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Stan Keith
Vol A B & M.

April 20, 1974

St. Jude Mine
Rosebudge Mtn.

140 ft Vertical Shaft
1890's 1935-1939

300 tons of silver ore
Miles Carpenter et al.

LC Bierbeter
62 — 1935
149 — 1939
98 — 1939

0.007 Au
33 Ag
.9 Cu
.2 Pb

Said to be in T 14S, R 9E, Sec. 17

Barry French
found N 75° W vein containing lead & manganese, dipping 80° N, with several shafts, diggings, & dumps.
in T 15 S R 9E, Sec. 17

ASARCO

Southwestern Exploration Division

March 30th, 1977.

TO: F. T. Graybeal

FROM: J. D. Sell

Native Copper & Silver in
Silver Bell Formation Equivalents,
Pima, Santa Cruz, Cochise and
Graham Counties, SE Arizona

Mr. Richard Lundin of Wallaby Enterprises called on March 24, 1977 to inquire about the Roadside Mine area. He had been told by John Kinnison that I was aware of some native copper in Silver Bell type rocks in the area.

Lundin went on to say that his group has been conducting district studies (folios are available through purchase from his group, as well as being in the U of A Geoscience Library (?)), and they have come across numerous native copper or silver mineralization in silicified and epidotized zones within Silver Bell units. Also found is the oxidized equivalent from native copper and silver.

He mentioned the following districts which have such deposits and they are most impressed with the Cerro Colorado district.

Cerro Colorado
Tumacacori
Sopori
North Pima
Papago (Roadside)
Whetstone
Dos Pobres, Safford
etc.

Lundin believes, from high-altitude photo study, that the linear nature of the deposits in intense silicification and epodote within a plus or minus propolytic alteration throughout the unit suggests later hydrothermal emplacement and control on the deposits.

He apparently couldn't find the Cu at Roadside, so asked for a specific locality. I stated that I thought I could if he would call back later. He is apparently putting a paper together for a "St.Louis" meeting and stated that he would send a copy over for review.

He also mentioned that he had asked Saegart if this would be presentable at AGS but was turned down.

Lundin also questioned why major companies had failed to follow up on these occurrences as they were obviously known and I stated that I had no answer to that question.

James D. Sell

JDS:jlh

ASARCO

Southwestern Exploration Division

August 18, 1977.

FILE MEMORANDUM

Roadside Mine
Pima County, Arizona

A brief visit was made to the Roadside mine on August 17, 1977. The general area appears to be underlain by various types of andesite porphyry, collectively similar to the Silver Bell formation. Limestone exposures are mentioned in several file reports, but time was not taken to locate them in the field. The small hill just northeast of the center of section 11, T.16S., R.8E.(San Vicente 15' quad) contains irregular pods of massive epidote up to 2 feet long with variable amounts of disseminated native copper, hematite, and chrysocolla. The enclosing andesite porphyries were barren and fresh. No prospect pits were noted in this area.

The Roadside mine dumps expose iron-stained andesite porphyries with occasional disseminated pyrite and copper oxides. Epidote was absent from these rocks.

In addition to the rocks described above, epidotized rocks are reported by J.D.Sell (personal communication) to occur farther north in sections 2 and 3. In view of the often poor exposures, the erratic but possibly widespread occurrences of epidote with native copper, the rather large area of andesite, and the lack of file data, it appears advisable that the area be reconnaissance mapped at 1"=2000 feet. Mapping should include andesite porphyry exposures farther east near Dobbs Buttes and to the west adjacent to the Kitt Peak road.

F. T. Graybeal

F. T. Graybeal

FTG:jlh
c.c. J.D.Sell

46 mailbox
15 miles from Cow Palace
turn right 4.5 miles
(UA)

To Jim Seid
Date Fri 28 Time 1:05

WHILE YOU WERE OUT

M Bill Hiort
of 884-4652 (UA)
Phone
Area Code Number Extension

TELEPHONED		PLEASE CALL	
CALLED TO SEE YOU		WILL CALL AGAIN	X
WANTS TO SEE YOU		URGENT	

RETURNED YOUR CALL

Message doesn't have a phone
will call again
in about ½ hour
Gd. Cu. Dr. Peters
Los Gueros
There was UA

Operator

No. 2725 S Clark Office Products Phone 298-2374

A REPORT ON PRELIMINARY GEOLOGIC RECONNAISSANCE FOR COPPER IN THE SOUTHERN ROSKRUGE MOUNTAINS, PIMA COUNTY, ARIZONA

by

Dr. Jan Krason

Texas Gulf Sulphur Company

Tucson, Arizona

June 18, 1970

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SUMMARY

Research of the Roadside mine area, examination of the old dumps, and intensive analysis of all available data reveals that the southern Roskruge Mountains is potentially an excellent harbor for copper that invites thorough geological exploration. The copper is probably disseminated in different types of altered igneous rocks and has been largely re-deposited in an enriched supergene zone. At present, copper values, thickness, depth, and lateral extent have not yet been precisely defined.

INTRODUCTION

This report includes a very brief description of a new recommended area and a very tentative hypothesis regarding presence of a predicted copper ore body and its control factors. Attached maps, cross sections, and other sundry information should probably lend sufficient support to this recommendation. Of course, the geologic setting and economic value of the target area will be more lucidly established when the present data is supplemented by more detailed field observations, allowing a more precise interpretation in a more detailed report.

Cursory field reconnaissance has been carried out after which this report was prepared with the assistance of Mr. Stanley B. Keith, a student enrolled at the University of Arizona.

LOCATION OF A NEW TARGET AREA

The new target area was located on the southernmost extreme of the Roskruge Mountains in Pima County, approximately thirty five miles west of Tucson, Arizona. The area is accessible from Tucson by state highway 86 to Ajo. Specifically, the area is situated in sections 10 and 11, T. 16 S., R. 8 E., Gila and Salt River Meridian, of the San Vincente and Comobabi Quadrangles (U.S.G.S. 15 minute series (topographic)). The

target area is bounded on the south by foothills of the Coyote Mountains and on the northeast by the conspicuous Bell Mountain. Viopuli, a small Indian village is located three miles to the northeast. The entire recommended area lies within the Papago Indian Reservation (Fig. 1).

The ground surface at this locality ranges from 2,780 feet to 3,000 feet in altitude. The highest elevations are Coyote Peak (6530 feet) in the Coyote Mountains to the south and Bell Mountain, (3,710 feet) to the northeast. The area enjoys a gentle rolling topography with intermittant streams flowing to the north.

PREVIOUS WORK

Mining in the target area has been restricted to the development of the old Roadside Mine and several prospects. A very intensive investigation revealed that the Roadside shaft was deepened to a depth of 800 feet in 1924. Having no official prospecting permit from the Papago Indians it is currently impossible to visit all the marked prospects and the writer suspects that time may have erased many of their locations.

The history and production of the Roadside Mine and nearby old prospects is, at this time, very difficult to determine. The only sizable published information was found in a publication regarding mercury deposits of Arizona (lausen, 1927):

> A specimen of quartz containing many small specks of cinnabar was shown the writer (C. Lausen) at the Roadside mine by Mr. Courtenay DeKalb. This is essentially a copper prospect and is situated 35 miles west of Tucson. The ore consists of pyrite, chalcopyrite, bornite, and chalcocite:* the last probably supergene in origin. Andesite flows, tuffs, and agglomerates are the prevailing rocks and have been extensively faulted and tilted. According to DeKalb (personal communication) the cinnabar was probably derived from mercurial tetrahedrite, small quantites of which may be present in the ore. This occurrence is not of economic importance.*

*Underlining the writer's.

Also from the Roadside mine the very rare mineral aikinite ($PbCuBiS_3$) is reported. Unfortunately, the reference if there was one could not be obtained.

Very excellent information regarding the Roadside Mine area is reported in an investigation dealing ostensibly with hydrological aspects of the Papago Indian Reservation (L. R. Kister, 1961). The drillers' logs of three important wells were obtained with supplementary information related to the occurrence of ground water and its quality (Table one, p. 21, Table 2, pp. 22, 23, and Table 3, pp. 24, 25.) From this data we found that the shaft was completed in 1924; its total depth is 800 feet; the elevation at the shaft collar is 2,910 feet; and ground water occurs at a depth of approximately 100 feet below the shaft collar. In 1924 the shaft was deepened through andesitic conglomerate and volcanic flows, and below 628 feet arkoses and arkosic sediments were penetrated with ten feet of red shale at the bottom of the shaft (Table 2, p. 23). An excellent indicator of mineralization seems to be the chemical composition of the ground water analyzed from the Roadside shaft. Particular attention should be drawn to the abnormally high concentration of bicarbonate (HCO_3---1,050 ppm), sulfate (SO_4---405 ppm), and dissolved solids (1,550 ppm) in comparison with other analyses from neighboring wells. (Table 3, p. 25). Indeed the pH is a relatively low 6.8.

Approximately, six-hundred feet east from the Roadside shaft the 'Roadside #5' water well is situated. This well was drilled and completed in 1957 reaching a total depth of 1,103 feet. Its ground surface is at an elevation of 2,890 feet, only twenty feet lower than the Roadside shaft collar. Here the static water level is eighty feet below ground surface. Presumably, the 'Roadside #5' was drilled with the intention of providing water for domestic and irrigational needs during the Papago Project. However, the drillers' log (Table 2, p. 22) has proved extremely useful for appraisal of copper deposition. One thousand and thirteen feet of lithology has been logged at the

'Roadside #5' and a gross correlation with the lithologies in the Roadside shaft can be established (Fig. 5). However, in 'Roadside #5' the lithological column is reported in more detail than the Roadside Shaft due probably to a lack of information from the much older shaft. The writer's attention is drawn particularly to the reported occurences of copper in the 'Roadside #5.' Copper mineralization was first observed in a four foot andesite prophyry breccia at a depth of 286 to 290 feet and a second 'zone' 49 feet thick carried disseminated pyrite and chalcopyrite in a "gray fine grained andesite, locally brecciated and porphyrytic" from 636 to 765 feet. Unfortunately, water analysis was not published for this hole.

It should also be noted that there are located at least three other prospects for copper in the vicinity of the Roadside Mine; one being located approximately 1 1/8 miles north and two others two and three miles towards the southwest of the mine. Another prospect is located six miles to the west.

PRESENT LAND STATUS OF THE TARGET AREA

After field reconnaissance and collection of preliminary data the land status of the target area was checked at the County Recorder at the Pima County Court House in Tucson. At present in Township 16 south, Ranges 8 and 9 east there exists only one recorded claim which is located immediately east of the Roadside shaft (see attached Xerox copy concerning Notice of Mining Location). It is recorded that Mr. David McGee (P. O. Box 332, Oracle, Arizona 85623) obtained claim rights on September 7, 1969, and has properly maintained the claim since. Between August 18, 1969, and August 22, 1969, $200.00 worth of improvements were completed upon said claim. The claim was renewed on November 19, 1969, and will expire on March 27, 1971. The writer has been informed by a clerk in

the county accessors office that the claim is not patented (not taxable).[1]

In the vicinity of the Roadside Mine there is no indication of recent work.

GENERAL GEOLOGY

To the south of the Roadside Mine, the Coyote Mountains are composed largely of intrusive rocks, namely diorite, quartz monzonite, alaskite, and granite. (Kirtz, 1955 and Wargo, 1954). Laramide (?) granite intrudes Mesozoic and early Tertiary rocks, and metamorphosed Paleozoic limestones (Figs. 3 and 2 after Galbraith, Neidel, and Sykes, 1959). Along the northern foot of the Coyote Mountains the Ajo Road fault separates metamorphosed limestones, gneisses, and granite on the south from Cretaceous and Tertiary sediments and volcanics on the north (Fig. 3). It can be seen that the Roadside mine is located one and one half miles to the north of the Ajo Road Fault. Two and one half miles west of the Roadside Mine the Ajo Road Fault intersects the north-south trending Pan-Tak Fault (Fig. 2).

Heindel (1965), dealing with volcanic stratigraphy in the southern Roskruge Mountains observes what he differentiates as the Roadside Formation cropping out in the Roadside Mine area. This unit consists mostly of volcanic agglomerates, andesite flows, and breccia. The Roadside Formation weathers much more readily than neighboring units giving rise to a low topographical expression. The formation weathers dark purplish gray to shades of olive drab and its characteristic feature is a preponderance of angular purplish andesite fragments. An erosional unconformity is reported 628 below the shaft collar at the Roadside Mine (Fig. 5).

---

[1] At present the author is not completely sure whether the claim alluded to here exists in the target area since a McGee Ranch exists in the Sierrita Mountains twenty-five miles to the southeast and the fact that the mine was listed under the Sierrita Mining District which would logically exist in the Sierrita Mountains. The McGee Ranch is also about thirty-five miles southwest of Tucson. Indeed there may may be no claims in the target area at all leaving only the Papago Indians to deal with.

Also according to Heindel, this unconformity is here interpreted to be between the Roadside formation and the Cocoraque formation from which a good gross correlation can be made with the Cretaceous Amole Group (Kinnison, 1958) in the Tucson Mountains. Considering the previously alluded facts concerning copper mineralization at the Roadside Mine, the following quotation regarding the Roadside formation is very constructive:

> The Roadside Formation comprises two generally distinguishable rock types which have been mapped separately in other areas (see Richard and Courtright, 1960). They are here included in a single unit because they intertongue. The lower part of the formation usually consists of dacitic flows and of poorly-defined to well-defined beds of material that ranges from pebbly mudstone to boulder conglomerate and breccia. The rock fragments are derived from all the older rocks in the area.[2] In addition to a great deal of dacitic debris, the beds contain fragments of arkosic, quartzitic, and andesitic rocks from older Mesozoic units, and fragments of limestone, quartzite, schist, and granite from Paleozoic and Precambrian sources. This lower part of the unit is the equivalent of the Calflin Ranch Formation of Richard and Courtright (1960). The upper part of the Roadside Formation consists largely of (1) poorly bedded lenses of angular to sub-rounded particles and (2) andesitic breccias and flows. The upper part includes some highly brecciated two to fifty foot thick limestone lenses, such as those 3 miles east of the Roadside mine, which look so remarkably like Paleozoic limestone that originally I mapped them as thrust slivers. The upper part of the unit is the equivalent of the Silver Bell Formation of Courtright (1958). Richard and Courtright (1960, p. 4) summarize their description of the Claflin and Silver Bell Formations as follows: "There may have been repeated episodes of deposition of clastic and volcanics, with local intervals of erosion. Thus, the sequences may be found to differ in order and number of units from place to place. The important points are that these rocks as a group are lithologically similar over wide areas; they lie on an erosion surface cut in (older) Cretaceous and older rocks; and this surface usually marks a pronounced change in the environment of sedimentation." This description applies equally well to the Roadside Formation.
>
> The Roadside Formation probably is several thousand feet thick in the vicinity of the Roadside Mine, where steeply dipping beds are exposed nearly continuously for about 2 1/2 miles across their strike. The amount of repetition by faulting in this intensely deformed area is unknown (Heindl, 1965).

---

[2]Underlining this writer's.

The geological structure and stratigraphic sequence of the target area is also illustrated on Figs. 2 and 3 (particularly cross section B-B' and the generalized columnar section on Fig. 2). It is easy to notice that the late Cretaceous Roskruge Rhyolite of Heindl (1965) is younger than the Roadside formation. Indeed the Roskruge rhyolite rests on tilted beds of the Roadside formation which in turn rests on the Cocoraque formation. The Roskruge rhyolite is overlain unconformably by late Tertiary volcanics and alluvial deposits. The rhyolite flows commonly are pinkish to reddish gray and are characterized by a high proportion of granule to small pebble-sized phenocrysts of quartz. The flows are lenticular and range from a few tens of feet to about 300 feet in thickness. On the Dobbs Buttes (Fig. 1) the Roskruge rhyolite is mostly pyroclastic and sedimentary. Here the lowest unit except for a few thin local lenses of basal conglomerate is a fifty foot thick grayish purple to brown tuffaceous agglomerate. The Dobbs Buttes member includes grayish green dacite flows. These flows and pyroclastic deposits are interbedded with thin water laid tuffaceous sediments, sandstone, and pebble conglomerate beds.

It should be added that the target area represents a block fault structure which was probably formed during the Laramide orogeny.

Alluvium is predominately composed of silt, sand, gravel, small amounts of clay, and an occasional evaporite. The thickness of the alluvium within the recommended target area ranges from zero feet on elevated hills to eighty-two feet in the flat areas. The thickness of the alluvium increases towards the northwest, and in the northwest corner of T. 16 S., R. 7 E. it reaches 570 feet.

COPPER MINERALIZATION

It has been stated that prospects for copper are located in several places throughout the Coyote Mountains and the northern part of the Roskruge Mountains. However, the only mine shaft in the entire area was excavated at the Roadside mine. Copper minerals were sampled on the dumps of the Roadside mine by the author. The most common mineral is malachite filling fractures in a light-gray rhyolite and andesite agglomerates.

In places there is some evidence of disseminated copper sulfides. Azurite was not common but chrysocolla was quite conspicuous. Brochantite may also be present. The best indication of a high concentration of copper at the Roadside mine is provided by the sulfides which are present chiefly as veinlets up to two millimeters wide. Less common are irregular disseminated sulfides.

The most common sulfide is chalcocite, then chalcopyrite and bornite in equal amounts. Aikinite has also been reported and many of the black veinlets occupying gray rhyolite and andesitic agglomerates, like the supergene minerals, may be of this mineral. Several samples of copper sulfides sprinkled throughout calcite veinlets were also taken.

Particular emphasis should be delegated to the 'Roadside #5' where copper mineralization was found at depths of 286-290' and disseminated pyrite and chalcopyrite in a 49 foot horizon from 765' to 814'.

The age of mineralization is not known. However, mode of occurrence and intimate association of the copper minerals with the rhyolites and andesites suggests deposition during late Cretaceous and early Tertiary.

PREDICTED ORE BODY

The form of occurrence and close association of copper minerals with Cretaceous sediments and volcanics strongly indicates an ore body localized within the Roadside formation and perhaps in the underlying Cocoraque formation. It is known that the Cocoraque formation is composed mostly of gray-green arkoses, graywackes, gray quartzite, red and gray mottled mudstone, and pebble conglomerate beds. In some areas it is calcareous. The Cocoraque formation is intruded by plutonic rocks, namely, quartz diorite or quartz monzonite. At this juncture it is difficult to ascertain whether the Cocoraque formation could be a primary copper source. Also, after examination of the Roadside dump the author believes that quartz monzonite may be an additional host rock.

There can be no doubt that in the vicinity of the Roadside mine the copper bearing zone occurs within the Roadside formation as the drill log of 'Roadside #5' indicates. The dump surrounding the Roadside shaft

contains abundant copper sulfide also. Therefore, the copper sulfide zone seems rather thick and occurs a short distance below the surface. Available documentation and the conclusions shown on the schematic sketch of the Roadside mine in Figure 5 suggests a shallow seated secondary enriched zone of copper. Presumably, then, the primary source source should be nearby and considering the geological setting of the target area the source of copper may be construed accordingly.

1) It is a time-tested empirical fact that in many mining districts in Arizona, New Mexico, and other states Paleozoic limestones and calcarious shales carry primary copper sulfides. To wit Paleozoic limestones are present in the northern flank of the Coyote Mountains (Fig. 2) where they are folded within late Cretaceous (?) intrusives. This complex was uplifted during Tertiary time. Indeed Paleozoic limestones are also one of the components of the Roadside formation. If the Paleozoic limestones contained primary copper sulfides, post-Tertiary deformation and even ground water circulation will leach, relocate, and redeposit the copper ion in a supergene zone. Altered igneous rock and permiable sediments of the Roadside mine area invite such a process.

2) The presence of Cretaceous volcanics (andesite) may be offered as an alternative explanation for a source rock for copper. Research and observation elicits a strongly fractured, well-weathered series of flows interbedded with Cretaceous sediments consisting in large part of volcanic debris. It can be argued that the reddish, rusty, and strongly leached Roskruge rhyolite once was spread over the target area and has since fallen prey to the teeth of erosion. Therefore, it is reasonable to expect a copper bearing secondary enriched zone in a lower member of the Roskruge rhyolite or in strongly altered intrusives currently residing under alluvium in the western reaches of the target area.

3) Yet another hypothesis may be held, consistent with the foregoing two; namely, that dark gray calcarious clayey Cretaceous sediments might carry primary copper sulfide.

RECOMMENDATIONS

At this time having made only a cursory examination in the field, the target area may still be recommended based on the conclusions gained from an intensive investigation of available data. Indeed, in the author's opinion there is little doubt that the recommended target area is worthy of detailed field examination and, possibly, immediate drilling. The following exploration program is confidently submitted in anticipation of a possible discovery.

1) All copper occurences in the field should be examined and their locations mapped.
2) A detailed geologic map at a scale of 1 : 12000 must be prepared at least of the area outlined in figure four. If copper occurrences are widespread a larger area should be mapped.
3) All old prospects, claims, etc. and their status should be plotted on a large scale map along with their physical dimensions if possible. Particular attention should be delegated to the Roadside shaft and 'Roadside #5.'
4) If these workings are reasonably accessible, water samples should be taken and subjected to a full chemical analysis. Samples should be taken at intervals of at least every thirty feet from the water surface to the presently existing depth. An adequate sampling instrument should be used. From such analyses the writer expects to obtain more detailed information regarding metalliferous mineralization in vertical profile.
5) In that the recommended target area is complicated in its structure and largely covered by alluvium, it is highly adviseable to conduct magnetic or gravimetric surveys. At this time only one aeromagnetic map includes part of the target area (Fig. 4).

6) After careful analysis of all presently available information, the writer suggests that five drill holes are called for during the exploration stage (each fully cored). Their final depth should be carefully logged to 2000 feet. A very tentative location of these drilling sites is proposed on Figure 4.

7) During the author's meeting with the Papago Indian Mining Council and their Mining Director, Mr. Vernon Smith, on June 16, 1970, in Tucson it was stated that Texas Gulf Sulphur Company can renew their old prospecting permit for another four months. However, the company must pay $500.00 per month. When the renewed permit expires the Papagos will be glad to issue another one provided that the same legal and financial conditions are met. If the company will not accept such conditions, the Papago Indians are not willing to give any other prospecting permits; not even for one day. As it was stated previously in the permit dated January 1, 1969, and assured us by the Papago Indian Mining Council exclusive prospecting will be a matter of confidential negotiation between participating parties. The writer urgently recommends immediate renewal of the prospecting permit.

8) If a new prospecting permit is obtained and due to the high cost of the permit, it is strongly urged that an immediate aggressive concentrated exploration program be directed to the target area and the following:

a) Roskruge Mountains, specifically, La Tortuga Bute (Figs. 1 and 3).

b) The entire area between the Roadside mine and the southeastern part of the Comobabi Mountains (south of Comobabi village, Fig. 2).

c) Geological structure of the Baboquiviri Mountains and location of many old prospects also invites worthwhile exploration. Simultaneously, several areas within the Papago Reservation should be examined by other geologic teams.

Indeed extensive, active exploration, if this recommendation is accepted, should be vigorously pursued.

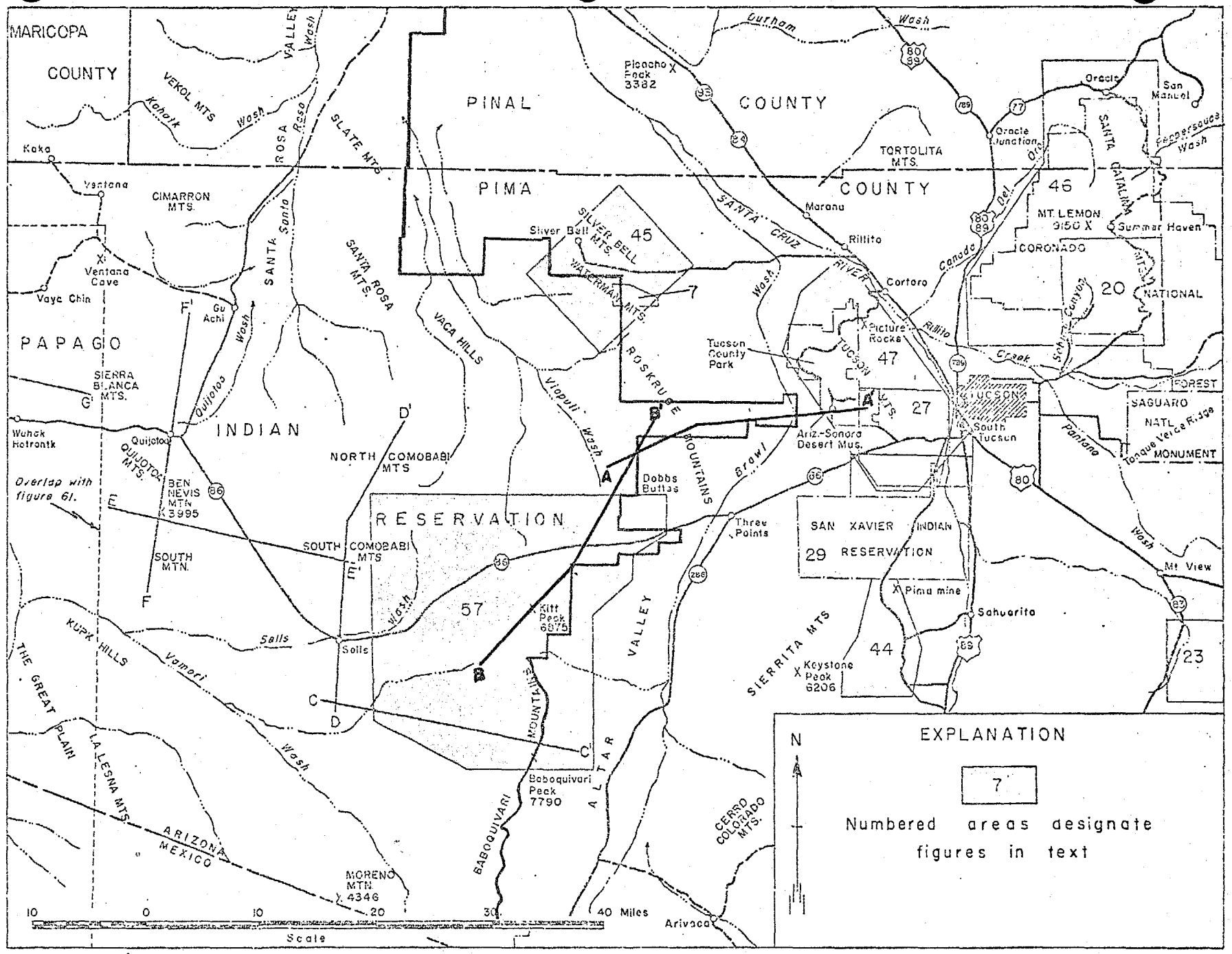


FIGURE 15. Index map of a part of central southern Arizona showing route of east half of Field Trip VI, locations and figure numbers of maps for Field Trips I, II, III, and IV and related articles, and generalized locations of diagrammatic cross sections shown in figures 56, 59, and 60.

