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## SULPHUR DISTRICT

## LOCATION

The Sulphur mining district is in the northwestern part of the Kamma Mountains 2 to 5 miles southeast to northeast of the Union Pacific railroad siding at Sulphur. The district is entirely in Humboldt County, in the east half of T35N, R29E. It is easily accessible from a good gravel road that connects Winnemucca and Gerlach.

## HISTORY

The numerous sulfur deposits in the district have been known and intermittently mined for many years. According to Adams (1904, p. 497) sulfur was discovered about 1870 and was first mined in 1874. In 1882 about 6 tons of sulfur reportedly were being produced daily. In 1904 the Nevada Sulfur Co. was operating two retorts to recover sulfur. Information on activity is sketchy, but apparently the sulfur deposits were mined intermittently until the early 1960's. In the earlier days the product was hauled to a railroad siding at Humboldt House; with the completion of the Western Pacific (now Union Pacific) line in 1911, the deposits were within a few miles of a railroad. Vanderburg (1938, p. 44) estimated that roughly 40,000 tons of sulfur had been produced by open pit and underground room-and-pillar methods. Extensive exploration drilling for sulfur in 1966 and a processing plant was built, but little or no sulfur was produced. Some additional drilling for sulfur was done by Duval Corp. in 1974. In 1931 several hundred tons of alunite was mined from vein deposits in the district and sold as a soil additive. (Fulton and Smith, 1932, Nevada Bureau of Mines and Geology file manuscript). Starting in 1941 small quantities of mercury were recovered from sulfur-bearing ore; Bailey and Phoenix (1944, p. 108) reported production of 25 flasks through 1943.

According to Vanderburg (1938, p. 44, 47) a silver deposit was discovered in 1908 at the southwestern end of the district. The principal property, the Silver Camel Mine, was reported to have produced \$100,000 in high-grade silver ore between 1908 and about 1912.

A gold deposit was discovered at the northern end of the district by Homestake Mining Co. in the early 1980's and was developed by the Standard Slag Co. as the Lewis Mine in 1984.

## GEOLOGIC SETTING

The district is along the northwestern edge of the Kamma Mountains, extending 3 miles north-northeast from the Humboldt-Pershing County line to the Winnemucca-Gerlach road. The district is essentially confined between two north-northeast trending major faults: the western one separates Recent sediments of the Black Rock Desert on the west from Tertiary sedimentary rocks; the eastern one—about 7000 feet to the east-southeast—separates the Tertiary sedimentary rocks from a sequence of rhyolitic to latitic volcanic rocks of somewhat older age. Essentially all the mineralization—the sulfur, alunite, silver, and gold—is in the block

of Tertiary sedimentary rocks, although some prospecting has been done in the volcanic rocks to the east.

The Tertiary sedimentary rocks appear to be predominantly conglomerates with some sandstones. Some lacustrine tuffaceous sediments are also present, but the pervasive alteration in the district makes quantitative estimation impossible. The rocks usually have dips of less than  $10^{\circ}$ , mostly eastward.

Two distinct types of hydrothermal alteration are present in the district. The areally most extensive and the most conspicuous type is a leached, opalized, argillized, and alunited rock that contains the sulfur deposits. This material probably was formed in the upper, near-surface part of a hot-springs system where sulfuric acid was abundant. The other type is a pervasive silicification-pyritization that probably developed lower in the system below the watertable. This material is the host for the silver deposits and, at least in part, for the gold deposit.

Two other major faults, also with north-northeast strike but with less vertical offset, are present in the district.

#### ORE DEPOSITS

The ore deposits are described in three parts: the high-grade silver ore; the sulfur-mercury and the alunite ores; and the low-grade gold ore.

