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ECONOMIC GEOLOGY EVALUATION  
OF THE GAZELLE AND ANTELOPE  
PROPERTIES, CROWN KING AREA,  
YAVAPAI CO., ARIZONA

For:

Bruce A. Bouley  
Chief Geologist  
Callahan Mining Corp.

By:

Don C. White C.P.G.  
Sept. 29, 1988

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## SUMMARY

The Gazelle-Tiger vein is thought to be a Tertiary epigenetic system crossing both Precambrian Spud Mtn. metavolcanics and metasediments and extending in to a Cretaceous granitic batholith. The Tiger Mine, within the granodiorite, produced silver, gold, copper, lead, and zinc from a quartz vein laced with pyrite, chalcopryite, sphalerite, galena, and tetrahedrite. The Hammond-Riggs Mine, on strike between the Tiger and Gazelle, has grades of .035 oz/t Au, 5.0 oz/t Ag, 1% Cu, 3% Pb, and 5% Zn over five feet. This is the best data available for guesstimating the Gazelle vein's potential grade. Surface assays on the Gazelle support these numbers.

Orebodies within the Gazelle would likely occur as raking shoots up to 5 feet thick, 400 feet wide, and 1,000 feet long. They would be unlikely to exceed 100,000 tons apiece with a more probably figure being 20,000 tons. Even several of these together would probably total only about 100,000 tons. Such targets are not likely economically viable.

The Antelope system is probably a Precambrian submarine exhalitive chemical sedimentary pile. It contains about 0.03 oz/t Au and 0.5 oz/t Ag over a twenty five foot thickness. It is associated with abundant magnetite, clusters and disseminations of pyrite and chalcopryite, and some extra siliceousness. The low grade coupled with inability to track the system along strike discourage further effort on that target.

In short, the submittal does not warrant further investigation.

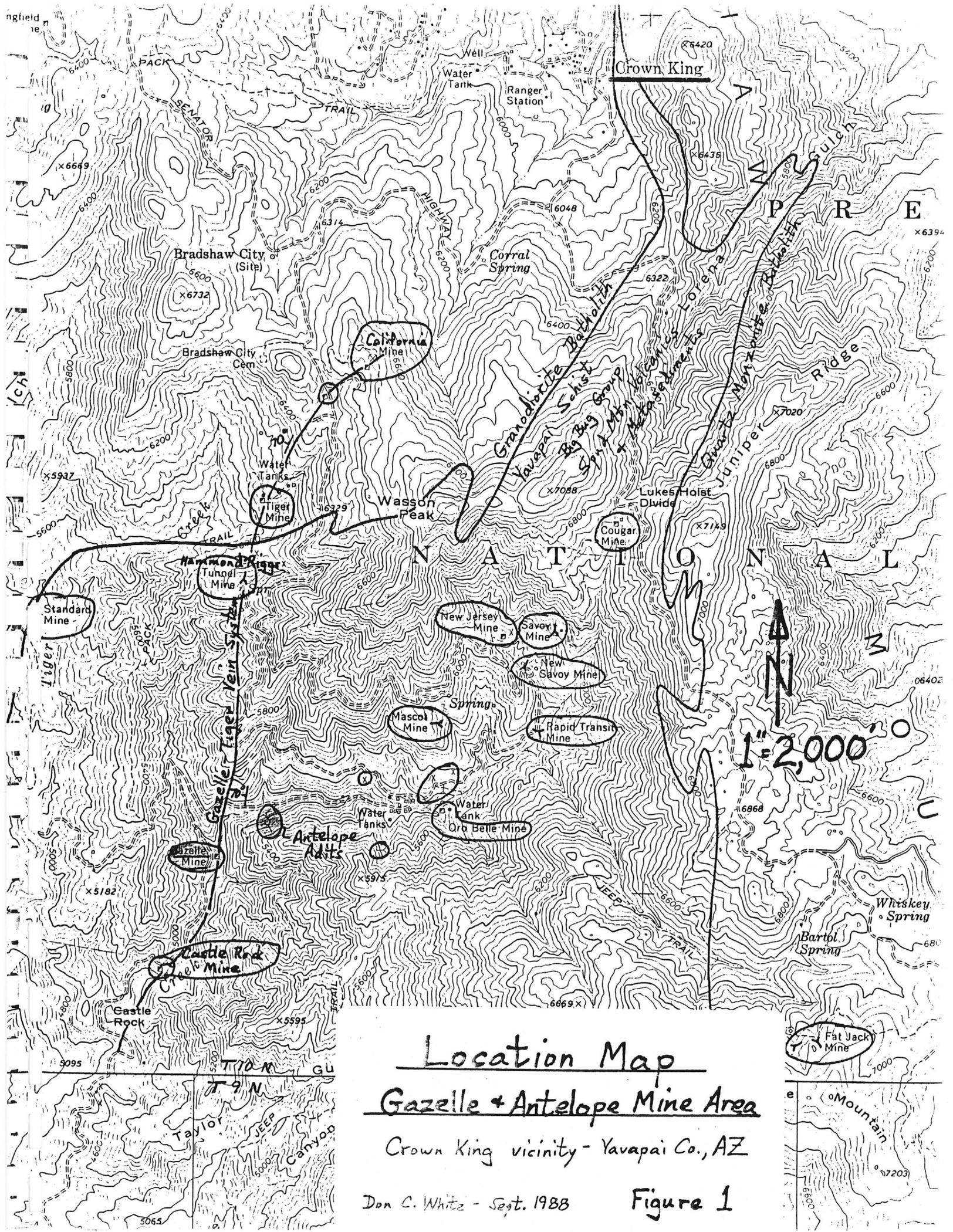
## INTRODUCTION

The Gazelle and Antelope properties were submitted to Callahan Mining Corp. for their evaluation and exploration. The Karry family own both patented and unpatented claims in the area. There are several prospects and workings on the property though none has had any documented production.

Bruce Bouley, chief geologist for Callahan, requested that I review the data available, walk out the property, and sample and map anything appropriate. He wished in particular to look for any sign of strike continuity of the Gazelle vein and the Antelope chemical exhalitive lithologies and any signs that either one could contain thicker zones of mineralization. Four days were spent on site doing exactly that. Considerable help was provided by Randy Karry who studied geology at Northern Arizona University and had many records which I was able to borrow and study. He also provided use of his cabin on the property.

## LOCATION AND ACCESS

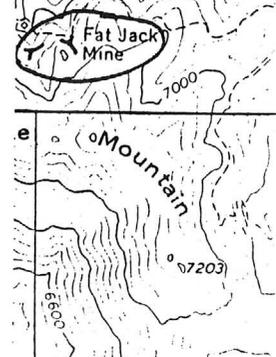
The property is about three miles southwest of Crown King in the central Bradshaw Mtns. of Yavapai County, Arizona. It is within a mile west of the OroBelle Mine and a mile south of the Tiger Mine. It is reached by unimproved dirt roads with numerous fords. Washouts and landslides on the steep grades render the road passable only by four-wheel drive much of the year. Heavy snows accumulate at the 5,000 to 6,000 foot elevations that prevail. Exploration drilling would likely require a track-mounted rig and much dozer work for drill roads.



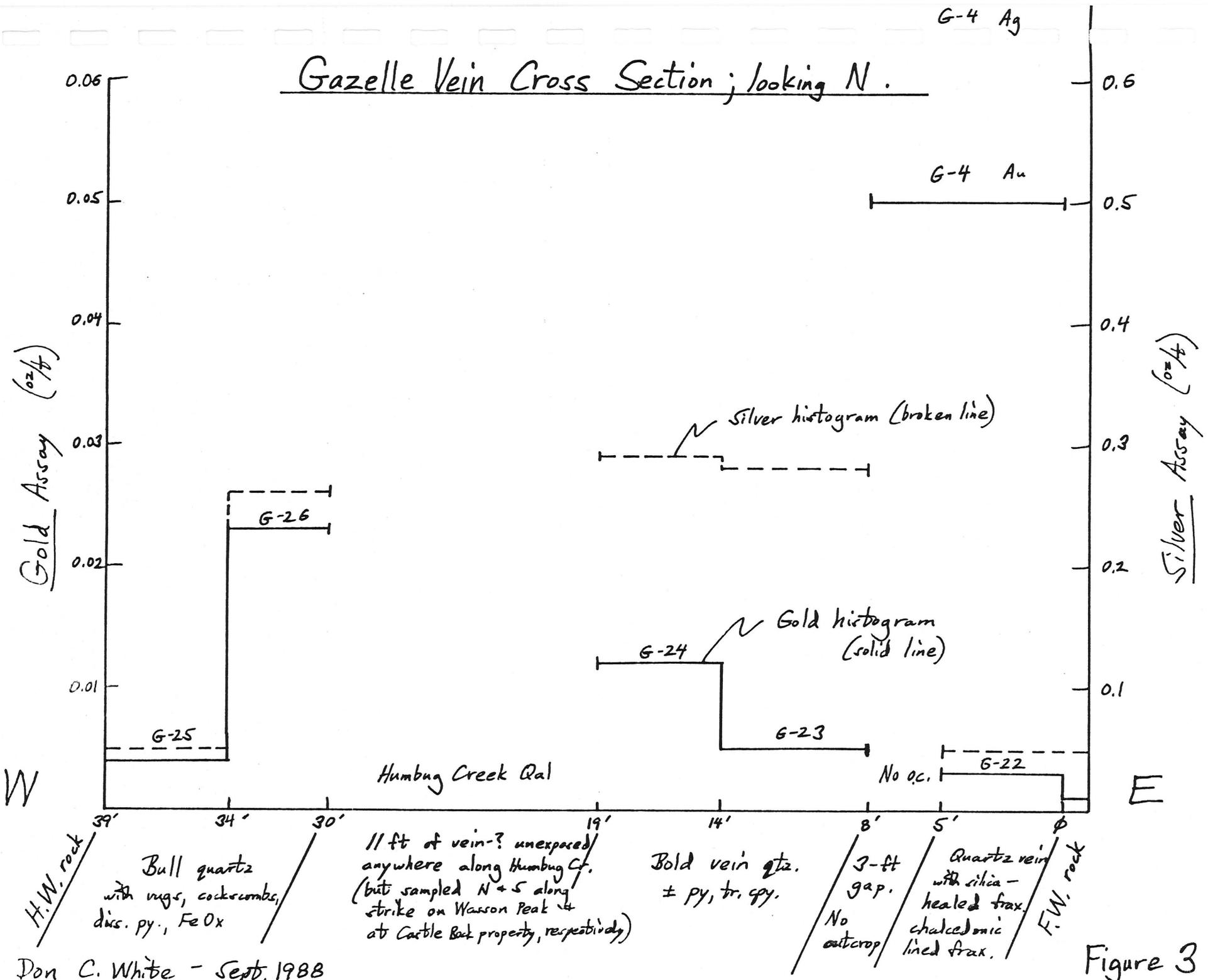
Location Map  
Gazelle + Antelope Mine Area  
 Crown King vicinity - Yavapai Co., AZ

Don C. White - Sept. 1988

Figure 1



# Gazelle Vein Cross Section; looking N.



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Figure 3

Upper Antelope Adit Cross Section; Looking W  
(at face of dozer cut)