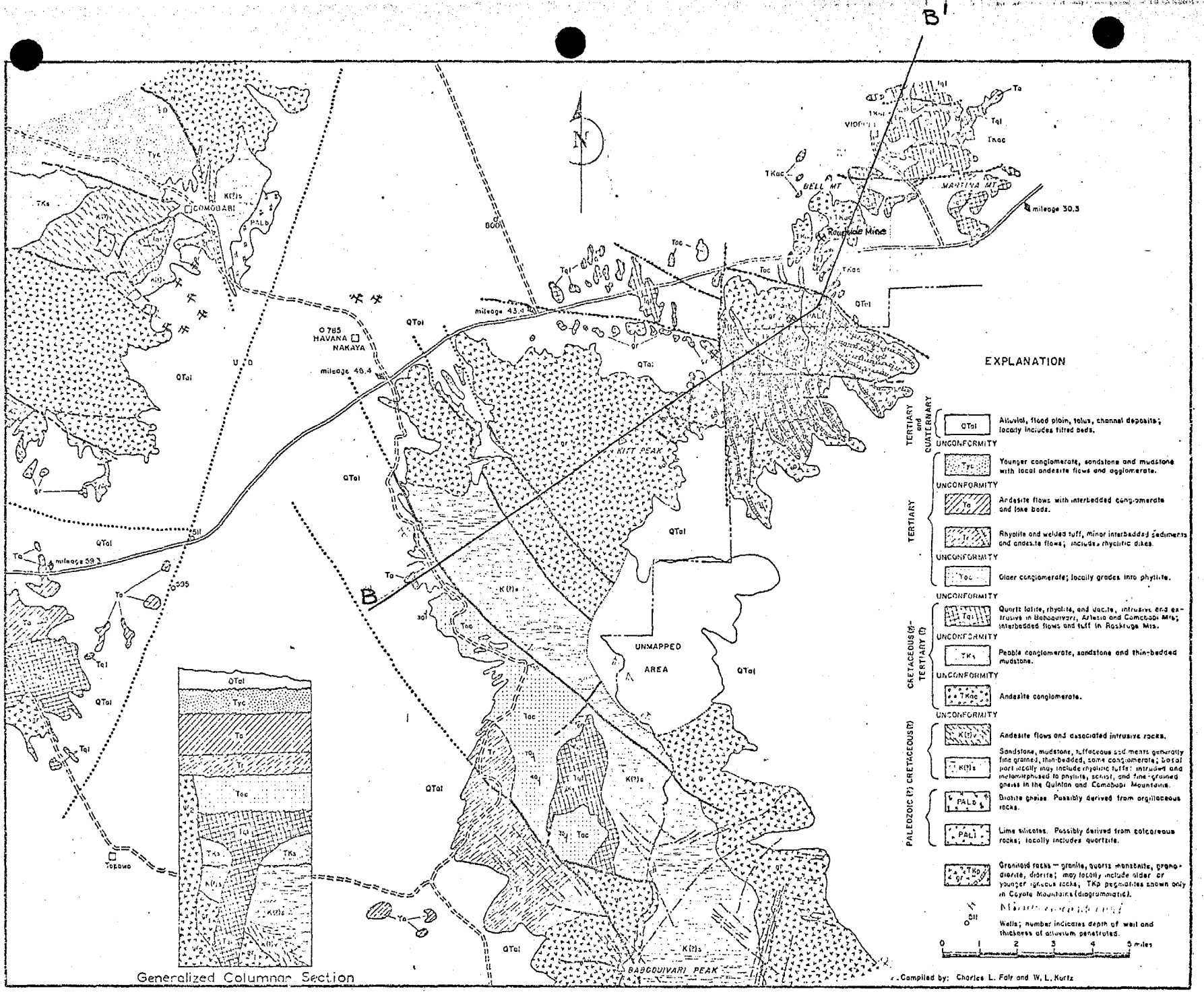


FIGURE 9. Generalized geologic map of parts of the Baboquivari, Roskruge, South Comobabi, and Artesa Mountains, Pima County, Arizona.

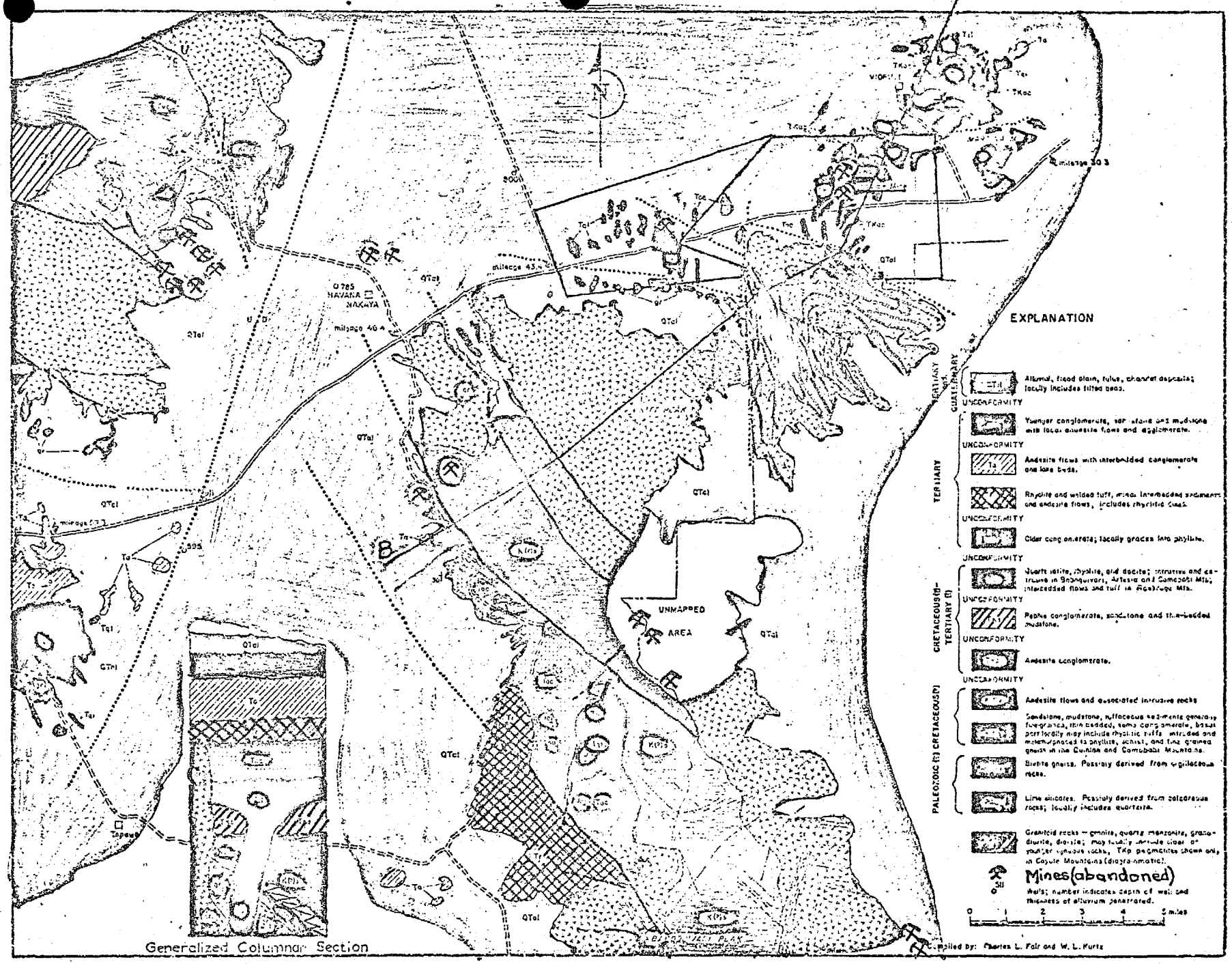
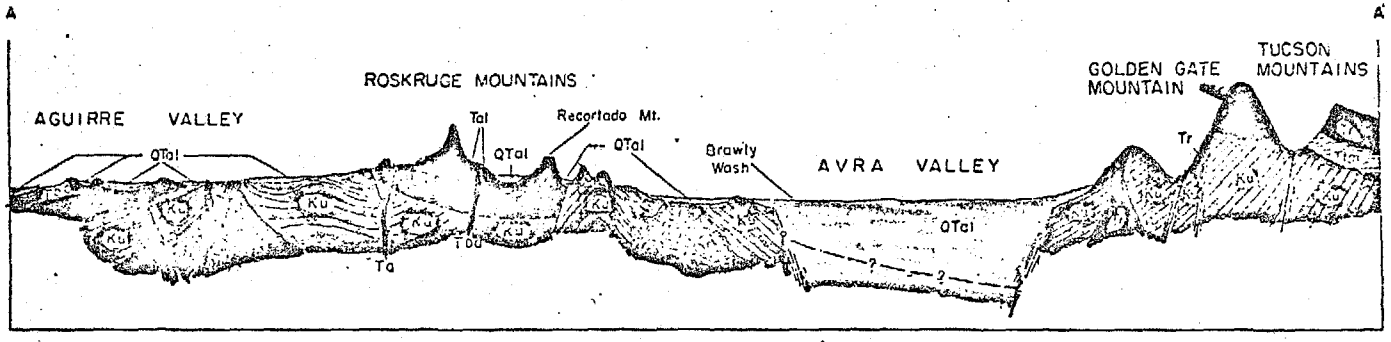


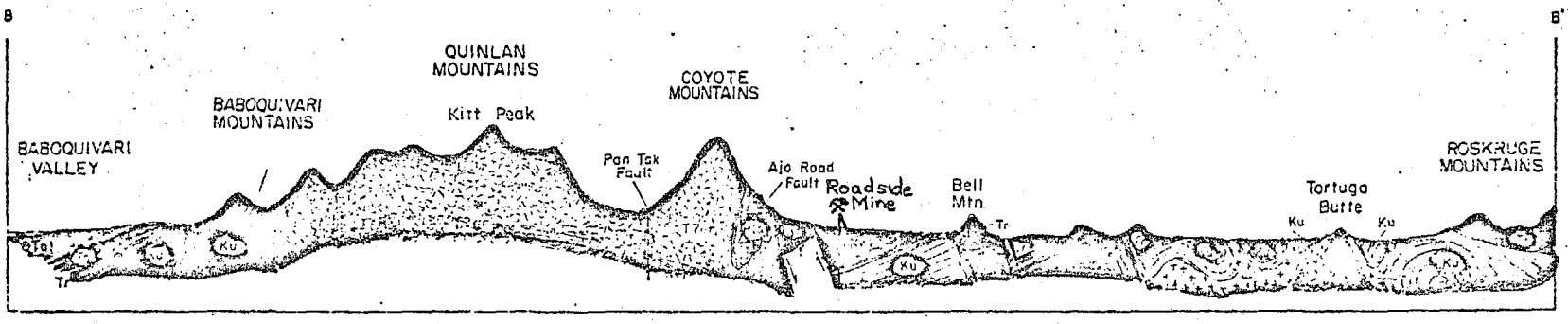
FIGURE 2. Generalized geologic map of parts of the Baboquivari, Roskruge, South Comobabi, and Artesa Mountains, Pima County, Arizona.

EXPLANATION

- QTal — Valley fill; undeformed where exposed; may cover deformed alluvial deposits at depth.
- Basaltic and andesitic flows and dikes; some interbedded conglomerate.
- Alluvium, deformed by normal faulting; may be of different ages in different areas.
- Andesitic flows and intrusive rocks.
- Tst — Silicic tuff, agglomerate, and flows.
- Tap — Andesite porphyry flows.
- Tas — Silicic tuff, agglomerate, and flows, with some andesitic rocks.
- Shallow intrusive rocks, principally silicic; may include some older shallow intrusive rocks
- Tal — Angular to well-rounded fanglomerate; deformed by normal and thrust faulting; locally metamorphosed; may be of different ages in different areas.
- Rhyolitic, latitic, and quartz-latitic tuff, agglomerate, flows, and intrusive bodies; may be of different ages in different areas.
- Ttm — Tucson Mountain chaos—giant breccia and conglomerate.
- Intrusive rocks; diorite, quartz monzonite, alaskite, granite; Tgr cuts younger Mesozoic-early Tertiary rocks, T?gr cuts older Mesozoic-early Tertiary rocks, and K?gr cuts Paleozoic rocks; may represent several periods of intrusion.
- Volcanic conglomerate and breccia, composed principally of andesitic porphyry fragments.
- Conglomerate, arkose, mudstone, and volcanic rocks; of at least two ages; K?v, locally separated volcanic rocks.
- Pzls — Paleozoic limestone.



Cross-section A-A' trends generally N. 70° E. and is viewed looking north between Field Trip VI mileages 12.9 and 35.9; approximate length of cross section, 24 miles.



Cross-section B-B' trends generally N. 30° E. and is viewed looking west between Field Trip VI mileages 30.1 and 39.8 and looking southeast between mileages 46.5 and 54.3; approximate length of cross section, 30 miles.

FIGURE 3. Diagrammatic cross sections A-A' and B-B' located on figure 55 and explanation to accompany cross sections referred to in Field Trip VI. Cross sections are not to scale; vertical exaggeration is approximately x5.

EXPLANATION

QTal — Valley fill; undeformed where exposed; may cover deformed alluvial deposits at depth.

Tbo — Basaltic and andesitic flows and dikes; some interbedded conglomerate.

Tal — Alluvium, deformed by normal faulting; may be of different ages in different areas.

Ta — Andesitic flows and intrusive rocks.

Tst — Silicic tuff, agglomerate, and flows.

Tap — Andesite porphyry flows.

Tas — Silicic tuff, agglomerate, and flows, with some andesitic rocks.

Ti — Shallow intrusive rocks, principally silicic; may include some older shallow intrusive rocks

Taf — Angular to well-rounded fanglomerate; deformed by normal and thrust faulting; locally metamorphosed; may be of different ages in different areas.

Tr / Tal — Rhyolitic, latitic, and quartz-latitic tuff, agglomerate, flows, and intrusive bodies; may be of different ages in different areas.

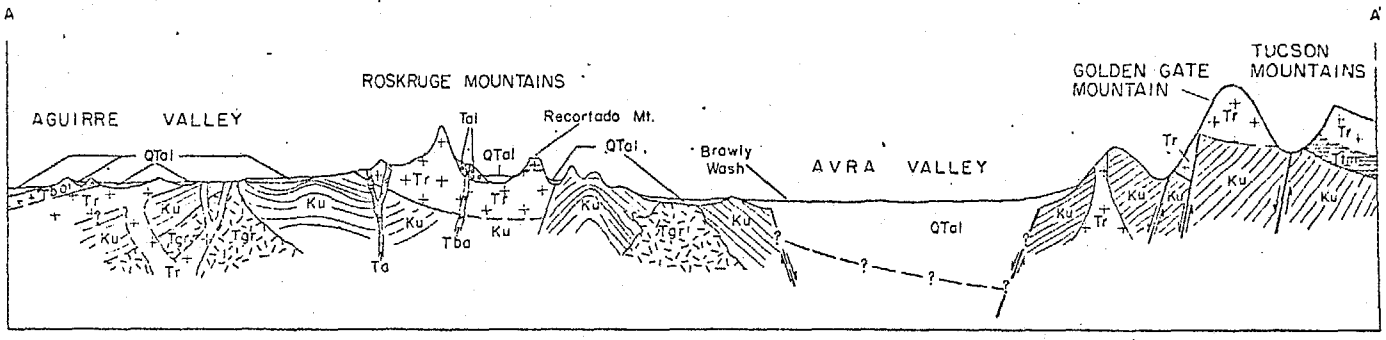
Ttm — Tucson Mountain chaos—giant breccia and conglomerate.

Tgr / T?gr / K?gr — Intrusive rocks; diorite, quartz monzonite, alaskite, granite; Tgr cuts younger Mesozoic-early Tertiary rocks, T?gr cuts older Mesozoic-early Tertiary rocks, and K?gr cuts Paleozoic rocks; may represent several periods of intrusion.

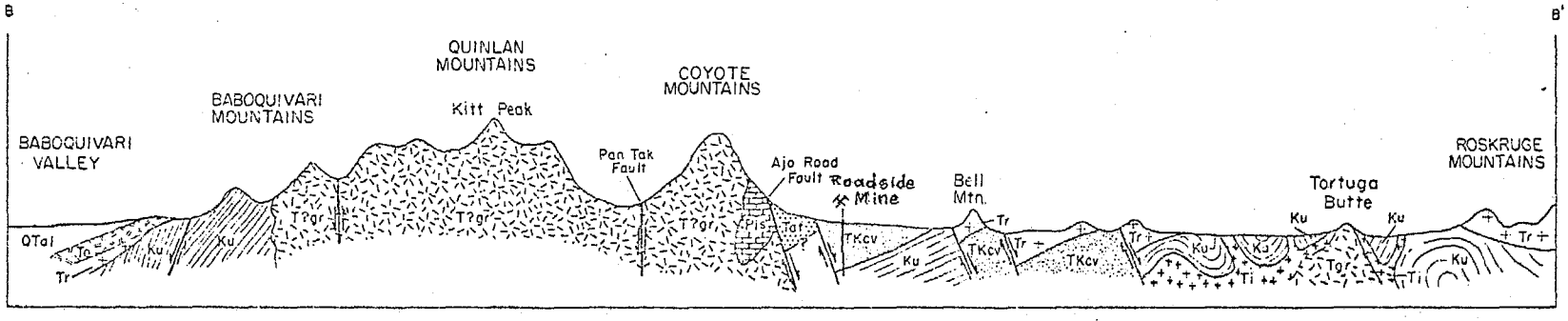
TKcv — Volcanic conglomerate and breccia, composed principally of andesitic porphyry fragments.

Ku / K?v — Conglomerate, arkose, mudstone, and volcanic rocks, of at least two ages; K?v, locally separated volcanic rocks.

Pls — Paleozoic limestone.



Cross-section A-A' trends generally N. 70° E. and is viewed looking north between Field Trip VI mileages 12.9 and 35.9; approximate length of cross section, 24 miles.

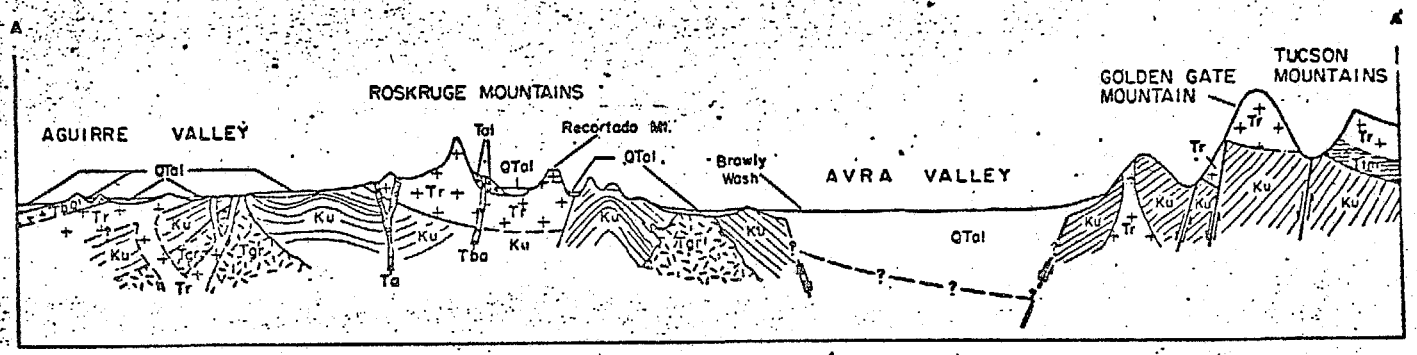


Cross-section B-B' trends generally N. 30° E. and is viewed looking west between Field Trip VI mileages 30.1 and 39.8 and looking southeast between mileages 46.5 and 54.3; approximate length of cross section, 30 miles.

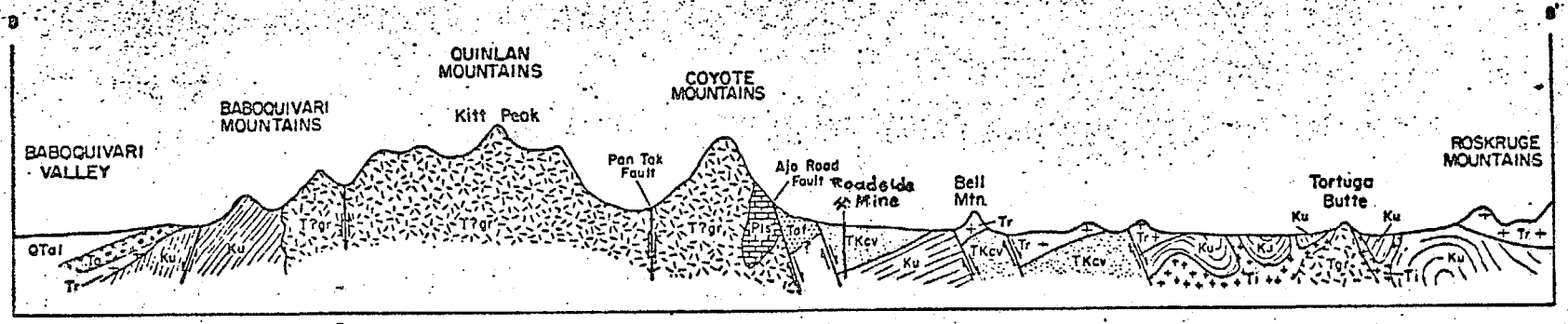
FIGURE 56. Diagrammatic cross sections A-A' and B-B' located on figure 55 and explanation to accompany cross sections referred to in Field Trip VI. Cross sections are not to scale; vertical exaggeration is approximately x5.

EXPLANATION

- QTal — Valley fill; undeformed where exposed; may cover deformed alluvial deposits at depth.
- Tba — Basaltic and andesitic flows and dikes; some interbedded conglomerate.
- Tal — Alluvium, deformed by normal faulting; may be of different ages in different areas.
- Ta — Andesitic flows and intrusive rocks.
- Tsl — Silicic tuff, agglomerate, and flows.
- Tap — Andesite porphyry flows.
- Tas — Silicic tuff, agglomerate, and flows, with some andesitic rocks.
- Ti — Shallow intrusive rocks, principally silicic; may include some older shallow intrusive rocks
- Taf — Angular to well-rounded fanglomerate; deformed by normal and thrust faulting; locally metamorphosed; may be of different ages in different areas.
- Tr / Tal — Rhyolitic, latitic, and quartz-latitic tuff, agglomerate, flows, and intrusive bodies; may be of different ages in different areas.
- Ttm — Tucson Mountain chaos—giant breccia and conglomerate.
- Tgr / T?gr / K?gr — Intrusive rocks; diorite, quartz monzonite, alaskite, granite; Tgr cuts younger Mesozoic-early Tertiary rocks, T?gr cuts older Mesozoic-early Tertiary rocks, and K?gr cuts Paleozoic rocks; may represent several periods of intrusion.
- TKcv — Volcanic conglomerate and breccia, composed principally of andesitic porphyry fragments.
- Ku / K?v — Conglomerate, arkose, mudstone, and volcanic rocks; of at least two ages; K?v, locally separated volcanic rocks.
- Pls — Paleozoic limestone.



Cross-section A-A' trends generally N. 70° E. and is viewed looking north between Field Trip VI mileages 12.9 and 35.9; approximate length of cross section, 24 miles.

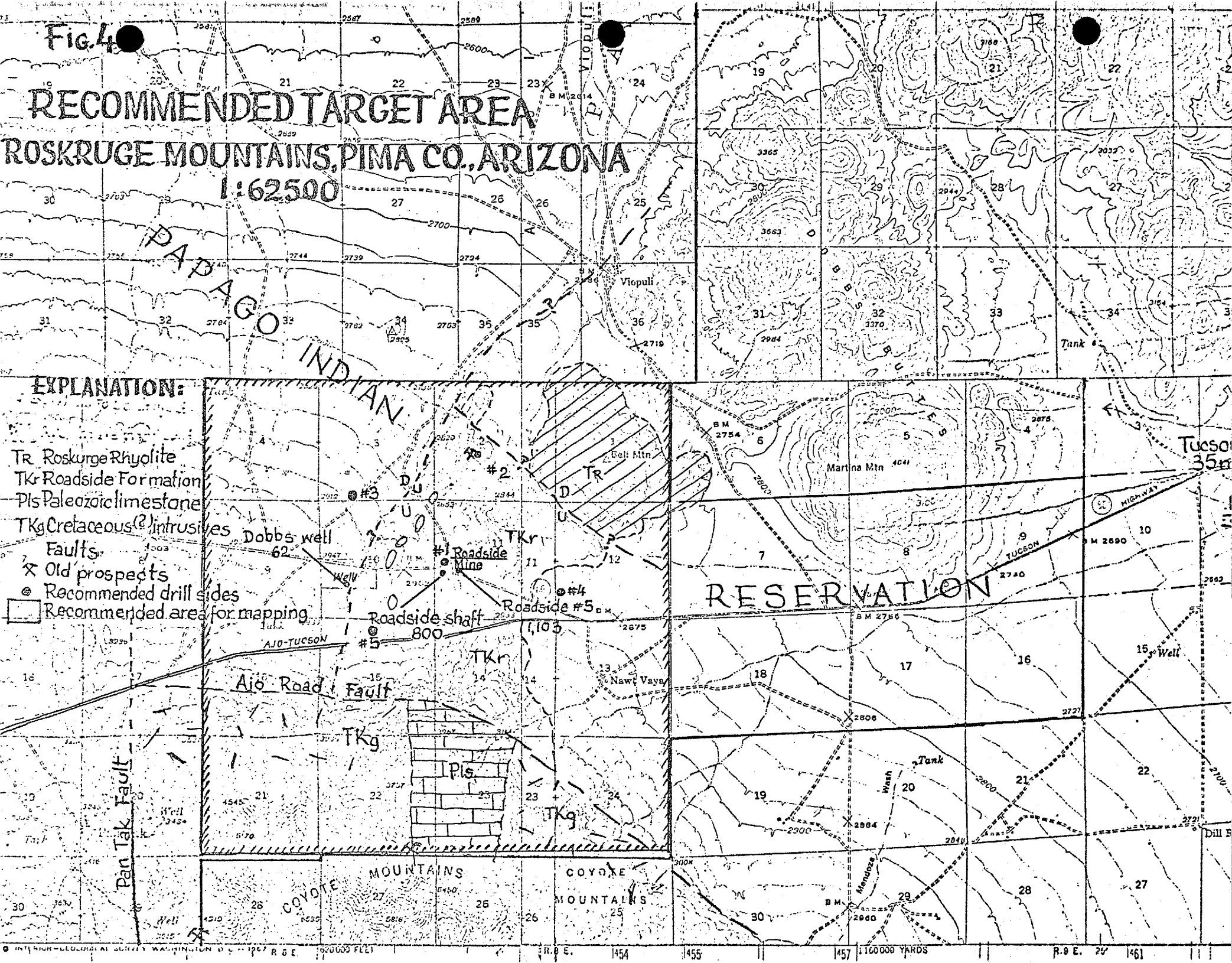


Cross-section B-B' trends generally N. 30° E. and is viewed looking west between Field Trip VI mileages 30.1 and 39.8 and looking southeast between mileages 46.5 and 54.3; approximate length of cross section 30 miles.

FIGURE 54. Diagrammatic cross sections A-A' and B-B' located on figure 55 and explanation to accompany cross sections referred to in Field Trip VI. Cross sections are not to scale; vertical exaggeration is approximately x5.

