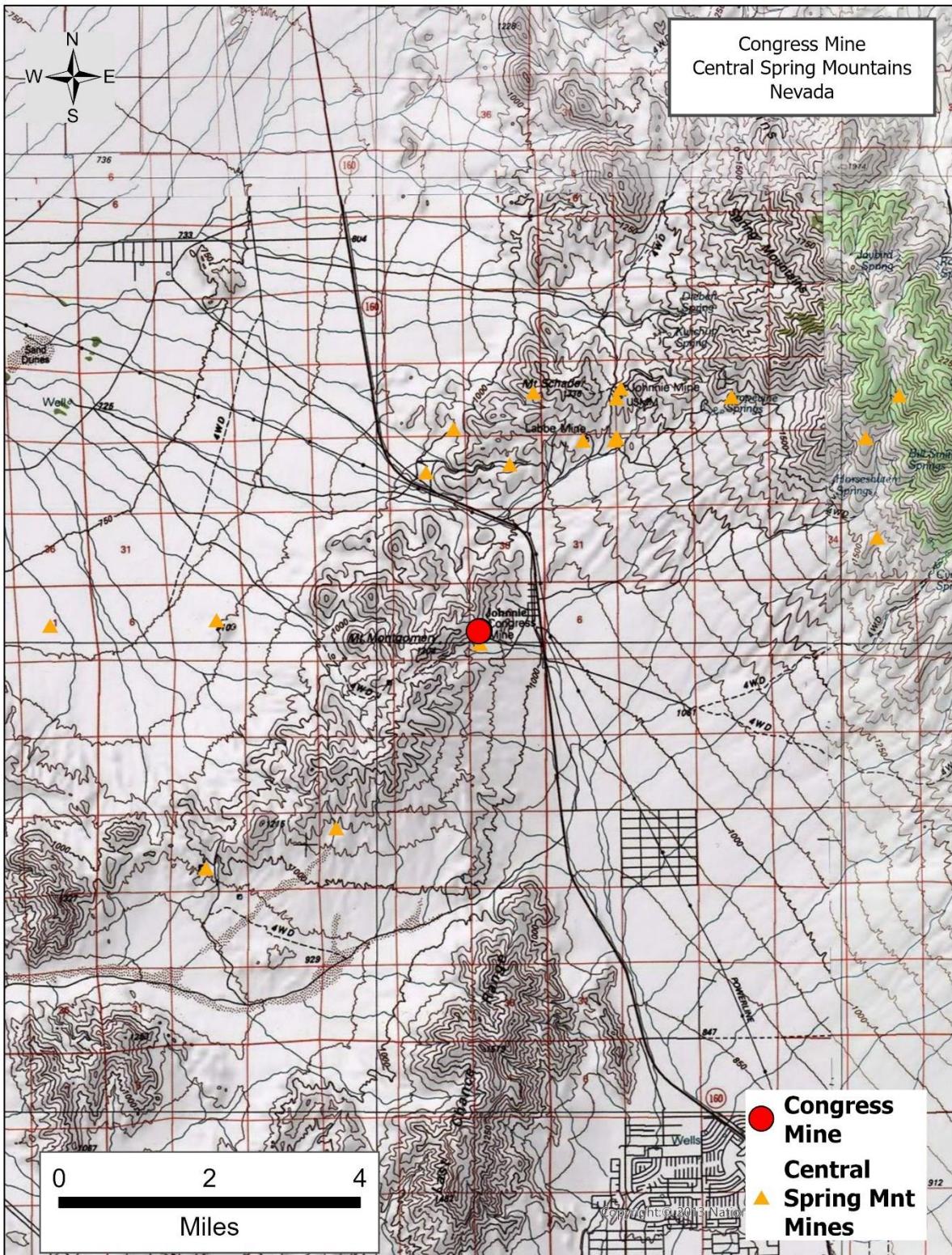


Figure 12. Regional topographic map of the Congress Mine. Opens source for educational purposes, no copyright.

