Feature

Mine of the Month

Antler Mine

(Hualapai District, AZ)

Located in Boriana Canyon in the foothills of the Hualapai Range near Kingman, Arizona, the Antler Mine was the primary producer of copper and zinc in the Hualapai District (aka Cedar Valley District). Although some sources report this to be a gold mine, only traces of gold have ever been recovered from this site throughout its long history.

A notable feature of the local geology is the scarcity of conspicuous quartz veins that would indicate a hydrothermal origin of the Antler ore deposits. Quartz veins represent the excess silica that was dissolved in the rising magmatic water that also carries all the elements from the cooling magma that were not used in making the rock-forming minerals (feldspars, micas, pyroxenes, amphiboles, et al) including, of course, the precious and base metals.

Following pre-existing faults in the overlying strata, the water precipitates various minerals according to decreasing temperature and pressure at it rises toward the surface. Silica is the last to precipitate, forming the quartz veins observed in impermeable rocks. Permeable rocks, such as limestone, are dissolve by the superheated water, forming the *bedded replacement deposits* that are so characteristic of most sulfide deposits throughout the southwest. However, at the Antler Mine and its surroundings, the relative absence of quartz veins, and the prevalence of the metamorphic assemblages, suggests an entirely different and unusual genesis.

The Antler Mine is representative of a proximal (close to the center of a geologic process) *massive sulfide deposit* in stratified rocks of mainly submarine volcanic and volcaniclastic origin. The ore zone is a roughly tabular body in highly folded and altered metamorphic layers composed primarily of 1.8 billion-year-old schistose, gneissic, and quartzofeldspathic formations that are presumed to have originally been laid down as felsic tuffs.

After discovery in 1879, the bulk of the mine's Cu-Zn-Ag-Pb production occurred during the years 1916–1953 and 1966–1975. In all, 78,251 tons of ore averaging 3% Cu, 6.5 % Zn, .75% Pb, 1.1 oz/ton Ag, and .01 oz/ton Au were recovered (34,236 tons in 1970, the last year of operation).

The mine includes drifts on 8 levels to a depth of about 650 feet. The lower levels are reported to be inaccessible due to toxic levels of H_2S gas. The ore bodies contain massive lenses of sulfides disseminated in a silicate gangue composed mostly of anthophyllite (a mineral diagnostic of thermally-metamorphosed chlorite alteration assemblages), with actinolite-tremolite, some quartz, and biotite. They ranged in thickness from .6 to 12 meters for about 730 meters along the strike that dips NW and plunges 63 degrees to the north. Total underground workings comprise about 6,600 feet.

Originally, early production took advantage of near-surface, high-grade oxidized ores, mainly smithsonite. Subsequently, all major production was derived from primary sulfides, including pyrrhotite (the most abundant of the sulfides), sphalerite, chalcopyrite galena, and pyrite. It is interesting to note that the mineral *antlerite* was first described from this locality. Copper staining is still prevalent on the hillsides above the mine, especially above a nearby trench, but very little of the oxide ore remains.

Standard Metals Corporation acquired the property in 1966 for feasibility and valuation studies. Underground development work and mill construction were part of a program to reopen the mine at an initial 300-ton-per-day schedule. Mining commenced in February, 1970, and continued until December, 1970 when the operation was terminated due to economic and technical difficulties. The currently inactive mine remains the property of Standard Metals.

OBSERVATIONS and COMMENTS

The Antler Mine is easily accessible even without a four-wheel drive vehicle, although high clearance is recommended for the final quarter mile. Alamo Road off I-40 is paved all the way to the turnoff at Boriana Mine Road, and that route is hard packed all the way to the working ranch just before reaching the mine.

The drive itself is interesting as you approach the mountains. The Antler Mine is situated in the transition zone between the Mojave and Sonoran Deserts. It is a peculiar sight, indeed, to see each desert's signature plant—the Joshua Tree and Saguaro Cactus—growing side by side!