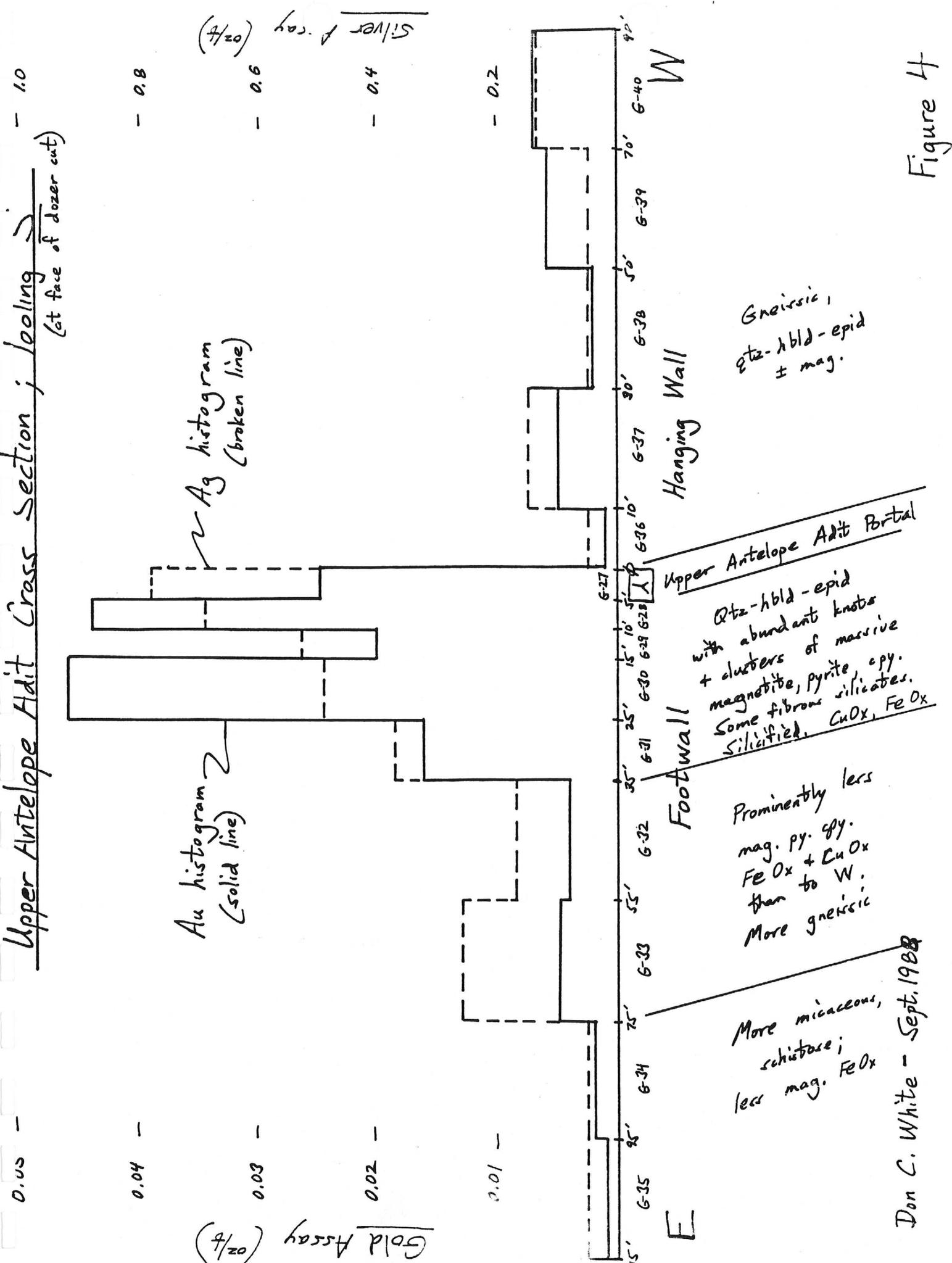


Figure 4

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TABLE I

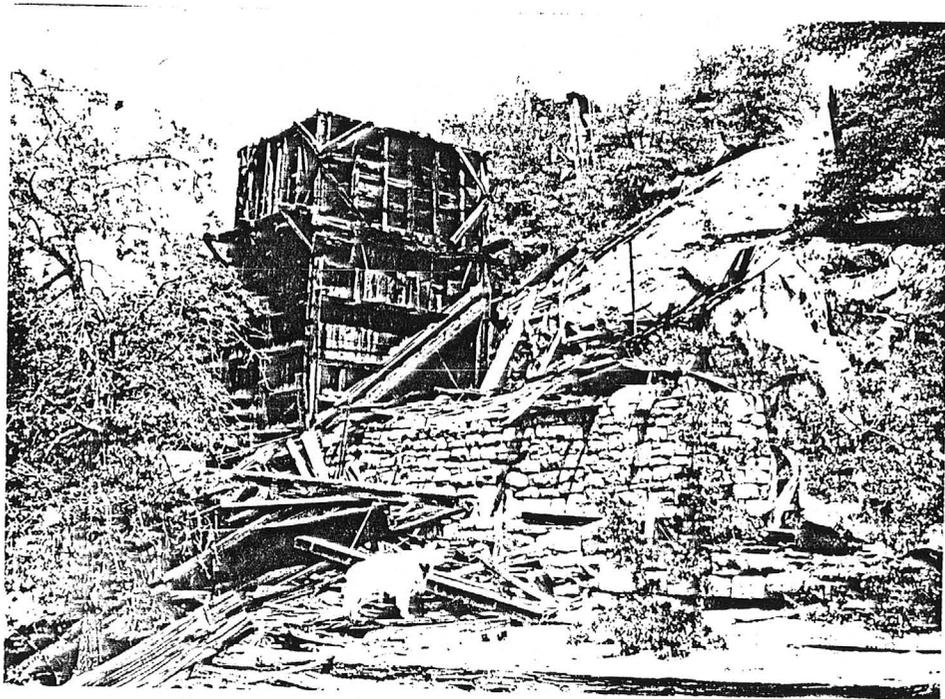
Compilation of Assays from the Hammond-Riggs (Tunnel) Mine\*

<u>Corner, D.C., Undated (pre-1943)</u>		<u>1" = 20' plan with channel samples.</u>						
		<u>Thickness</u>	<u>Au</u>	<u>Ag</u>	<u>Cu</u>	<u>Pb</u>	<u>Zn</u>	<u>Fe</u>
Arg. of 75' drift (12 channels wall to wall)		4.3'	.04	5.5	0.7	4.3	7.4	~5
Arg. of 35' drift (7 channels)		4.7'	.03	4.4	1.4	2.5	4.3	~5
Arg. of 40' drift (7 channels)		6.5	.05	6.5	1.1	1.3	2.0	~10
Overall average; 151' drift (26 channels, wtd. by footage)		5.0	.040	5.5	1.0	3.0	5.2	~6.
<u>Mammoth St. Anthony Mining &amp; Dev. Co.</u> 1938-39 sampling (64 channels over ~280' drift)		4.8	.031	4.5	1.1	2.8	5.2	—
Overall average of above figures (Rounded for Gazelle extrapolation)		5.0	.035	5.0	1.0	3.0	5.0	~6

\* Hammond-Riggs Mine assays are the best documented grades along the Gazelle-Tiger vein system and close enough to the Gazelle to be useful in predicting what the Gazelle could run in better mineralized zones. Both H-R and Gazelle are principally in the schist while the Tiger is granodiorite hosted.



Figures 5 and 6: Tiger Mine headframe and ore bin/mill foundation. Note granitic country rock.



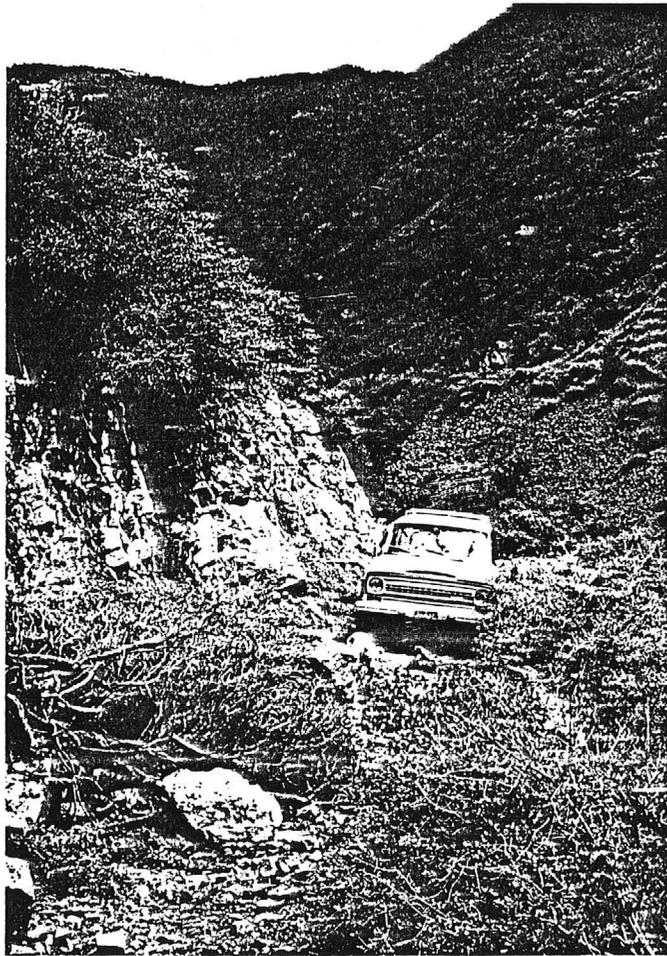


Figure 7: Roads to the Gazelle Mine area are steep, narrow, and subject to blockage as by this rain-induced rockfall on the author's first visit August 29, 1988. Lower Antelope adit on far hill, above Jeep.

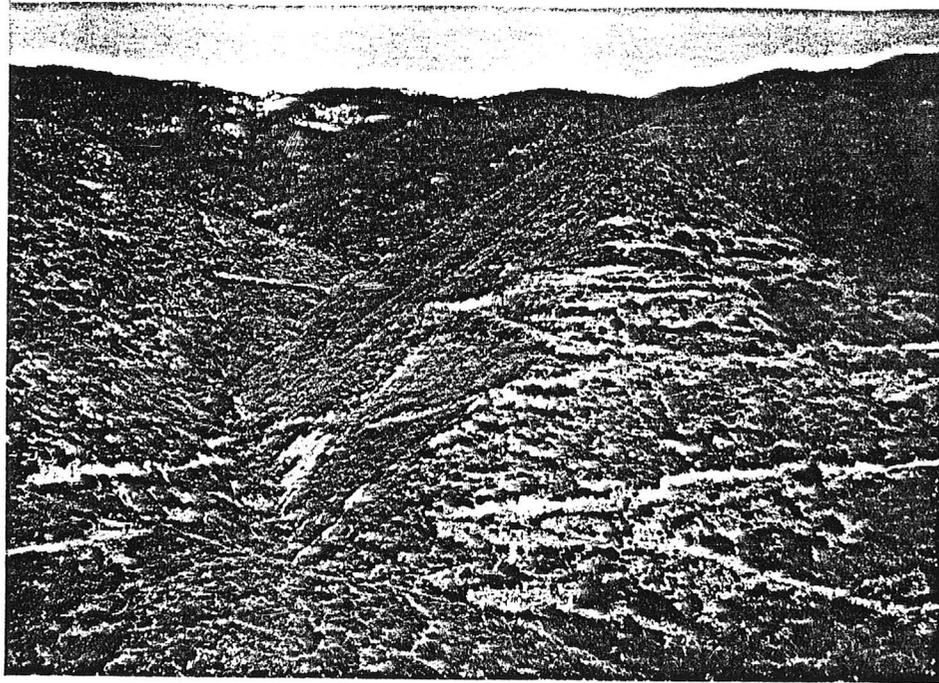


Figure 8: View E, up Humbug Creek to the OroBelle mine area near the pegmatitic batholith on the skyline, with zig-zag dozer cuts of the Antelope area closer right.



Figure 9: View S, looking down Humbug Creek along Gazelle Vein (in creek, lower right) to Karry's cabin with dozer cuts to Antelope adits (lower adit, lower left; upper adit, left center).

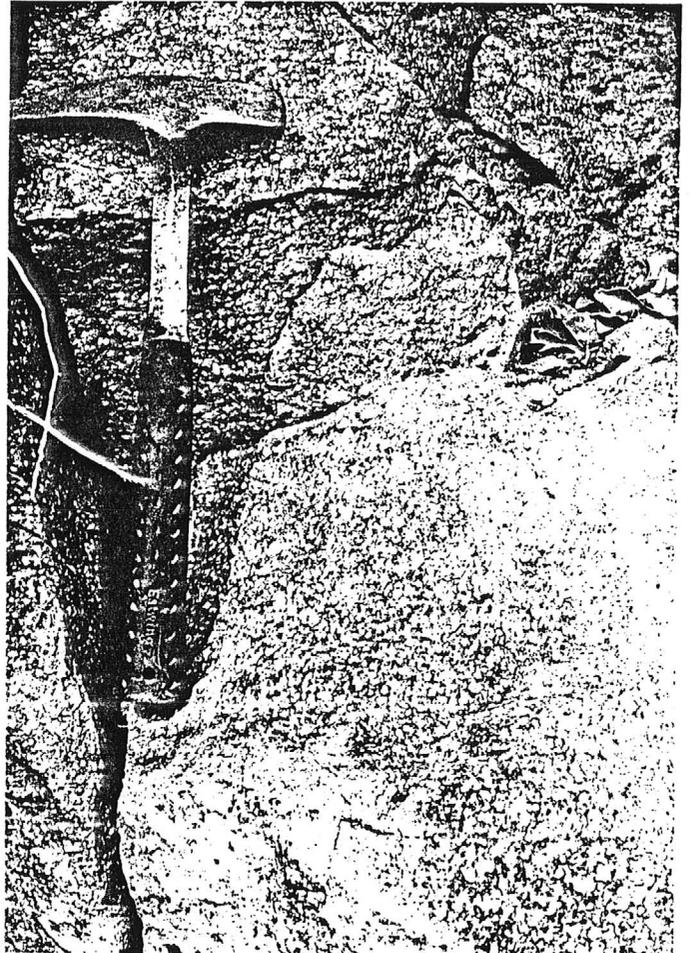
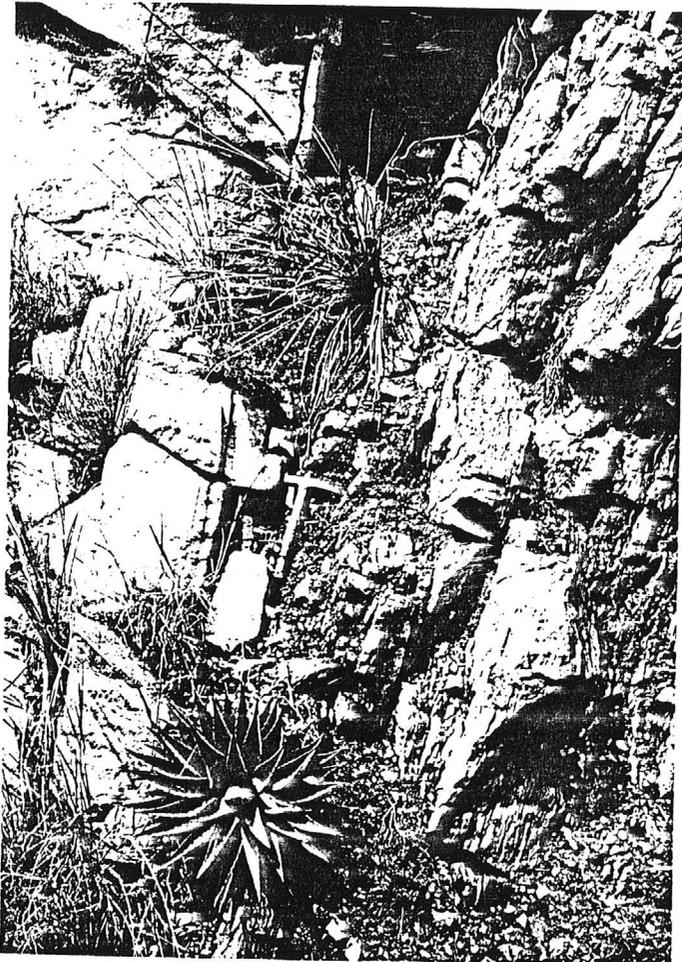


Figure 10 and 11: Gabbro dike showing conformable contact with Precambrian wall rock and close-up of fresh gabbro surface showing calcic plagioclase phenocrysts in a finer grained pyroxene-hornblende-biotite groundmass. Samples of the gabbro and wall rock all assayed 0.001 oz/t Au or less, indicating the dikes are not critical to the mineralization.