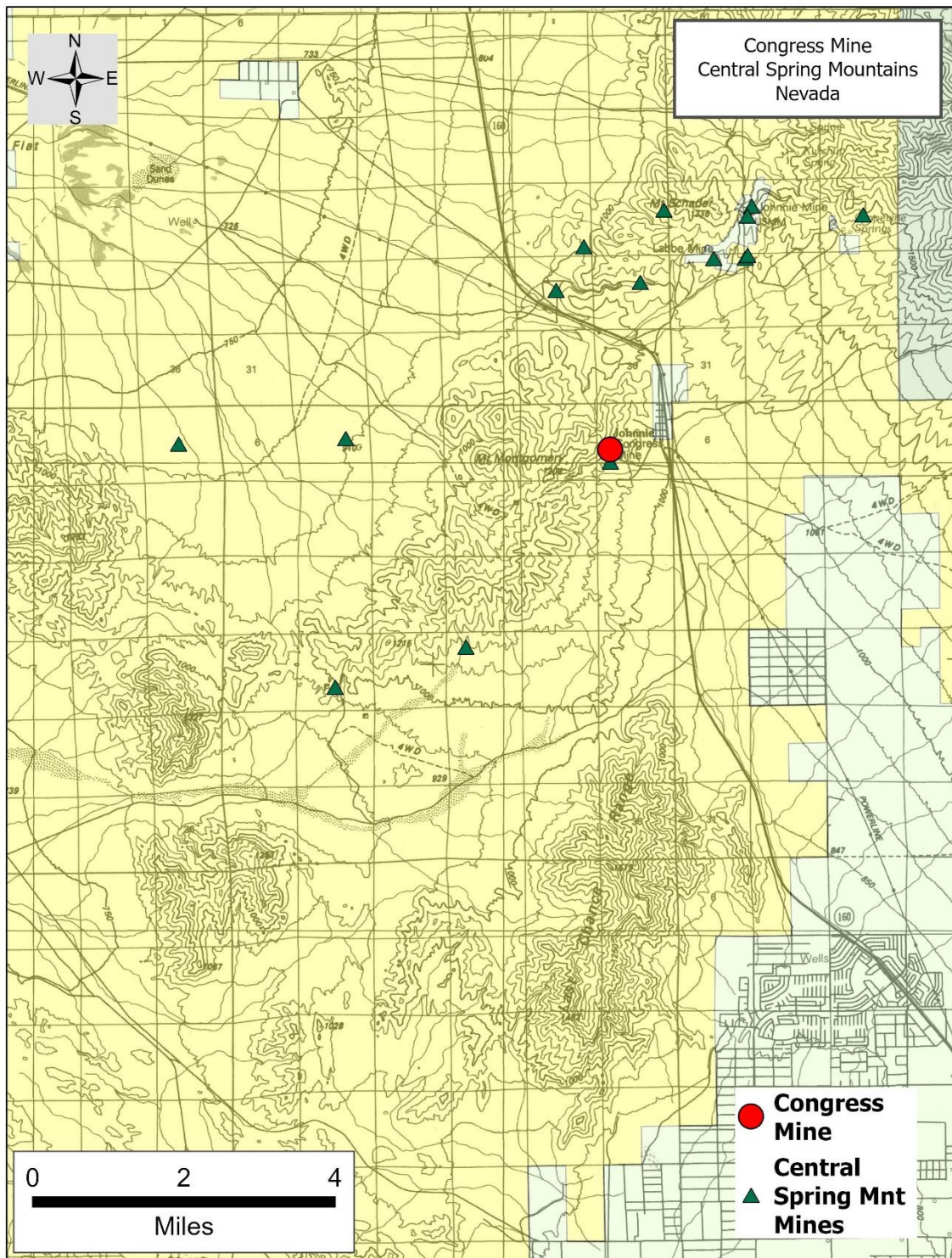


Figure 13. Land status map of the Congress District and surrounding areas. Green is U.S. Forest Service. Yellow is U.S. Bureau of Land Management. Blue is private land. Purple is military lands. Opens source for educational purposes, no copyright.