The Antler has always been one of my favorites as it is guaranteed to provide many interesting—and some quite rare—specimens without having to enter the mine. On the hillside just above the hoist look for a reddish brown mineral composed of radiating, bladed crystals. This is cummingtonite, which is usually associated with almandine garnet. Over twenty years ago there was a dump of spectacular anthophyllite near the mine, but this has since been removed. However, I recently discovered a small outcrop that provided some nice fresh specimens. I'm sure a more thorough search will yield other sources of this rare mineral, plus outcrops of tremolite-actinolite.

Entry into the mine is a difficult proposition to negotiate the two vertical shafts; the main one is several hundred feet deep! In the past I have found spectacular specimens of chalcanthite, which have proven to survive very well over the years in my collection. I have also acquired large, but pulverulent, aggregates of yellow copiapite and magnesiocopiapite, greenish melanterite, and white branching gypsum aggregates capped by light blue chalcanthite. Antlerite, for which the Antler Mine is the type locality, is difficult to find. I was fortunate to have collected some minute clusters of blackish green crystals embedded in stalactites of chalcanthite/copiapite many years ago, but none recently.

The trench in quartzofeldspathic schist just to the southwest and uphill from the Antler shaft is another good source of easily obtainable specimens without risking life and limb. Here you can collect aggregates of silky white halotrichite associated with chalcanthite and copiapite. Watch out for the thick beds of cactus spines (gathered by enterprising kangaroo rats) that have accumulated over the years. I have emerged with my shoes and pants completely engulfed in the very sharp and stubbornly clingy spines!

A trip to the Antler Mine should also include a visit to other nearby workings. However, four-wheel drive is definitely advised. Just a mile or so up the jeep trail, the Copper World Mine, like the Antler, hosts a volcanogenic massive sulfide deposit in a small belt of quartz-biotite feldspar gneiss. Oddly, pyrite was the dominate sulfide at this locality, whereas at the Antler Mine pyrrhotite prevailed.

The Boriana Mine (once the largest tungsten producer in Arizona), about 5 miles farther up the mountain, is another location worth inspecting. This tungsten deposit provides decent specimens of fluorescent scheelite and minute crystals of wolframite. I have also found some rather impressive veins of strontianite in limestone, though this may have been a purely surreptitious find, as I have never found another specimen like it!

If time permits, I recommend you continue your trek through the mountains rather than return the way you came. The road is relatively easy to traverse, the views are spectacular, golden eagles and elk usually make an appearance, and the trail eventually emerges at Hualapai Mountain Park just a short drive from Kingman.

LOCATION

DISTRICT: Hualapai (formerly Cedar Valley) Mohave County, Arizona

TOPO MAP: Wabayuba Peak Quadrangle 7.5 Minute Series
Sec 3 T 17 N R 16 W

GPS: 113° 58' 06" N, 34° 52' 57" W

DIRECTIONS: From Kingman, AZ, I-40 at US 93 (Exit 48) west 23 miles to Yucca (Exit 25); left across overpass to Alamo Rd; turn right, then 3 mile to Boriana Mine Rd on left; continue on well-graded dirt road 6.3 miles to 1st cattle guard, 1 mile to 2nd cattle guard, continue past working ranch on left; after a half mile, continue on jeep trail for another half mile to turnoff to mine on left. Main adit is in view on the hillside.

GEOLOGY

SETTING:

Massive sulfide deposit in quartzofeldspathic schists and gneisses associated with amphibolite, cordierite-anthophyllite, talc-actinolite, and cummingtonite pods and lenses.

REFERENCES:

Sawyer, M.B., Gurmendi, A.C., Daley, M.R., and Howell, S.B., 1992, Principal Deposits of Strategic and Critical Minerals in Arizona: United States Bureau of Mines Special Publication, 334 p.

More, S.W., 1980, The Geology and Mineralization of the Antler Mine and Vicinity, Mohave County, Arizona, Tucson, University of Arizona, unpublished master's thesis, 149 p.

PHOTOS OF LOCATION and MINERALS

Boriana Mine Road

This maintained dirt road provides a well-paved access to the Antler Mine and other nearby excavations in the Hualapai Mountains wilderness area. Four-wheel drive is not necessary virtually all the way to the mine workings, but will be required to explore further from that point.