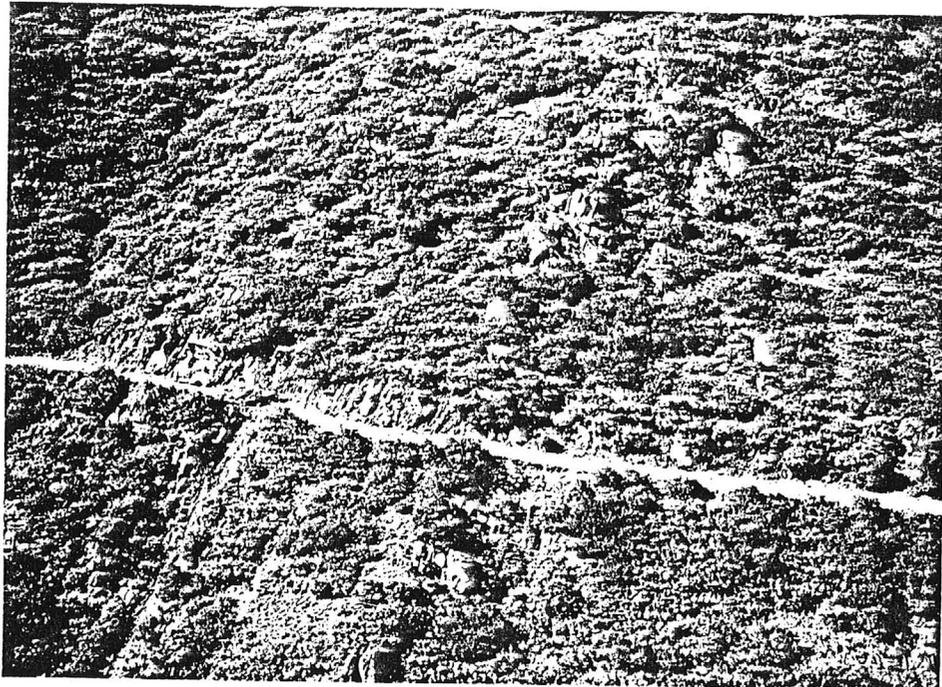
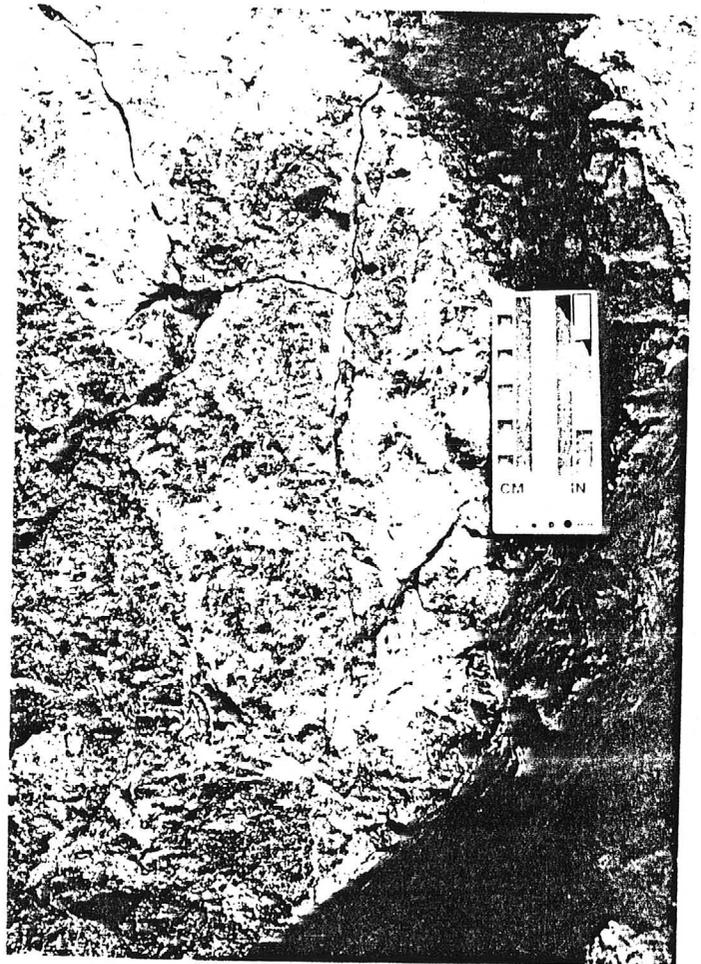
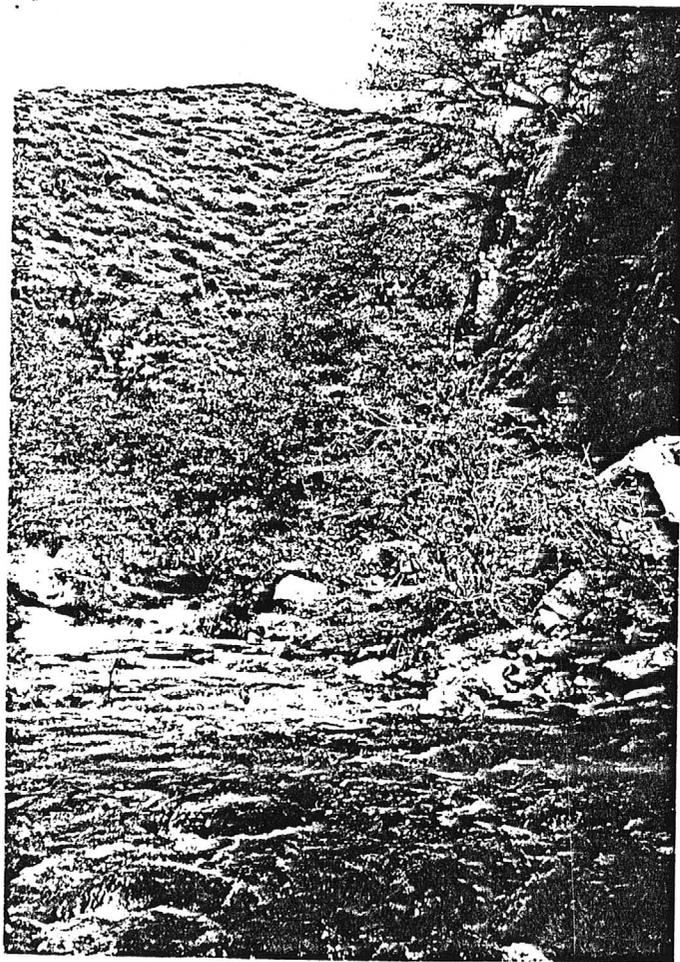


Figure 12: View N from the Antelope adit to the south slope of Wasson Peak revealing the steep westerly dip of the Precambrian bedded rocks, the more prominent exposures of two Cretaceous (?) gabbro dikes, and the trace of the Gazelle vein (swale in upper left).



Figure 13: Outcrop of Gazelle vein just above field of view in Figure 12. Note bold outcrop of nearly barren quartz over dog's head versus the poorly exposed iron-stained, gossanous, more precious-metal rich zone where the rock hammer lies. Quartz assays 0.006 oz/t Au, 0.3 oz/t Ag, Gossan (G-21) assays 0.04 oz/t Au, 3.7 oz/t Ag.



Figures 14 and 15: Gazelle Vein. Vein outcrops on both W and E sides of Humbug Creek and presumably underlies the creek (as seen in flood, above) for a total thickness of about 40 feet. A new exposure (site of sample G-1) blasted by the Karry family reveals fresh sphalerite, galena, pyrite, and chalcopyrite in white quartz. Samples there average 0.08 oz/t Au, 1.4 oz/t Ag, and visually estimated 5% Zn, 1% Pb, 0.5% Cu.



Figure 16: Upper adit of the Antelope claim exhibiting copper oxide stain coincident with iron oxides and abundant magnetite. A sample selected to maximize mag., py., cpy. assayed 0.07 oz/t Au, 2.3 oz/t Ag. Three 5-foot channels and a 10-foot channel yield 25 feet overall at 0.03 oz/t Au, 0.5 oz/t Ag, with limit corresponding to the field of this photo.

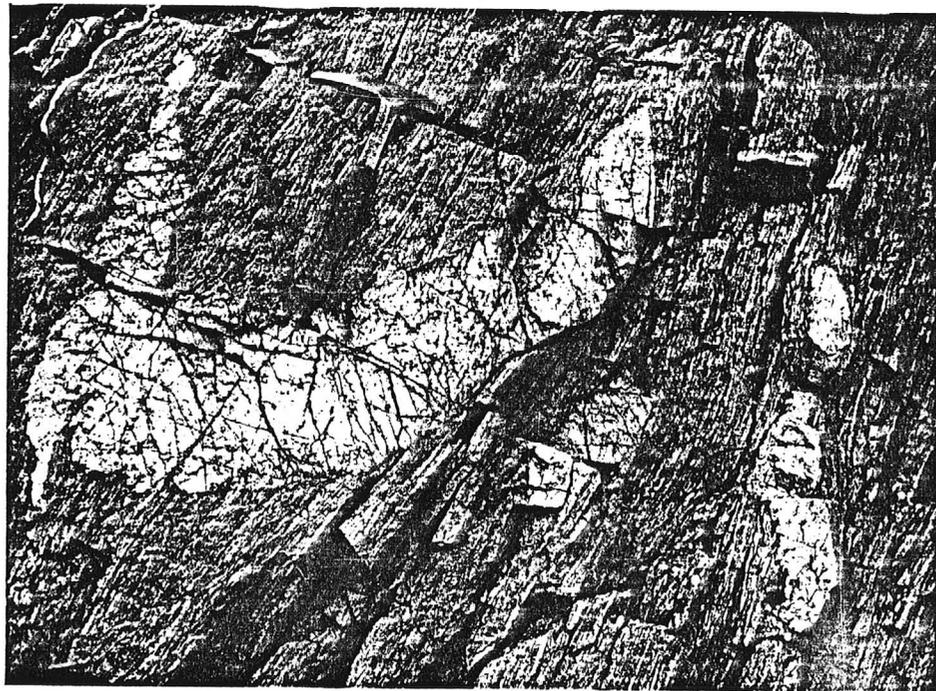


Figure 17: Typical example of quartz lenses demonstrating extreme deformation (boudinage, multiple direction folding) within an otherwise apparently undisturbed bedding sequence. Orebody geometries would more likely mimic the quartz lenses.

## HISTORY

The Crown King mining camp is famous for its small, sometimes high grade precious metal mines. Nearly all are steeply dipping, siliceous, sulfidic, base-metal-related vein systems. They produced from the 1880's to 1943. Some have seen renewed exploration and small production though generally only from dumps and tailings. The lodes are plagued with problems of thinness, lack of continuity, and erratic grades.

The abundant patented mining claims in the district are gradually being developed for real estate to meet the demand for summer residences. Crown King is increasingly such a summer community. In fact, the Karry's are apparently considering the real estate option if mineral ventures can't be consummated soon.

## PREVIOUS WORK

The Gazelle shaft was sunk to a reported depth of 200 feet. It is in the hanging wall and probably hits the 70° west dipping vein at about that depth. Quartz with sulfides on the dumps is evidence of drifting or crosscutting of the vein. The shaft is now caved within forty feet of surface in alluvium. Other workings along strike of the Gazelle include abundant prospect pits and an old caved adit at the right angle bend in Humbug Creek on the vein.

To the north is the Hammond-Riggs (Tunnel) Mine and then the Tiger Mine. To the south is the Castle Rock Mine. All three of these mines had shafts, adits, and drifts on the vein. Only the Tiger, however, had any significant production. More on that in the discussion of economic geology.

The Antelope property (unpatented) east of the Gazelle, has two adits with short, open drifts. The age of those efforts is not known though the timber at the upper adit looks to be post-WWII. That matches the clearly less than 20-year old dozer cuts zig-zagging the hillside to and above the adits.

The Karrys have submitted the properties to several other exploration groups recently. Superficial geochemical sampling has been done by Homestake (Richard Kern), and Phelps Dodge (Jon DuHamel) from whom we have assays only. Inspiration, through their gold subsidiary (WestGold) had Ed Speer look at the Wildflower group of claims northwest of Crown King. His report is included in the appendix to this report.

No evidence could be found of any exploration drilling ever having been attempted.