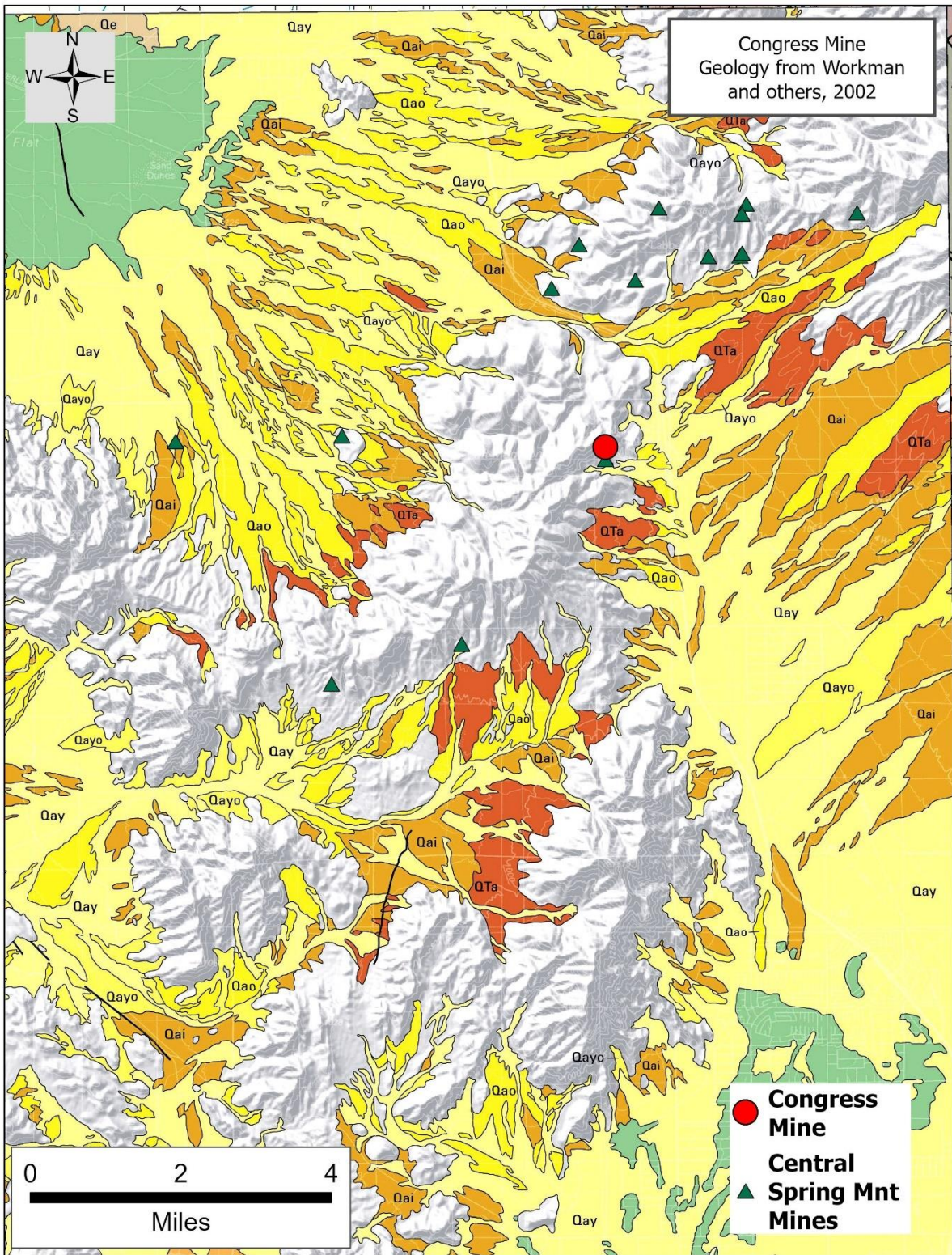


Figure 15. Regional geologic map of the area surrounding the Congress Mine showing Quaternary units only. Opens source for educational purposes, no copyright.

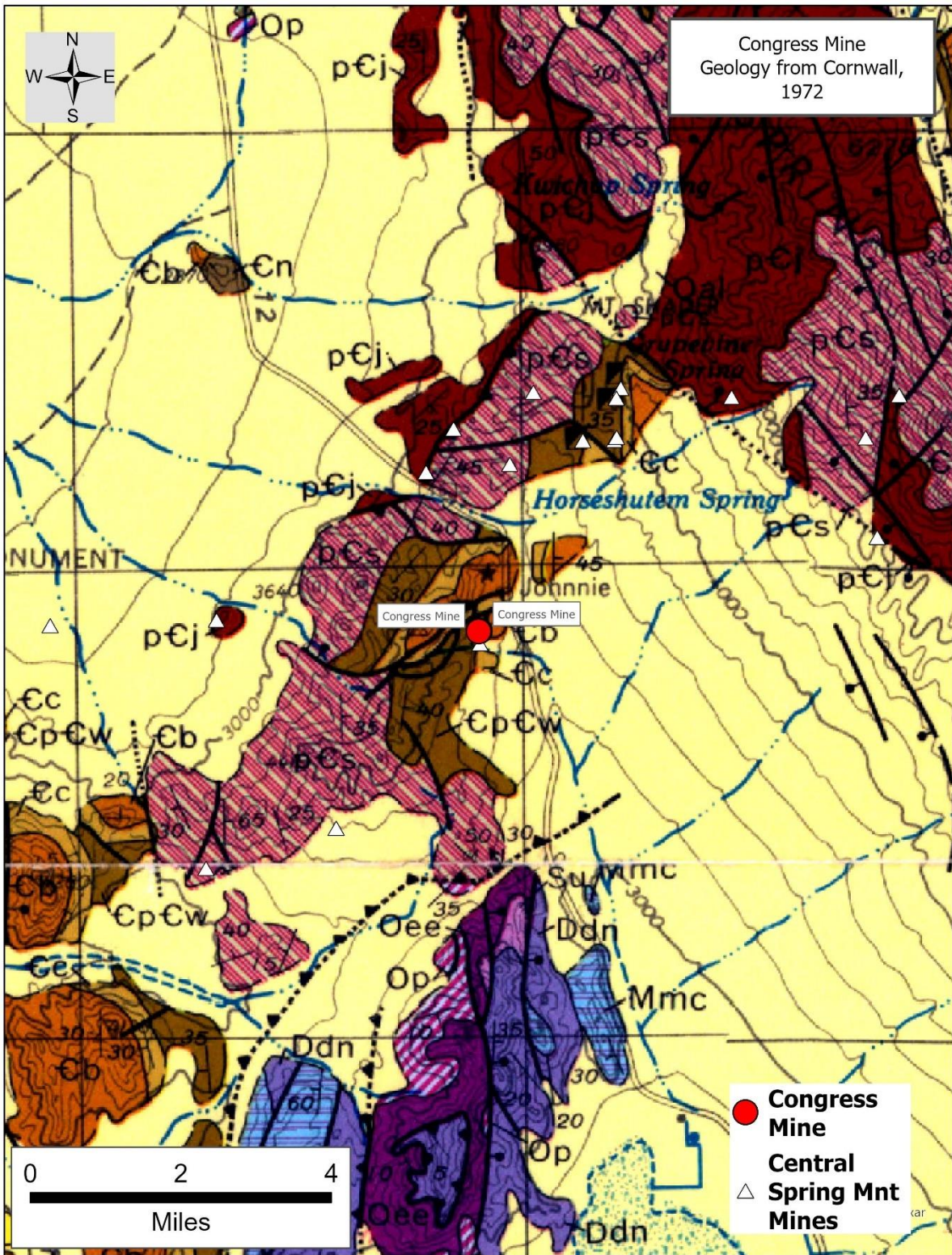


Figure 16. Regional geologic map of the Congress Mine and surrounding areas. Opens source for educational purposes, no copyright.