The high-grade silver ore, mined mostly in the Silver Camel Mine, occurs in the south-central part of Section 34 west and southwest of Devils Corral, a prominent, highly colored topographic basin. Almost all the data on this deposit is from Vanderburg (1938, p. 47). Development consists of a number of trenches and shafts, the deepest 95 feet. The silver occurs as cerargyrite in east-west or northwest-southeast seams a fraction of an inch to 4 inches wide in silicified conglomerate. Minalable material was not found more than 20 feet below the surface; a 300-foot-long adit at greater depth did not penetrate ore.

The sulfur-bearing material occurs in two general areas: one a zone that extends from the vicinity of Devils Corral north-northeast for about 6000 feet in the E/2E/2 S34, the W/2W/2 S35, and the SW/4 S26; and a much smaller area in the SW/4 S25. In the first area sulfur has been mined in about a dozen open pits (including the Mercury and East China pits) and, to a lesser extent, in underground workings. Sulfur generally does not appear to be present in any quantity on the surface outside of these pits. In the pit areas the rocks are mostly altered, and now are light colored, leached, and brecciated in places. They consist mostly of opal, chalcedony, quartz and kaolin, but alunite, gypsum, anhydrite, pyrophyllite(?), iron oxides, and jarosite have been recognized. The sulfur occurs as disseminated grains, preferential replacement of conglomerate matrix, irregular veins and masses, and coatings on fracture surfaces. In the present exposures, sulfur is present in occasional areas up to about 25 feet across where it makes up as much as one-third by volume. The rock between such areas contains essentially no sulfur. In a few places sulfur bodies appear to have horizontal elongation or are beneath a siliceous cap. The average grade mined in the past is said to be 15 to 38% S, but very little such material is now exposed. Finely crystalline cinnabar is sparsely present, mostly as coatings.

At the second area, in the SW/4 S25, some of the sulfur occurs as described above. The Peterson open pit, however, is along the fault zone that separates the Tertiary sedimentary rocks from the older volcanic rocks. In this pit the sulfur occurs on fracture surfaces and impregnates altered rock in the vicinity of a sinuous shear zone. In the central part of the pit, this zone strikes N50°E and dips 75°NW. The sulfur-bearing zone is estimated to be up to 20 feet wide and to contain as much as 20% S.

Alunite veins are present in several places, mostly on the east and west edges of the largest sulfur-bearing zone. The veins generally have northerly strike and steep dip, and they range from 2 feet to 20 feet in width. The fine-grained alunite contains some opal and is most pure in the thinner veins.

The Lewis gold mine is at the north end of the district, probably in the SE/4 S23. The host rock is conglomerate which is, at least in part, silicified and pyritized. Chalcedony veinlets are abundant in the eastern part of the area. Some of the flat-lying beds apparently had preferential replacement by gold.

An unpublished report by Homestake reported that 30 samples taken over an east-west distance of 2000 feet contained 0.04 to 0.099 oz/gold and traces of silver. Initially the heap-leach operation, using run-of-mine ore, was at a rate of 5000 tons/day. Reportedly reserves are more than 10 million tons; the grade probably in about 0.03 gold.

#### GEOCHEMISTRY

Eleven geochemical samples were taken in the district; all were of the highly altered materials associated with sulfur. All samples appear to be anomalous in barium with values ranging from 500 to 2000 ppm. A sample of sulfur-bearing material from the Mercury pit contained anomalous quantities of lanthanum, lead, and vanadium. One sample from the Peterson pit contained an anomalous amount of silver; another sample contained a slightly anomalous amount of lanthanum. Another sample from the district (No. 1794) contained more than usual amounts of antimony and lead.

#### SELECTED REFERENCES

- Adams, G. I. (1904) The Rabbit Hole sulfur mines, near Humboldt House, Nevada: U.S. Geological Survey Bull. 225-M, p. 497-500.
- Bailey, E. H., and Phoenix, D. A. (1944) Quicksilver deposits in Nevada: Nevada Bureau of Mines and Geology Bull. 41.
- Vanderburg, W. O. (1938) Reconnaissance of mining districts in Humboldt County, Nevada: U.S. Bureau of Mines Information Circular 6995.