Fig. 4

RECOMMENDED TARGET AREA
ROSKRUGE MOUNTAINS, PIMA CO., ARIZONA
1:62500



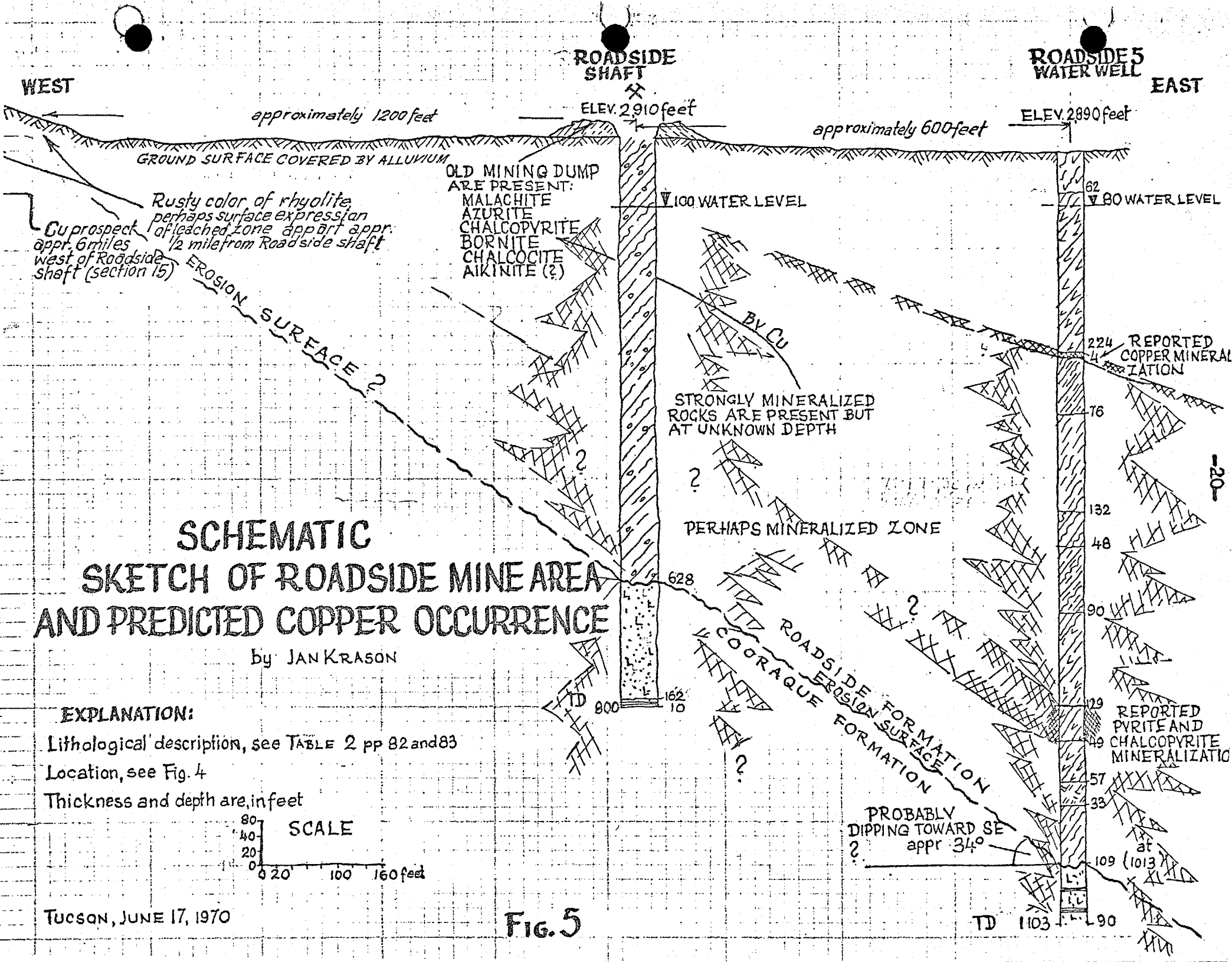
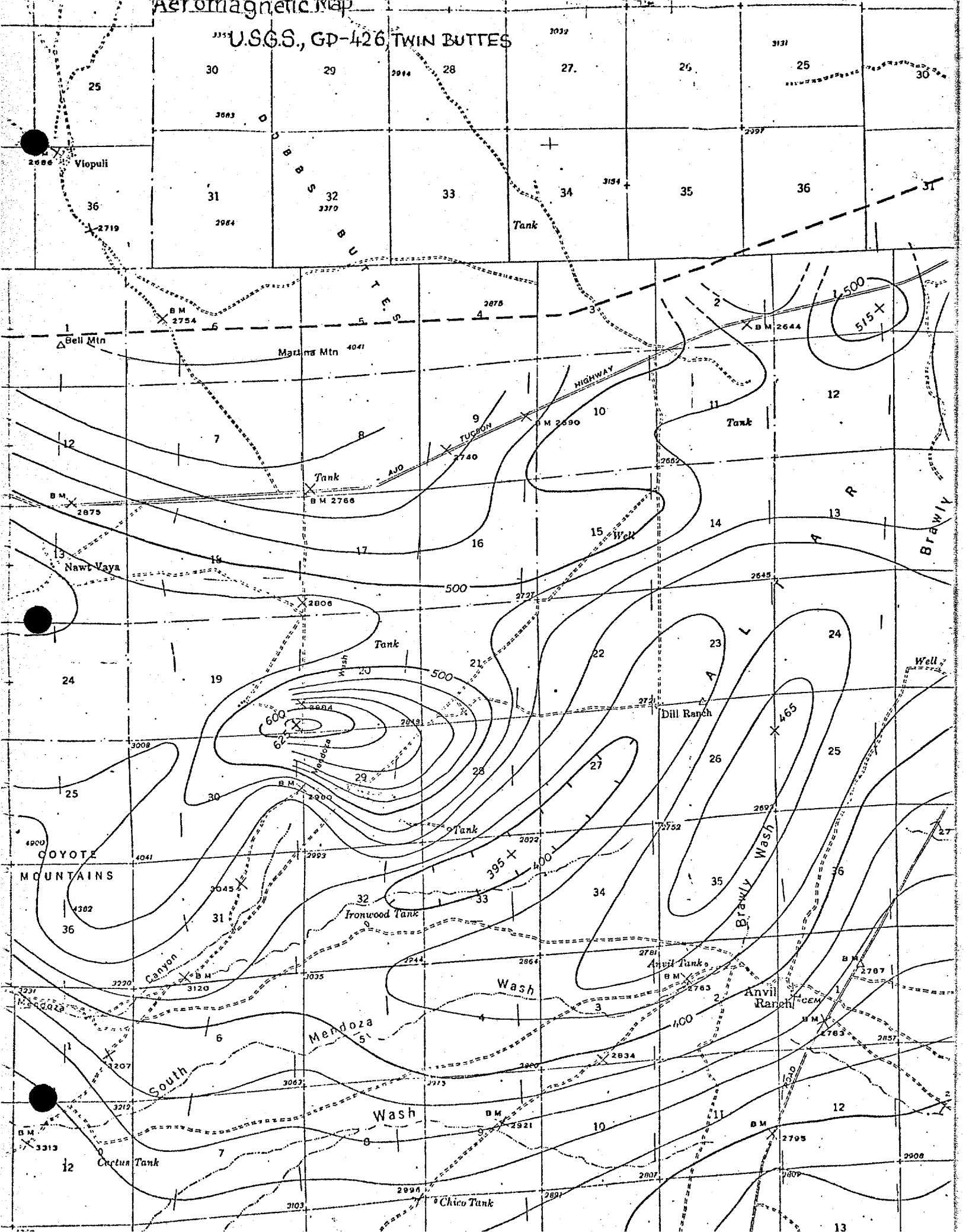

WEST
ROADSIDE SHAFT
ROADSIDE 5 WATER WELL
EAST
approximately 1200 feet
ELEV. 2910 feet
approximately 600 feet
ELEV. 2890 feet
GROUND SURFACE COVERED BY ALLUVIUM
OLD MINING DUMP ARE PRESENT:
MALACHITE
AZURITE
CHALCOPYRITE
BORNITE
CHALCOCITE
AIKINITE (?)
Rusty color of rhyolite perhaps surface expression of leached zone apport appr. 1/2 mile from Roadside shaft
Cu prospect appr. 6 miles west of Roadside shaft (section 15)
EROSION SURFACE ?
100 WATER LEVEL
80 WATER LEVEL
62
224
4
REPORTED COPPER MINERALIZATION
76
132
48
90
129
49
57
33
109
90
BY Cu
STRONGLY MINERALIZED ROCKS ARE PRESENT BUT AT UNKNOWN DEPTH
PERHAPS MINERALIZED ZONE
628
162
10
TD 800
ROADSIDE FORMATION
COORAQUE FORMATION
EROSION SURFACE
REPORTED PYRITE AND CHALCOPYRITE MINERALIZATION
PROBABLY DIPPING TOWARD SE appr 34°
at (1013)
TD 1103
-20-
SCHEMATIC SKETCH OF ROADSIDE MINE AREA AND PREDICTED COPPER OCCURRENCE
by JAN KRASON
EXPLANATION:
Lithological description, see TABLE 2 pp 82 and 83
Location, see Fig. 4
Thickness and depth are in feet
SCALE
80
40
20
0
0 20 100 160 feet
TUCSON, JUNE 17, 1970

FIG. 5

Aeromagnetic Map

U.S.G.S., GP-426, TWIN BUTTES



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SUPPLEMENTARY REPORT
REGARDING PRELIMINARY GEOLOGIC RECONNAISSANCE FOR COPPER DEPOSITS IN THE SOUTHERN ROSKRUGE MOUNTAINS - ROADSIDE MINE AREA
Pima County, Arizona

by
Jan Krason
Texas Gulf Sulphur Company

Denver, Colorado
October 10, 1970

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Summary

The Roadside Mine Area is located thirty-five miles west of Tucson. The discovery shaft was sunk in 1880, and since that time the mine was never in operation, and up to now this area was not properly examined.

The author's geological reconnaissance in the field and studies of published and unpublished data revealed that in the Roadside Mine Area there occurs highly concentrated and widely disseminated copper mineralization. Massive and disseminated copper sulphides and copper-carbonates were found from the depth fifteen feet below ground surface (in shaft No. 1) up to 700 feet (in shaft No. 3). Copper showings on ground surface are widely scattered, but the old mining prospects (with copper mineralization) are concentrated on the area of at least three square miles.

The Roadside Mine Area (if legally accessible) is recommended for immediate detailed geological, geochemical, and geophysical surveying, then for exploration drilling.

Introduction

The author's exploration idea for the southern Roskruge Mountains was to examine Cretaceous-Tertiary andesitic and rhyolitic volcanics (TKv) as an eventual copper source, with hope for disseminated and highly concentrated copper deposit, in the vicinity of an old Roadside mine. This mine is located thirty-five miles west of Tucson, Arizona (by Highway 86), within the Papago Indian Reservation. Not having an exploration permit, the author's field observations were very brief. However, gathered information and data showed sufficient premises for recommendation of the Roadside Mine Area for detailed geological exploration (see report by J. Krason, dated June 18, 1970). When it was announced that the Knox-Arizona Corporation mining claims, notably the Roadside Mine Area, have been leased for Coronado Copper Corporation (see the article "Exploration Scheduled Near City", in Tucson Daily Citizen, dated July 20, 1970), the author's exploration activity in this area was suspended.

However, according to advice by Dr. J. A. L. White, the author paid a visit at Knox-Arizona Corporation and met Mr. William A. Knox (corporation president) and Mr. Anthony Lane (mining engineer and geologist). At this time I was informed that the Roadside Mine property is comprised of forty-one unpatented mining claims containing a total area of 847 acres. There is no royality payment due to the Papago Indians, as these claims had been validated before the establishment of the Papago Indian Reservation. A surface right payment of $0.05 per acre is the only obligation to the Indian Tribal Council.

W. A. Knox has stated that he signed a ninety-day lease on July 16, 1970, with Ford Bayler and David Downing. They formed Coronado Copper Corporation for exploration and development on the old Roadside mine. Recently (on September 29, 1970), the author was told by A. Lane (Knox-Arizona Corporation) that this lease will probably be dropped (on October 15, 1970) due to the financial troubles of Coronado Copper Corporation. A. Lane mentioned also that lately Phelps Dodge Corporation is doing some geological exploration in the southern Roskruge Mountains.

The author's idea for the Roadside Mine Area becomes strongly

supported when some of additional field observations were made (between Coyote Mountains and La Tortuga Butte, see report by J. Krason, dated August 4, 1970) and particularly from unpublished reports obtained from Knox-Arizona Corporation (see enclosed). Also, good indications for a widespread copper mineralization toward the south of Roadside mine shafts were found by some of the geochemical analyses collected from the highway cuts (as advised by Allan P. Juhas).

This report summarizes gathered information, gives them additional interpretation, and contains the author's suggestions for exploration program.

History of Exploration and Mining Workings

When the author's preliminary report was prepared (on June 18, 1970) only published information was available. However, later very valuable unpublished reports were also found. It is known now that the Roadside mine, formerly known as the St. Francis mine, was mined in 1880 and shipments of copper ore continued intermittently from this date to 1917. In this time one shallow shaft was dug, up to thirty feet. When the owner of the property, Mr. Collins P. Hunington, died in 1900, his widow took over the property, but further workings were stopped until 1912. At this time Mr. Courtney de Kalb was engaged by Mrs. Hunington. Under his supervision Shaft No. 2 was started in that year and some additional work done in Shaft No. 1, connecting the two shafts on the 200 foot level. On account of the soft zone encountered on the 380 foot level of Shaft No. 2, this shaft was abandoned and Shaft No. 3 started. It reached the 800 foot level in September of 1924, when the property was shut down. Mr. de Kalb died in the 1920's, and there has been virtually no exploration since that time, except for a short time in the mid-1950's and in early 1960's.

In 1953, Mrs. de Kalb, inheritress of the Roadside mine requested from Mr. Edwin A. Stone (consulting geologist, Tucson, Arizona) an appraisal for her property. Following her order, Mr. Stone made some of the regional geological mapping, additional ground was acquired, and in 1957, one borehole was drilled up to 1,103 feet (see drillers

log attached to the author's report, dated on June 18, 1970).

According to Mr. Stone's recommendation, some geophysical surveying was made too (see report by Heinrichs Geoexploration Company, dated January, 1960). In early 1960's, Mr. E. A. Stone died and the Knox-Arizona Corporation acquired the mining claims. Then in 1966, the Duval Corporation made some exploration and drilled one borehole. Unfortunately, their results are not known to the author. However, it was possible to find Duval's Photo-Geologic Map (see enclosed). This map looks very detailed but covers a small area. This area is located northeast of the Roadside mine shafts. From this map it could also be seen that Duval's borehole was located approximately 2,500 feet northeast from Shaft No. 3.

Geological Setting of the Target Area

The regional geological location and the stratigraphical sequence of the Roadside Mine Area have already been briefly described in the author's preliminary report (June 18, 1970). However, later field observations and additional collected information gives a new lgiht on the geological setting of the target area.

Now, it is known that the Roadside property is located within the bordering zone of the Laramide granitic massive of the Coyote Mountains, on the south, and Cretaceous-Tertiary volcanics and sediments composing mainly the Roskruge Mountains, on the north. The nature of this zone is fault-shearing, but also with large lateral dislocations. It is worth noticing that according to E. A. Stone's geologic report (see enclosed) and Duval's Photo-geologic map, probably the same Paleozoic limestone which is exposed in the northern Coyote Mountains, crops out also on the footwall side of the Ajo Road Fault, northeast of the Roadside mine shafts.

The Ajo Road fault can be observed in many arroyes, particularly on the northern side of the Coyote Mountains. This fault strikes approximately N75°W and dips steeply to the north. It can be seen also that this is a rather shear zone, along which the northern side dropped down. The author's limited observations do not allow to

confirmation of Stone's opinion that within the Roadside Mine Area several other faults occur parallel to the Ajo Road fault. However, the occurrence of the Paleozoic limestone, northeast of the Roadside mine shafts, indicates at least for the second large fault. Probably along this fault or perhaps fault zone, the northern side was uplifted. The northeast-southwest fault system is very common in the Coyote and Roskruge Mountains, but also widely extends toward east and west. Even the author's cursory glance revealed in the Roadside Mine Area the second main tectonic dislocation and shearing system, striking approximately north-south. Particularly this one has been exposed and traced in the underground workings. According to E. A. Stone the north-south fault and shear zone, on the Roadside Mine Area is over 5,000 feet wide. Stone mapped this adjustment zone from Coyote Mountains through the Roskruge Mountains up to the Silver Bell Area. The Silver Bell copper ore body occurs along this system, where it intersects another strong east-west structure. Stone also points out that displacement of the rock formations on the north-south fault system does not appear to be extensive; however, blocks are faulted down on elements, toward the east, and total displacement may be several hundred feet. Particularly for the structural characteristics and copper mineralization associated with it, a very instructive description by Stone (1963) follows:

> Within the property limits there are two areas of extensive deformations which were developed by these two regional adjustments. They are termed:
>
> 1. The <u>Shaft Structure</u> in which a series of tension zones or shears were developed between strong elements of the north-south system. These wide shear zones are mineralized in the volcanic horizon but where exposed they are now characterized by oxidized and leached gossan. All of the early mining was done on one of these shear zones which was opened by three shafts, the deepest 800 feet, together with over 2,000 feet of lateral work. All ore shipments came from the oxidized zone. DeKalb shipped no ore, but in the course of his development he reports that he blocked out 40,000 tons of ore

containing three percent to three and 1/2 percent copper, nine ounces of silver, and 0.02 to 0.03 ounces gold.

2. The North structure which lies 2,000 feet and more north of the shaft and strikes about N75°W. This structure traverses the property for a distance of 6,600 feet following a series of east-west fractures which are probably a part of the Ajo Road fault adjustment. Deformation is intense within this structure where it is intersected by the north-south Roadside fault system. This zone of deformation is about 2,000 feet wide as far as known but its southerly limit cannot now be accurately defined.

The North structure is mineralized through out with occasional outcrops of oxidized copper minerals in shears and fractures or replacement in some of the volcanic beds. The chief mineralization, however, is epidote which occurs abundantly having been introduced along shears and fracture intersections where it has replaced the volcanic rocks. The epidote, in most places is highly mineralized with oxidized copper minerals, native copper, chalcocite, some bornite and occasional particles of chalcopyrite. No important work was done on this structure in the early periods of mining. The most extensive exploration is a DD Hole 1,005 feet deep which the writer drilled on the east end of the structure, last year (1957). This hole was not completed due to lack of money but it is cased and capped so that drilling can be resumed at any time with BX size hole.

The above described blocks were not observed in the field by the author; however, a shear zone approximately one mile wide is very evident. It is expressed by morphology, and by color anomalies. This zone strikes N10 to 15°E, and its eastern limit occurs about 300 feet east of Shaft No. 3 (see enclosed Photo 17). The source shear zone can also be observed in the road cuts of a new highway (No. 86) which traverses through the southern part of the Roadside mine property (see Photo 15). It is possible that the NEN-SWS shear zone is much wider, and extends toward the west, but here brecciated

rocks are covered by alluvial sediments. Even so, when flying by helicopter, as shown on the enclosed areal photograph, rusty, widespread spots can be noticed. This zone along strike can be traced through several miles, from the foothills of the Coyote Mountains, through the Roadisde Mine property and probably up to La Tortuga Butte. At this time it is difficult to say if the discussed shear zone is the northern extension of Pan Tak fault (J. Krason, June 18, 1970). However, judging by the morphological feature, such a conclusion might be justified. It is also possible that the side limits of the main shear zone are irregular.

For the structural characteristics of the Roadside Mine Area, the following statement by E. A. Stone is very important: "The shaft (No. 3) passed out of andesite and into a monzonite granite at 630 feet depth. Crosscuts and drifts connect with Shaft No. 1 on the 200 foot level, and other crosscutting and drifting was done on the 300 foot, 400 foot and 700 foot levels. The crosscut on the 700 foot level entered the monzonite granite at ninety-five feet. It was shattered and heavily oxidized in the seams, with small amounts of copper and silver present. This continued over a distance 125 feet and again entered the andesite at 240 feet from the shaft. The main vein was reached at 275 feet from the shaft, having a width of fifteen to twenty feet a heavily oxidized vein matter, but low in copper, if any."

The above facts permit us to conclude that granitic and monzonitic stock exposed in the Coyote Mountains extends through the Roadside Mine property, but in the vicinity of old shafts occurs at the depth below 1,000 feet; however, its apophysis can ve reached much shallower. In the above described shear zones strongly altered granite-monzonite is also exposed on the ground surface. Granitic rocks could also be easily reached, beyond the above mentioned Paleozoic limestone (outcrops, located northeast of Roadside mine shafts). Besides this, it should be mentioned too that on the west and east of the Roadside Mine property are widely exposed Roskruge rhyolite and rhyolitic tuffs (Cretaceous-Tertiary). According to L. A. Heindl (1965) the Roskruge rhyolite is younger than the Roadside Formation (Cretaceous,

refer to J. Krason report, June 18, 1970). Such a stratigraphical situation can be observed but only at the Bell Mountain and Dobbs Buttes (see Fig. 2 enclosed). However, rhyolite which crops out west of the Roadside mine probably also rests directly on the Laramide intrusives.

Gathering all above mentioned information, and comparing it to the similar data from many copper mines in operation, it could also be concluded that the geological setting of the Roadside Mine Area might be excellent for location of a large copper ore body.

Copper Occurrence

The data regarding copper mineralization cited in the author's previous report (June 18, 1970) were also very limited. However, in the light of the later field observations and after studying of unpublished reports, the author's previous predictions can also be strongly supported.

Particularly from the C. de Kalb report (September 6, 1928) we know that the copper showings on ground surface are widespread through the entire Roadside Mine Area. Also the author's observation revealed that copper carbonates can be found in many places between the Coyote Mountains and La Tortuga Butte (through approximately eight miles long distance). However, the mining prospects are chiefly scattered on the area of about three miles long and one mile wide. In most places copper occurs as chrysocolla and malachite and it is associated with andesitic rocks.

Very interesting indications for copper occurrences have been found also by geochemical analysis of the soil and rock chip samples. These samples have been collected from the road cuts along Highway 86, through 2.4 miles. The best results, up to 2,200 ppm copper, 1,300 ppm lead, 110 ppm zinc, and 3 ppm silver in soil showed sample No. 116-A-i, taken from the point located over a half mile south of the Shaft No. 3. Other samples are not so impressive, but the value of copper in another seven samples (from total eleven) ranges from sixty to 160 ppm copper, which is three to eight times higher than the background. The same samples showed up to five times higher

value of lead and zinc. An attempt was made to take representative specimens of the rock, so the samples were selected for their lack of any obvious mineralization. The original intent was to possibly turn up values which would be high enough to be considered anomalous under any circumstances, and in this respect the survey was successful. These facts draw attention that the proper geochemical surveying (author did not have a legal permission for exploration) besides the detailed geological mapping, might be very helpful for an accurate location of an ore body. But it should also be added that if the surface indications of copper are very strong, this property would already be in mining operation. Particularly for this reason that the morphology of the Roadside Mine Area is flaty, with small hills, and older rocks are widely covered by alluvial sediments, the geological information from the underground workings are very valuable. Regarding copper mineralization, which has been observed in the shafts of the Roadside mine, very interesting data can be summarized after E. A. Stone:

> Mining in the early stages was for high grade copper carbonate and unaltered bornite from sealed off water pockets which had escaped thorough oxidation. One of these, found in the first fifteen feet of Shaft No. 1 and another at 137 feet, are reported to have been twenty to thirty feet wide and fifty to ninety feet long, and to have assayed six to seven percent copper and fourteen to fifteen ounces of silver. In this part of the mine quicksilver was also found, assaying 0.79 percent per ton. Surrounding the pockets of high grade was thoroughly oxidized vein matter assaying 1.5 to three percent copper and three to seven ounces of silver.
>
> Shaft No. 2, started in the H. W., is said to have cut through forty feet of vein matter in connecting thru to Shaft No. 1, with seams of copper carbonate throughout. No assays are reported. No information is available as to the ore found in the lower levels of Shaft No. 2, and they are now caved and inaccessible. It is reported however, that an attempt to break

into the 380 foot level from the north drift on the 400 foot level of Shaft No. 3, disclosed a viscous mass of sooty chalcocite in a bluish mud with fragments of undecomposed vein filling which also carried some bornite and mercurial tetrahedrite. This level was not reopened.

From Shaft No. 3, on the 400 level, a twenty-foot vein was disclosed, streaked with green carbonate with a diffusion of iron staining beyond Roadside mine, the main vein for some distance into the hanging wall. Drifting to the north from this shaft entered another water pocket, as encountered in Shaft No. 1. After draining for several days it was found to contain chalcocite, both secondary and primary. Some of these masses of chalcocite were a foot long by three inches wide. Another interesting feature of this part of the deposit is a net work of seams of ore entirely distinct from the enclosing altered andesite. These were from less than 1/2 inch to three inches wide, consisting of mass bornite and tetrahedrite intermingled with a gangue of mixed silica and calcite. The seams lay in every direction and had evidently been injected into the confusedly shattered rock. Some of these injected masses assayed eighteen percent copper and sixty-four ounces of silver. The intermediary rock was also mineralized and assayed from three to five percent in copper and from eight to fifteen ounces of silver. The length of the water pocket was fifty-five feet. A raise from this level, starting from the footwall of mineralized vein matter, averaged 4.78 percent copper and 11.5 ounces of silver. Also ninety-six feet along the vein in the north end of the 400 foot level assayed 4.3 percent copper and 9.3 ounces of silver and 0.03 ounces of gold.

As to the bottom of the No. 3 shaft, Mr. de Kalb reports: "The rock from the last twenty-five to thirty feet, i.e. from 770 to 800 feet was below water level. A great change occurred at about 750 feet depth. Nevertheless, the water level had evidently been fluxuating in height, and the material from the shaft was still in progress of oxidation, especially along the

PAGE
10.

favorable for copper deposit might be a crossing fault system, and presence of an extensive shear zone.

3. Probably all the Roadside shafts and mining prospects are located mainly within the eastern part of the faulted and sheared zone, widely extended toward NEN-SWS. It is possible that this zone has been lateraly displaced; it is mostly covered by alluvial sediments. Some places might be penetrated and covered by much younger (Pliocene or Pleistocene) basalt extrusions.

4. Both described deformation systems followed after formation processes of Laramide granitic intrusions.

5. It is very probable that beyond Cretaceous volcanics and sediments (Cocoraque and Roadside Formations, refer to J. Krason's report, June 18, 1970) the Paleozoic limestone is resting. Its lithological and metallogenic features are not known, but if this limestone is not a source of the primary copper, it might be a good host rock.

6. An important factor for the metallogenic processes is probably associated with Cretaceous andesites and especially with Cretaceous-Tertiary rhyolitic flows and tuffs. Rhyolites are usually very rusty, strongly porous, and at least in some places (e.g. west of the Roadside property) are also resting upon the Laramide granitic rocks.

7. The copper mineralization encountered widely in the Roadside Mine workings is probably on the secondary place.

8. The metallogenic enrichment (including vein filling) came probably after deformation and alteration.

9. Irregular concentration of silver and copper, particularly in the form of bornite, chalcocite, and native copper is probably due to a different stage of alteration, porosity, and permeability of the host rocks.

10. So called "water pockets" and associated with them high metallic concentration, widely described by de Kalb, are porbably local but frequent. They form strongly porous and permeable zones within the rocks weakly fractured and perhaps with clayey matrix (probably kaolinitic).