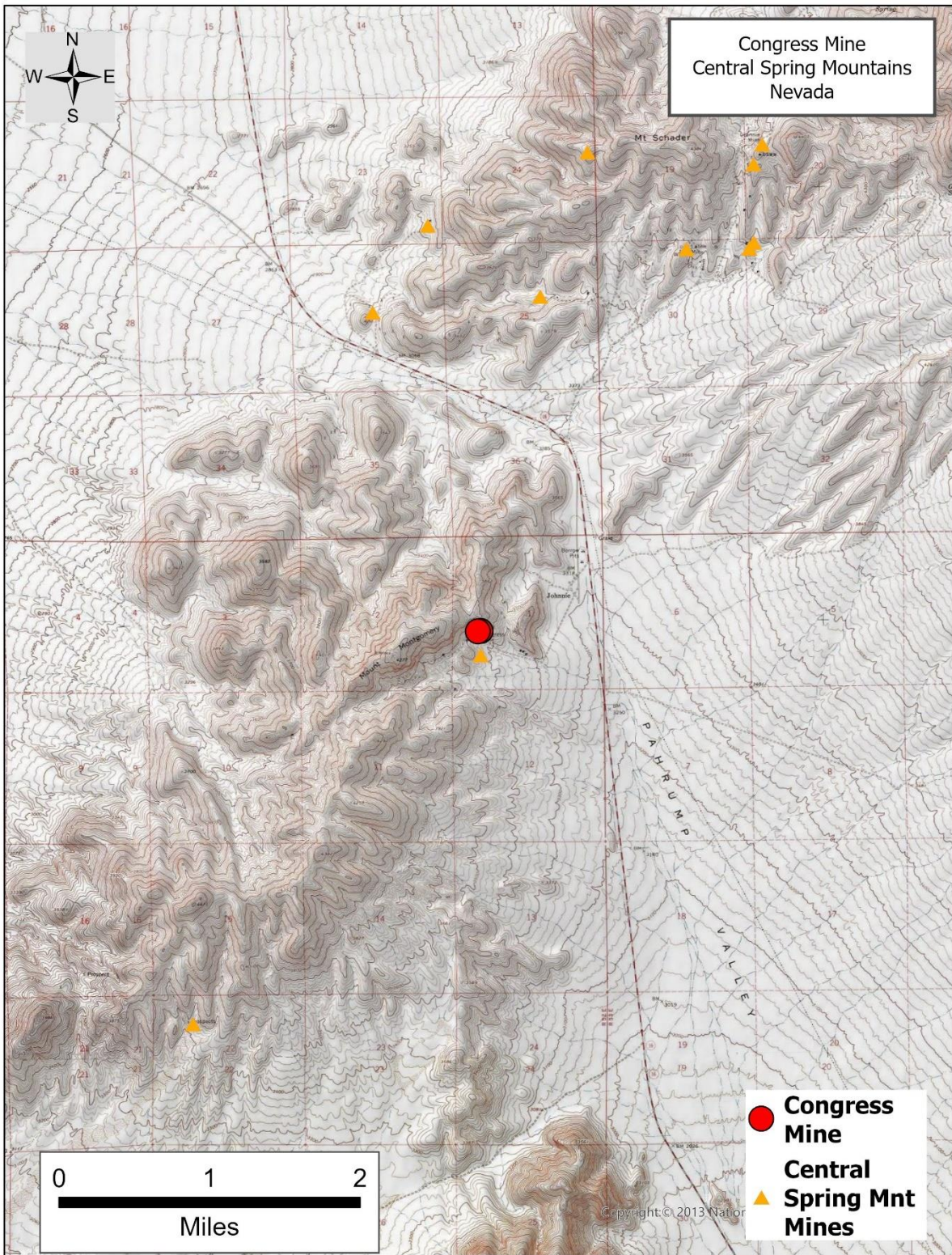


Figure 17. Area topographic map of the Congress Mine. Opens source for educational purposes, no copyright.