Working Ranch

The approach to the Antler Mine leads past a small working ranch just beyond the second cattle guard heading north on the Boriana Mine Road from Alamo Road.

Drive With Caution!

The fact that there's a cattle ranch near the Antler Mine is no bull...but watch out for the cows! The mine is just a half mile past this bovine hazard.

PHOTOS OF LOCATION and MINERALS

Prime Accommodations

This former bunkhouse was once called home by the miners at the Antler deposit during its early glory years. It is now just a dilapidated reminder of how remote, lonely, and difficult life was for the late 19th- and early 20th-century fortune seekers.

Core House

Piles of old rock cores litter the deteriorated floor of this shack near the main shaft of the mine. The cores provide valuable clues to the underground geology of the site, and hint at reserves that offer promise for future exploition.

Conspicuous Scars

Early mining operaters were not mindful of the deleterious effect their endeavors would have on the sensitive desert environment. The Antler Mine has been singled out by the Arizona BLM for future remedial efforts to counter the decades-long discharge of sulfur compounds

PHOTOS OF LOCATION and MINERALS

Secondary Shaft

This vertical shaft is just to the right of the hoist shown above. It is lined with a corrigated steel pipe about four feet in diameter. Many years ago, metal rails afforded easy access; they have since been removed to discourage entry.

Primary Shaft

The main entry is a steep inclined shaft. It extends for several hundred feet under the hoist.

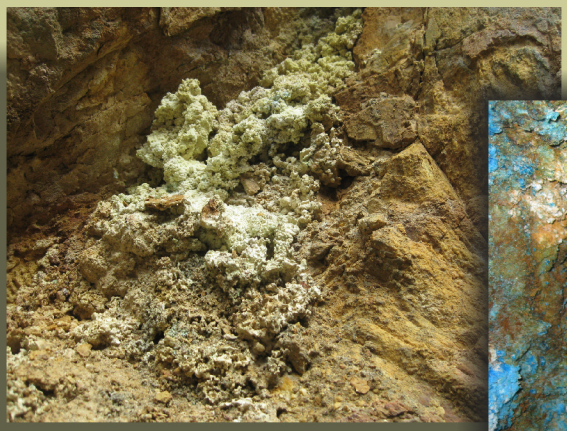
Throat of the Beast

The secondary shaft is about twenty-five feet deep. At the bottom, workings start at the 12-o'clock position, extend more than thirty yards into the deposit, then gophering and stoping continued throughout the mineralized zone.

PHOTOS OF MINES and MINERALS

The trench near the main shaft of the Antler Mine is excavated in a quartzofeldspathic schist heavily stained by oxidized copper minerals. Workings extend about forty yards into the formation.

Efflorescent minerals still forming at the Antler Mine and environs include copiapite, chalcanthite, and minimal malachite (shown below, left to right), plus halotrichite, magnesiocopiapite, melanterite, boothite, chalcocyanite, and botryogen.



PHOTOS OF MINES and MINERALS

X 104 D
Botryogen
2.5" x 1.5" x 1.5"

X 72 C
Halotrichite
5.5" x 4"

X 103 C
Copiapite
3.25" x 2.75"

X 51 D
Gypsum
2.25" x 1.25"

X 44 Cb
Pisanite
3.5" x 2" x 1.5"

X 43 D
Chalcocyanite
3.25" x 2"

X 114 D
Chalcanthite
1.5" x 1.25" x .58"

X 42 D
Boothite
2.75" x 2.25"