11. Wide vertical and lateral dispersion (in Shaft 1 already fifteen feet below ground surface and up to 800 feet in Shaft 3) of copper-carbonates indicates that less porous and weakly permeable rocks are also copper-bearing but in lower grade. This observation and common vein and veinlet type of copper mineralization draws attention that high grade copper ore might be located in sufficiently porous and permeable rocks.

12. It is possible, as observed and concluded de Kalb, that porosity and permeability will increase below 800 feet (bottom of No. 3 shaft). De Kalb reported that in the Shaft No. 3, the dynamic water level has been found at the depth 700 feet. However, besides this, the geological conditions, very favorable for occurrence of the massive and disseminated copper sulphides might be located within faulted and sheared zone, described above.

13. It is believed that in the Roadside Mine Area, particularly along extensive tectonic zones, all rocks are sufficiently saturated by sulphides, so it is expected that here a large volume of disseminated copper will be found.

14. It is necessary to point out that the Roadside Mine Area is located in a very excellent geographical situation: only thirty-five miles from Tucson, and Highway 86 crosses the property, morphology of this area will also be very accessible for exploration and operation.

Recommendations

The previous author's report on the Roadside Mine Area was based on very weak field observations and limited information, but for preparation of this report, the field studies were also insufficient. However, in the light of above summarized new data, the recommendation of the Roadside Mine Area for detailed geological examination became much stronger. Generally the author's new recommendations are similar to that one suggested in June, 1970.

Now, it is proposed to contact immediately Mr. W. A. Knox (actual

owner of the Roadside property and president of the Knox-Arizona Corporation) offering him Texas Gulf Sulphur Company's interest in exploration and development of the Roadside Mine Area. If the property would be legally accessible, the following exploration program is proposed:

1. To prepare a detailed geologic map at a scale 1 : 12,000 for the area located north of Coyote Mountains, at least five miles north-south and four miles east-west. This map should also include all tectonic features and copper showings.

2. From the mapped area, the soil and rock chip samples should be collected and assayed for copper, silver, molybdenum, lead, and zinc. The sampling grid will depend on the situation in the field, but for whole area should not exceed 1/8 mile. It is also recommended to condense sampling grid for 150 feet apart, for strongly faulted, sheared, and altered zones.

3. For geological mapping and particularly geochemical sampling, it will be necessary to establish in the field topographic base lines, with marks at least every 1/2 mile corner.

4. All geochemical data should be computerized, plated on the map, compared (by overimposing) with geologic map and properly interpreted.

5. Geophysical surveying; I. P. and aeromagnetic might also be helpful. However, previously obtained results by Heinrichs Geoexploration Company (see report dated January, 1960; unfortunately without maps and diagrams) are not very impressive.

6. After gathering and interpretation of all data obtained from detailed field examination, the proper drilling locations should be found.

7. At this time, the author suggests that five drill holes are called for exploration stage (each fully cored). Their final depth should be planned at least to 3,000 feet. A very tentative location of drilling sites was already proposed

in the previous author's report. Now, after additional examination of the Roadside Area, and considering Stone's and de Kalb's reports, proposed drill holes should be approximately located as shown on enclosed Fig. 3.

8. Alternatively it is recommended that before drilling the Roadside mine shafts and all accessible underground workings should be also carefully examined. In this case an exploration stage will be more expensive but probably would be more effective too.

THE ROADSIDE MINE AREA

Pima County, Arizona

PHOTOGRAPHIC DOCUMENTATION

Photography and Explanation

by

Jan Krason

Texas Gulf Sulphur Company

Denver, Colorado

October 10, 1970

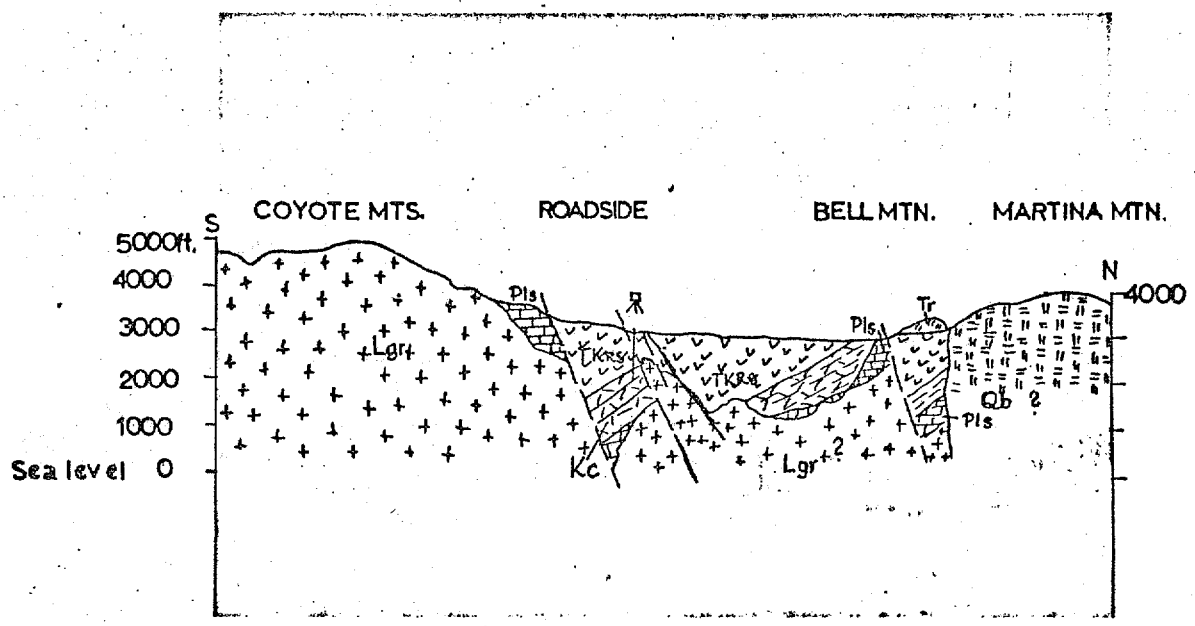


Fig. 9 Cross section through the Roadside Mine Area, Pima County, Arizona (compare with Figure 1 and Photo 11.
Explanation: Pls - Paleozoic limestone, Lgr - Laramide granitics, Kc - Cocorque Formation, TK_{RS} - Roadside Formation (Cretaceous), Tr - Tertiary rhyolite and rhyolitic flow, Qb - Quaternary basalts.

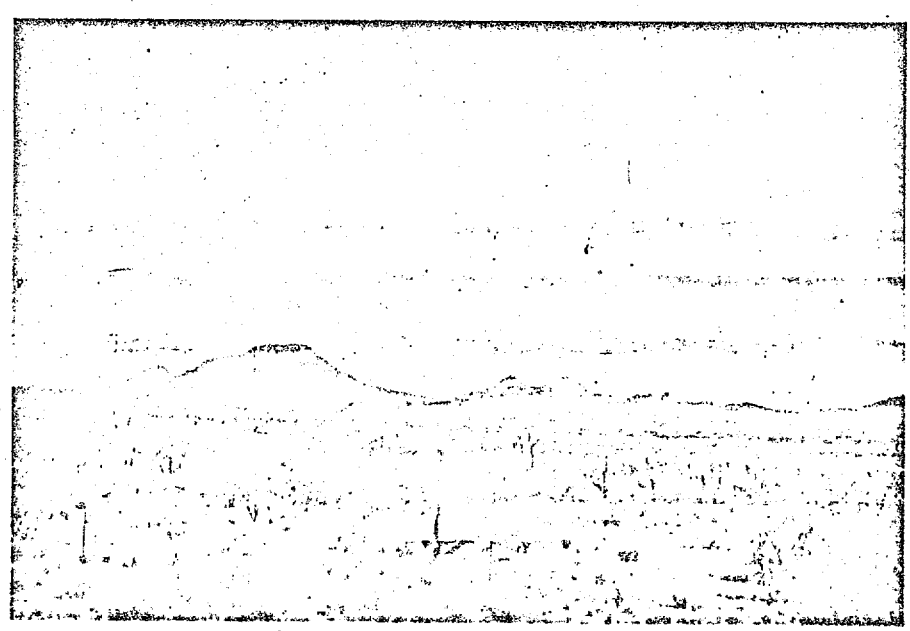


Photo 2. The Roskruge Mountains, in the vicinity of the Roadside Mine.

Plate I

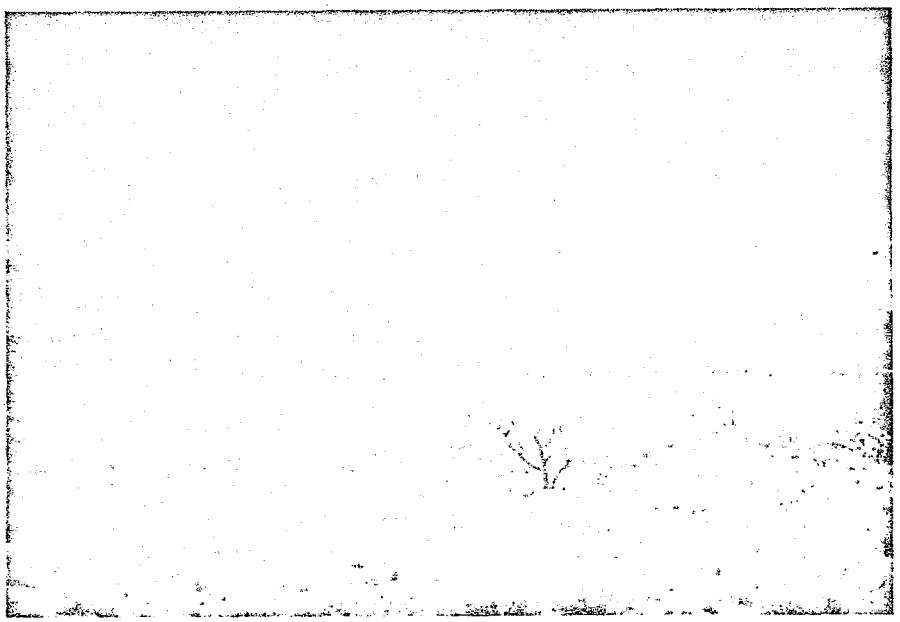


Photo 1. View and schematic cross-section through the Roadside Mine Area (on left Coyote Mountains, in the middle Roadside Mine Area, on right Bell Mountain, closer Martina Mountain).

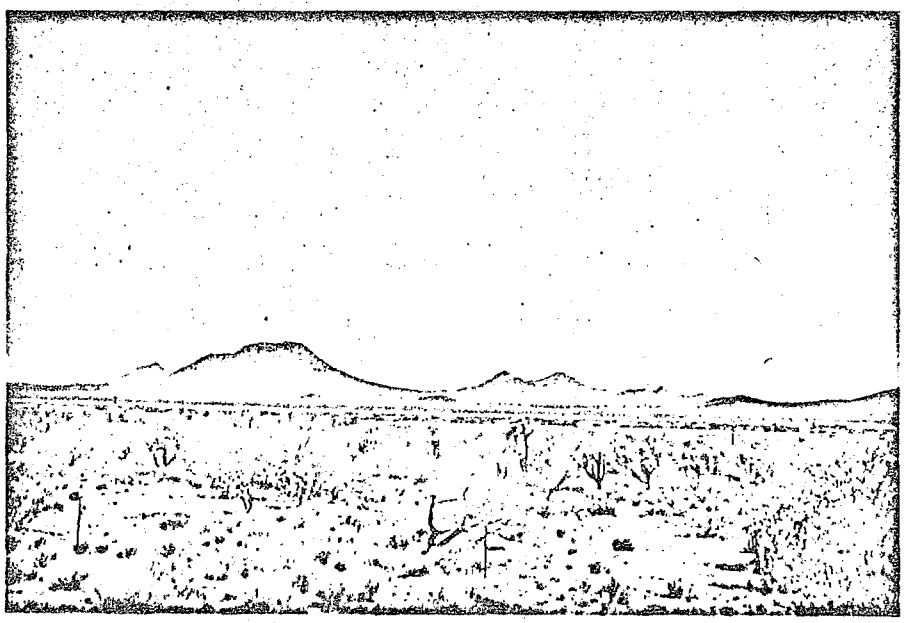


Photo 2. The Roskruge Mountains, in the vicinity of the Roadside Mine.

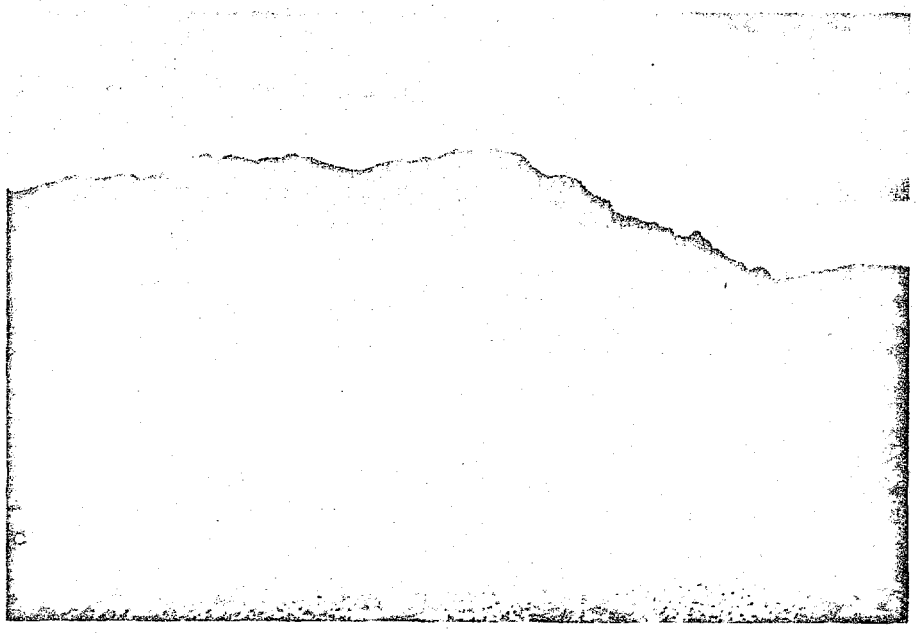


Photo 3. The Roadside Mine Area, on foreground and the Coyote Mountains behind.

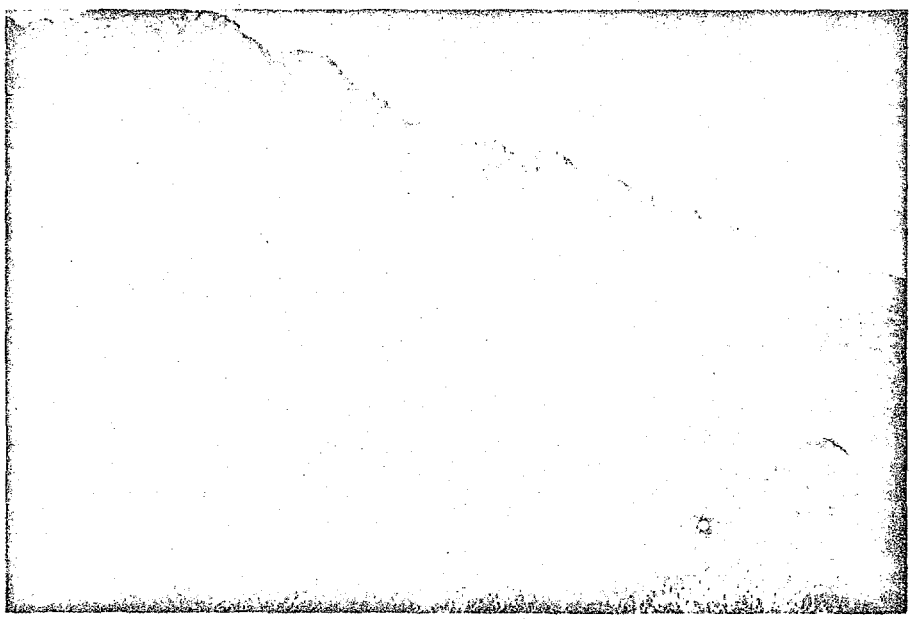


Photo 4. The Coyote Mountains and their northern foreground (Section 14).

Plate III

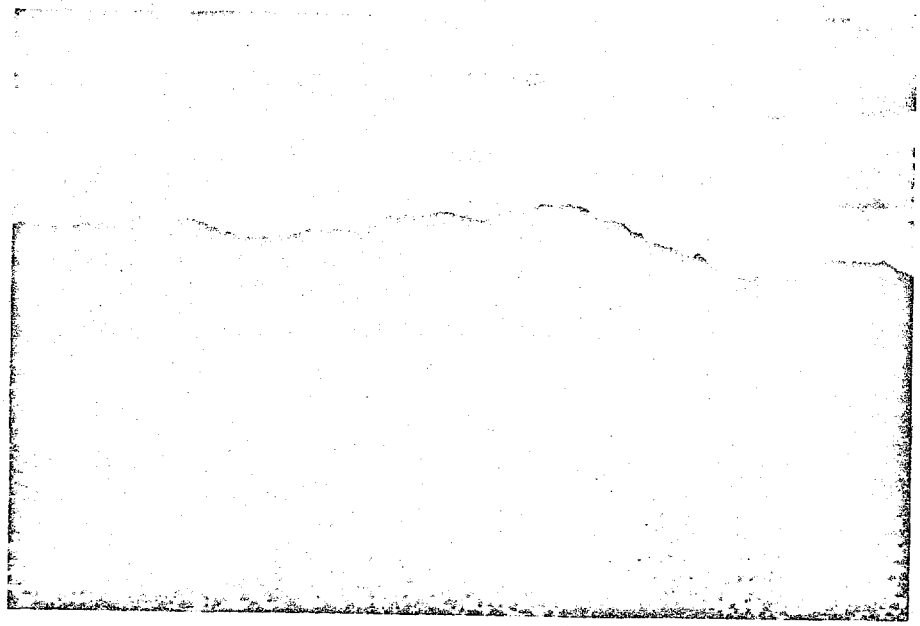


Photo 5. Morphology of the Roadside Mine Area (on left Bell Mountain - Section 1 and 2, behind the Coyote Mountains).

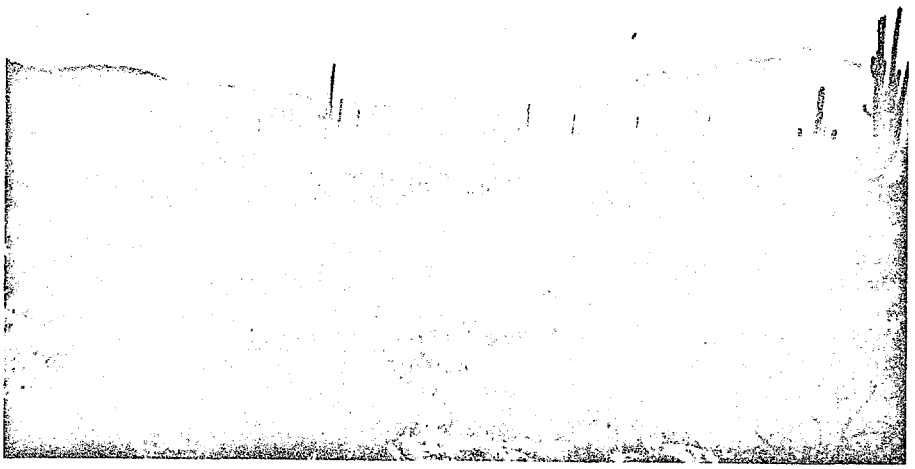


Photo 6. Morphology of the Roadside Mine Area (from the western side).

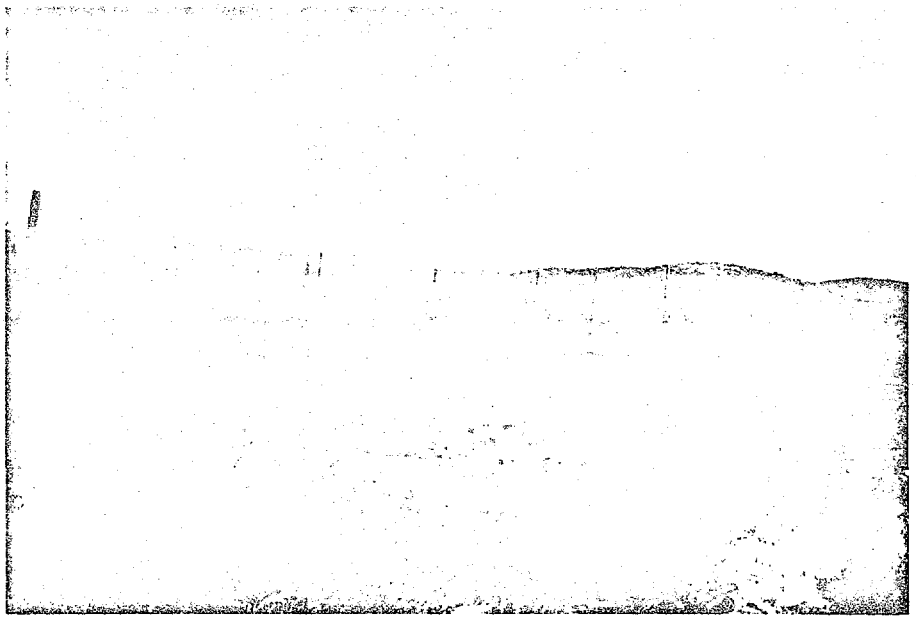


Photo 7. Morphology of the Roadside Mine Area, Section 10.

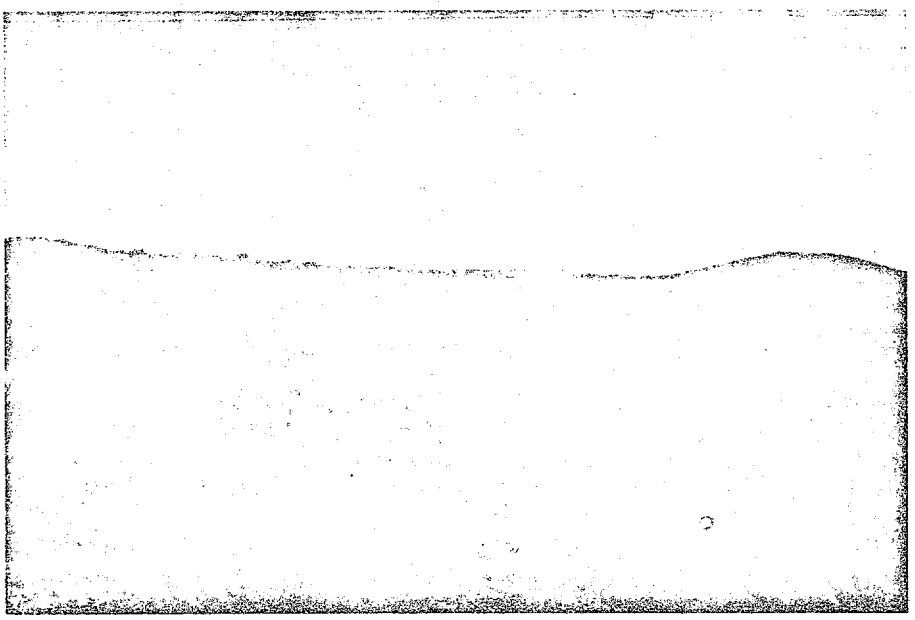


Photo 8. Morphology of the Roadside Mine Area, Sections 10 and 11, here are many old mining prospects.

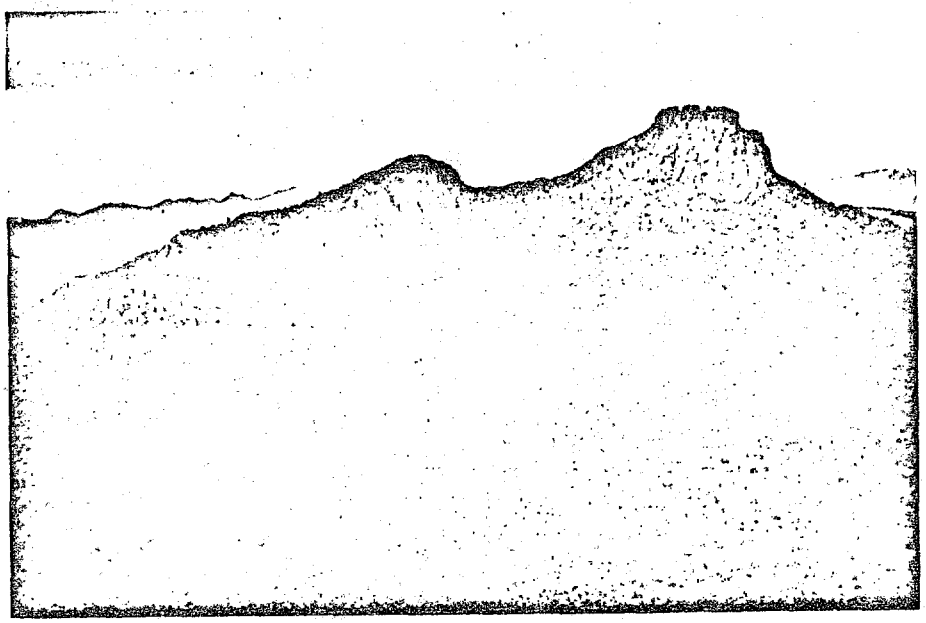


Photo 9. The Roskruge rhyolite and rhyolitic tuff, in Dobbs Buttes, Section 30

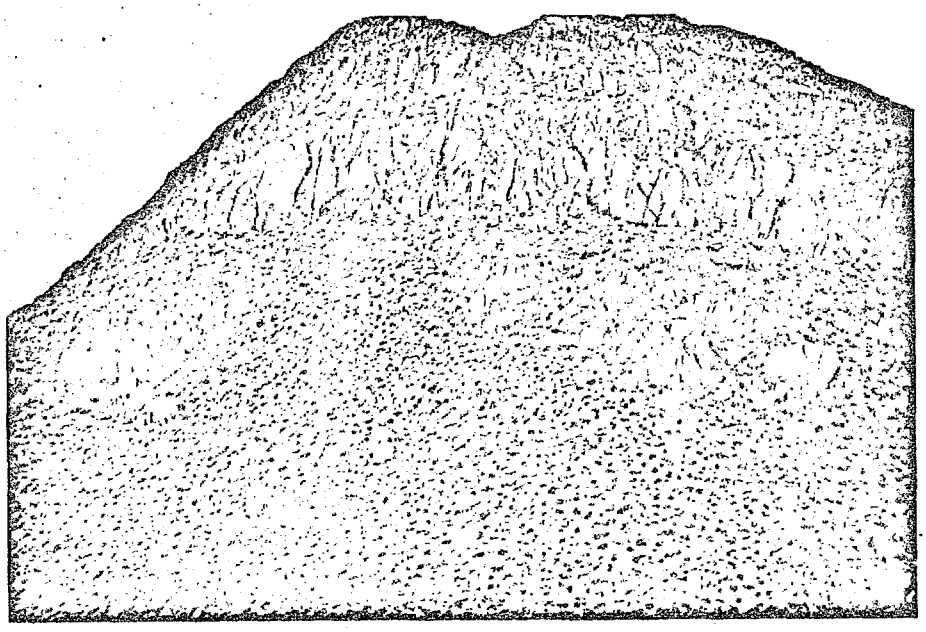


Photo 10. The Roskruge rhyolite and rhyolitic tuff, in Dobbs Buttes, Section 30. Here on foreground copper-carbonate mineralization was found.