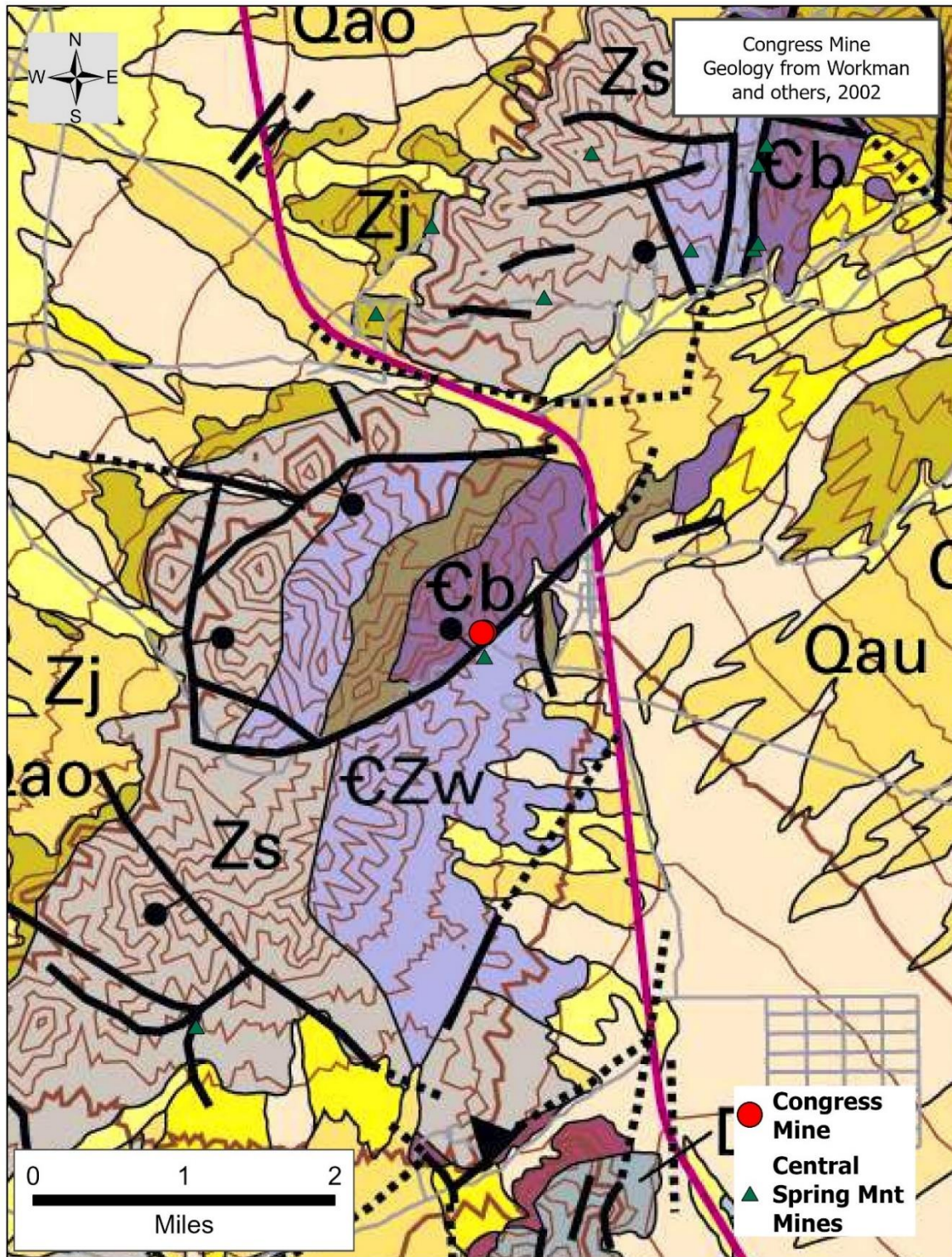


Figure 18. Area geologic map of the Congress Mine. Opens source for educational purposes, no copyright.

