Field Trip #4: "Reno to Brady - Desert Peak - Humboldt House - Golconda - Getchell": Geothermal Res. Council Mtg. in Reno, NV, May 19-20, 1983

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Item 15

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Distance	Cumulative mileage	
6.7	15.1	Golconda offramp (Exit 194). Exit freeway to the right and turn left back across the freeway at the stop sign. At the next stop sign turn right and proceed to the east towards Midas. The prominent hill immediately to the south of the overpass across the freeway is Kramer Hill which consists of the Cambrian Osgood Mountain Quartzite, a light-brown weathering, white to light-gray, thin-to massive bedded, relatively pure quartzite. The quartzite is intruded by Upper Cretaceous granodiorite dikes which are commonly altered, with biotite replaced by chlorite + magnetite + calcite, and plagioclase replaced by sericite. Gold was discovered on Kramer Hill in 1866, and minor amounts of bullion were produced through the first part of the 1900's. All values were recovered from oxidized ore in quartz veins (Vanderburg, 1938, U.S.B.M.I.C. 6995). Steam from active hot springs can be seen on the north and northeast sides of the town of Golconda. According to Garside and Schilling (1979, NBMG Bulletin 91), the springs range from 109° to 165°F, are anomalously radioactive, and are actively depositing travertine. Metals in the spring waters include arsenic (0.02 ppm), manganese (0.10 ppm), copper (0.05 ppm), mercury (0.0001 ppm), and lithium (0.36 ppm).
2.6	17.7	Highway bends to the north to Golconda tungsten-manganese mine.
2.7	20.4	Turn right on dirt road, proceed 0.4 miles and then turn right on dirt road 0.1 mile to open pit of the Golconda Mine. Stop 1. These tungsten-manganese deposits occur in ferruginous and manganiferous clay beds in alluvial gravels that rest on the Cambrian Pebble Formation. In part the deposits are overlain by travertine, which forms an irregular, horizontal sheet that strikes north-south. Kerr (1940, Bull. Geol. Soc. America) delineated two stages of tufa development. An older tufa caps higher elevations and is underlain by the tungsten-manganese blankets, whereas the younger tufa fills in depressions between the higher elevations, and forms a bench with intermittently active springs.

The Cambrian rocks beneath the alluvial deposits consist primarily of phyllitic shale with lesser amounts of interbedded, thin carbonaceous limestone.

The tungsten-manganese deposits were discovered in 1885 in the expectation of finding gold and silver (Pardee and Jones, 1920, USGS Bull. 710-F). They occur as blankets and veins adjacent to a fault trending N.25°E., and the blankets dip gently to the northwest. The deposits vary from a few inches to a few feet in thickness, and in places are intermixed with the top of the tufa cap. The veins consist of linear masses of anastamosing groups of veinlets along the northeast trend beneath the tufa caps. Both ferruginous and manganiferous vein fillings contain tungsten with accompanying quartz, barite, and jarosite. Kerr (1940) reports that the ferruginous zones in part replace the manganiferous phases, and there is a higher concentration of tungsten in the ferruginous zones. The paragenesis of vein types is best observed in the Cambrian sediments away from the high concentrations of manganese and iron. Quartz veins with sericite selvagos are the earliest and these veins contain minor amounts of manganese. This episode was followed by manganese-calcite veins which retrograded the sericite to illite, and finally the ferruginous veins were emplaced. The veins acted as feeders to the blanket deposits. In general, the manganiferous and ferruginous materials are separated into different layers, although both occur as streaks in the layers of the other material. The manganiferous and ferruginous layers are underlain by a massive illite layer with some fine quartz-rich zones. Tungsten occurs in all of these layers.

The mineralogy of the ores in very complex. Iron occurs primarily as goethite, lepidocrocite, and amorphous limonite minerals. Manganese occurs as psilomelane, hollandite (?), and pyrolusite. Tungsten occurs in limonite as an unidentified complex. Ferritungstite and tungstite may occur, but have not been identified. Tungsten also occurs as a heterogeneous mixture in psilomelane. Neither wolfranite nor scheelite have been found in the ores.

The major element chemistry of the ores is given in Table 1.

Table 1.

Analyses of Tungsten-Manganese Ores from the Golconda, Nevada Occurrences

(all values given as weight percent of the oxide)

Analysis	1	2	3	4	5	6	7
SiO_2	1.70	4.70	38.54	0.21	1.70	----	----
Al_2O_3	0.34	----	12.96	1.32	0.34	----	----
Fe_2O_3	3.32	12.00	24.71	0.47	3.32	12.00	0.49
MgO	1.26	----	3.05	0.45	1.26	----	----
CaO	3.44	1.99	1.44	0.22	3.44	1.99	----
Na_2O	n.d.	----	0.78	0.53	n.d.	----	----
K_2O	0.35	----	2.12	3.42	0.35	----	3.53
TiO_2	----	----	0.51	----	----	----	----
P_2O_5	n.d.	----	0.83	----	----	----	----
MnO	65.66	48.96	0.09	68.33	65.66	48.96	70.52
WO_3	2.78	1.54	2.64	2.24	2.78	1.54	2.31
H_2O	4.16	----	12.19	4.04	4.16	----	4.17
BaO	5.65	4.73	----	4.16	5.65	4.73	4.29

n.d. none detected in analysis
---- no analysis made

Samples:

1. Penrose (1893), manganese ore
2. Pardee and Jones (1920), manganese ore
3. Kerr (1940), ferruginous ore
4. Kerr (1940), psilomelane
5. Kerr (1940), psilomelane
6. Kerr (1940), psilomelane
7. Kerr (1940), hollandite

Marsh and Erickson (1974) found a distinct geochemical partitioning between the manganiferous and ferruginous layers. The black manganiferous layers contain higher concentrations of barium, cobalt, copper, niobium, nickel, strontium, and thallium than the orange-brown ferruginous layers which contain higher concentrations of arsenic, boron, beryllium, germanium, and vanadium.

To the east of the tungsten-manganese deposits, altered limestone occurs along a northeastern trend. The limestone is locally silicified, and Kerr (1940) found a jarosite vein with quartz, barite, calcite, psilomelane, and limonite derived from the alteration of an earlier mineralized rock that probably contained pyrite and scheelite. This interpretation is consistent with the reference of Berger, Silberman, and Koski (1975, Econ. Geol.) to skarn-type mineralization at depth beneath the tungsten-manganese deposits.

Penrose (1893, Jour. Geol.) recognized that the travertine and associated tungsten-manganese deposits are related to Pleistocene hot springs activity. Water apparently emerged along the northeast-trending faults in the Preble Formation phyllite with a parallel line of springs in limestone upslope from the exploited tungsten-manganese deposits. It is evident that the early waters were silica-rich and were followed by tungsten-bearing carbonate-rich waters. White (1955, Econ. Geol.) believes that the travertine and tungsten-manganese deposits were deposited contemporaneously. A drill hole near the Golconda mine encountered considerable marcasite and a temperature of 143°F at 220 feet. A short distance northeast of this hole is a well that flows 1.5 gallons/minute of water at 69.5°F (Garside and Schilling, 1979). The most likely source of the metals deposited by the hot springs system was the carbonaceous phyllite shales, dolomitic limestones, and calc-silicate altered limestones known to underlie the Golconda deposits.

Distance	Mileage	
1.0	21.4	Return to paved road and proceed to the northeast.
0.8	22.2	Turn right on dirt road (opposite gravel pit) and proceed to the east. This road