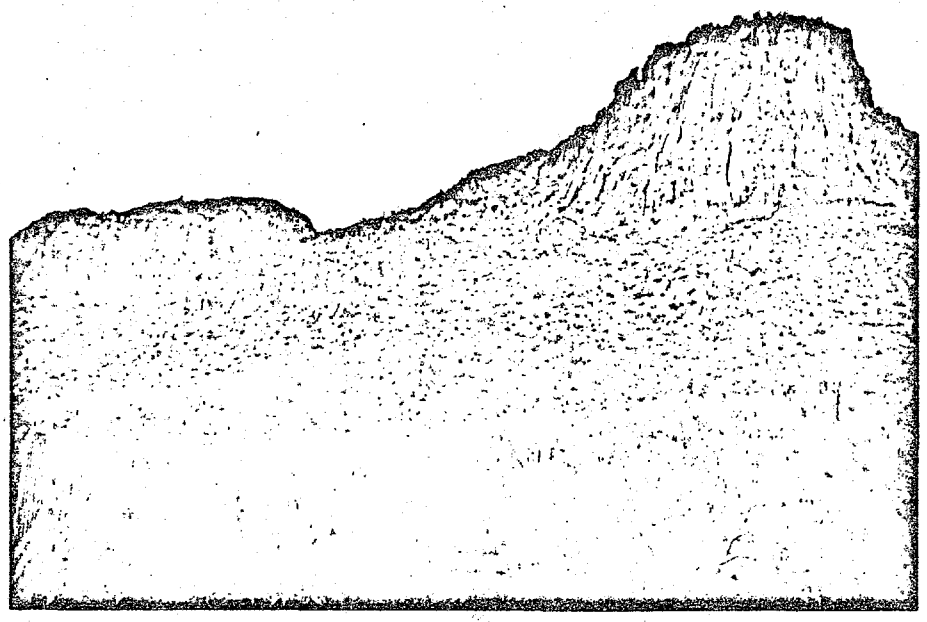


Photo 11. The Roskruge rhyolite and rhyolitic tuff on the Roadside Formation beneath (Section 30).

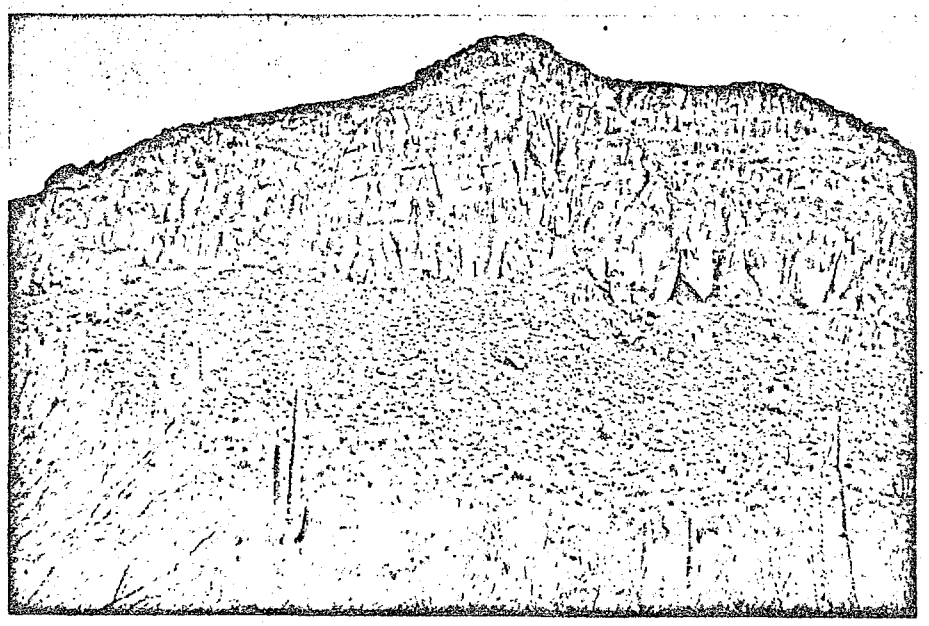


Photo 12. The Roskruge rhyolite and rhyolitic tuff on the Roadside Formation beneath (Section 30)

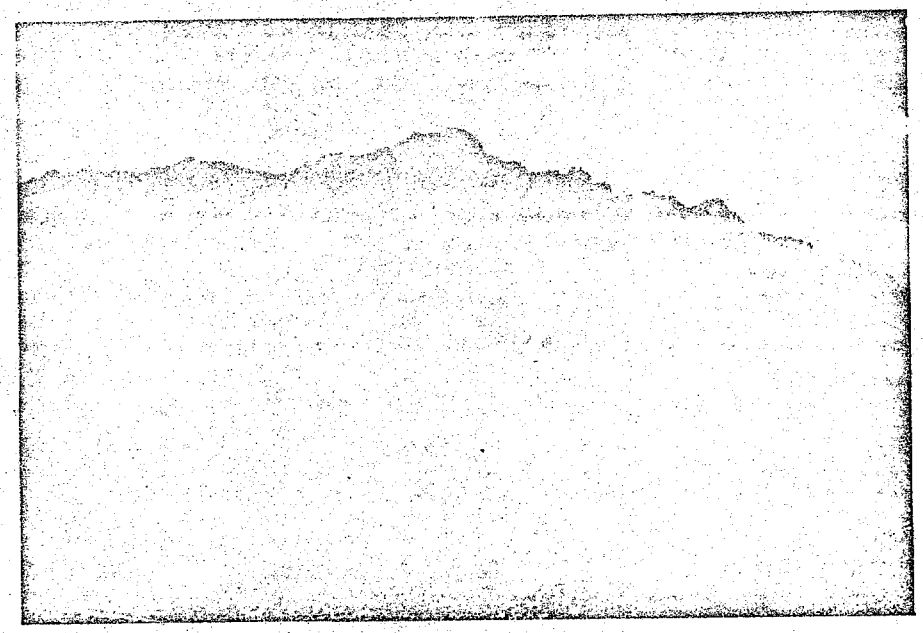


Photo 13. The Coyote Mountains cut off by Ajo Road fault at the foot (exposed in arroyo, section 15).

Photo 14. The foot of the Coyote Mountains (on the northern side) along the fault zone of the Ajo Road fault (section 14).

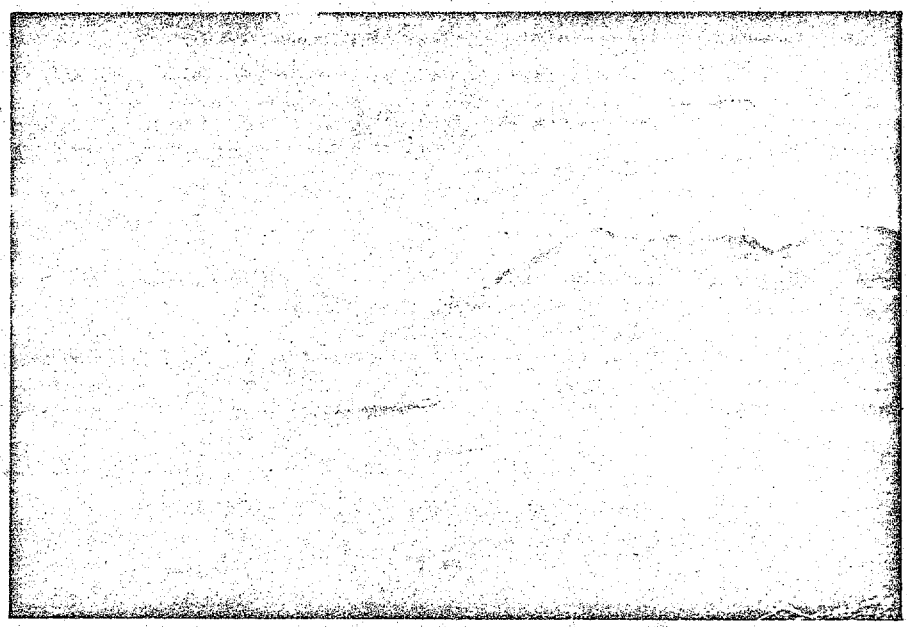


Photo 15. Airphoto of the Roadside Mine Area (taken from the western side), on right the Coyote Mountains with Pan Tak fault at the foot, in the middle Ajo Road fault, on left shear zone extended toward the Roadside shafts, the white line; Highway 86 (Sections 9, 16, 15, and 10.

Photo 16. Shear zone (tectonic contact between the Roadside Formation on left and altered granitic rocks on right), exposed in the highway cut, Section 11.

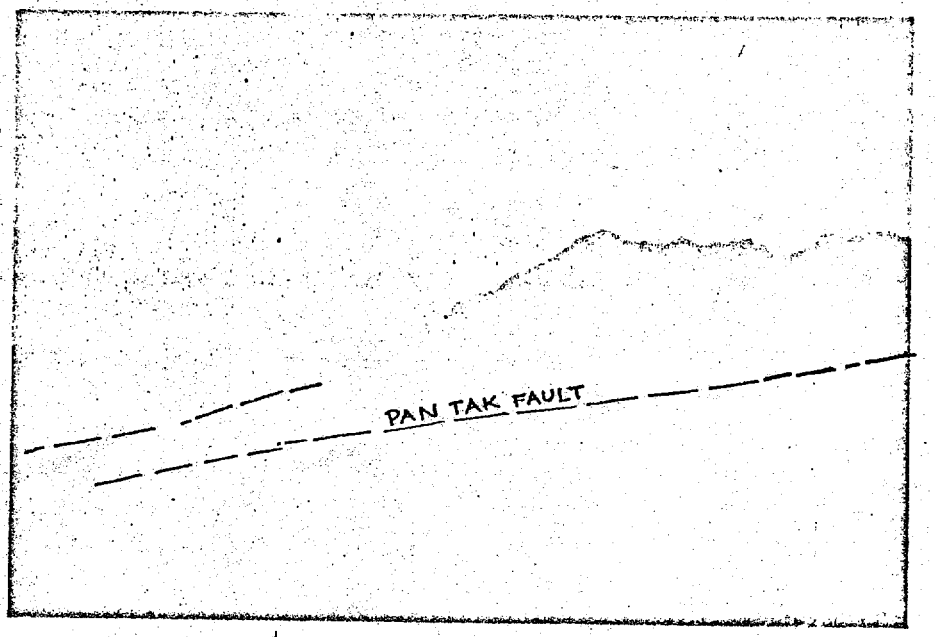


Photo 15. Airphoto of the Roadside Mine Area (taken from the western side), on right the Coyote Mountains with Pan Tak fault at the foot, in the middle Ajo Road fault, on left shear zone extended toward the Roadside shafts, the white line; Highway 86 (Sections 9, 16, 15, and 10.

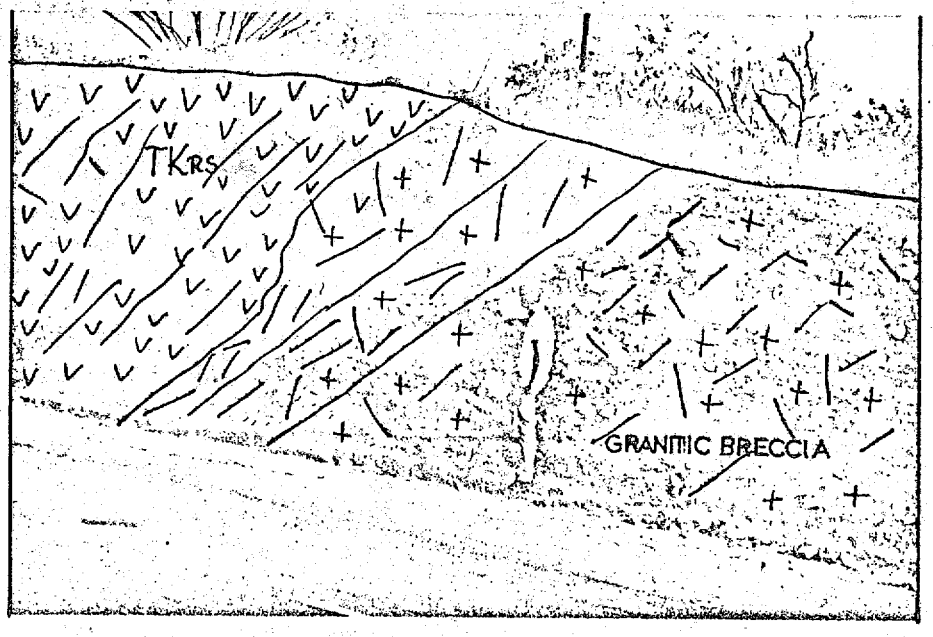


Photo 16. Shear zone (tectonic contact between the Roadside Formation on left and altered granitic rocks on right), exposed in the highway cut, Section 11.

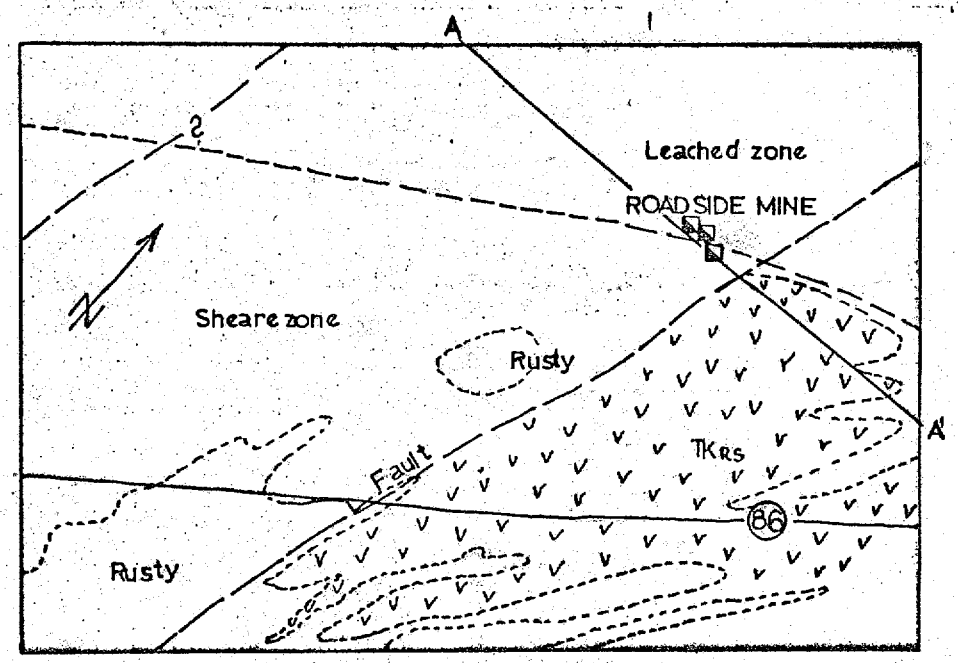


Photo 17. Airphoto of the Roadside Mine Area (between Highway 86 - higher and old Ajo road - lower, sections 11 and 10). See also topographic situation, tectonic interpretation and cross-section here under, compare also Photo 16, 18, and 19.

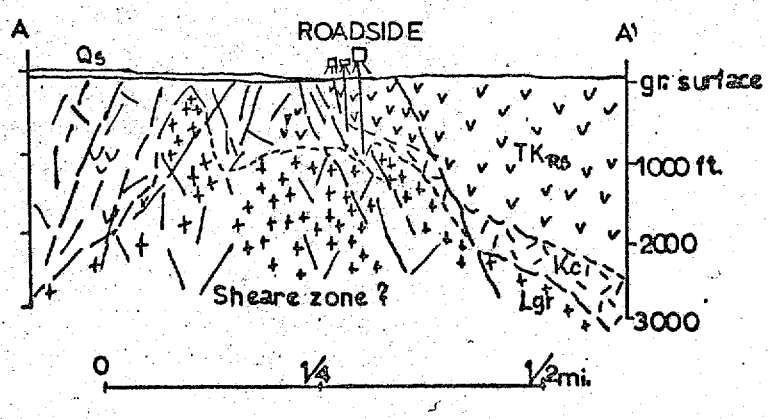
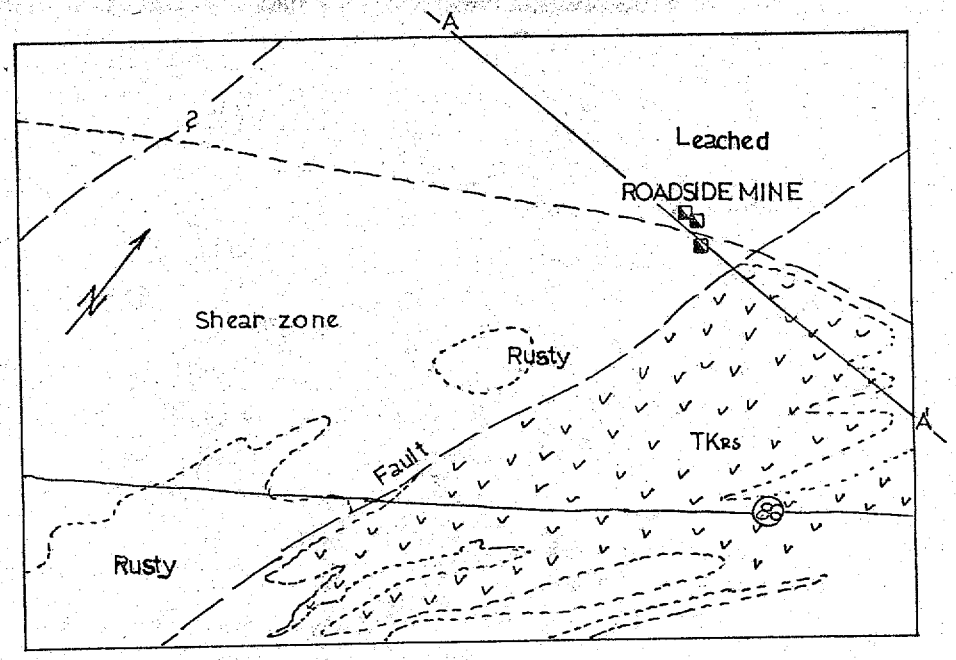
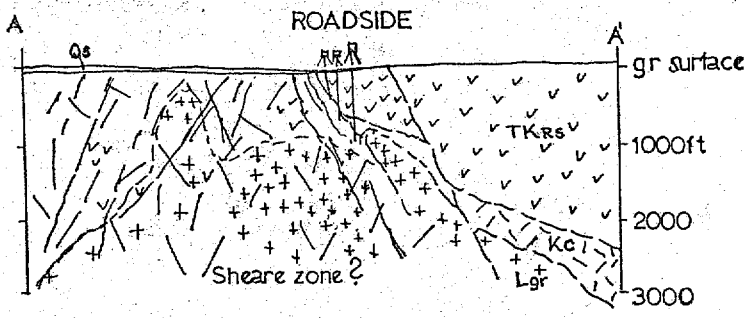


Fig. 10 Geologic cross-section through the Roadside Mine Area.


A
?
Leached
ROADSIDE MINE
Shear zone
Rusty
TKRS
Fault
Rusty
A'


A
ROADSIDE
A'
Qs
gr surface
TKRS
1000ft
2000
Kc
Sheare zone ?
Lgr
3000

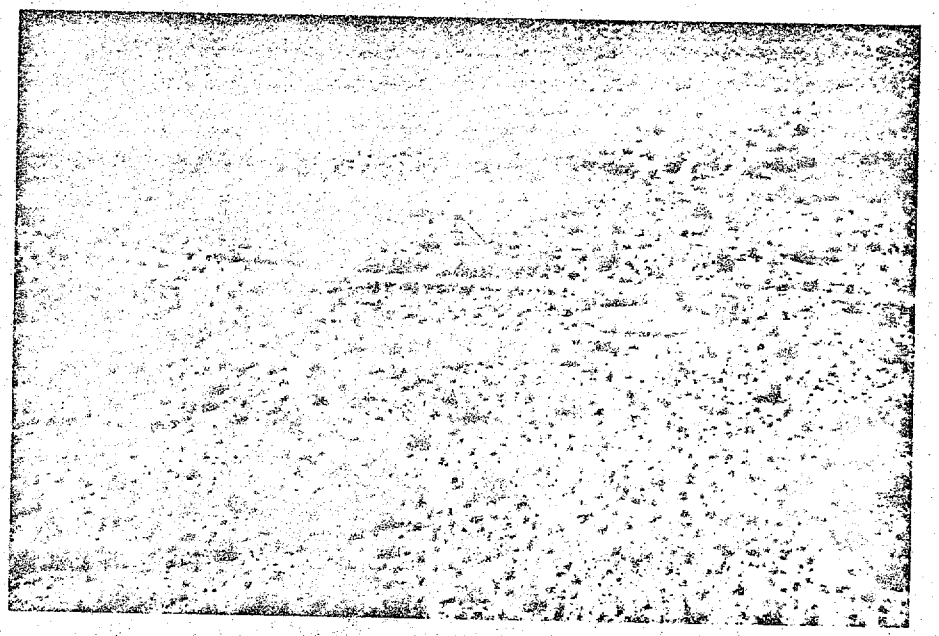


Photo 18. Airphoto of the Roadside Mine Area; lower on right Shaft No. 1, in the middle Shaft No. 2, above the Ajo road Shaft No. 3, notice also white-strongly leached zone (compare Photo 17 and 19).

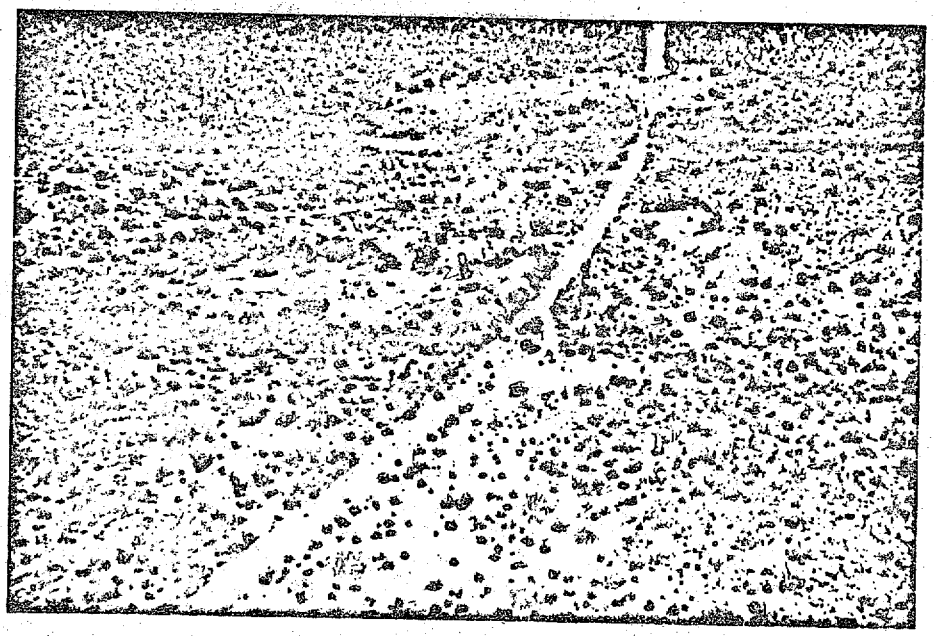


Photo 19. Airphoto of the Roadside Mine vicinity; on left Shaft No. 3, on right Shafts No. 1 and 2.

Photo 20. The Roadside mine, entrance to the Shaft No. 1

Photo 21. The Roadside mine, dump and entrance to the Shaft No. 2.

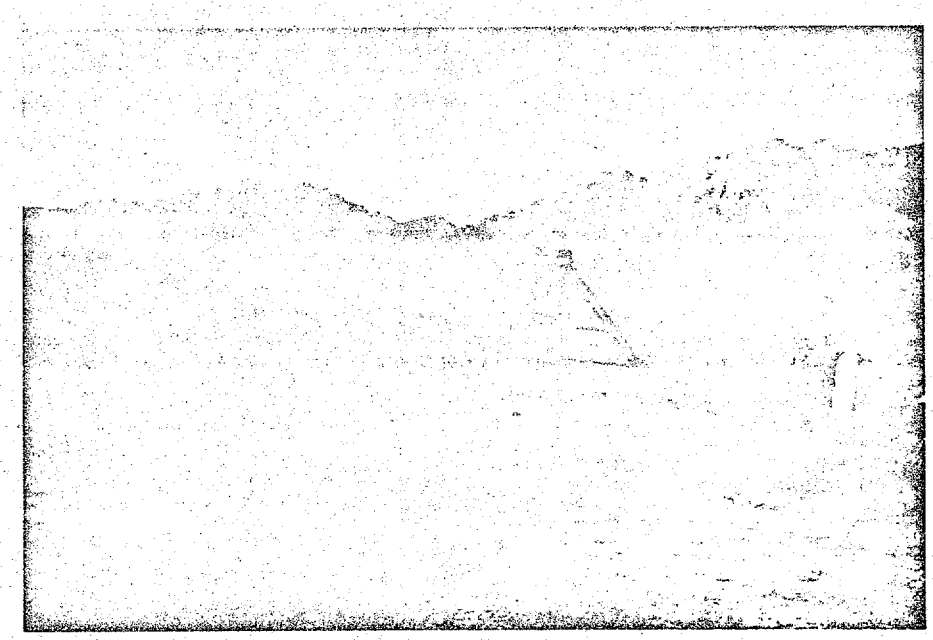


Photo 22. The Roadside mine, Shaft No. 3 (notice also leached zone at the foot of the Coyote Mountains, along Ajo Road fault).

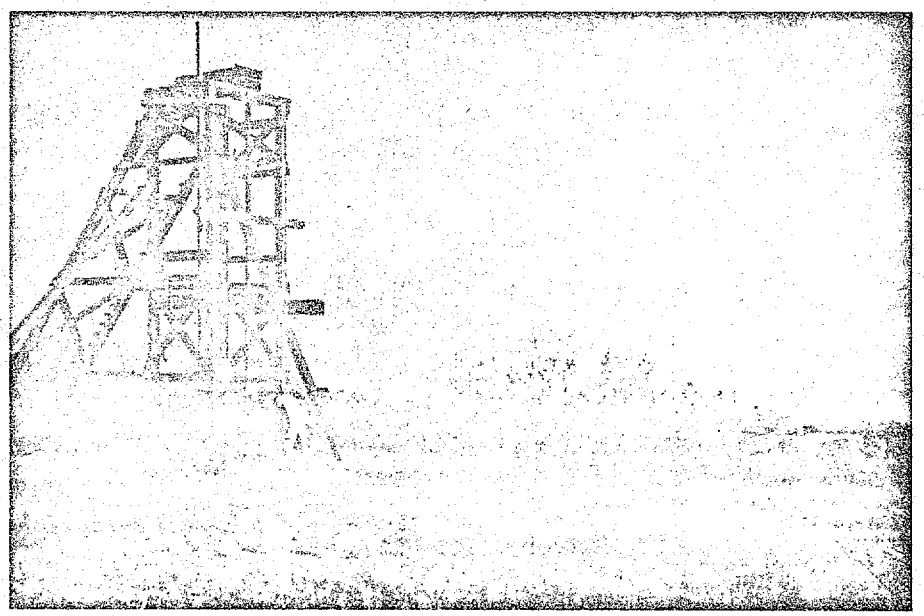


Photo 23. The Roadside mine, remined surface construction of the Shaft No. 3.