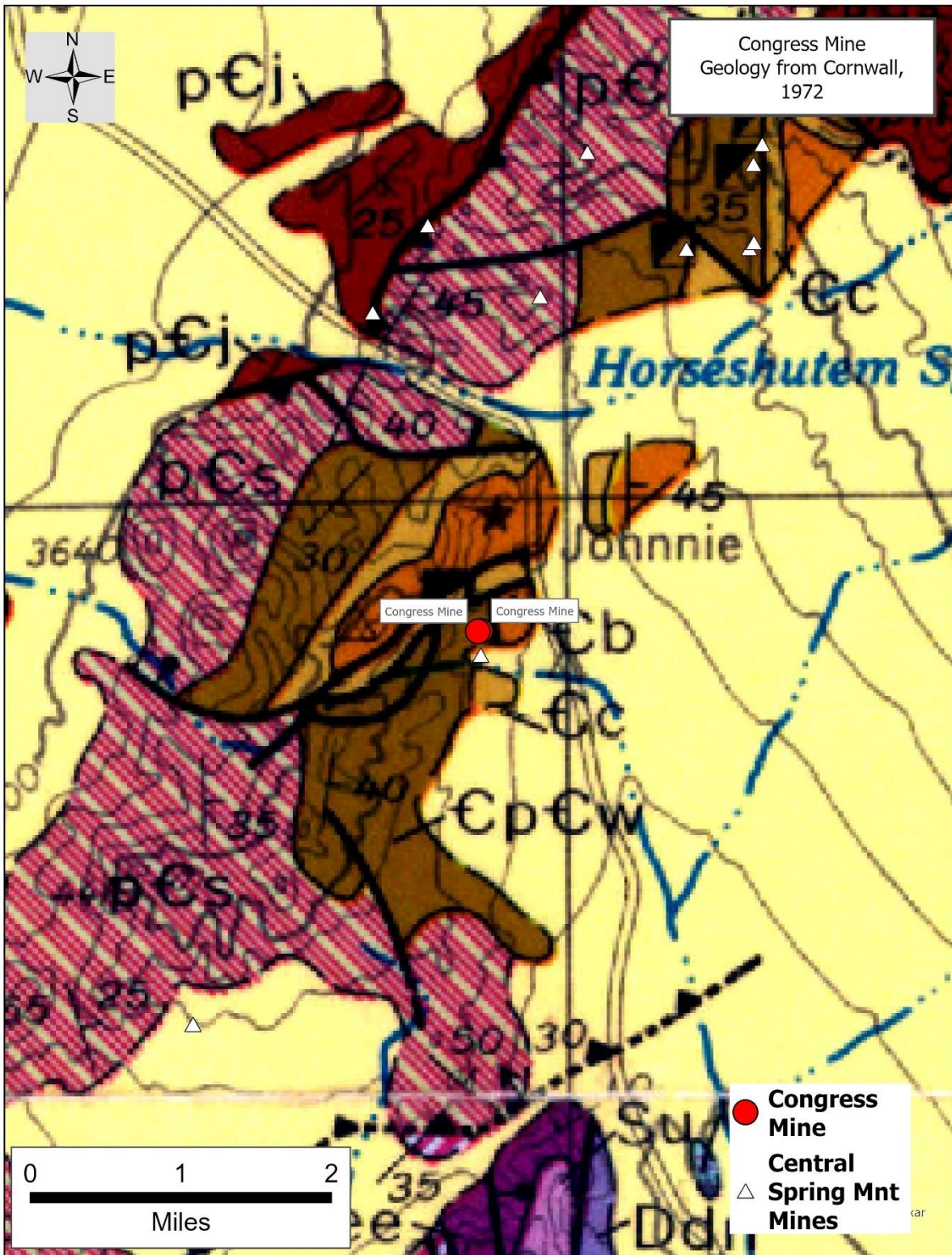


Figure 19. Area geologic map of the Congress Mine. Opens source for educational purposes, no copyright.

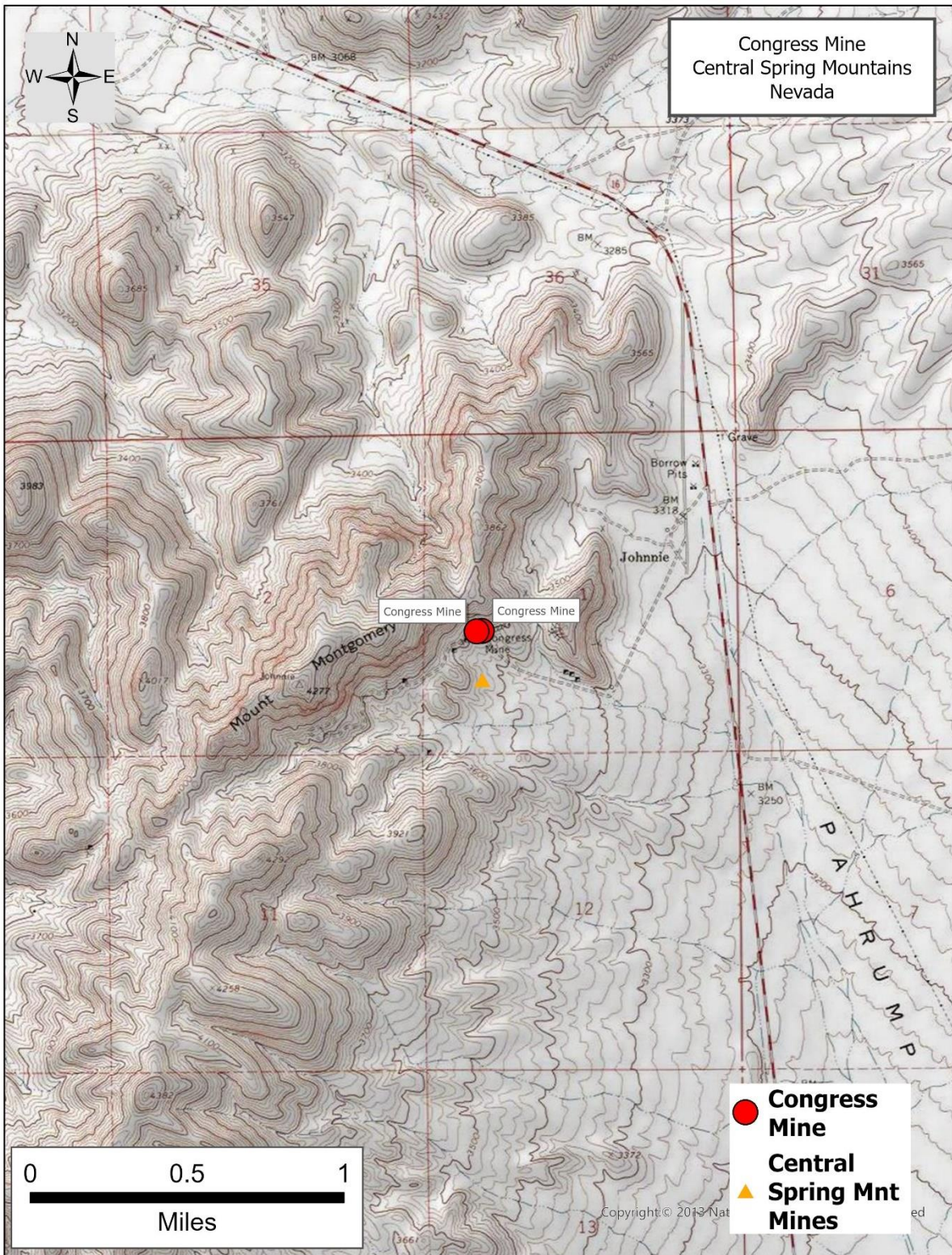


Figure 20. Site topographic map of the Congress Mine. Opens source for educational purposes, no copyright.