## REGIONAL GEOLOGY

The Gazelle-Antelope area lies within a several mile long wedge of Yavapai Schist between likely Cretaceous age granitic batholiths (figure 1). The schists are probably part of the Big Bug Group and, more specifically, the Spud Mtn. Volcanics which I believe may be as much metasediments as metavolcanics in this area.

The schists are NNE striking and steeply dipping, generally 60°-80° to the west. They are cut by grossly conformable fissure veins of quartz, often

sulfidic and precious-metal containing. The veins seem to be related to the latest stage Cretaceous or more likely Tertiary epigenetic activity as they cross schists and granites alike, as exemplified by the Gazelle-Tiger vein.

### METAMORPHISM AND DEFORMATION

The entire Precambrian metavolcanic/metasedimentary sequence has suffered at least lower amphibolite grade metamorphism. Much of the sequence displays a nearly gneissic black and white banded quartz-hornblende-feldspar-epidote mineralogy. Accessories are calcite, magnetite, sulfides, and some fibrous silicate minerals. Where these accessories are most abundant the chemistry and stratigraphy are suggestive of a submarine chemical exhalative environment. This is the case at the Antelope adits.

While the overall bedding and foliation are N5°-25E, 60°-80°W, interbedded quartz lenses of Precambrian age are deformed in bizarre fashions such as that in figure 17. Polyphase deformation is quite apparent in the more competent or competency-contrasting units. Any Precambrian age orebodies would likely have similarly distorted geometries.

The Tertiary veins however, are fairly planar. The Gazelle-Tiger system seems to hold its stratigraphic position remarkably well. This applies even where the vein crosses the contact from schists to granitic plutons. Maps of the underground workings at the Hammond-Riggs Mine, straddling that contact, indicate an absence of influence of country rock on vein attitude.

There are no recognized major fault offsets to any of the units examined. High angle structures are curiously absent for an area of such plutonic activity. Some nearly flat faults are evident in the dozer cuts of the Antelope area but offsets are generally less than one foot.

### ECONOMIC GEOLOGY

The Gazelle vein seems both structurally and mineralogically tied to the Tiger vein with the Hammond-Riggs Mine between them. Thus assay data available from the Hammond-Riggs may be used as a fair indicator of what may be expected on the Gazelle. Mineralization there, like the Tiger, was mainly pyrite, chalcopyrite, sphalerite, galena, and tetrahedrite as disseminated grains within quartz. The quartz was white, locally drusy and chalcedonic, and up to several feet thick. The Tiger was up to twenty feet thick but that zone with paying grades was rarely over five feet thick. Three separate sampling studies of the Hammond-Riggs, each comprehensive, yield very similar figures to that of the Tiger. Table I summarizes that data, concluding that about five feet at .035 oz/t Au, 5.0 oz/t Ag, 1% Cu, 3% Pb, and 5% Zn is what occurs there and could be expected for certain other sectors of the Gazelle vein. That is about .12 oz/t Au equivalent with 8% combined base metals and would have gross contained metal value of about \$140./ton at today's prices.

The newly blasted exposure within the Gazelle vein, sampled at G-1 (figures 14 and 15) displays very nearly the same assemblage though higher in gold and lower in silver. Were the Hammond-Riggs producing today it would be considered a zinc-silver-copper-lead-gold mine, in order of economic significance. The Gazelle might be a zinc-gold-copper-lead-silver mine, for comparison, if sample G-1 is any indication.

The presumption is that these grades could persist to substantial depths since they seem to be primary sulfide-hosted, and unoxidized ores. A note of caution is in order, however. My own sampling indicates that iron oxides in this environment are very effective scavengers of gold and silver. Samples G-2 and G-15 (figure 13) are graphic examples of this. Very high (.23 to .61 oz/t respectively) gold grades occur in these gossan samples along with multi-ounce silver. Underlying, less oxidized rock assays only a few percent of its corresponding gossan. Such gossans are only superficial with unoxidized sulfides at shallow depth in the tight quartz. Lindgren (1926, attached in appendix) noted that the Tiger vein yielded very much higher grades from oxidized ore ("much of it containing \$100 to the ton") while grades at depth were a small fraction of that.

In addition to oxidation enrichment near surface, Buchanan's Oatman-type epithermal model would suggest a likely increase in base metals at the expense of precious metals with depth in these systems. For these reasons conjecture on down-dip grades and dimension is risky.

The Crown King Mine is another similar deposit, at least structurally and in age, to the Gazelle-Tiger system. Documentation of ore shoot dimensions there allow guesstimates for the Gazelle-Tiger. Crown King Mine ore shoots, mainly in the oxidized zone, were 200 to 400 feet wide, 500 to 1,000 feet long (plunge dimensions) and if we use 5 feet thick as the likely Gazelle thickness, then 35,000 to 140,000 ton ore shoots could be conjectured. That is on the optimistic side based upon analogy to the largest producer in the district.

WestGold's analysis of the Wildflower property (Speer, 1988, attached as appendix) northwest of Crown King may be closer to the mark in terms of probabilities. He envisions no more than 20,000 ton bodies at maximum five-foot thickness.

The Antelope system, interpreted to be Precambrian and syngenetic, is much lower grade than the Gazelle. Antelope precious metal values for 25-foot thickness are 0.03 oz/t Au, 0.5 oz/t Ag and no significant or recoverable base metals. Such grades are far from economic in this setting. Were they open pitable it may be worth consideration but with steep dip and steep topography that is hopeless.

Furthermore, the Antelope system, unlike the Gazelle, is not traceable along strike. The magnetite dies out promptly to N and S along strike. So too does the copper oxide stain, iron oxide abundance, and the siliceousness and carbonates. In brief, the Antelope adit area seems to be unique. It appears to have little exploration potential along strike and grades at the surface give inadequate encouragement to go subsurface by drilling.

#### INTERPRETED POTENTIAL

The Tertiary vein target of the Gazelle vein is limited mainly by mineralized thickness of five feet. Given the likelihood of raking ore shoots, only a few tens of thousands of tons per ore shoot are likely and no more than five ore shoots within the Gazelle strike length. An inferred total reserve would be 100,000 tons at .04 oz/t Au, 5.0 oz/t Ag, 1% Cu, 3% Pb, 5% Zn with considerable pyrite. Such ore would not be amenable to cyanidation. A mill would be required or direct shipping.

Such grades and tonnages preclude shaft sinking. If underground mining were viable at all it would be by horizontal haulage. Adit elevation at Humbug

Creek would limit exploration of the Gazelle to that sector of the vein from the old adit at the bend in Humbug Creek (N of Karry's cabin, site of old caved adit) northward to the limits of the property or property that could be acquired. With acquisitions that could allow extension beneath the old Hammond-Riggs and Tiger workings. Mineable orebody height would be limited by elevation difference between surface and adit levels, only a few hundred feet.

The Precambrian target of the Antelope exhalite has very low grade gold and silver (.03 and 0.5 oz/t, respectively) and virtually no base metals. The lack of strike extension on the Antelope is frustrating. The limited surface exposures and low metal grades coupled with the absence of strike extent and steep dip within steep topography discourage drilling. Any drill target there would be blind and deep.

I can not recommend either the Gazelle or Antelope as likely attractive exploration plays. They are too small, too low grade, and not very favorably located.

If, however, the Gazelle vein grades and tonnages postulated are attractive enough for your consideration, I would be happy to compile longitudinal sections of the Combined Tiger, Hammond-Riggs, and Gazelle data and formulate a drilling plan to test the most likely targets.



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Don C. White, C.P.G.  
September 29, 1988

DW:sk

## REFERENCES

- Anonymous, 1913-1916; uncredited newspaper clipping from the local papers archived at the Sharlot Hall library, Prescott, AZ.
- Brown, B.W., 1944; Castle Rock mine field engineer's report; unpublished memo on 1943 site visits and assays for the AZ Dept. of Mines and Mineral Resources, 2 p., April, 1944.
- Corner, D.C., No date (pre-1943) Assay plan, south portion of Tiger Mine. 1"=20'.
- Cuniff, Bernard, 1905; The Castle Rock property, unpublished report, 7 p., Jan. 1905.
- Guiteras, Jos. R, 1936; Gold Mining and milling in the Black Canyon area, Yavapai Co., AZ; U.S. Bur. of Mines Information Circular (I.C.) 6905 p. 39-43, Nov. 1936.
- Lindgren, Waldemar, 1926; Ore deposits of the Jerome and Bradshaw Mtns. Quads., AZ. U.S. Geological Survey Bulletin 782, p. 44, 172-175.
- Speer, Wade E. (Ed), 1988; Wildflower Mine. Unpublished property examination report for WestGold. Outline format, 3 p. plus figures and assay listings. March 7, 1988.
- Sund, J. Olaf, 1966; Castle Rock Gold Co. Unpublished memo on a property examination for Shattuck Denn Mining Corp., 1 p., May 9, 1966.

TABLE II

Gazelle and Antelope Properties  
Sample descriptions and assays

(Also see sample location map, figure 2)

<u>Sample #</u>	<u>Description</u>	<u>Fire assay ± AA</u>	
		<u>Au (oz/t)</u>	<u>Ag (oz/t)</u>
G-1 thru G-4	Gazelle vein about 500 ft. N. of Karry cabin, E. Bank of Humbug Creek, newly blasted outcrop. See figures 14 and 15 (photos).		
G-1	Vein N10°E 70°W. Selected for abundant sphalerite, pyrite, chalcopyrite, galena in white and translucent gray quartz. Some beige bands of crosscutting barren quartz. Brecciation and silica healing very apparent.	.084	1.44
G-2	Same site as G-1; selected for total oxidation; gossanous, light weight, porous, heavily iron stained.	.611	1.97
G-3	1-foot of wall rock E of Gazelle vein at site of G-1, 2. Exhibits some brecciation (vein emplacement related or later - ?) and gouge, argillic and silicification.	.001	<.10
G-4	8-foot continuous chip sample at G-1,2 site with every effort to be representative of the whole.	.050	.67
G-5 thru G-11	Sequence along the N side of the OroBelle-Gazelle road on the S. face of Wasson Peak, straddling the gabbro sills to test for dike-related mineralization or metal enrichment. W sill is 20' thick. Main sill about 75' thick. Sill separated by 110'. Wall rocks exhibit some hornfelsing and silification. See photos, figures 10, 11, 12.		
G-5	15 ft of HW rock W of W. sill	.001	<.10
G-6	20 ft body of W. sill	.001	<.10
G-7	15 ft of F.W. rock E of W sill	<.001	<.10
G-8	10 ft of HW rock W of main sill	<.001	<.10
G-9	10 ft of main sill against HW	<.001	<.10
G-10	10 ft of main sill against FW	<.001	<.10
G-11	10 ft F.W. rock E of main sill	<.001	<.10

Sample #	Description	Fire assay ± AA	
		Au (oz/t)	Ag (oz/t)
G-12 thru G-18	All Antelope upper adit area and highest dozer cut above upper adit.		
G-12	Selected for maximum magnetite, pyrite, and chalcopryrite in first 25 ft E of (F.W. to) upper adit. See photo, figure 16.	.072	2.29
G-13	Selected for maximum silica (several quartz varieties) same area as G-12.	< .001	< .10
G-14	Selected to maximize black and white amphibole/hornblende-rich rock plus epidote, calcite, some py, cpy.	< .001	< .10
G-15	Selected for most gossanous, light weight, iron stained debris/float from above upper Antelope adit.	.234	3.66
G-16	Upper-most dozer cut, about 40 feet above upper Antelope adit, on strike with adit. 2-ft saccharoidal quartz o.c. with fine, anastomosing black magnetite bands thruout (some straight, both conformable and cross-cutting, others swirly and nebulous).	.008	.17
G-17	5 ft. grab of very carbonate (calcite) rich exhalite (?) about 20 ft W of G-16.	.006	.10
G-18	5 ft thick sample from even thicker (about 20 ft - ?) reddish, slightly magnetic siliceous exhalite W of and adjacent to G-17.	.007	< .10
G-19 thru G-21	Gazelle vein samples taken between the two sectors of the Crown King Rd. N on S slope Wassan Peak.		
G-19	10 ft. cont. rock chips from o.c. of vein about 400 ft. below "upper cattle guard." W contact exposed, E contact concealed. Vein attitude N5°E, 60°W. Mostly wt. qtz., some cockscombed, some chalcedonic qtz lining youngest frax. Jarosite stained. Site of Homestake's A1 tag #2052 (.003/.28).	.009	.44
G-20	About 600 ft below upper cattle guard. 10 ft cont. rock chips from HW (W) portion of vein, here N20°E, 60°W. More chocolate brown, accretionary chalcedony than G-19. Sample excludes gossan of G-21 following. Site of Homestake's A1 tag #2053 (.001/1.08).	.006	.31
G-21	2-ft channel of soft brown, gossan (earthy, porous) from E end of G-20 to limit of digging ability (probably extends further beneath slope debris). Presumably a weathered sulfidic core or lense within the more siliceous vein.	.040	3.69