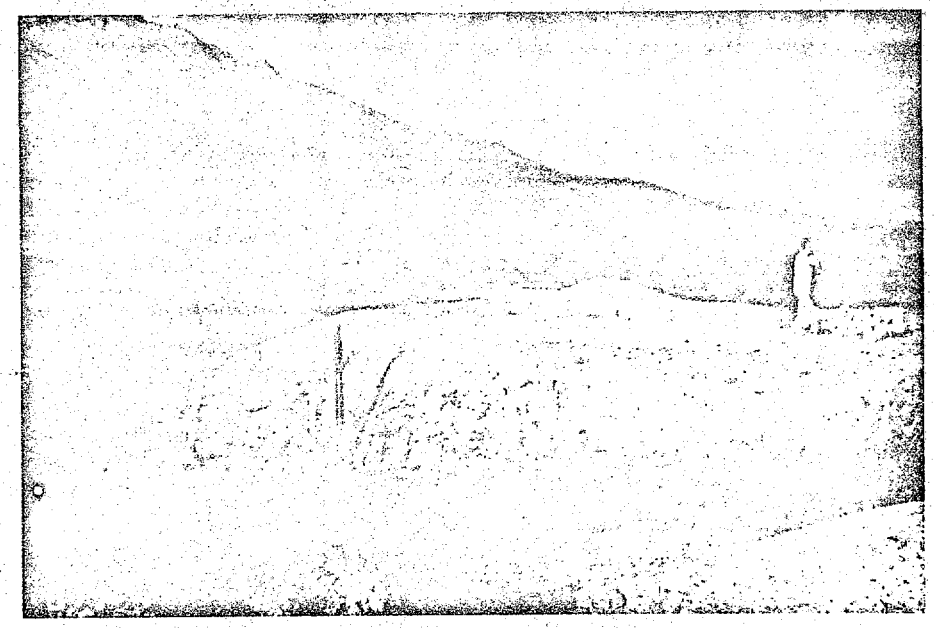


Photo 24. The Roadside mine, dump around the Shaft No. 2, and morphology within shear zone, toward west.

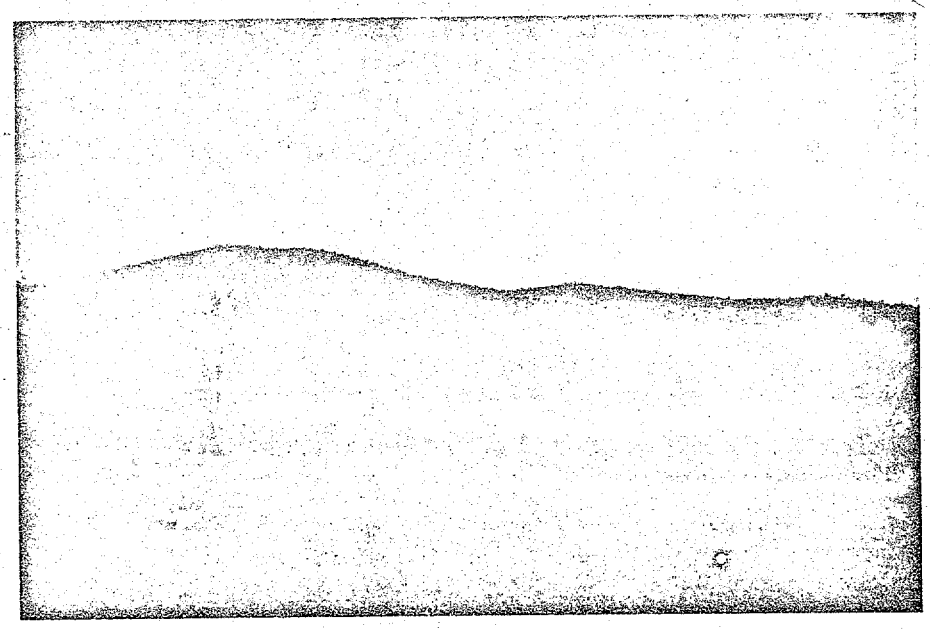


Photo 25. The Roadside mine, the waste dumps around Shafts No. 3 and 2, and morphology within shear zone, toward north.

THE ROADSIDE MINE AREA

Pima County, Arizona

GRAPHIC DOCUMENTATION

by

Jan Krason

Texas Gulf Sulphur Company

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Fig. 4 Diagrammatic cross sections A-A' and B-B' located on Figure 1, ...

Fig. 5 Diagrammatic cross sections C-C' and E-E' located on Figure 1, ...

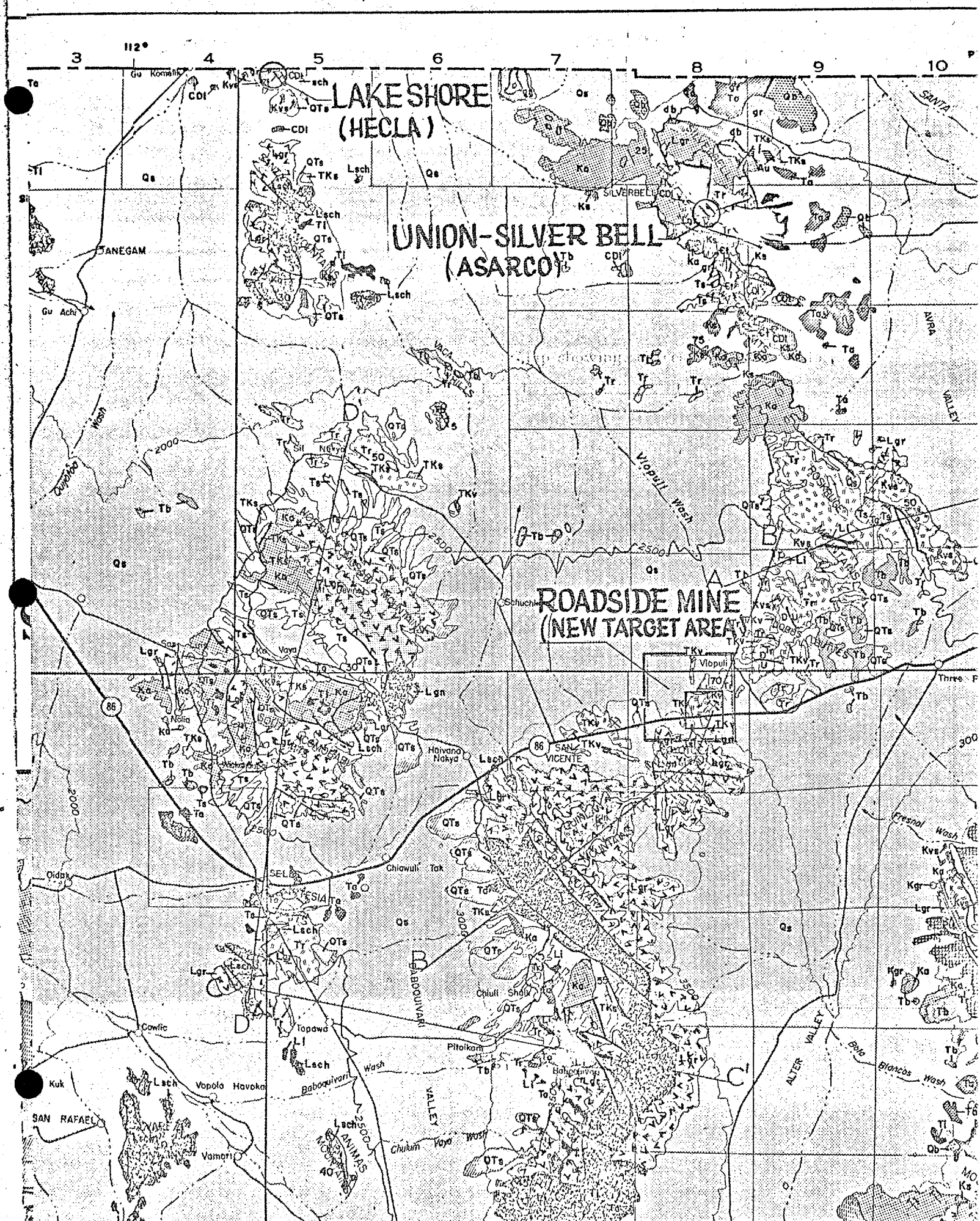
Fig. 6 Claim Map, Roadside mine, Pima County, Arizona

Fig. 7 Geologic Sketch of the Roadside Mine Area, Pima County, Arizona (compare with Figure 3 and 8).

Fig. 8 Mining Workings and Recommended Drill Sides, Roadside Mine Area, Pima County, Arizona (compare with Figure 3 and 7).

Fig. 9 Cross-section through the Roadside Mine Area, Pima County, Arizona (compare with Figure 1 and Photo 1).

Fig. 10 Cross-section through the Raodside mine, Pima County, Arizona


LAKE SHORE
(HECLA)
UNION-SILVER BELL
(ASARCO)
ROADSIDE MINE
(NEW TARGET AREA)
SILVERBELL
JANEGAM
Gu Achi
Gu Komalik
Vlopuli
Vlopuli Wash
Schuchim
Haivana Nakya
SAN VICENTE
Chiawuli Tak
Chiuli Shaik
Pitaikam
Baboquivari
Topawa
Cowlic
Kuk
Vopola
Havoka
SAN RAFAEL
Vamori
Chukum Vaya Wash
Fresnal Wash
Bate Blancos Wash
ALTER VALLEY
SANTA CRUZ VALLEY
ANIMAS MOUNTAINS
Three P

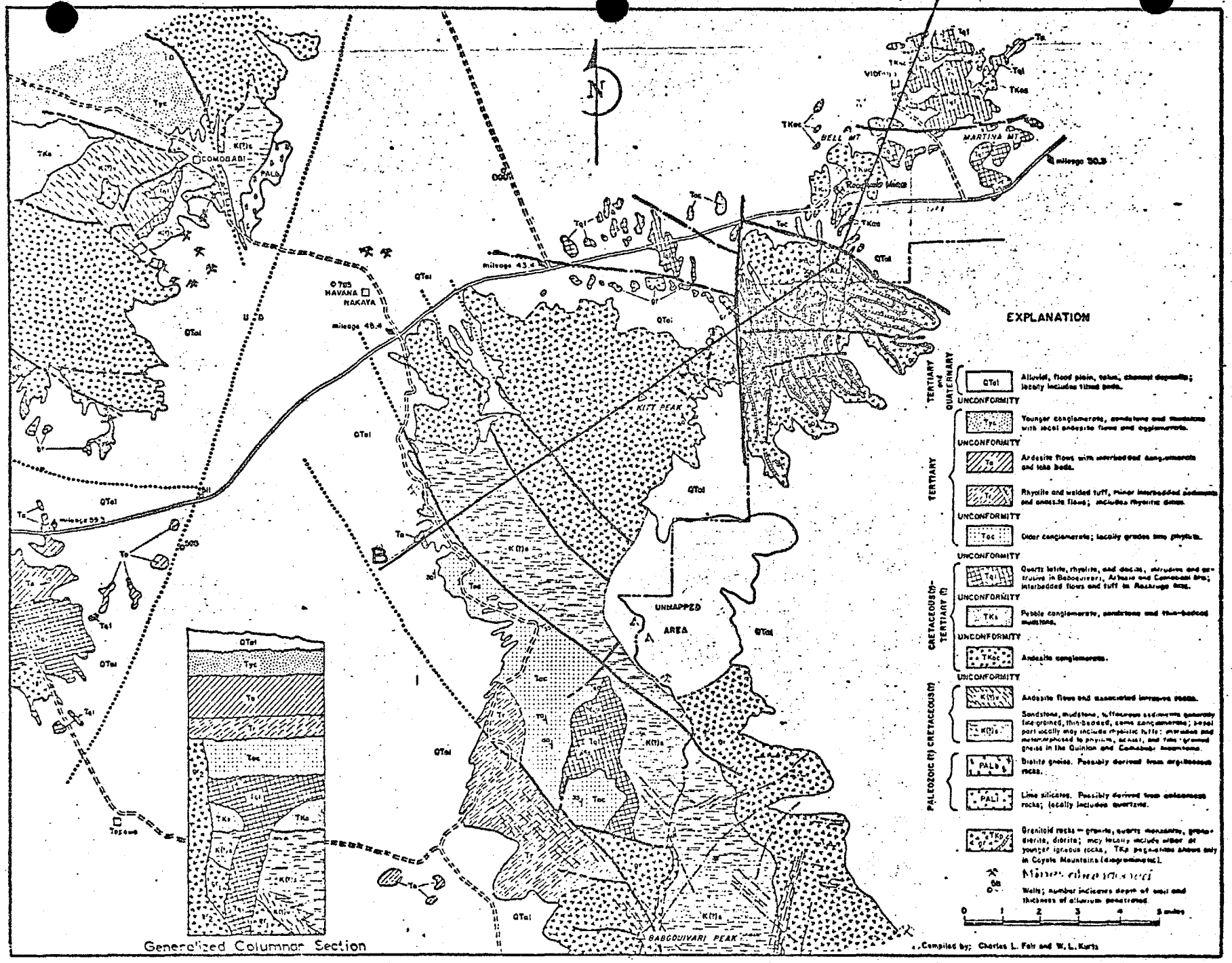


FIGURE 2. Generalized geologic map of parts of the Baboquivari, Roskruge, South Comobabi, and Artesa Mountains, Pima County, Arizona.

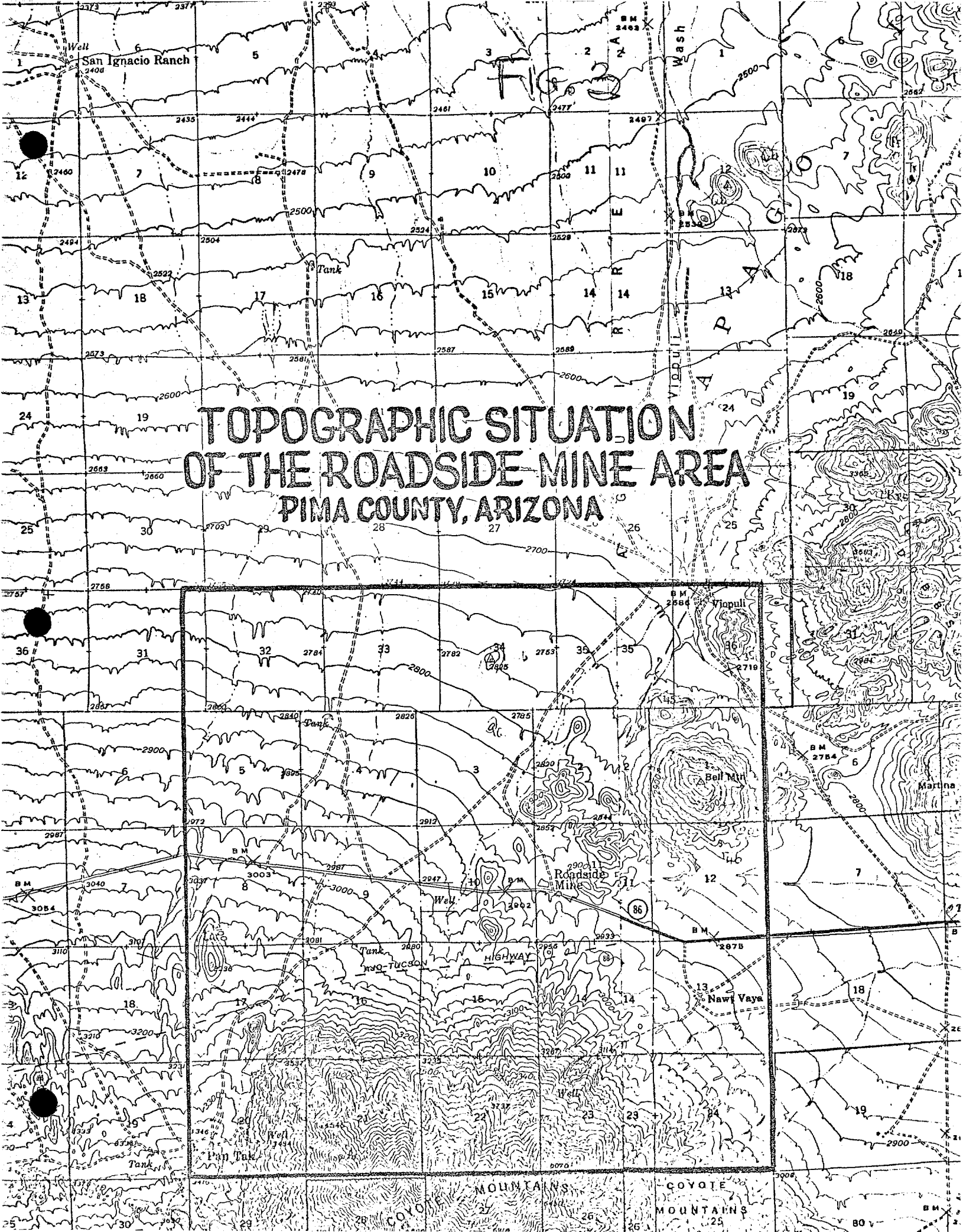


Fig 2
TOPOGRAPHIC SITUATION
OF THE ROADSIDE MINE AREA
PIMA COUNTY, ARIZONA
San Ignacio Ranch
Viopuli
Bell Mtn
Martina
Roadside Mine
Nawt Vays
Pan Tak
COYOTE MOUNTAINS
HIGHWAY
TUCSON
Viopuli Wash

EXPLANATION

QTal — Valley fill; undeformed where exposed; may cover deformed alluvial deposits at depth.

Tbg — Basaltic and andesitic flows and dikes; some interbedded conglomerate.

Tal — Alluvium, deformed by normal faulting; may be of different ages in different areas.

Ta — Andesitic flows and intrusive rocks.

Tst — Silicic tuff, agglomerate, and flows.

Tap — Andesite porphyry flows.

Tas — Silicic tuff, agglomerate, and flows, with some andesitic rocks.

Ti — Shallow intrusive rocks, principally silicic; may include some older shallow intrusive rocks

Tal — Angular to well-rounded fanglomerate; deformed by normal and thrust faulting; locally metamorphosed; may be of different ages in different areas.

Tr / Tql — Rhyolitic, latitic, and quartz-latitic tuff, agglomerate, flows, and intrusive bodies; may be of different ages in different areas.

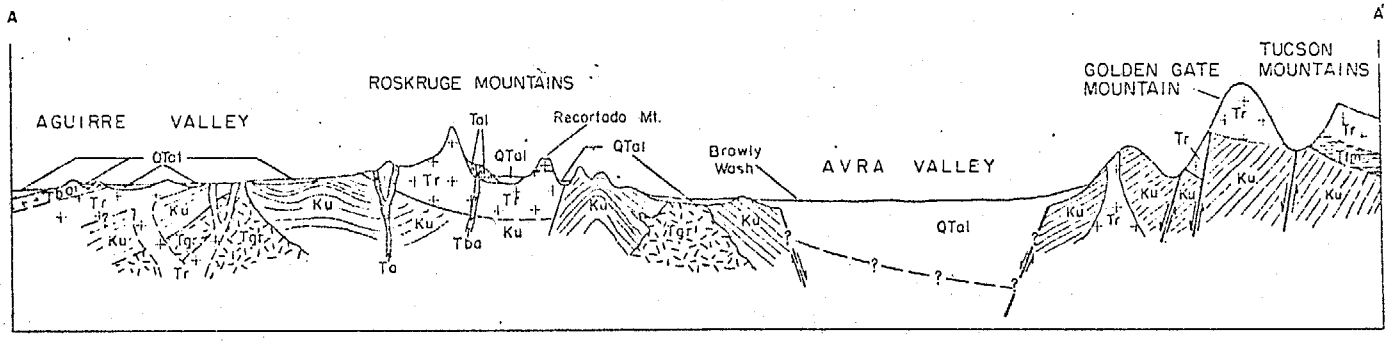
Ttm — Tucson Mountain chaos—giant breccia and conglomerate.

Tgr / T?gr / K?gr — Intrusive rocks; diorite, quartz monzonite, alaskite, granite; Tgr cuts younger Mesozoic-early Tertiary rocks, T?gr cuts older Mesozoic-early Tertiary rocks, and K?gr cuts Paleozoic rocks; may represent several periods of intrusion.

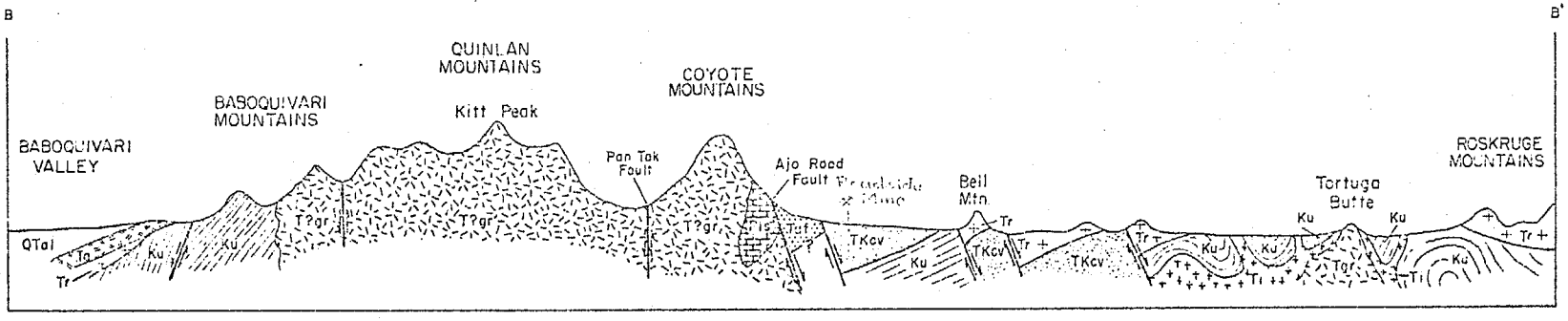
TKcv — Volcanic conglomerate and breccia, composed principally of andesitic porphyry fragments.

Ku / K?v — Conglomerate, arkose, mudstone, and volcanic rocks; of at least two ages; K?v, locally separated volcanic rocks.

Pls — Paleozoic limestone.

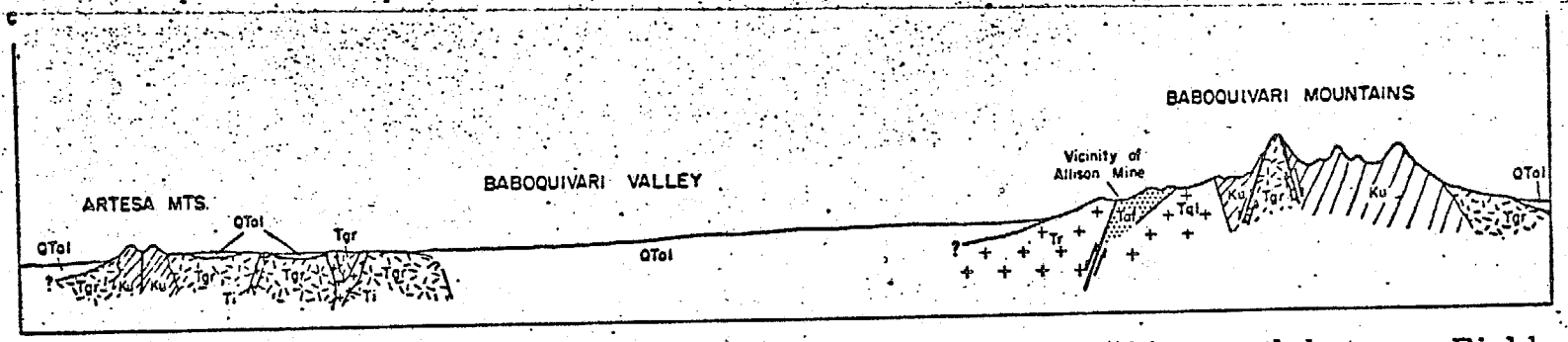


Cross-section A-A' trends generally N. 70° E. and is viewed looking north between Field Trip VI mileages 12.9 and 35.9; approximate length of cross section, 24 miles.

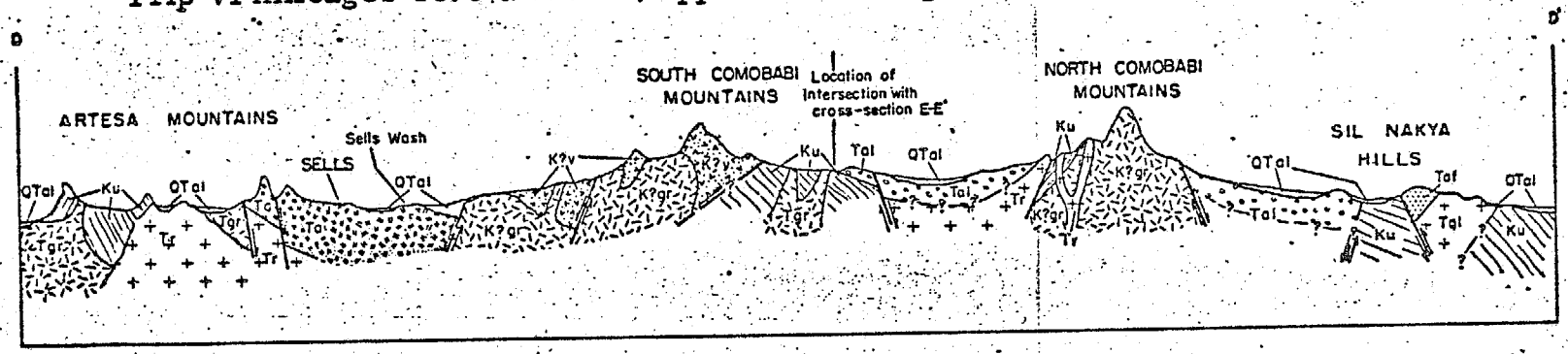


Cross-section B-B' trends generally N. 30° E. and is viewed looking west between Field Trip VI mileages 30.1 and 39.8 and looking southeast between mileages 46.5 and 54.3; approximate length of cross section.30 miles.

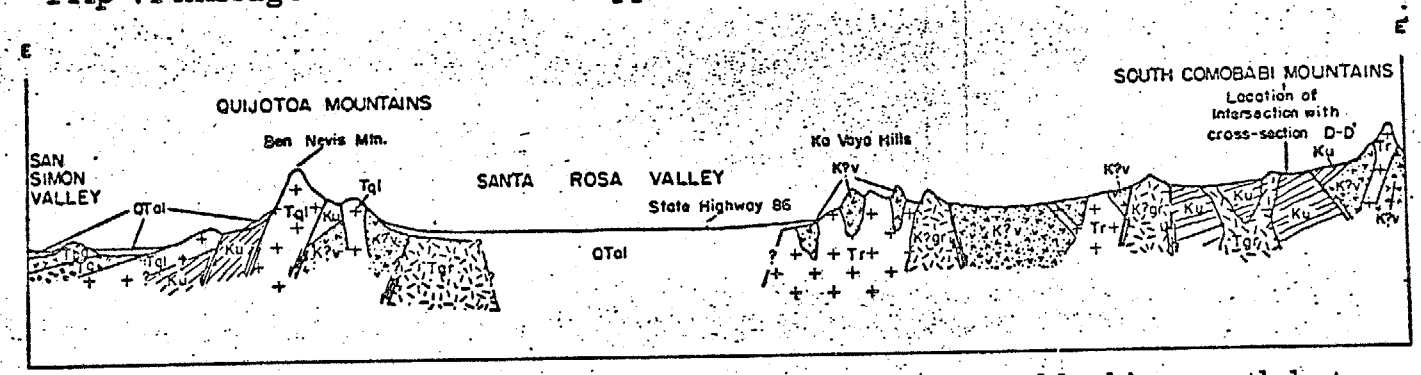
FIGURE 4. Diagrammatic cross sections A-A' and B-B' located on figure 55 and explanation to accompany cross sections referred to in Field Trip VI. Cross sections are not to scale; vertical exaggeration is approximately x5.