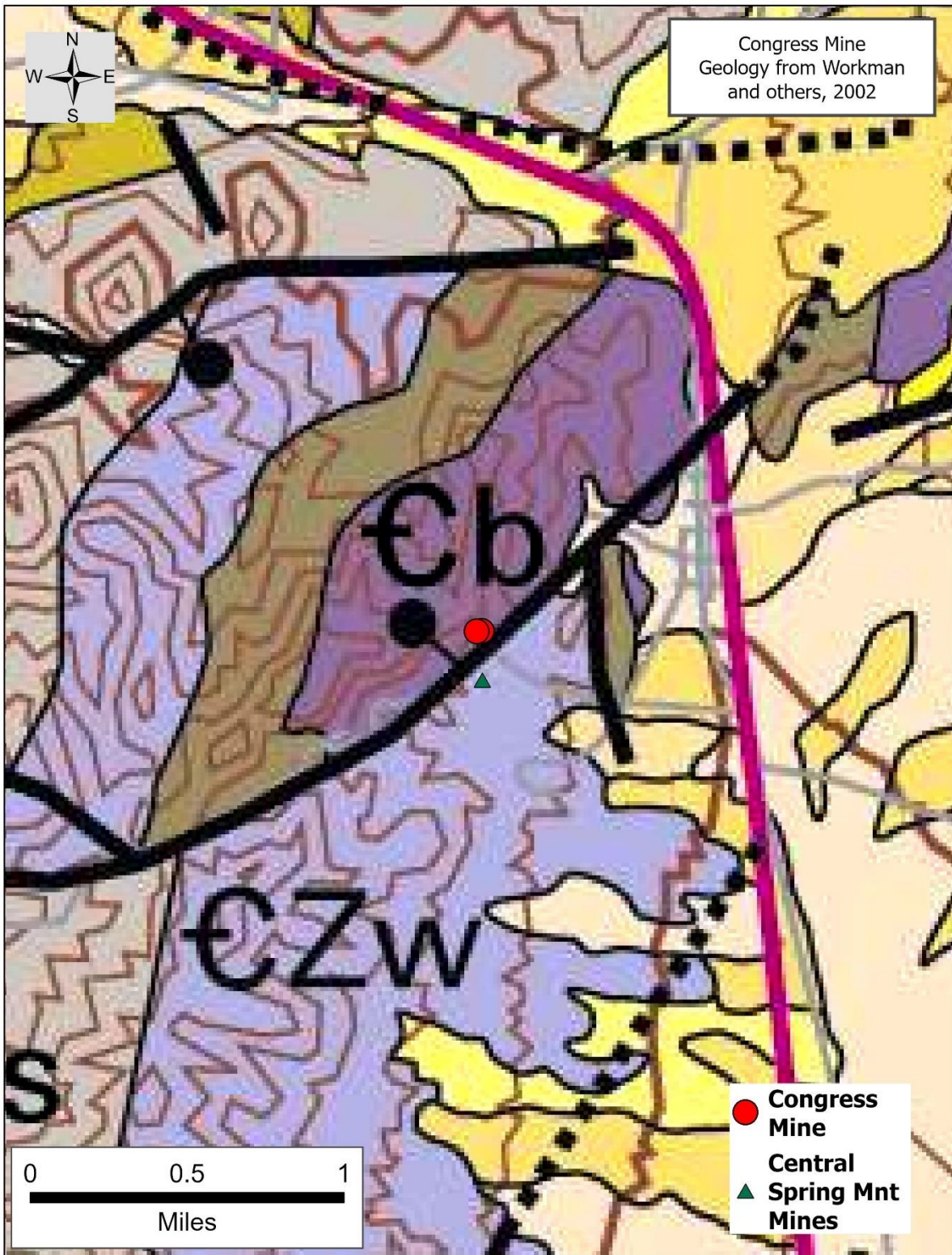


Figure 21. Site geologic map of the Congress mine and surrounding areas. Opens source for educational purposes, no copyright.