<u>Sample #</u>	<u>Description</u>	<u>Fire Assay ± AA</u>	
		<u>Au (oz/t)</u>	<u>Ag (oz/t)</u>
G-22 thru G-24	Sequence of 3 continuous rock chip samples from E (FW) contact to mid-vein (limit of outcrop) on E side Humbug Creek about 800 feet N of Karry's cabin. (See histogram, figure 3).		
G-22	5 ft E-most edge of vein, including 2 ft gossanous/earthy zone against country rock and 3 ft siliceous and chalcedonic zone with dogtooth-calcite lined vugs.	.003	<.10
G-23	6 ft continuous rock chips mid-vein, W of G-22 with 3 ft gap not sampled for lack of outcrop. Bold quartz with much iron stain.	.005	.28
G-24	5 ft. sample of vein qtz with up to 5% fresh pyrite (trace cpy). W end is limit of outcrop in creek.	.012	.29
G-25, 26	W. bank of Humbug Cr., opposite G-1 to 4 samples, still within Gazelle Vein. (See histogram, figure 3)		
G-25	5 ft. cont. rock chips from W (HW) contact. Bull quartz with vugs, cockscombs, disseminated py, FeOx stain.	.004	<.10
G-26	4 ft chips from G-25 to limit of outcrop in creek. Same qtz lithology as G-25.	.023	.26
G-27 thru G-40	Upper Antelope adit area. Sequence of samples from dozer x-cut. Sample G-27 corresponds to the 5 ft width of the adit portal, G-28 thru 35 are sequentially to the E and G-36 thru 40 are sequentially to the W, as plotted in figure 3.		
G-27	5 ft corresponding to adit width. Taken over the portal, rib-to-rib. Qtz-hbld-epid-mag. Silicified, oxidized. Knots and clusters of fresh pyrite and fibrous silicates (actinolite, tremolite, anthophyllite). Abundant FeOx, CuOx.	.025	.78
G-28	5 ft. Similar lithology to G-27 though more black, sooty magnetite, white calcite, fresh py and cpy.	.044	.69
G-29	5 ft same lithology.	.020	.53
G-30	10 ft. Same as G-27-29. W extreme is 3 inches semi-massive pyrite in silica.	.046	.49
G-31	Same as G-27-30.	.016	.37
G-32	20 ft. Prominently less FeOx than to W. Mag. and py still occur as clusters and disseminated grains with some CuOx.	.004	.17

<u>Sample #</u>	<u>Description</u>	Fire Assay ± AA	
		Au (oz/t)	Ag (oz/t)
G-33	20 ft, same as G-32	.005	.26
G-34	20 ft, grading more micaceous and thus more schistose, also less magnetic.	.002	<.10
G-35	20 ft, same trend as G-34. Beyond is another 200 ft of dozer cut grading more rich in hblid and epid. More black and white, gneissic banding, more barren.	.001	<.10
G-36	First 10 ft W of adit. Considerable py, FeOx, CuOx.	.001	<.10
G-37 thru G-40	20 ft each; all qtz-hblid-epid-mag ± trace py, cpy, some FeOx, trace CuOx, Magnetite sometimes occurs as anastomosing siliceous veinlets.  Another 400 ft of the same to the W until the gabbro dike.	All .002-.007	<.10-.15
G-41	High-graded sulfidic and quartz-rich grab from the Gazelle shaft collar area dump. Shaft reportedly to 200 ft but now caved to within 40 ft of surface, all in alluvial boulders and cobbles. Dump exhibits abundant qtz with py, cpy, sph. and gal.	.024	.50
G-42	Castle Rock mine adit dump. Adit heads W into hillside W of Humbug Creek, E of road, probably intersects shaft with collar just S of road. Some brecciated qtz, with abundant cockscombs. Seams of py, trace sph, gal.	.058	3.03

CONTENTS OF APPENDIX

Patented claim map

Assay reports

D. White for Callahan

A. Walkup for Callahan

R. Kern for Homestake

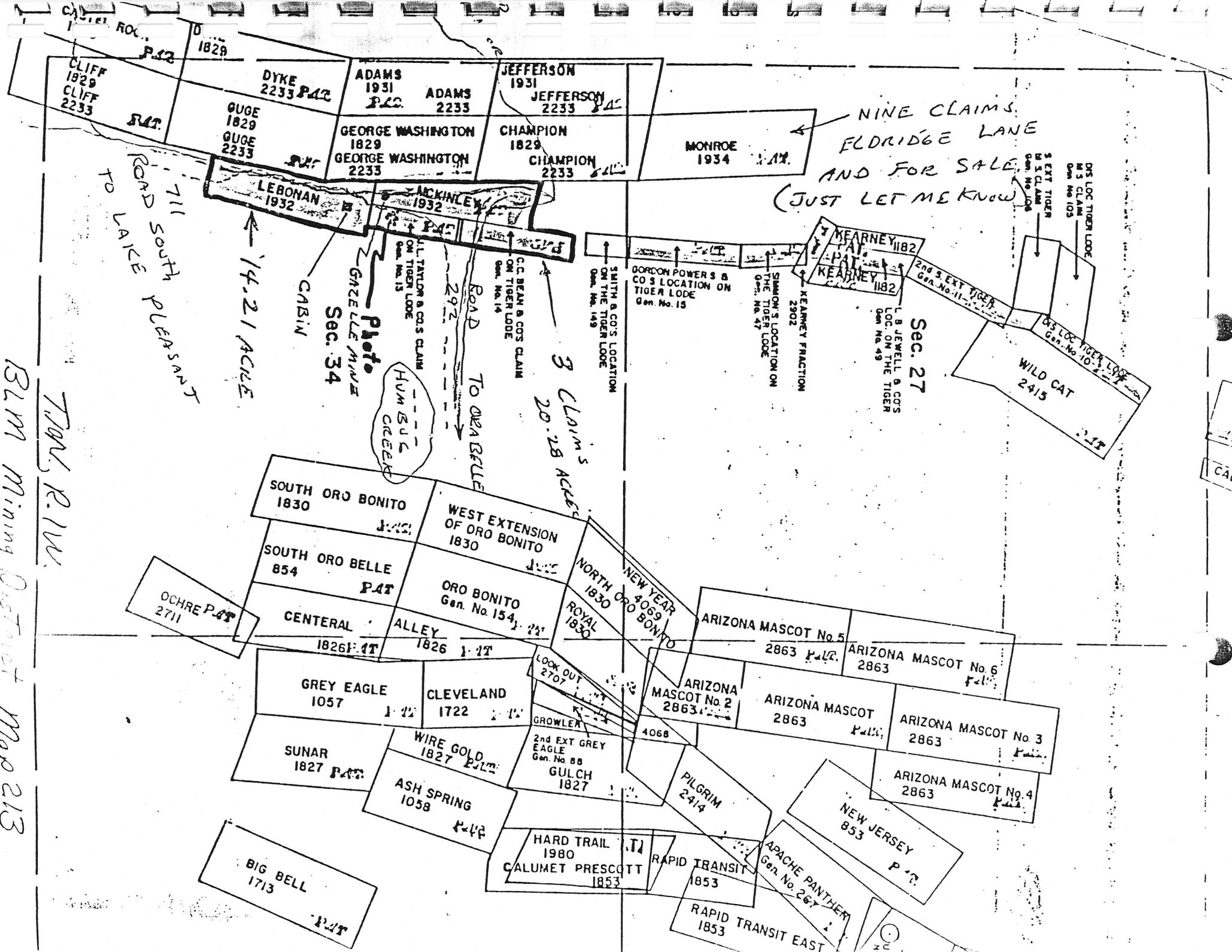
J. DuHamel for Phelps Dodge

Selected references

Guiteras, 1936

Lindgren, 1926

Speer, 1988



BLM Mining District Map 213

TRAVIS R. W.

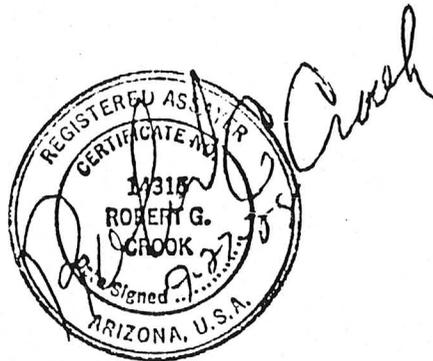
CALI





Client ID	Lab ID	FA/AA Au oz/ton	Fire Assay Ag oz/ton
MSC03034			
G-31	3034- 17	0.016	0.37
G-32	3034- 18	0.004	0.17
G-33	3034- 19	0.005	0.26
G-34	3034- 20	0.002	<.10
G-35	3034- 21	0.001	<.10
G-36	3034- 22	0.001	<.10
G-37	3034- 23	0.005	0.15
G-38	3034- 24	0.002	<.10
G-39	3034- 25	0.006	<.10
G-40	3034- 26	0.007	0.14
G-41	3034- 27	0.024	0.50
G-42	3034- 28	0.058	3.03

\* High results obtained by straight Fire Assay per B.Crook.



# IRON KING ASSAY INC.

Page 1

07-Jul-

LAB JOB #: MSC02736  
Client name: Callahan Mining Corp.  
Billing address: 1181 N. Tatum Blvd.  
Suite # 4055  
Phoenix, AZ 85028  
Phone number: (602) 953-5965

No. Samples: 5  
Date Received: 06-28-88  
Submitted by: A. Walkup

INVOICE ATTACHED

## ANALYTICAL REPORT

Client ID	Lab ID	Fire Assay		AA	Cu wt%	Pb wt%	Zn wt%
		Au oz/ton	Ag oz/ton				
MSC02736							
U.O.#1 - Tiger vein - upper outcrop	2736-	1	0.022	0.33	0.02	0.11	0.25
O.#2 Tiger vein - Lower outcrop	2736-	2	0.061	0.51	0.18	0.13	5.00
#2 - 10' Footwall Antelope (E)	2736-	3	0.012	0.16	0.80	<.01	0.03
#4 - 20' center "	2736-	4	0.013	0.15	0.50	<.01	0.01
20' Hanging wall " (W)	2736-	5	0.042	0.63	0.60	<.01	0.01



*Richard Kern*

REPORT OF ANALYSIS

Submitted by:

Date: October 14, 1987

HOMESTAKE MINING COMPANY  
330 CONEY ISLAND DRIVE  
SPARKS, NEVADA 89431

Laboratory number: 32025

Analytical Method: AA  
Fire AT

Your Order Number: 7709-1

Report on: 39 Samples, pulp

Sample Mark	Gold oz/ton	Silver oz/ton	Copper ppm	Lead ppm	Zinc ppm
52AP	0.003	0.28			
2053	0.001	1.08			
54	0.051	0.61			
2055	0.006	0.52			
56	0.102	1.04			
2057	0.001	0.11			
58	-0.001	0.65			
2059	0.006	0.75			
2060	0.001	0.19			
61	-0.001	2.23			
2062	-0.001	0.25			
53	-0.001	0.47			
2064	-0.001	0.12			
55	-0.001	0.13			
2066	-0.001	0.23			
57	0.125	0.16			
2068	-0.001	0.07			
59	0.009	0.64			
2070	-0.001	0.09			

*Tiger*

*Wild Flower*

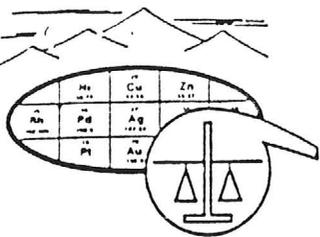
*Rosa Lea*

*Wooley*

*Hidden Treasure*

*Hootenpyle (St. Louise)*

*Wickenburg - Widner*



SKYLINE LABS, INC.  
 1775 W. Sahuaro Dr. • P.O. Box 50106  
 Tucson, Arizona 85703  
 (602) 622-4836

REPORT OF ANALYSIS

JOB NO. TEP 714  
 December 22, 1987  
 15188-15189  
 PAGE 1 OF 1

PHELPS DODGE CORPORATION  
 Western Exploration Office  
 P.O. Box 50427  
 Tucson, AZ 85703-1427

LOCATION:  
 COLUMBIA QUAD. 246  
 R. C. KARRY SUBMITTAL  
 ARIZONA

Analysis of 2 Pulp Samples

J. E. DuHAMEL

SPL DATE: 11-4-87

SAMPLE NUMBER	ITEM	SAMPLE NO.	FIRE ASSAY				
			Au (oz/t)	Ag (oz/t)	As (ppm)	Sb (ppm)	Cu (ppm)
ARRY 1	1	15188	.050	1.76	28.	85.	3900.
	2	15189	.135	2.11	42.	150.	5250.

*your submitted samples*

ITEM	SAMPLE NO.	Pb (ppm)	Bi (ppm)	W (ppm)	Zn (ppm)
1	15188	1250.	55.	<2.	83000.
2	15189	1300.	65.	<2.	107000.