Cross-section C-C' trends generally N. 10° W. and is viewed looking south between Field Trip VI mileages 46.5 and 56.3; approximate length of cross section, 26 miles.

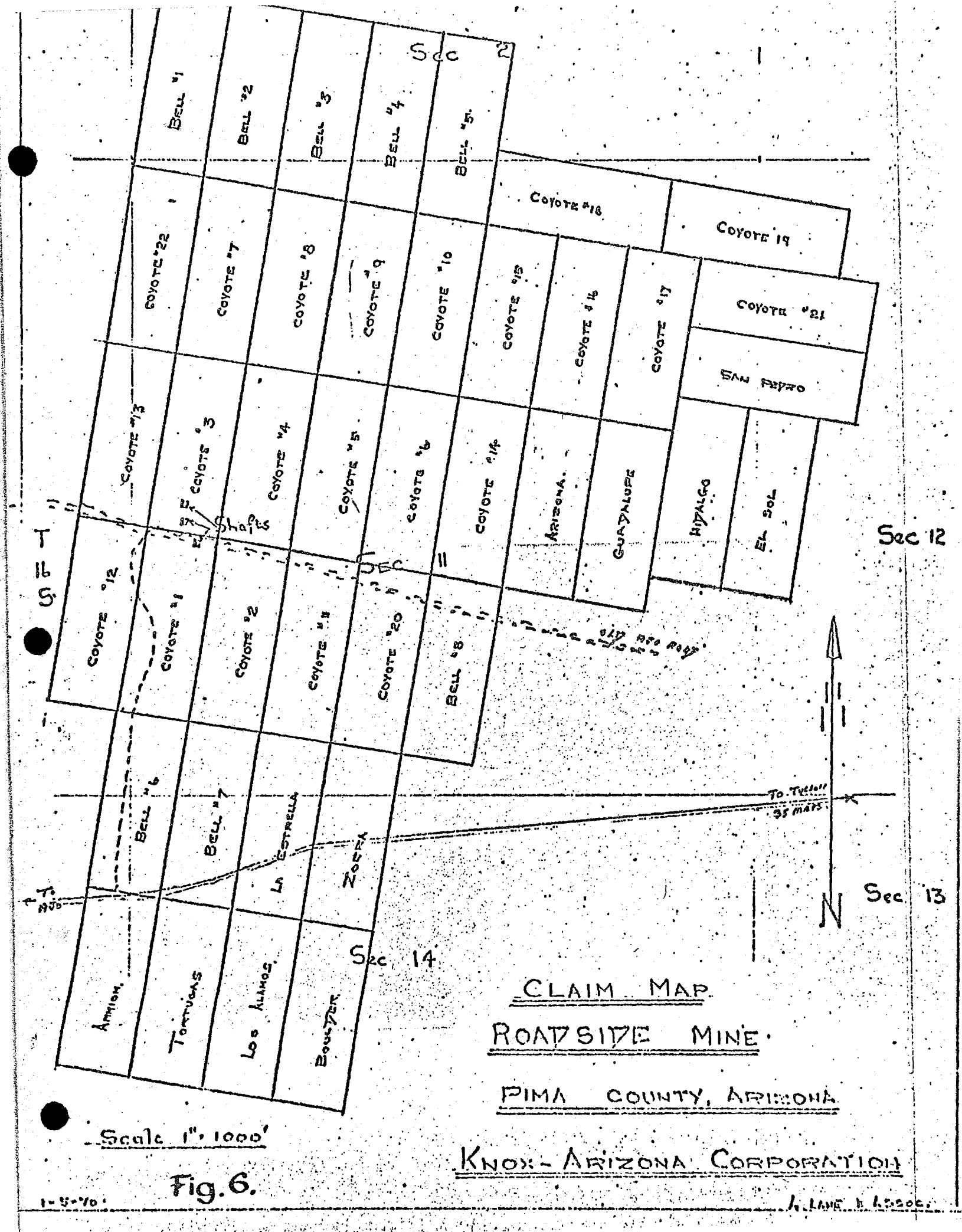


Cross-section D-D' trends generally N. 15° E. and is viewed looking west between Field Trip VI mileages 43.0 and 56.3; approximate length of cross section, 27 miles.



Cross-section E-E' trends generally east-west and is viewed looking north between Field Trip VI mileages 61.8 and 78.1; approximate length of cross section, 23 miles.

FIGURE ~~59~~ 5. Diagrammatic cross sections C-C', D-D', and E-E' to accompany Field Trip VI (fig. 55). Cross sections are not to scale; vertical exaggeration is approximately x5.



CLAIM MAP

ROADSIDE MINE

PIMA COUNTY, ARIZONA

KNOX-ARIZONA CORPORATION

Scale 1" = 1000'

Fig. 6.

1-5-70

L. LANE & ASSOC.

GEOLOGIC SKETCH OF THE ROADSIDE MINE AREA
PIMA COUNTY, ARIZONA
1:62,500

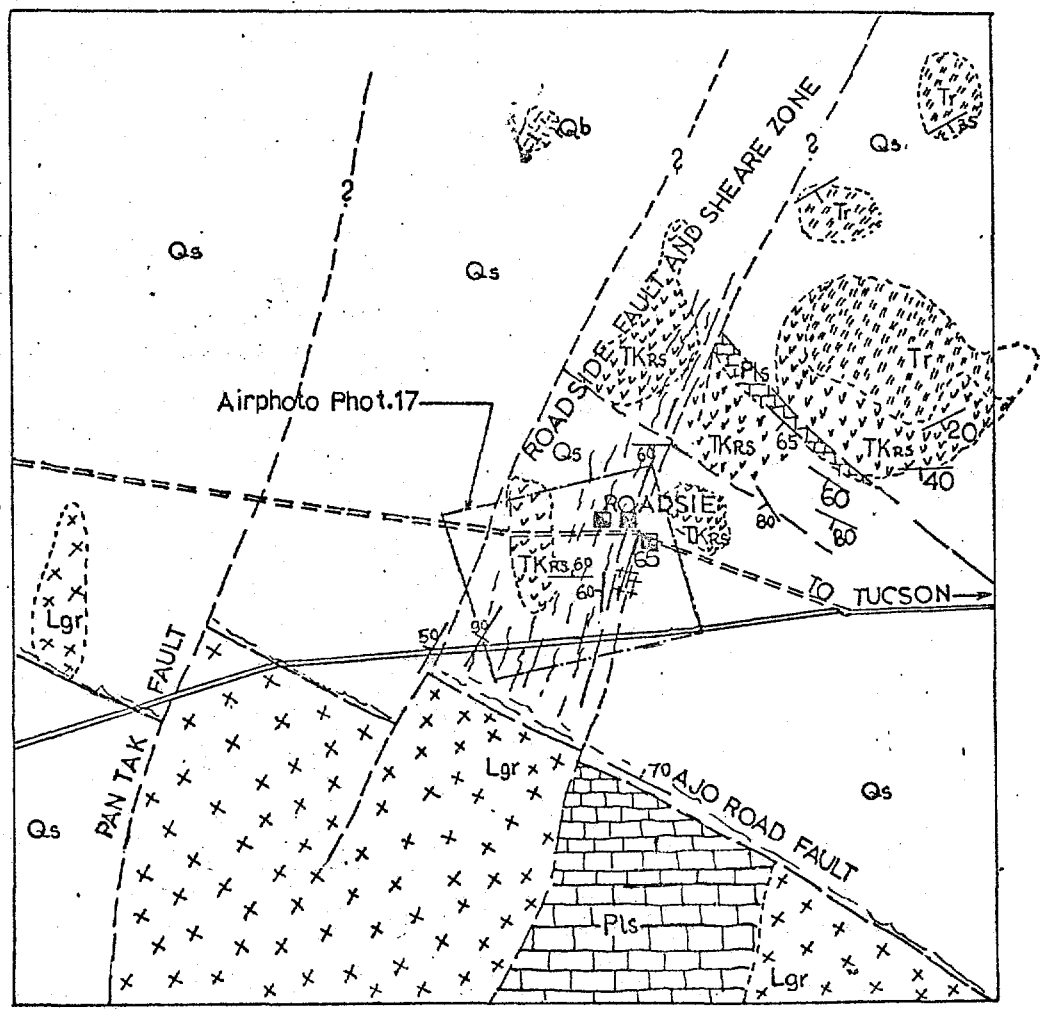


Fig. 7 Explanation: Pls - Paleozoic limestone, Kc - Cocoraque Formation (Cretaceous), TK_{RS} - Roadside Formation (Cretaceous), Tr - Tertiary rhyolite (Roskruge rhyolite), Qs - Quaternary basalts.

MINING WORKINGS AND RECOMMENDED DRILL SITES
ROADSIDE MINE AREA
PIMA COUNTY, ARIZONA
1:62,500

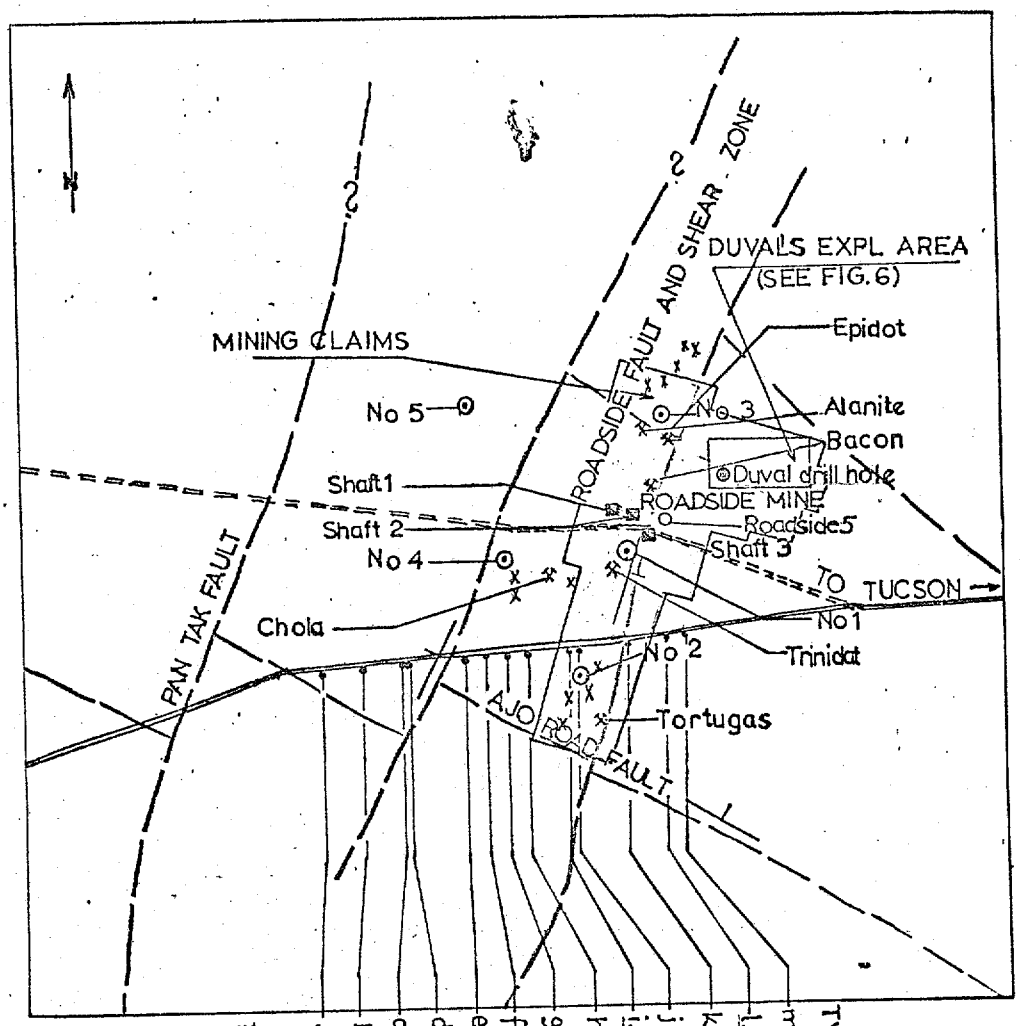
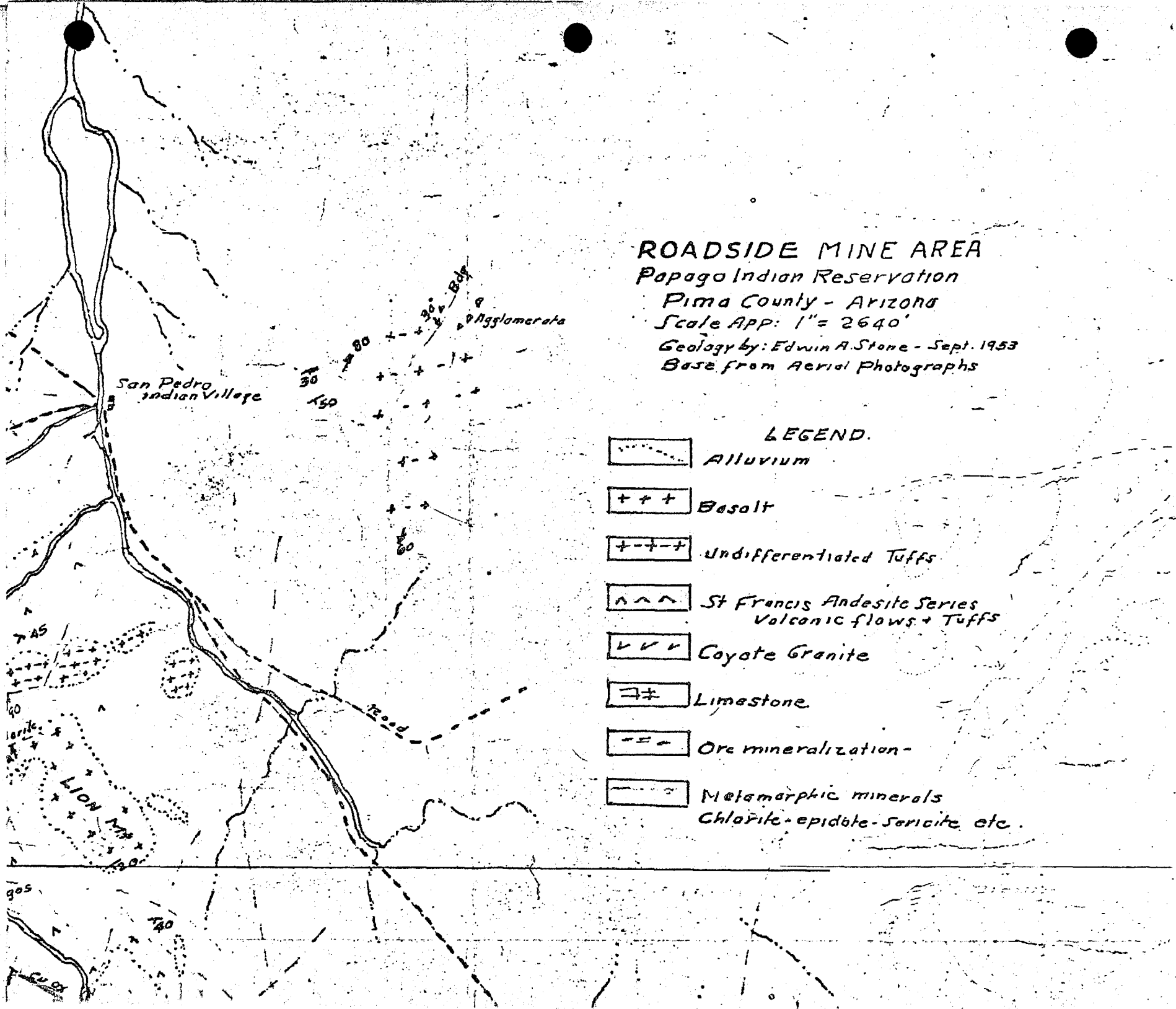


Fig. 8

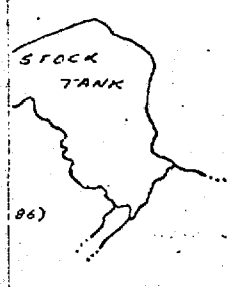
CHEOCHEM. ANALYSIS
RESULTS, IN ppm.

	TYPE	Cu	Pb	Zn	Ag	Mo	Au	Hg
l.	ROCK CH	160	150	130	1	2	.04	.05
m.	Rock CH	160	20	50	.1	.02	.02	.01
k.	ROCK CH	70	20	70	.1	.02	.04	.01
j.	ROCK CH.	60	100	110	1	.02	.02	.02
i.	SOIL	2200	1300	110	3	.02	.02	.05
h.	SOIL	50	40	60	1	.02	.02	.05
g.	ROCK CH.	70	40	30	.1	.02	.02	.01
f.	SOIL	90	50	50	.1	2	.04	.02
e.	ROCK CH.	10	20	30	.1	.02	.04	.02
d.	SOIL	30	50	80	2	.02	.08	.08
c.	SOIL	20	20	50	.1	.02	.02	.02
b.	ROCK CH.	30	20	20	.1	.02	.04	.0
a.	ROCK CH.	70	10	30	.1	.02	.04	.01
	STANDARD:							
	ROCK CH.	20	30	110	.1	.02		
	SOIL	20	40	100	.1	.02		


ROADSIDE MINE AREA
Papago Indian Reservation
Pima County - Arizona
Scale App: 1" = 2640'
Geology by: Edwin A. Stone - Sept. 1953
Base from Aerial Photographs
LEGEND.
Alluvium
Basalt
Undifferentiated Tuffs
St Francis Andesite Series
Volcanic flows + Tuffs
Coyote Granite
Limestone
Ore mineralization -
Metamorphic minerals
Chlorite - epidote - Sericite etc.
San Pedro
Indian Village
Agglomerate
Bdg
Road
LION Mts

EXPLANATION

- QAL — QUATERNARY ALLUVIUM
- ELUV — ELUVIUM
- CRETACEOUS
  - AN — ANDESITE LARGELY FLOW-BRECCIA BUT LOCALLY W/O INCLUSIONS
  - ARK / G.W. — ARKOSE / GRAYWACKE
  - LS — LIMESTONE
- EPIDOTE AS FLOAT + IN PLACE
- SILICIFICATION
- CuOx. ALWAYS ASSOC. W. EP; INCLUDES MAL, CUP, Cu°, + RARELY AZ + CHRYS.
- FeOx ALONG SOME VEINS + FRAX
- CONTACTS
- 75 — FAULT
- 80 — PEBBLE DIKES (?). CONTAIN FRAGS OF VARIOUS ACIDIC EXTRUSIVE + INTRUSIVE RX, QTZT, SOME LS.
- 65 — VEIN. GEN CONSIST OF SID, QZ (INCLUDING OPALINE QZ), CAL, + LOCALLY A LITTLE LIM.
- 80 — JOINT
- SHEETING
- 70 — FLOW STRUCTURE
- 25 — BEDDING
- DRILL HOLE (DDH-R1)
- CLAIM MONUMENT
- PROSPECT



DUVAL CORPORATION—EXPLORATION DEPT.	STATE: ARIZONA
ROADSIDE PROSPECT	COUNTY: PIMA
TYPE: PHOTO-GEOLOGIC MAP	TOWNSHIP & RANGE: T. 15 S., R. 8 E.
DRAWN BY: RWS & AWT · DRAFTED BY: RWS · DATE: 15 DEC 1966	MAP NO. B-1669
0' 100' 200' 400' 600' 800'	PLATE NO.

THE ROADSIDE MINE AREA

APPENDICES

To the Supplementary Report Regarding Preliminary Geologic Reconnaissance For Copper Deposits In The Southern Roskruge Mountains - Roadside Mine Area

by
Jan Krason

Denver, Colorado
October 10, 1970

List of Contents

Appendix 1 Heinrichs Geoexploration Company; Analysis of Geophysical Data, Roadside Mine Area, Pima County, Arizona, for Inspiration Consolidated Copper Corporation, Inspiration, January, 1960.

Appendix 2 E. A. Stone, Mine Report, Roadside Mine, Pima County, Arizona (Original report - September 6, 1928).

Appendix 3 E. A. Stone, Roadside Mine, Santa Rosa Mining District, Pima County, Arizona, September 14, 1963.

Appendix 4 St. Francis, Copper Silver Mine, Tucson Arizona, October 1, 1948.

Appendix 5 C. DeKalb, St. Francis Copper Mine, Commonly Known as the Roadside Mine, Geologic Report, Tucson, Arizona, September 6, 1928.

Diagrams
No. 1 to 15

HEINRICH REPORT

ANALYSIS OF GEOPHYSICAL DATA
ROADSIDE MINE AREA
PIMA COUNTY, ARIZONA

January 1960

for

INSPIRATION CONSOLIDATED COPPER COMPANY

Inspiration, Arizona

by

HEINRICHS GEOEXPLORATION COMPANY

P. O. Box 5671 Tucson, Arizona

INTODUCTION

In response to a letter request from Mr. R. F. Reed dated 11 December 1959, maps and data of geophysical results from the property were borrowed from Mr. Edwin A. Stone on 12 December 1959. At this time Mr. Stone also discussed his knowledge and ideas about the area and the work that had been done.

On 28 December 1959, after pencil recontouring and profiling part of the magnetic data and rendering to a common scale for overlay purposes, a stucy was made of the information and a futher short discussion held with Mr. Stone. The following day, Bill Marlatt of GEOEX, briefly inspected part of the property while enroute returing from other work in the vicinity.

CONCLUSIONS AND RECOMMENDATIONS

One area of magnetic anomolies indicates a sone, or several stringers, of magnetite concentration, tops of which are less than 300' deep as a group, or very near surface in individual cases, and dipping southerly on a fault zone. This is near and along the only known limestone esposures on the property and probably on the lime hanging wall. Occurrence of lime and metamorphic rocks suggest possibility of a contact metamorphic origin for the magnetite. A few random surface grab specimens of epidote-andesitic-basaltic rocks containing native, oxide and sulfide copper are occasionally more magnetic

than other surface rocks in this zone. However, time did not permit obtaining a representative complete or comprehensive suite of samples from the area, which might provide more definite and positive interpretation and correlation, of magnetics versus copper mineralization.

Essentially the magnetic results are encouraging and alone, if the geological aspects are considered sufficiently favorable, they would warrant additional evaluation. Phelps Dodge resistivity and metal factor (induced portential or I. P.) results are, for the most part, negative, especially when interpreted in an absolute sense (probably partly why P. D. was not further interested). However, experience shows that absolute geophysical interpretations are usually risky and seldon possible. On a relative basis, both the resistivity and I. P. indicates a slightly decreasing over all resistance and increasing sulfide content with depth. In any mineralized area this is the normal expetation, but with some geological and magnetic correlation with the weak electrical anomalies indicated, the resistivity and I. P. results may justifiably bear more consideration. Although the electrical maps refer to "apparent depths" of 1000', 1500' and 2000' it is doubtful that effective penetration depths exceed 500' - 750' or 1000'. This interpretation is further substantiated by the deep oscidation reported in drilling results which would tend to cause poorer indications at shallower depths, especially in I. P. work.

The rather persistent occurrence of copper in the considerable amount of epidote rocks reported, is interesting and raises the question whether its source might represent an economic target. The geophysical data neither confirms or denies the existence of a disseminated intrusive in the mapped area, except that the I. P. work and the drilling infer smaller chance above 1000'. Geophysically, the relative throw on the magnetic fault zone could be either normal or reversed. Depending on the best geological consensus, a logical procedure for further exploration, would be to explore this relatively shallower zone first, to try and develop a better lead which might then provide greater incentive for deeper work.

Before any substantial drilling expendature is made, additional geophysical work is recommended. This should consist of a few days momag and/or hand mag checking and fill in, and a few reconnaissance profiles of self potential work across the more favorable geologic-magnetic trends. Cost for such work could range from $1,000.00 to $2,500.00 and should be based in part on the sponsors favorability opinion and desired over all expenditure. With further study, geochemical and electromagnetic recon tests might also be worthwhile.

If any further interest is contemplated, it is first strongly recommended that a joint geological-geophysical discussionbe held to review all available ideas and data and eventually with Mr. Stone included. This would provide the best practical over all economical evaluation of objectives,

problems, possible solutions, costs and potential.

APPARENT GEOPHYSICAL-SURFACE GEOLOGICAL CORRELATIONS

LIME BELT AREA:

The northwest-southwest trending limestone belt from Sections 2 to 12 across the northeast corner of Section 11, appears to coincide roughly with the two main Western Geophysical Co.'s magnetic lows and very well with an average - 850 gamma low shown on the P. D. magnetic data. Immediately southwest is an adjoining parallel and related high, averaging about 1300 gammas from the P. D. data, which shows up roughly similar on both the Western and P. D. magnetic plots. Exact geographical correlation is only approximate because of apparent mapping inaccuracies, discrepancies and lack of map overlay ties. To be certain, field check work would be necessary.

Customarily, magnetic highs are often considered with prefered value over lows, however, lows can be equally or more economically significant, as can also the boundary-intercept-zone between highs and lows. Similarly the significant geologic zone may be in the limestone, along either contact or in the adjoining formation near either limestone contact.

Almost invariably, andesitic volcanics will give a much higher and more erratic magnetic level than limestone. Since most of the magnetic observations are over andesite and are not quite as anomalous in this area, a concentration of magnetite

in or near the andesite-limestone contact is indicated. The reported and mapped concentrations of metamorphic minerals and copper oxide, which in part, are rudely parallel to this zone on the southwest, could be indicative of a contact metamorphic origin for the magnetite concentration, but it could also be due to contact segregation solely in the andesite.

The P. D. resistibity data show a broad-general correlation between 100 and 120-unit resitivity highs (?) and this general area. Usually resistivity lows are preferred correlation to metallic mineralization, but diametric exceptions are possible for example, in highly dry and silicated zones. There is room for some doubt in reviewing the available data that signs could have been erroneously reversed, in which case the highs would be lows.

The I. P. results show very little metal factor relief, particularly in this part of the area. On the 1000' and 1500' apparent depth plots, there is a very slight vague correlation in this area with weak plateaus or highs in the range of metal factor values between 1 to 10, which theoretically, commonly relate to unmineralized basic rocks. On the 2000' apparent depth plot, this area shows a metal factor low in a slightly higher range of values theoretically approaching rocks containing finely disseminated sulfides.

METAMORPHIC ZONE APPROXIMATELY 1500' NORTH OF COMMON CORNER SECTIONS 2, 3, 10, & 11:

This zone correlates with a P. D. magnetic high, but was not

quite covered by the Western Geophysical Co. data. P. D. resistivity results show very little anomalism in this area, as do the P. D. 1000' and 1500' apparent-depth I. P. plots. However, on the 2000' I. P. plot, this zone represents the highest metal factor-theoretical-sulfide balues shown on the P. D. I. P. data. This lineation also coincides with the NE trending wash immediately west of the old Roadside Mine site.

Together, the geology, the wash and the I. P. anomaly, imply some structural correlation, most likely a fault, or at least a water course. Although the magnetic trends are generally normal to this, there is some suggestion of magnetic effect along this trace, with additional anomalism, both the highs and lows, along it to the southwest. This would include the respective high and low at stations 28 and 37 on the Western Coephysical Co. map.

MISCELLANEOUS:

A single station #50 high on the Western Geo. magnetic map, without additional readings, can only be assumed to be caused by the Bell Mt. basalt and of no other significance. Mr. Stone's statement that this is why Western took no more readings here is reasonable, but their contouring of this area without more data, is subject to question. P. D. results show no coverage obtained in this area.