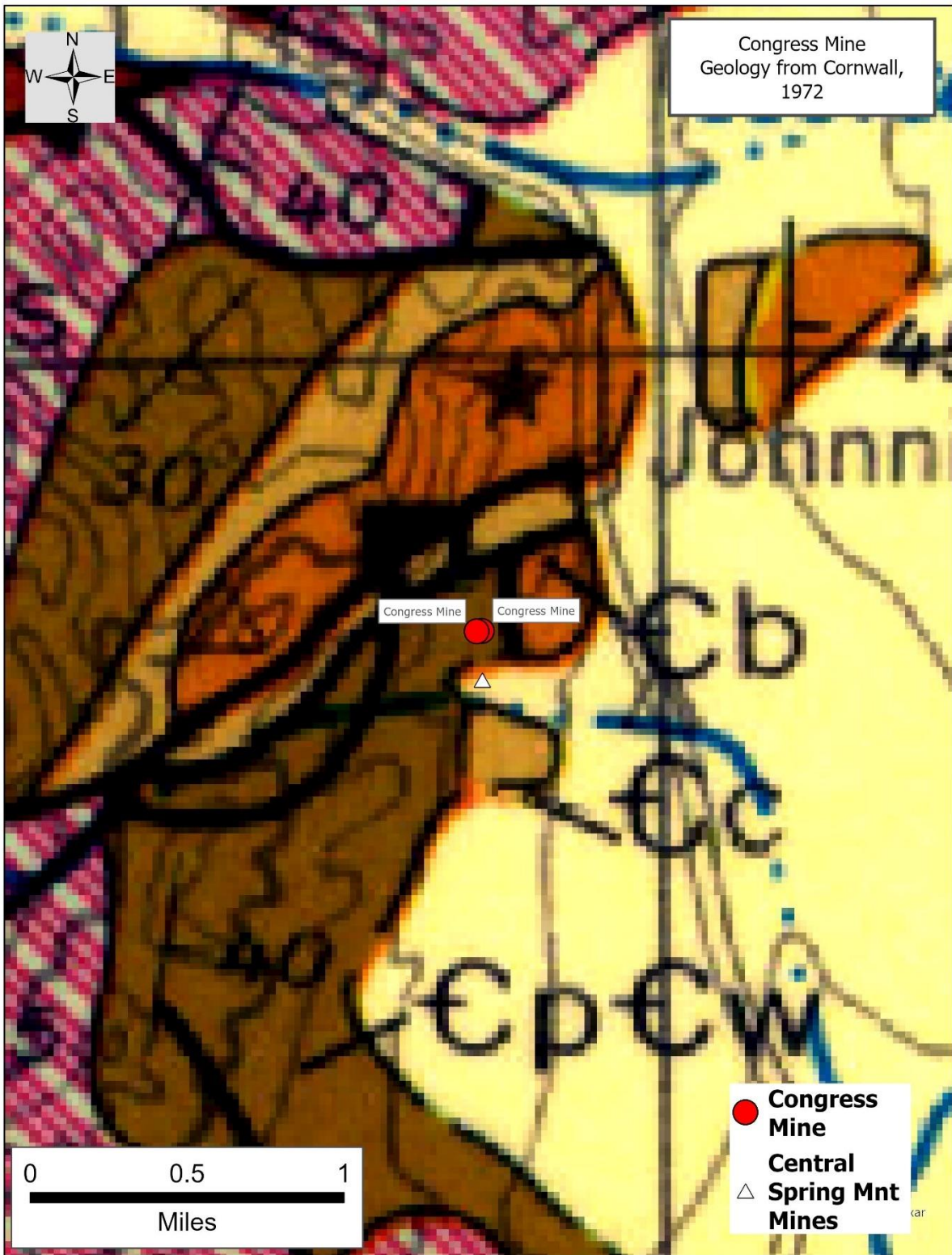


Figure 22. Site geologic map of the Congress mine and surrounding areas. Opens source for educational purposes, no copyright.



Figure 23. Aerial site photo of the Congress Mine and surrounding areas. Opens source for educational purposes, no copyright.

APPENDIX A. Placer Deposits of the Johnnie District

The following is from Maureen G. Johnson (1973, USGS Bulletin 135).

Location: North end of the Pahrump Valley, in the low hills west of the Spring Mountains, Townships. 17 and 18 S., Rangess. 52 and 53 E.

Topographic map: Mount Shader 7.6 minute quadrangle (preliminary).

Geologic map: Cornwall, 1967, Preliminary geologic map of southern Nye County, Nevada, scale 1 : 250,000.

Access: From Las Vegas, 8 miles south on U.S. Highway 91 to junction with State Highway 16; from there, it is about 70 miles west and north on State Highway 16 to Johnnie and placer deposits north and south of the town. ,

Extent: Small placers are found in hillside and gulch gravels adjacent to, and below, many of the gold-quartz veins in the Johnnie district. **Most placer-mining activity occurred in the gulches below the Congress mine (sec. 1, T. 18 S., R. 52 E.), located east of Mount Montgomery and half a mile south of the town of Johnnie.** Most of the gold is concentrated in the 6 inches of gravel material that overlies bedrock and is overlain by as much as 25 feet of gravel. Samples of the 6 inches of material on bedrock have values as high as \$6 to \$30 per cubic yard, but the amount of material in this pay streak is unknown. Placers are also found near the Johnnie and Overfield mines (sec. 20, T. 17 S., R. 53 E.) and the Labbe mine (sec. 30, T. 17 S., R. 53 E.) located northeast of the Johnnie on the west slope of the Spring Mountains. Parts of these placers are residual concentrations of gold, and parts are stream and hillside concentrations of transported gold.

Production history: The first recorded production of placer gold from the Johnnie district occurred in 1918, but the more productive accumulations of placer gold were discovered in 1920. This later discovery created considerable excitement and led to a short boom. A small amount of placer gold was produced almost yearly until 1950, and sporadically, until 1960. Most of the placer gold was recovered by drywashing the gravels. In 1949 the hillside below the Johnnie mine was mined by sluicing with water under high pressure. The amount of gold recovered by this technique did not differ appreciably from the amount recovered by drywashing techniques.

Source: The placer deposits were derived from the gold-quartz veins along faults in the Cambrian sedimentary rocks of the region thought to have formed mainly during the middle Cretaceous and to have remained active into the Tertiary.

Literature:

Cornwall, 1972: Notes placer-mining activity in 1949 and 1960; describes gold-quartz veins in district.

Engineering and Mining Journal, 1921: Names and locates placer leases in the Johnnie district. Kral, 1951: History; location and extent of placers; type of placer; thickness of gravels; concentration and value of pay streaks; placermining operations.

Labbe, 1921: History; location; distribution of gold in gravels; thickness of pay streaks; characteristics of the gold; amount of gold in pyrite; placer-mining techniques with Mexican Air Jig.

Lincoln, 1923: History.

Vanderburg, 1936a: History; production; location and extent of placers; thickness of gravels and gold-bearing pay streak; size of large nugget; placer-mining activity in 1935.