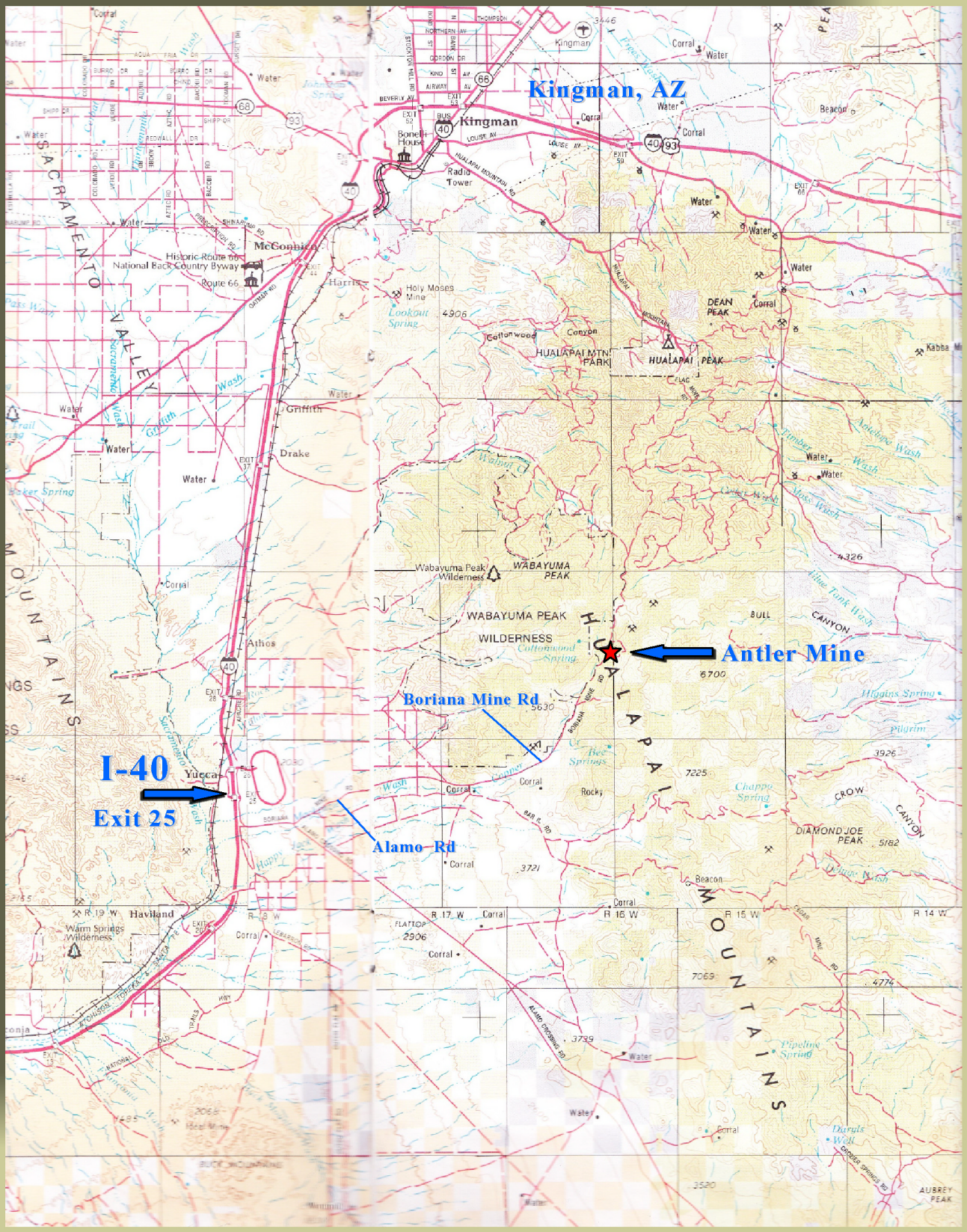
X 62 D
Antlerite
1.75" x 1.25"

XX 31 D
Anthophyllite
2.75" x 1.75" x 2.75"

XX 69 D
Cummingtonite
2.25" x 1.63" x 1.75"

A visitor to the Antler Mine can expect to find at least some of these minerals.
All specimens from the G. Miles Lehman Collection

TOPOGRAPHIC MAP



This is a scan from the *Arizona Atlas & Gazetteer* showing the mines in the Hualapai District in the Hualapai Mountain Range south of Kingman, Arizona.

View of Workings

Aerial view of the Antler Mine on the foothills of the Hualapai Mountain Range south of Kingman AZ.