*[Signature]*  
 William L. Lehbeck  
 Manager  
 12/22/87

SPECTROGRAPHIC ANALYSIS

NOV. 4 '87  
SAMPLE DATE

COLUMBIA QD. 246 ARIZONA  
LOCATION

J.E. DUHAMEL  
GEOLOGIST

11/10/87 LAT

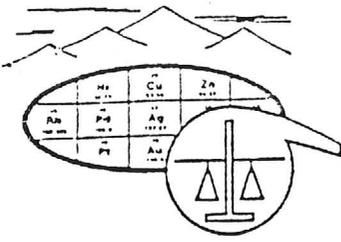
R.C. KARRY SUBMITTAL

PULP #	LOCATION	CD	CU	PB	ZH
15183	1	170	VS	S	VS
15189	2	170	VS	M	VS

ALSO CHECKED FOR :

NO NI P B V CO BA BE HG TE GE SH TL LI IN PT TH OS IR TA PD RH RU RE

NUMERICAL VALUES LISTED IN 'PPM' EXCEPT AG-AU (OZ/TON)



SKYLINE LABS, INC.  
 1775 V. Sahuaro Dr. • P.O. Box 50106  
 Tucson, Arizona 85703  
 (602) 622-4836

REPORT OF ANALYSIS

JOB NO. TEP 780  
 December 14, 1987  
 16452-16457  
 PAGE 1 OF 1

PHELPS DODGE CORPORATION  
 Western Exploration Office  
 P.O. Box 50427  
 Tucson, AZ 85703-1427

LOCATION:  
 CROWN KING QUAD. 246  
 TIGER MINE-KARRY SUBMITTAL  
 ARIZONA

Analysis of 6 Pulp Samples

J. E. DuHAMEL

SPL DATE: 11-23-87

ITEM	SAMPLE NO.	Au (ppm)	As (ppm)	Sb (ppm)	Bi (ppm)	TWNP	RGE	SEC NO...
Wildflower	1	.08	1100.	540.	65.	10	1W	3 1 D
	2	<.02	145.	5.	3.			2
	3	.08	135.	16.	465.			10 1
Gazelle	4	.94	70.	140.	34.			34 3a
	5	.66	65.	165.	6.			3b
	6	.56	110.	110.	46.			4

*[Signature]*  
 William L. Lehbeck  
 Manager  
 12/15/87

# SPECTROGRAPHIC ANALYSIS

NOV. 23 '87  
SAMPLE DATE

CROWN KING QD. 246 ARIZONA  
LOCATION

J. E. DUHAMEL  
GEOLOGIST

TIGER HINE - KARRY SUBMITTAL

NO	LOCATION	HO	CO	B	PB	V	CU	ZN	CG	IN
15452	10.1W. 3. 1 D	24	138	F	VS	51	VS	VS	17	..
53	2	..	..	..	F	26	S	S	..	..
54	10. 1	20	233	M	S	131	VS	VS	44	F
15455	34. 3a	10	191	F	S	20	VS	VS	20	..
56	3b	..	84	F	S	18	VS	VS	..	..
57	4	..	..	S	M	89	VS	VS	..	..

CHECKED FOR :

NI P BA BE W HG TE GE SN TL LI PT TH OS IR TA PD RH RU RE

ALL NUMERICAL VALUES LISTED IN 'PPM' EXCEPT AG-AU (OZ/TON)

\*\*\*\* GEOCHEMICAL ANALYSIS \*\*\*\*

NOV. 23 '87

CROWN KING QD. 246 ARIZONA

J.E. DuHAMEL

SAMPLE DATE

LOCATION

GEOLOGIST

12/16/87 LAT

TIGER MINE - KARRY SUBMITTAL

PHLP #	LOCATION	CU	ZN	PB	AG
16452	10.1W. 3. 1 D	3300	1.96%	2030	2.07
16453	. 2	153	158	92	<.05
16454	. 10. 1	3930	3.15%	245	1.58
16455	. 34. 3a	2020	3.86%	1440	0.70
16456	. 3b	584	1.07%	1350	.058
16457	. 4	237	2150	801	1.40

NUMERICAL VALUES LISTED IN 'PPM' EXCEPT AG-AU (OZ/TON)

DEPARTMENT OF THE INTERIOR  

---

UNITED STATES BUREAU OF MINES  
JOHN W. FINCH, DIRECTOR  

---

INFORMATION CIRCULAR

GOLD MINING AND MILLING IN THE BLACK CANYON AREA,  
YAVAPAI COUNTY, ARIZ.

DEPARTMENT OF MINERAL RESOURCES  
MINERAL BUILDING  
FAIR GROUNDS  
PHOENIX, ARIZONA



BY

JOS. R. GUITERAS

---

AFTER THIS REPORT HAS SERVED YOUR PURPOSE AND IF YOU HAVE NO FURTHER NEED FOR IT, PLEASE RETURN IT TO THE BUREAU OF MINES, USING THE OFFICIAL MAILING LABEL ON THE INSIDE OF THE BACK COVER.

TABLE 6. - Production of Pine Grove district by Mines<sup>1/</sup>.

	Copper, pounds	Lead, pounds	Gold, value	Silver, value	Total value
Wildflower, 1917-19 .....	400,000	.....	\$ 15,000	\$ 30,000	\$ 104,000
Crown King, 1893-1922 .....	.....	.....	1,100,000	100,000	1,200,000
Lincoln, 1902-8 .....	.....	.....	100,000	35,000	135,000
Del Pasco .....	.....	.....	200,000	.....	200,000
Philadelphia .....	.....	.....	100,000	.....	100,000
Total .....	400,000	.....	1,515,000	165,000	1,739,000

<sup>1/</sup> Elsing, M. J., and Heineman, R. S., Arizona Metal Production: Arizona Bureau of Mines Bull. 140, 1936, p. 101.

### Crown King

The Crown King mine is well up in the eastern foothills of the Bradshaw Mountains west of the Black Canyon district. It has been the largest producer in the Pine Grove Mining district and is about  $1\frac{1}{2}$  miles from the town of Crown King, which lies at an altitude of 6,000 feet above sea level. The mine is now idle. Wilson<sup>2/</sup> states that during the early days rich gold ore was mined from near the surface. From 1890 to 1895 the property was operated by the Crown King Mining Co. Its 10-stamp mill recovered \$10 to \$12 per ton on the plates and made a lead concentrate that contained \$150 to \$350 in gold and silver per ton. The middlings were stock-piled. In 1895 the property was bonded to H. E. Chamberlin & Co., of Denver. The mine was operated until 1901, when it was closed by court order. During the 1890-1901 period the ore shoot was followed to a depth of 650 feet with an estimated production of \$1,500,000, of which \$200,000 was paid in dividends.

During 1906 and 1907 the Crown King Mines Co. worked the old middlings pile and shipped concentrates containing gold, silver, zinc, iron, and copper.

In 1909 the property was sold at receiver's sale to the Yavapai Consolidated Gold-Silver-Copper Co., controlled by the Murphy estate, for \$75,000. In 1916 lessees organized the Bradshaw Reduction Co., which installed flotation equipment and made a few tons of concentrates from old middlings. Some ore is reported to have been blocked out above the 480-foot level but was not mined.

In 1923 the mine was taken over by the Crown King Consolidated Mines, Inc. During the winter of 1926-27 a flood wrecked the mill. The railway tracks from Middleton to Crown King were torn up during 1926 and 1927 and the grade has been utilized for a road. In 1933-34 a 300-ton flotation-concentration mill was built.

The production of the mine since 1890 is estimated at \$1,340,000.

The Crown King vein averaging 2 feet in width, strikes north-northeast and dips 70° W. The ore consists of quartz with sphalerite pyrite and chalcopyrite. It is said to contain 0.5 ounce of gold and 4 ounces of silver per ton.

<sup>2/</sup> Work cited, pp. 56-57.

The mine workings include a 480-foot shaft, a 913-foot tunnel 150 feet below the collar, and a 500-foot winze with five levels, each of which extends about 1,200 feet north and from 200 to 500 feet south. Water stands 250 feet below the tunnel level.

According to the caretaker at the mine, the last ore treated in the mill was taken from the surface of the California claim. Assays available at the mine office showed the following values of this ore and the mill products:

	<u>Gold,</u> <u>per ton</u>	<u>Silver,</u> <u>per ton</u>	<u>Total value</u> <u>per ton of ore</u>
<b>July 4, 1935:</b>			
Day shift:			
Heads .....	\$ 5.25	\$ 1.33	\$ 6.58
Tails .....	.52	.18	.70
Concentrates .....	35.70	12.70	48.40
Night shift:			
Heads .....	1.40	.46	1.86
Tails .....	.35	.45	.80
Concentrates .....	43.05	9.94	52.99
<b>August 3, 1935:</b>			
Day shift:			
Heads .....	4.90	2.88	7.78
Tails .....	1.40	1.31	2.71
Concentrates .....	100.80	23.70	124.50
Night shift:			
Heads .....	6.30	1.66	7.96
Tails .....	1.05	1.22	2.27
Concentrates .....	56.70	14.82	71.52
<b>September 9, 1935:</b>			
Concentrates .....	27.30	17.57	44.87

The only activity on the Crown King group of claims at the present time is the driving of two adits, one from the north and the other from the south, to intersect ore at depths in the old Union claim. Four men are employed in each heading.

Idle Mines in the Pine Grove District

Springfield<sup>16/</sup>

The Springfield group of copper claims is about 2-1/2 miles west of Crown King. The principal rock is granodiorite. The Springfield shaft is 175 feet deep and connects with a 200-foot tunnel 80 feet below the collar. A small chimney of sulphides has yielded 2 carloads of ore containing 12 percent copper.

Lindgren, work cited, pp. 165-166.

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- 19/ Lindg
- 20/ Lindg
- 21/ Lindg

Wildflower<sup>17/</sup>

The Wildflower group comprises 13 patented claims. The mine is 3,000 feet east of Towers Mountain at an altitude of 6,800 feet. The country rock is much mixed and is sericitized. A fissure vein with quartz-sulphide filling has been exposed for 4,400 feet. The development consists of a 700-foot inclined shaft with levels at 110, 200, 300, and 480 feet. The ore body has been stoped to an average width of 5 feet. The mine was worked from 1917 to 1919 and production amounted to \$104,000. About 13,000 tons of ore were milled, averaging \$9 a ton. There are two ore shoots; the larger one yielded ore assaying \$1.20 in gold, 6 ounces of silver to the ton, 2-1/2 percent copper, and 12 percent zinc.

Del Pasco<sup>18/</sup>

The Del Pasco vein is about 4,000 feet east of the Wildflower at an altitude of 6,300 feet. It is mentioned in Raymond's report of 1874. Here several tunnels have followed veins of quartz containing some sulphides and a little gold and silver.

Philadelphia<sup>19/</sup>

The property of the Philadelphia Mining Co. includes a number of claims covering the Nelson and Gladiator veins. Both veins are traceable for considerable distances and have been developed by shafts and tunnels.

Fairview<sup>20/</sup>

The Fairview vein, considered to be an extension of the Nelson, lies high on a ridge 2 miles north of Crown King. The country rock is generally a black clay slate. Tunnels on the property have disclosed sulphides and oxidized vein matter in quartz. A carload of ore was reported to be worth \$30 a ton; most of the value was in gold.

Lincoln<sup>21/</sup>

The main workings on the Lincoln vein are 2 miles north-northeast of Crown King at an altitude of about 7,000 feet. The mine was worked in 1902 and from 1905 to 1908 and 10,000 tons of ore are said to have produced \$135,000 net. The vein is contained in Yavapai schist. The ore consists of sulphides in a gangue of quartz and ankerite; it is reported to average 5 to 6 feet in width.

The property is developed by a shaft and several tunnels. A 15-stamp mill with plates and concentrating tables provided for the reduction of the ore. The concentrates contained 1 to 4 ounces of gold and 10 to 24 ounces of silver to the ton, and 15 percent copper.

17/ Lindgren, work cited, pp. 166-167.

18/ Lindgren, work cited, pp. 167-168.

19/ Lindgren, work cited, p. 169.

20/ Lindgren, work cited, p. 170.

21/ Lindgren, work cited, pp. 170-171.

TIGER DISTRICT<sup>22/</sup>

The Tiger district adjoins the Pine Grove district on the south. The northern part is occupied by the granodiorite of the Crown King district, and at the south end this rock borders with intrusive contact against Bradshaw granite and an intercalated belt of Yavapai schist.

The veins form in general the scutterly extension of the Crown King fissure deposits. The most westerly is the Standard group. Next east is the Tiger vein, which may be the extension of the Crown King system. East of this is the Oro Belle system. The deposits yield predominantly silver ores. Table 7 shows the production of the Tiger district by mines.

Oro Belle and Gray Eagle

The Oro Belle and Gray Eagle is  $4\frac{1}{2}$  miles by road south of Crown King on the southern slope of Wasson Peak.

TABLE 7. - Production of Tiger District by Mines<sup>1/</sup>

	Copper, pounds	Lead, pounds	Gold, value	Silver, value	Total value
Tiger .....	200,000	.....	\$ 50,000	\$ 700,000	\$ 730,000
Oro Belle-Gray Eagle .	.....	.....	640,000	60,000	700,000
Lukes (Gradbury) .....	.....	.....	.....	200,000	200,000
Cougar (Bond) .....	.....	100,000	.....	95,000	100,000
Total .....	200,000	100,000	690,000	1,055,000	1,780,000

<sup>1/</sup> Elsing, M. J., and Heineman, R. S., Arizona Metal Production: Arizona Bureau of Mines Bull. 140, 1936, p. 102.

According to Lindgren<sup>23/</sup>, the mine was worked between 1900 and 1912. The total production is estimated at \$700,000. Weed, in the Mines Handbook, gives the following partial figures of production:

Gold, silver, and copper produced at the Oro Belle and Gray Eagle mine, 1907-9

	1907	1908	1909
Gold, fine ounces .....	4,313	123	1,226
Silver, do .....	9,937	3,639	2,725
Copper, pounds .....	19,010	.....	4,820

Some work was done, it is said, in 1915 and 1916.

<sup>22/</sup> Lindgren, work cited, p. 172.

<sup>23/</sup> Work cited, pp. 174-175.

The Oro Belle veins are developed by eight tunnels, of which the longest extends 1,000 feet. The Gray Eagle vein is opened by a shaft 600 feet deep. It is said to be from 2 to 15 feet wide and the ore is reported to have assayed \$20 in gold and 2 ounces of silver to the ton and 1 percent copper.

The country rock is in large part sedimentary schist. In several places the schist is intruded by fine-grained granite dikes. The Oro Belle vein is said to be small and was worked mainly by lessees through the several tunnels. Nothing has been shipped from this property since 1916, but five men are at present engaged in driving underground workings to intersect an expected extension of an ore shoot indicated by a study of the maps.

#### Idle Mines in the Tiger District

##### Tiger<sup>24/</sup>

The Tiger mine is 2 miles south-southwest of Crown King. The property comprises 9 patented and 10 unpatented claims and is mentioned in the early Mint reports and in Raymond's reports. The total production, mostly in silver, is estimated at \$750,000. In 1918 the tailings were reworked and yielded about \$59,293. The heads are said to have assayed 13 ounces of silver to the ton, and the concentrates obtained averaged \$150 a ton. The last work done in the mine was in 1910 and 1911. During this period 440 tons were shipped, yielded \$40,700 net. About 13,000 tons were milled and averaged 0.07 ounce of gold and 22 ounces of silver to the ton.

The country rock is granodiorite. The principal vein is a composite quartz lode 20 feet wide. The ore, which was several feet in width, is mainly quartz with finely disseminated pyrite. The mine is developed by a vertical shaft 750 feet deep. Drifts extend along the vein several hundred feet on each side of the shaft.

##### BIGBUG DISTRICT<sup>25/</sup>

The Bigbug district, one of the oldest in the region, lies on the northeast slopes of the Bradshaw Mountains, extending from Bigbug Mesa down to the foothills of the Agua Fria valley. The altitude ranges from 4,500 to 7,000 feet.

The predominating formation is Yavapai schist with numerous interbedded quartzite lenses. There are also many dikes of rhyolite porphyry with which certain of the deposits appear to be genetically connected.

The ore deposits belong to five classes: (1) Pyritic copper deposits in schists are represented by the Blue Bell, Hackberry, Butternut, Boggs, and other mines. (2) Pre-Cambrian quartz veins are represented by the old Mesa mine near Poland and probably by several veins near McCabe. (3) A gold-silver replacement deposit, the Iron King, near Humboldt is of an unusual type. (4) Veins of later date, probably connected with the rhyolite dikes, are best exposed in the vicinity of Poland and Providence. The rich silver deposits with barite and calcite gangue about 2 miles west of the Humboldt smelter also belong to this group. (5) Placers have been worked in several gulches near McCabe.

Table 8 shows the amount and value of the metal production of the Bigbug district from 1901 to 1933. Table 9 shows the production of the district by mines.

Lindgren, work cited, p. 172.

<sup>25/</sup> Lindgren, work cited, pp. 126-127.

DEPARTMENT OF THE INTERIOR  
Hubert Work, Secretary

U. S. GEOLOGICAL SURVEY  
George Otis Smith, Director

55713  
6277  
10/17/20

Bulletin 782

ORE DEPOSITS OF THE  
JEROME AND BRADSHAW MOUNTAINS  
QUADRANGLES, ARIZONA

BY  
WALDEMAR LINDGREN  
WITH STATISTICAL NOTES BY  
V. C. WEIKES



WASHINGTON  
GOVERNMENT PRINTING OFFICE

TIGER DISTRICT

The Tiger district adjoins the Pine Grove district on the south and drains southward into Humbug Creek. The northern part is occupied by the granodiorite (quartz diorite) of the Crown King district, and at the south end this rock borders with intrusive contact against Bradshaw granite and an intercalated belt of Yavapai schist. The schist here is largely of sedimentary origin and near the granite contact contains many pegmatite veins.

The veins form in general the southerly extension of the Crown King fissure deposits. The most westerly is the Standard group. Next east is the Tiger vein, which may be the extension of the Crown King system. On the east of this is the Oro Bello system, the continuation of which would extend just east of the Crown King mill. The deposits yield predominantly silver ores. The subjoined table shows the combined production of the Tiger and Pine Grove districts:

Gold, silver, copper, lead, and zinc produced in Pine Grove and Tiger districts, 1901-1924

[Compiled by V. C. Hoikes, U. S. Geological Survey]

Year	Ore treated or shipped (tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
1901		65.00	1,087				\$1,996
1902	112	32.00	822				1,091
1903	4,600	1,787.00	8,124				41,291
1904	5,430	3,919.69	10,606				85,305
1905	31,706	13,505.00	48,638	(121,157		(140,000	339,166
1906	16,858	8,685.78	19,984	40,119			200,690
1907	16,097	4,875.54	11,577	21,562			108,605
1908	5,374	2,082.31	20,103		16,096		54,377
1909	1,336	1,517.10	2,736	4,802			33,403
1910	3,916	3,079.82	41,729	(16,800	(14,281		88,961
1911	21,868	3,671.78	169,045	(55,332	(25,530		173,562
1912	11,899	1,621.12	107,550	17,731	70,780		105,810
1913	3,296	201.36	2,228	16,462	2,982	57,160	11,392
1914	1,174	306.60	576	391	2,818		6,823
1915	3,101	231.95	2,173	12,176		(48,580	14,114
1916	9,621	(2,137.76	(27,561	(23,195	(1,372	(637,768	164,780
1917	6,818	1,713.61	21,805	92,140	(20,723	(528,360	134,223
1918	12,410	(2,583.39	88,252	80,643	1,774		157,568
1919	1,455	251.01	16,153	32,903			29,463
1920	332	52.10	10,420	17,314			15,621
1921	145	88.57	8,052		5,226		10,118
1922	173	53.06	10,362	713			11,555
1923	82	85.70	2,227	971			3,741
1924	26	22.00	12				403
1901-1924	147,106	52,210	631,792	454,430	161,582	1,311,865	

TIGER MINE

The Tiger, an old-time property, now belongs to the Yavapai Consolidated Gold-Silver-Copper Co., practically the Murphy estate. It is mentioned in the early Mint reports and in Raymond's reports. The total production, mostly in silver, is estimated at \$750,000. After having been closed for many years, the mine was bought by the Murphy estate from F. E. Harrington and partners. In 1918

the tailings were reworked by the Randolph-Gemmill Co. and gave a yield of about \$59,293. The heads are said to have assayed 13 ounces of silver to the ton, and the concentrates obtained averaged \$150 a ton. The last work done in the mine was in 1910 and 1911. During this period 440 tons was shipped, yielding \$40,700 net. About 13,000 tons was milled and averaged 0.07 ounce of gold and 22 ounces of silver to the ton. These data were obtained from a report by William A. Farish. So far as can be ascertained, there is little ore of workable grade showing in the mine.

The Tiger mine is 2 miles south-southwest of Crown King. The road that leads to it ascends over white outcrops of granodiorite to a divide 6,600 feet in altitude, from which there is a beautiful view southward toward the brushy slopes of Silver Mountain. From this divide the road descends to an altitude of 6,100 feet, where the main shaft and the mill are located.

The Tiger property comprises 9 patented and 10 unpatented claims, and the principal vein is developed by a vertical shaft 750 feet in depth. Drifts along the vein extend on the several levels for several hundred feet on each side. The country rock is granodiorite, which a short distance south of the mine is in contact with Yavapai schist.

The principal vein crops out boldly about 100 feet below the shaft in a small gulch. It is here a composite quartz lode 20 feet wide with a body of quartz 4 feet thick on the hanging wall. The strike ranges from N. 10° E. to N. 15° W., and the dip is 60°-70° W. It is claimed that the same vein has been worked 1 mile farther south under the name of the Gazelle, on a property owned by the Philadelphia Mining Co., which has a shaft 200 feet deep but no mill.

The ore, which was several feet in width, consists almost exclusively of white quartz, in places rather dense and flinty, but containing small druses and finely disseminated pyrite. Other sulphides, also sparsely distributed, are sphalerite, galena, and tetrahedrite. It is probable that the rich ore bodies contained oxidized silver minerals derived from this sulphantimonide of copper. This rich ore of the upper levels apparently broke up into several more or less primary smaller shoots in the lower levels.

The California vein, also included in the Tiger property, crops out strongly on the divide north of the road to Crown King, but seems to lie about a quarter of a mile east of the Tiger vein. The oxidized outcrops strike N. 25° E. and dip 60° W. The main tunnel, 100 feet below the divide, is 500 feet long and shows much milky quartz, in part fine grained and drusy, with much pyrite, chalcopyrite, galena, and sphalerite. The ore carries mostly silver but apparently is not of high grade. It is said that the California vein continues southward to a point half a mile south of the Tiger shaft, where it forms a strong outcrop averaging 10 ounces in 100 tons.

1910-11  
An  
M  
3  
tails

Gazelle  
ext'n

or, at a short distance below this level, the primary sulphides. However, from the Arizona National and the Black Canyon veins much sulphide ore, perhaps enriched to some degree, has been shipped. The rich oxidized ores have been amalgamated or cyanided; the sulphide ore is shipped crude or concentrated. Much of the oxidized ore carried \$50 to \$100 to the ton. The primary ores are much poorer.

Among the notable mines on deposits of this type are the Silver Belt, Arizona National, and adjacent properties in the Bigbug district (p. 128); the Peck and Swastika, in the Peck district (pp. 161-162); the N. C. 4, in the Hassayampa district (p. 117); and the Tuscumbia, in the Bradshaw district (p. 170). Dikes of rhyolite porphyry occur in all the districts. They are abundant near the N. C. 4 and Peck mines.

VEINS MAINLY WITH QUARTZ GANGUE

The silver-quartz veins are narrow, with comb structure or drusy quartz and in places some ankeritic carbonates. They contain more pyrite than the barite veins, also a little chalcopyrite, rarely tetrahedrite. Here and there a comb of quartz crystals coats the walls.

Among these veins may be mentioned that worked in the Tiger mine (p. 172), in the district of the same name. It is contained in granodiorite. Here the quartz attains a width of several feet and it is less drusy than elsewhere. The sulphides are sparse and comprise pyrite, sphalerite, galena, and tetrahedrite. The oxidized ore was very rich, much of it containing \$100 to the ton. Deeper and poorer ore, said to have yielded 0.07 ounce of gold and 22 ounces of silver to the ton, was mined in 1910. In depth the ore appears to be of decidedly lower grade.

East of the Tiger is the Gray Eagle lode, which in its southern part contains much gold, but its northerly extension carries more silver. Oxidized ores enriched by horn silver and argentite were shipped in 1922. One lot of 2 tons contained \$2 in gold and 454 ounces of silver to the ton and 15 per cent of lead (p. 175).

The Tiptop vein (p. 180) is another old-time producer of somewhat unusual type. It is at most 6 feet wide. The quartz shows coarse comb structure near the walls but is finer grained in some parts, and the druses are coated with chalcedony. The scanty ore minerals consist of wolframite (earliest and along the walls), arsenopyrite, pyrite, sphalerite, bornite, and galena, formed in the order given. Here too the oxidized ore was very rich, and work was stopped at the 800-foot level.

There remain to be mentioned the flat veins of the Black Canyon district, not far from Turkey Creek station. These narrow veins dip

Mixed  
Rich oxidized ore  
Much poorer sulphides

schist. The Thunderbolt and the Howard Silver are the principal producers (p. 158). The War Eagle, Bueno, Goodwin, and Morgan veins, in the Turkey Creek district, are of the same or similar type.

Rhyolite porphyry dikes occur near the Morgan mine and at the Tiptop mine.

GOLD AND GOLD-SILVER VEINS

PROPORTION OF GOLD TO SILVER

By far the greater number of veins in the Bradshaw Mountains quadrangle are gold-silver deposits. The relative amount of each metal may vary in the same vein. The gold quartz veins properly so called are few in number. The Senator group, the Walker veins, and some of the veins of the Crown King (Pine Grove district) may be counted in this class, and even here the "free" gold, recoverable by amalgamation, probably averages only one-third of the total value. The Mudhole mine, in the Walker district, for instance, yielded concentrates which averaged, it is said, \$70 in gold and 5 ounces in silver to the ton and some lead. The Crown King mine, in the Pine Grove district, has ore reported to average \$10 in gold and 4 ounces of silver to the ton, though some of it was much richer in gold. The McCabe ore (Bigbug district) carried about 1 ounce of gold and 10 ounces of silver to the ton.

By weight silver always greatly exceeds the gold in the ore; by value either gold or silver may predominate. Copper, lead, and zinc have been recovered as by-products in the concentrates from many mines.

It has already been pointed out that the gold in the silver veins may vary considerably along a single vein. In the same way the mineralization may vary, silver being succeeded by gold. For instance, the gold veins of the Humbug district appear to have essentially the same origin as the silver veins of the adjacent Tiptop district.

ASSOCIATED ROCKS

The veins appear in the Yavapai schist and more rarely in the Bradshaw granite. In the Walker and Pine Grove districts they occur in granodiorite, and these veins appear to contain more gold than others. Dikes of rhyolite porphyry are found in almost all the districts. They are abundant in the Hassayampa district, especially about the Senator, Tillie Starbuck, Venezia, and Mount Union mines. They are likewise abundant in the lower Walker district, in the Bigbug district in the western part of the Pine Grove district, in the northern part of the Black Canyon district, and in the Tiptop, Humbug, and Castle Creek districts. Some of the veins follow the porphyry, as in the Mudhole and Starlight mines, but the only

M. & M. VEIN

Another vein belonging to the same system but farther east is exposed by a short tunnel on the M. & M. claim, operated in 1922 by J. J. McNeil and Mrs. Reid. This tunnel is on the Poland Creek slope at the foot of Wasson Peak. The vein strikes N. 18° E. and dips steeply west. It is a small fissure from 2 to 3 feet wide, with a pay streak about 6 inches wide. The ore, which is partly oxidized, carries mainly silver, though the thoroughly oxidized material pans free gold. The "black ore" consists of quartz and ankerite with calcite and more or less pyrite, galena, sphalerite, and tetrahedrite. Much of it shows native silver, and it contains at best \$18 in gold and 180 ounces in silver to the ton.

ORO BELLE AND GRAY EAGLE MINE

A winding road along the hillside leads from the Tiger mine to the Oro Belle and Gray Eagle. The Oro Belle mill and mine are in a canyon on the brushy south slopes of Wasson Peak, at an altitude of 5,400 feet. An old wagon road in bad condition reaches the Oro Belle mine from Minnehaha Flat and Walnut Grove. From the Oro Belle a trail leads up from the hot brushy slopes to the cool forests of Wasson Peak and to Crown King.

The Oro Belle and Gray Eagle was worked by F. E. Harrington between 1900 and 1912, but its early history goes even farther back than this date. The total production is estimated at \$700,000. Weed, in the Mines Handbook, gives the following partial figures of production:

Gold, silver, and copper produced at the Oro Belle and Gray Eagle mine, 1907-1909

	1907	1908	1909
Gold.....fine ounces..	4,313	123	1,226
Silver.....do.....	9,937	3,639	2,725
Copper.....pounds..	19,010		4,820

Some work was done, it is said, in 1915 and 1916. At the present time the property is owned by Mrs. Hattie Barnes, of New York. In 1922 the property was in a sad condition. The 20-stamp mill and the office buildings were dilapidated and wide open, serving as a stable for cattle. No caretaker was present to look after valuable surface equipment.

The Oro Belle veins are developed by eight tunnels, of which the longest extends 1,000 feet. The Gray Eagle vein is opened by a shaft 600 feet deep.

The road from the Tiger mine to the Oro Belle soon enters highly metamorphosed, in large part sedimentary schist, which continues to the mine. In several places the schist is intruded by fine-grained granite dikes. The Oro Belle vein is said to be small and was mainly worked by lessees through the several tunnels. The Gray Eagle shaft is about a quarter of a mile north of the mill; this is close to the contact of schist and Bradshaw granite, and pegmatite dikes are very abundant—in fact, the footwall of the inclined shaft is in pegmatite and the hanging wall in schist. The Gray Eagle vein is said to be from 2 to 15 feet wide, and the ore is reported to have contained \$20 in gold and 2 ounces of silver to the ton, with 1 per cent of copper.

The Big Belle is a parallel vein striking north-northeast a quarter of a mile east of the Gray Eagle. It was not visited.

NORTHWARD EXTENSIONS OF GRAY EAGLE LODE

The strong vein of the Gray Eagle continues northward across the pass and down for some distance on the slope toward Crown King, passing through the Savoy group, the Cougar, and the Bradbury group. Near the pass on the south side C. V. Carlson had recently shipped high-grade ore from a vein regarded as a spur of the Gray Eagle. At the summit Mr. Andree was taking out high-grade silver ore from a 75-foot shaft on the Cougar vein. Both these veins contain honeycombed quartz, drusy in places and oxidized in part. The ore evidently once contained ankeritic carbonates, which are now dissolved. The sparse primary sulphides are sphalerite, galena, and a little pyrite. (See pl. 14, B.) Some of this ore is of very high grade. It is said that 20 tons was shipped by Mr. Andree in 1922 and netted about \$5,000. One lot of 2 tons shipped contained 454 ounces of silver and \$2 in gold to the ton and 15 per cent of lead. The secondary silver ores appear to be cerargyrite, argentite, and native silver. A quarter of a mile north of the Cougar is the Bradbury group (Lukes mine), which in 1922 was leased by Mr. Barnequino. Some high-grade ore of similar character to that from the Cougar was shipped in 1923. The Lukes mine is developed by a tunnel, and in recent years ore worth \$200,000 is reported to have been shipped from it.

On the west side of the Gray Eagle, on the south slope, is the Fourth of July and New Jersey vein, on which considerable work has been done and from which ore has been shipped.

These veins are contained in highly metamorphosed schist, mostly of sedimentary origin; the contact with the Bradshaw granite is close by on the west, and the schist contains many pegmatite veins.

(EJ)  
WADE E. SPEER  
GEOLOGICAL CONSULTANT

1595 North Glen Place.  
Kingman, Arizona 86401  
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March 7, 1988

PROPERTY EXAMINATION

WestGold

Inspiration's Au sub.

FILE NO. \_\_\_\_\_

M.P.R. NO. \_\_\_\_\_

CLASSIFICATION:

No Interest

Notations by District Geologist & Chief Exploration Geologist \_\_\_\_\_

PROPERTY:

Wildflower Mine

1/250 AMS Map:

15' Topo:

7 1/2' Topo:

Commodities:

Examined by:

Date:

In Field:

Office Research:

How Submitted:

Crown King

Au, Ag, Cu, Pb, Zn

W.E. Speer

March 7, 1988

*one day* Feb 16, 1988

Feb-Mar, 1988

Steve Rudnyk (owner) contact w/ J.E.

Worthington (WestGold Consultant)

LOCATION:

State: AZ County: Yavapai

Sec(s) 3,4

Twp(s) 10N.

Mining District: Tiger

Rge(s) 1W.

B&M Gila/Salt R.

ACCESS ROUTE/TOPOGRAPHY:

Approx 2.5 miles NW of Crown King; Approx 65 miles NW of Phoenix. Located on the east flank of Towers Mountain at 6,600 to 7,200 feet elev.

LAND STATUS:

Approx 200 acres in 11 or 12? patented claims (five along trend of vein for 4,400'; six or seven? adjacent claims)

DEVELOPMENT & PRODUCTION:

Shafts: Wildflower--minus 60 degrees, 480' deep, winze to 700', seven levels w/ 2,300' of drifting.  
Sabronje----480' deep.  
Consolidated--300' deep, connects to Wildflower workings.  
Adits: Wildflower Tunnel--NE end of vein, 6405' elev, 1000' long.  
Anaconda Tunnel--SW end of vein, 6685' elev, 1300' long.

Production: Partial, 1917-19, 400,000 lbs Cu, \$15,000 Au, 13,000 tons.

SUMMARY & RECOMMENDATIONS:

Additional small ore bodies (< 20,000 tons each w/ ~\$4m contained metals) are likely between 200' & 1,000' depths. Vein widths <5' preclude large tonnages. Ore bodies would be high sulfide (>20%) and are probably locatable by IP or EM surveys, however they are too small for WestGold. No further action.

REGIONAL GEOLOGY:

Country rock is Precambrian diorites (quartz & hornblende types). Wildflower vein trends NE, parallel to the other veins in the district.

GEOLOGY OF DEPOSIT:

Wildflower vein is 2.3' <sup>thick</sup> wide where exposed on the surface; reportedly 5' wide in ore stopes below; tracable for 4,400' on the surface. Two known ore bodies: North Shoot-22,000 tons; and South Shoot-32,000 tons (0.2 opt? Au, 6 opt Ag, 2.5% Cu, 12% Zn). Host-rock sulfides evident on dump (17547B), but ore outside of vein is not evident.

FIELD WORK ACCOMPLISHED:

Brief visit w/ Randy Karry (locale resident & geologist). Six samples collected; minor problem w/ snow cover.

CONCLUSIONS & RECOMMENDATIONS:

Ore outside of veins is not known in the district. Within Wildflower Vein one or two new small ore bodies are possible to 1000' depth; likely discovery estimated to be: 5' X 200' X 200' = 16,000 tons at 0.4 opt Au, 6 opt Ag, 2% Cu, 10% Zn. This may contain as much as \$4 million in combined metal values. This would take an expensive underground mine with surface flotation mill to produce a shippable smelter concentrate. This is too small and too risky for WestGold. No further action is recommended.

REFERENCES:

ATTACHMENTS:

Maps  
Reports

Ed Spur 3/7/88

WADE E. SPEER  
GEOLOGICAL CONSULTANT

1595 North Glen Place  
Kingman, Arizona 86401  
(602) 757-7448

March 7, 1988

Steve Rudnyk  
8687 E. Via De Ventura  
Suite 213  
Scottsdale, Arizona 85261

Dear Mr. Rudnyk;

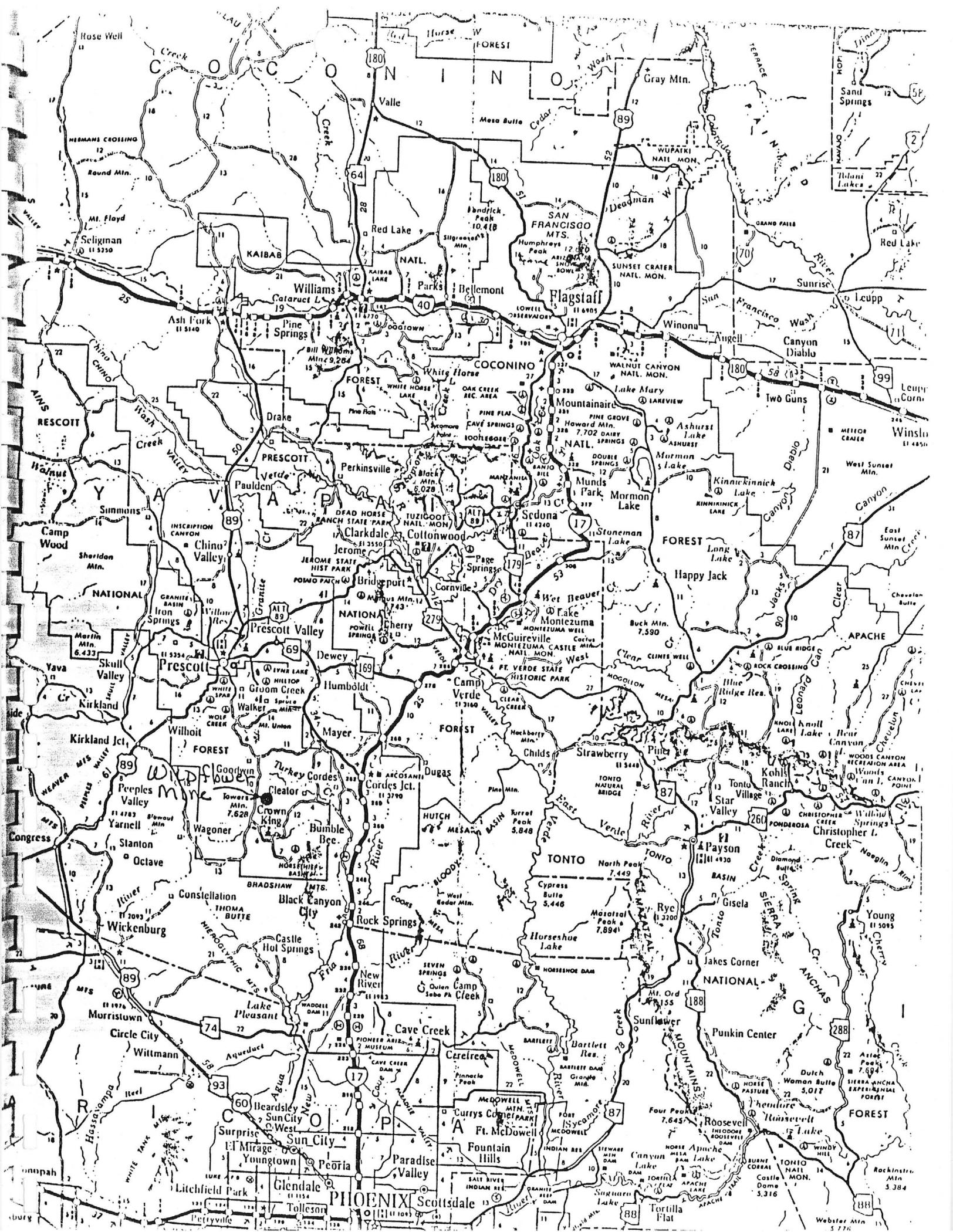
Thank you for allowing WestGold (formerly Inspiration Gold) to examine your Wildflower Mine property near Crown King, Arizona. Unfortunately, we will not be able to pursue your property further.

Although I feel that the Wildflower Vein very likely might contain additional "ore", the small sizes of the previously-mined bodies (20,000 to 30,000 tons) and the two-to-five-foot widths of the vein preclude the sizable tonnages that would be of interest to WestGold. The property is not without merit however, and might be of interest to a small mining company or a company already mining in the area.

Best of luck with your property and if I can be of any help in the future, feel free to call.

*Ed Speer*

Ed Speer









Ed Speer  
1595 N. Glen Place  
Kingman, AZ 86401

ANALYTICAL REPORT

PO #  
PROJECT  
685

SAMPLE NUMBER	PPM AU	PPM AG	PPM AG	PPM SN	PPM W
175468	0.004				
175469	0.009		<.2		
175470	0.121	<.2	0.3		
175471	0.010	<.2		6	<1
175472	0.014	<.2		5	<1
175473	0.272			5	<1
175474	0.232		283		
175475	0.140		51.6		
175476	0.328		11.0		
175477	0.396		12.7		
			153		
175478	0.030		3.0		

← Wild flower

METHOD  
DIGESTION  
PRECISION

A.A.  
FA/20G  
7%

AA/BC  
P/N  
5%

AA/BC  
4Acid

A.A.  
Fus'n

Color  
Fus'n