Other readings presented are too meagre to justify further

interpretation without additional data.

ADDED COMMENTS:

P. D. geology was fairly broad and general and did not provide too much correlation. Ed Stone's geology was more detailed and specific and seemed to be less academic and more accurate and reliable, especially regarding structure and, to be a certain extent, alteration. Detailed stratigraphy admittedly would be quite difficult in this area without further study and information.

With the extremely wide spacing used, the Western mag data barely confirmed the broad-general features, but it could easily have been misleading without further detail. Station #50 value should be 10730 rather than 10231 and #49 should be 10221 rather than 10881, but the contouring as shown was more or less satisfactory.

P. D. mag contouring is strictly interpretative of only the broad-deeper features and not their actual results. This was probably done on purpose because of a tendency of being interested solely in direct detection of large deposition. Unfortunately this is extremely difficult and a better approach is probably to hope to be able to expand the large from one of a group of smaller successful leads. In this case, as in most, the data can be contoured consistent with the detail obtained.

This provides maximum interpretation value of all features simultaneously, without excluding any of possible importance. Because of the rougher gradients observed on line 350S, between G & K it would be helpful to extend line H north to about 200 South, and lines J & L from 200 South to 500 South.

No.I. P. data nor resistivity results for the 1500' and 2000' apparent depth plots were included on the P. D. (John Sumner, chief geophusicist) affidavit of labor.

Respectfully submitted,

HEINRICHS GEOEXPORATION COMPANY

by_____
Walter E. Heinricks, Jr.
President & General Manager

8 January 1960
P. O. Box 5671
Tucson, Arizona

DATA REVIEWED

TITLE	SCALE	BY
1 Colored Surface Geology Map	1" = 2640'	Ed Stone
1 Surface Geology map	1" = 500'	P. D.
3 Apparent Metal Factor (Induced Potential) contour maps apparent depths 1000', 1500' and 2000'	1" = 500'	P. D.
3 Apparent resistivity Contour maps. Apparent depths 1000' 1500' and 2000'	1" = 500'	P. D.
1 Vertical Intensity magnetic contour map	1" = 500'	P. D.
1 Vertical Intensity magnetic map (contour))superimposed on geologic structure)	1" = 1000'	Western Geophysic Company
24 Aerial Photos	1" = 1000'	----------
1 Affidavit of Labor 1959 Incl. 8 pages of tabulated mag. & resistivity data		P. D. (John Sumner
Southern Arizona Guidebook II		Ariz. Geo Society19
Drill Hole log		Ed Stone

STONE REPORT

Appendix 2

(Orig. report 9/6/28)

MINE REPORT

ROADSIDE MINE
Pima County, Arizona

Summary

Mr. Marion L. Thomas, mining engineer of 1700 East Lester Street, Tucson, Arizona, has recently secured an option and lease on the old Roadside Mine (sometimes called the St. Francis Mine) situated on the Tucson - Ajo highway, about 36 miles S-W of Tucson. The property comprises 36 mining claims, covering an area two miles along the main vein structure and one mile in width. It was owned and operated originally by the C. P. Huntington family of Los Angeles, California. After Mrs. Huntington's death in September 1924, additional funds from this source were not available for further development work and the property has since remained idle.

During the Huntington ownership Mr. Courtney de Kalb, a mining engineer of prominence, now deceased, was engaged to examine and report on the property. He favored continuing development by shaft to depths below the permanent water level, estimated at 700 to 800 feet, and remained in charge of the work. A depth of 800 feet was reached when Mrs. Huntington died, with no well defined division point between the oxidized and primary sulphide ores established. It is estimated that 100 to 200 ft. more depth will be required to reach the permanent water level where primary copper sulphides of commercial grade are considered a strong possibility.

The mineralization occurs in a shattered zone within an elliptical area of low andesite hills, resembling a laccolith, from which the original overlying sediments have been almost entirely removed. The main no th and south vein system is along drainage courses from Coyote mountain, rising abruptly from the southern group of claims to an elevation of 5000 feet above. Leaching from surface waters has removed nearly all of the copper content from the original ores, leaving behind completely oxidized iron (limonite) with some silver and gold, filling the seams which originally carried pyrite and chalcopyrite together with small amounts of these precious metals. In support of this conclusion, occasional "water pockets" or areas sealed off from circulating waters, were found at 15 and 84 foot levels in shaft No. 1, and again on the 400 ft. level from shaft No. 3 a pocket 15 ft. wide by 55 ft. long is reported assaying 4.3% copper and 9.3 oz. silver. Also the center of some of the larger boulders broken down in the shaft at near the 800 ft. level showed some unaltered pyrite and chalcopyrite. No assays are reported.

An important feature is the intrusion of monzonite granite exposed in the 700 ft. crosscut which shows mineralization over a width of 125 ft. This was brownish in color and had the appearance of being thoroughly leached.

All three shafts and, presumably, most of the underground workings are now caved and inaccessible. As the previous owners and Mr. De Kalb, had never considered the possibility of disposing of the property, only brief records were kept. The assays reported show little regard for widths sampled and, presumably, were taken merely as a guide in conducting the exploration work.

Introduction

A description of the property, with Plan, Vertical Section and Claim Map, mostly taken from information made available by records kept by Mr. De Kalb, and a report by him dated Sept. 6, 1928, follows:

The property is known locally as the Roadside Mine. Mrs. C. P. Huntington of California supplied the funds for developing the property. When she died in September of 1924, all development work was suspended and the ownership was transferred to Mr. Courtney De Kalb, the engineer in charge and Mr. A. B. Hazeltine, accountant and business manager, both of Tucson. At this time an effort was made to change the name of the property to St. Francis, in honor of Mrs. (Frances) De Kalb. Mrs. De Kalb succeeded to her husband's interest after his death, and is now part owner with Mr. Hazeltine, both joining in the present option to Mr. Thomas.

The property is situated on the Tucson-Ajo Highway, 36 miles southwest of Tucson, Pima County, Arizona. It is within the lands of the Papago Indian Reservation. A fee of 5¢ per acre is charged for all mining claims.

A group of 36 mining claims comprise the property, covering a distance of two miles on the strike of the main lode and one mile in width to include some cross veins of importance.

History

In 1880 a prospector brought the attention of the property to Mr. Epes Randolph, prominent locally in connection with the Southern Pacific Railway. Mr. Randolph in turn interested Mr. Collis P. Huntington, largely responsible for financing this railway through the southwest. Shaft No. 1 was started during this year by funds furnished by Mr. Huntington and under Mr. Randolph's supervision. After Mr. Huntington's death in 1900 his widow took over the property. Shaft #1 was discontinued at the 30 ft. level for reasons of safety as the vein was soft from kaolization of the andesite.

Mr. Courtney de Kalb, an engineer of prominence, was engaged by Mrs. Huntington in 1912 to report on the property. Thru his recommendation Shaft #2 was started in that year and some additional work done in shaft #1, connecting the two shafts on the 200-foot level. On account of the soft vein matter encountered on the 380-foot level of shaft No. 2, this shaft was abandoned and shaft #3 started. It reached the 800-foot level in September of 1924 when the property was shut down. It has been idle since that time.

Physical Features

The property lies at an elevation of approximately 3000 feet. The area is surrounded by a series of low andesite hills set in a basin, rising to an additional height of 5000 feet on Coyote mountain, some three miles to the south. To the north the vein meets a faulted zone at the rim of the eliptical area ending in Saddle Mountain, which rises to nearly 500 feet above the plane level. To the northeast are tertiary eruptives within a mile, interspersed with beds of tuff, possibly a continuation of the same upheaval which is responsible for the vein system exposed at the Roadside claims. Beyond the elliptical area referred to the surface both east and west dips off to a wide plane for many miles, with no rock formation showing in place. Drainage from the Coyote range traverses the Roadside group of claims from south to north along the vein system and is probably responsible for the extensive leaching out of its original copper content.

Description of the Deposit

The principal ores are copper oxides, carbonates and native copper, finely disseminated, in the upper levels, with a fairly uniform silver content of 3 ounces of silver to 20 lbs. of copper. Gold is usually present in amounts of 0.02 to 0.03 ounces per ton in the oxidized portion.

The mineralization occurs in seams and crevices of shattered andesite with no well-defined limits in width. Twenty to forty feet are mentioned in Mr. de Kalb's report, with indications of mineral penetration into the shattered andesite beyond. Parallel fracturing on both sides of the main Roadside vein are in evidence, showing copper carbonate and heavy iron oxide staining the accompanying soil and rocks. Cross veins enter the main fracture zone at four or more points within the two mile extension of the main lode. These cross veins and parallel fissures contain much saussurite and epidote which usually carries bornite and some native copper as an accessory. Thru oxidation the bornite has been converted to copper carbonate in places, and especially is this noticeable on Saddle Mountain at the north end of the property. However, these blue carbonates and iron stained andesite are features of the deposit in many places over the surface.

Leaching of the original copper content by circulating waters has been so thorough above the permanent water level at around 800 ft. there remains only isolated water pockets in the upper levels where shipping ore might be expected. The possibilities of the property are, therefore, confined to primary ores of low grade copper and silver, but payable in large tonnage operations, yet to be found below the 800-foot level.

Mine Workings

Shaft #1, alongside the Tucson-Ajo roadway, reached a depth of 200 feet on the incline. This shaft is said to have encountered copper carbonates, oxidized vein matter and a high grade "water

pocket", all within 15 feet depth. Another high grade water pocket was entered at the 84 foot level. Owing to soft kaolinized material along the vein walls, the work in this shaft was discontinued for reasons of safety.

Shaft #2 was started on the hanging wall side of the vein 111 feet north of shaft #1, reaching a depth of 380 feet. This shaft was connected with shaft #1 on the 180 foot level. It is supposed to have cut a minor vein, lying on the hanging wall of the main vein, at a depth of 380 feet. Had the drift to the south been continued another 20 feet it would have reached the larger deposit which was later found on the 400 foot level from the No. 3 shaft. Shaft #2 is now caved and inaccessible.

Vertical shaft #3 was started on the south side of the road, 180 feet S. E. of shaft #2, also on the H. W. side of the vein. This shaft cut the main vein at 350 feet, passing through it and into the footwall at 450 feet and continuing to 800 feet depth. The vein has a dip of 65° to the east. The shaft passed out of andesite and into a monzonite granite at 630 feet depth. Crosscuts and drifts connect with shaft #1 on the 200 foot level, and other crosscutting and drifting was done on the 300 ft., 400 ft. and 700 foot levels. The crosscut on the 700-foot level entered the monzonite granite at 95 feet. It was shattered and heavily oxidized in the seams, with small amounts of copper and silver present. This continued over a distance of 125 feet and again entered the andesite at 240 feet from the shaft. The main vein was reached at 275 feet from the shaft, having a width of 15 to 20 feet of heavily oxidized vein matter, but low in copper, if any.

THE ORE

Mining in the early stages was for high grade copper carbonate and unaltered bornite from sealed off water pockets which had escaped thorough oxidation. One of these, found in the first 15 feet of shaft No. 1 and another at 137 ft., are reported to have been 20 to 30 feet wide and 50 to 90 feet long, and to have assayed 6 to 7% copper and 14 to 15 ounces of silver. In this part of the mine quicksilver was also found, assaying 0.79% per ton. Surrounding the pockets of high grade was thoroughly oxidized vein matter assaying 1.5 to 3% copper and 3 to 7 ounces of silver.

Shaft #2, started in the H. W., is said to have cut through 40 ft. of vein matter in connecting thru to shaft #1, with seams of copper carbonate thrucut. No assays are reported. No information is available as to the ore found in the lower levels of shaft #2, and they are now caved and inaccessible. It is reported however, that an attempt to break into the 380 foot level from the north drift on the 400 ft. level of shaft No. 3, disclosed a viscous mass of sooty chalcocite in a bluish mud with fragments of undecomposed vein filling which also carried some bornite and mercurial tetrahedrite. This level was not reopened.

From shaft #3, on the 400 level, a 20-foot vein was disclosed, streaked with green carbonate with a diffusion of iron staining beyond

the main vein for some distance into the hanging wall. Drifting to the north from this shaft entered another water pocket, as encountered in shaft #1. After draining for several days it was found to contain chalcocite, both secondary and primary. Some of these masses of chalcocite were a foot long by 3 inches wide. Another interesting feature of this part of the deposit is a net work of seams of ore entirely distinct from the enclosing altered andesite. These were from less than 1/2 inch to 3 inches wide, consisting of mass bornite and tetrahedrite intermingled with a gangue of mixed silica and calcite. The seams lay in every direction and had evidently been injected into the confusedly shattered rock. Some of these injected masses assayed 18% copper and 64 ounces of silver. The intermediary rock was also mineralized and assayed from 3% to 5% in copper and from 8 to 15 ounces of silver. The length of the water pocket was 55 feet. A raise from this level, starting from the footwall of mineralized vein matter, averaged 4.78% copper and 11.5 ounces of silver. Also 96 feet along the vein in the north end of the 400 foot level assayed 4.3% copper and 9.3 ounces of silver and 0.03 ounces of gold.

As to the bottom of the #3 shaft, Mr. de Kalb reports: "The rock from the last 25 to 30 feet, i. e. from 770 to 800 feet was below water level. A great change occurred at about 750 feet depth. Nevertheless, the water level had evidently been fluxuating in height, and the material from the shaft was still in progress of oxidation, especially along the seams which had been filled with sulfides. In blocks between the seams there was no vestige of oxidation. The rock had been completely mineralized throughout with pyrite, chalcopyrite and specks and small seams of chalcocite. It seems quite certain that the next 100 or 200 feet would bring one into completely unoxidized ground." No assays are reported.

Outlying Claims and Workings

Allanite Shaft. This is situated on the south flank of Saddle mountain, 2800 feet N 10 E. of the Roadside workings. It is on one of the longest cross lodes and, in its extension to the east of the shaft, shows probably the most copper carbonate of any. The shaft has a depth of 69 feet. It was started on the H. W. side of the vein, which is 14 feet wide, with a 60° dip to the south, and cut it at 65 feet. At this point only yellow and brown oxide were present, similar to the outcrop except for crystals of calcite appearing along the walls of the vein. Further depth is necessary ay this point to prove the vein.

Epidote shaft. This shaft is located on the Roadside main lode, about 2800 feet directly north, and reached a depth of around 100 feet. Some secondary chalcocite is said to have been found below 40 ft. depth, where it is now caved and inaccessible.

Bacon shaft. This is the only shaft on the first cross lode north of the Roadside mine. It is on the Plata claim and has a depth of 14 feet. It is reported to "show copper carbonate in considerable abundance."

Trident shaft. This shaft is located on a claim by that name, some 1500 ft. S. E. of the Roadside mine. It is on an east

lying faulted extension of the Roadside vein where the Waycross lode crosses the main vein system from east to west. The vein is 22 feet wide; distinct in appearance from the andesite wall rock by having a large amount of canary yellow oxide of iron. This alteration may be said to be typical of "cloistral oxidation" or a leaching out of the original sulphides that, on oxidation, have had no tendency to diffusion of the oxide of iron, but remained behind as a pulver filling of the cavities without staining the enclosing rock or gangue. The shaft is 56 feet vertical and an additional 20 ft. following the incline of the vein which is 60° to the west. No change of mineral content is reported. At 6 ft. depth the vein assayed 0.0 copper and 0.88 oz silver. At 27 ft. depth, also no copper and 0.36 silver.

Cholla shaft. This shaft is on the Waycross lode, 1500 ft. to the west of the Trident shaft. It has a depth of 40 ft. on the incline, which is 50 to 70° to the north. At 10 ft. depth the vein assayed copper 0.0 and silver 0.05 ounces.

Tortugas shaft. This shaft is located on the Alamo 2 claim, about 5000 feet S. 15 W. of the Roadside mine, and 3/8 miles south of the new Tucson-Ajo highway. It has a depth of 8 feet, and is sunk on a 40-foot outcrop of saussurized andesite. Some copper carbonate and specks of bornite are exposed in the outcrop and in the dump. No assays are reported.

Proposal

A free option to examine the property.
For sale outright, with payments over an 8-year period. $175,000; $200 month, 1/1/49.
For sale on a five-year basis, retaining 30% ownership for the vendors.

Program of Immediate Work

It would seem advisable to investigate the possibilities of reopening #3 shaft. What appears to be caved ground and fill at around 50 feet may be merely a matting of shaft timbers at this point, without obstruction below.

If reopening of the shaft is practical, sinking should be continued below the 800 ft. level, with a crosscut thru the unaltered monzonite, and the vein beyond, to determine its possibilities of ore of commercial grade.

If not practical to reopen shaft #3, four to six churn drill holes should be put down to below the permanent water level; one in the area of the Allanite shaft near Saddle mountain; one near the Roadside workings; one in the region of the Trident shaft and one in the region of the Tortugas shaft.

These drill holes should be from 1000 to 1500 feet deep, and would cost approximately $7.00 per foot.

General

Accessibility to the State Highway is a favorable feature.

A supply of water on the property for domestic use and possibly other uses is another asset. Supplies and labor would have to be brought in from Tucson, the largest nearby city, distant 36 miles. Concentrates would be shipped to the smelter at El Paso, a distance of 250 miles from Tucson, or to the smelter at Hayden, Arizona, 75 miles directly north from Tucson, but 150 miles by rail.

The climate is ideal for year around mining.

Conclusion

It is to be regretted that the assay results available are little more than a guide to the limits of mineralization. However, the possibilities of the property are confined almost entirely to what values may be found below the oxidized zone where no development work so far has been done. A net work of shattered andesite and crevices filled with iron oxide, where oxidation has been complete, and carbonate of copper and occasional bornite in areas sealed off from circulating waters, would seem to thoroughly justify a reasonable expenditure for proving the possibilities of primary sulfides of commercial grade a short distance below the 800 feet depth reached in shaft No. 3.

The intrusion of monzonite granite, as shown in the 700 ft. crosscut in shaft #3, over a width of 125 feet with oxidized iron in its seams and crevices and slightly mineralized throughout, is an encouraging feature. This shattered formation is not unlike the great low grade orebodies now in preparation for mining in the "Greater Butte Project" which will add 130,000,000 tons of around 1% copper at depths between 700 and 3400 ft. to their present reserves.

Also, saussurite and epidote found in many places outcropping on the Roadside property, showing blue carbonate of copper, bornite and specks of native copper, are features of the large low grade mines at Morenci, Arizona and the Santa Rita Mine in New Mexico, with possible similarity of origin.

ROADSIDE MINE

Santa Rosa Mining District

Pima County, Arizona.

Area and Location

The property is comprised of 41 unpatented mining claims containing a total area of 847 acres. Patent application was made on 31 claims and all of the required procedures completed and fully paid. Patent application was withdrawn in the final stage pending completion of the proposed drilling program.

The property is situated on the Papago Indean Reservation and lies in the low hills on the north slope of Coyote Mt. which is a part of the Quinlan Mt. range. It is reached via paved highway, No. 86, in a distance of 56 miles from the city of Tucson.

History

The property was first mined in 1880 and shipments of oxide copper are continued intermittently from this date to 1917. Mr. Courtenay DeKalb and associates took over the property about 1917 and at the end of World War One decided to sink a new shaft (No. 3) to the sulfide zone where they expected to encounter a thick zone of chalcocite below the oxidized and intensely leached upper section of the vein. This shaft was sunk to 700 ft. and a crosscut driven to the vein where it was found to be still oxidized. At this point Mr. DeKalb resumed sinking the shaft, his next objective to crosscut to the vein on the 900 ft. level. He reached a little over 800 feet in the shaft when he became ill and work was suspended. A short time thereafter he died and the objective was never reached.

Mrs. DeKalb, his widow, held some of the property for a number of years and at her request the writer made an appraisal of it in 1953. It was found essential to make a regoinal study in order to understand the local conditions and as a result over one-hundred square miles was maped. Subsequent to the initial study additional ground was acquired, title to the claims held by Mrs. DeKalb was perfected and some drilling done in order to check the mineralization and vein characteristics reported by Mr. DeKalb. In this period a

corporation was formed with 1,000,000 shares authorized par value of $ 1.00 per share. To date, 54,000 shares of stock have been issued.

Geology

- Structure

1. The Ajo Road fault which strikes N 75° W and dips at a moderate angle to the north.

2. The Roadside fault zone which is a major adjustment striking N 10° E and dipping rather steeply to the east.

Hereafter, these two zones of adjustment are referred to as the E-W structure and the N-S structure.

The E-W structure is the oldest and many of the elements within it have been rehealed making it rather obscure in surface outcrops. It is a part of the adjustment termed, the Texas Lineament, by F. L. Ransome, USGS. A great part, or all of the movement on it took place in post-Paleozoic time evidenced by massive blocks of Paleozoic limestone (roof pendants) resting upon the granite on the footwall side of the fault together with drag blocks of limestone lying within the fault zone. This fault system has dropped the formations of its north side for an unknown distance, and at present Cretaceous formations lie in contact with the pre-Cambrian granite on the south side of the fault. The Roadside property lies within the down faulted block.

The N-S structure developed in Tertiary times and it furnished the channelways to the ore bearing media. On the Roadside this fracture system is over 5000 ft wide. The writer mapped this adjustment zone through the Roskruge and Silver Bell ranges to the north and south through the granite to the Alter Valley. The Silver Bell Mine orebodies occur along a strong element of this system where it intersects another strong E-W structure. Displacement of the rock formations on this system does not appear to be extensive; however, blocks are faulted down on elements of it, toward the east, and total displacement may be several hundred feet.

Within the property limits there are two areas of extensive deformation which were developed by these two regional adjustments. They are termed:

1. The Shaft Structure in which a series of tension zones or shears were developed between strong elements of the N-S system. These wide shear zones are mineralized in the volcanic horizon but where exposed they are now characterized by oxidized and leached gossan. All of the early mining was done

on one of these shear zones which was opened by three shafts, the deepest 800 ft, together with over 2000 ft of lateral work. All ore shipments came from the oxidized zone. DeKalb shipped no ore, but in the course of his development he reports that he blocked out 40,000 tons of ore containing 3% to 3½% Cu. 9 oz silver, 0.02 to 0.03 oz gold.

2. The North structure which lies 2000 ft and more north of the shaft and strikes about N 75° W. This structure traverses the property for a distance of 6800 ft following a series of EW fractures which are probably a part of the Ajo Road fault adjustment. Deformation is intense within this structure where it is intersected by the NS Roadside fault system. This zone of deformation is about 2000 ft wide as far as known but its southerly limit cannot now be accurately defined.

The North structure is mineralized throughout with occasional outcrops of oxidized copper minerals in shears and fractures or replacement in some of the volcanic beds. The chief mineralization, however, is epidote which occurs abundandly having been introduced along shears and fracture intersections where it has replaced the volcanic rocks. The epidote, in most places is highly mineralized with oxidized copper minerals, native copper, chalcocite, some bornite and occasional particles of chalcopyrite. No important work was done on this structure in the early peria of mining. The most extensive exploration is a DD Hole 1003 ft deep which the writer drilled on the east end of the structure, last year. This hole was not completed due to lack of money but it is cased and capped so that drilling can be resumed at any time with BX size hole.

Rocks

The surface exposures within the Roadside property are composed chiefly of volcanic rocks which are late Cretaceous or early Tertiary in age. The Cretaceous formation is exposed at the surface west of the property but it is covered by volcanics 628 ft thick at shaft No 3 and the volcanic section is over 1000 ft thick on the east side of the property. South of the Highway the volcanics thin out toward the footwall of the Ajo Road fault and the Cretaceous formation is exposed at the surface. Limestone forms a series of low hills in the NS part of the property bordering the North structure. It is not known whether this block of limestone is a section of Paleozoic thrust into contact with the volcanics or if it is Cretaceous in age.

Alteration

Alteration of the rocks has been rather intense. Chlorite commonly replaces the original mineral constituents in the volcanics at many places and sericite in present in strong fractures and locally along fractures and shears. Epidote is present through out the property but is most abundant within the North structure. Drill cores from the hole in the North structure show some alteration and locally the feldspars have

been kaolinized. In the course of taking a number of samples for spectrum analysis one sample was taken outside, the mineralized zone. This sample showed a high content of sodium and aluminum whereas all samples from the mineral zone were high in potassium and silicon. The purpose of spectrum samples and the results obtained will not be discussed herein.

Mineralization

Excepting in the veins at the Shaft area and locally within the more intense fracture zones on the North structure no important volume of ore is expected to be encountered in the volcanic section. This is typical of the volcanic section, of the same age, at San Manuel, Silver Bell, Mammoth St. Anthony and other mines, familiar to the writer. The volcanics overlying these large ore-bodies contained only minor amounts of spotty and erratic ore mineratization.

In general, the ore minerals present at the Roadside Mine will be oxidized to a depth on the order of 1000 ft. DeKalb did encounter some sulfide in tighter sections of the vein which were sealed off from leaching solutions and the writer encountered a pyritic section about 40 ft wide in one prospect hole drilled to the vein at the shaft. No 3 shaft, about 100 ft in the footwall at 800 ft in depth encountered numerour small veinlets of pyrite and chalcopyrite in the last 30 to 40 ft. It is not nor known in what form the silver occurs. Assays on one or two clean sulfide samples which showed no signs of oxidation showed 3 oz of silver to each 1% copper which corresponds to the ratio reported by DeKalb.

Conclusions

1. The vein-type ore occurances in the shaft area should be an important source of ore, and DeKalb's objective should eventually carried out. This will be an expensive undertaking and the writer does not believe that this should be done in the initial stage of development.

2. The objective of the Roadside owners is to first explore the North Structure by drilling. This offers a much bigger target and it could contain many times the volume of ore that might be developed in the veins sections. This can also be done at a much lesser cost. It is believed that if the Cretaceous formation is penetrated within the sulfide zone in this area it will be found to contain a large volume of disseminated ore. The writer observed the easterly trend of the Ajo Road fault zone (Texas Lineament) will into the Sierrita Mt. range and believes that the major ore occurance

in the Twin Buttes Mining District lie with in this lineament where it is intersected by the major Twin Buttes thrust fault. He mapped the Twin Buttes district in 1943-44 and noted a series of offsets on the thrust blocks.
The E-W striking lineament was not recognized at that time.
-Development of the Mission and adjacent orebodies has proven a large volume of disseminated ore occuring in the same Cretaceous formations that we are striking for at Roadside.

3. The initial exploration program undertaken by the owners of the Roadside property called for two drill holes, each 2000 ft deep, one located on the east portion of the structure and the other on the west part of it. The west hole should have been drilled first due to the fact that the volcanic section is thinner in the western part of the area. This sequence is still recommended and the easterly hole can be completed after information is gained on the west part of the structure unless it appears advisable to revise the drilling program upon completing the first hole.

REGISTERED GEOLOGIST
CERTIFICATE EXPIRES
EDWIN ASHLEY STONE
DEC. 31, 19
ARIZONA, U.S.A.

Edwin A. Stone

Edwin A. Stone - Sept 14, 1963

COPY ST. FRANCIS OCTOBER 1, 1948

COPPER SILVER MINE, TUCSON, ARIZ.

This mining property lies within an elliptical area of andesite defined by a broken rim of andesite hills, representing a probable laccolith resting upon a floor of ancient orthoclase granite. Later, occured the intrusion of a great massif rising several thousand feet and an extensive faulting movement which split into a number of components. The location is adjacent to a main, improved highway 36 miles from rail and city facilities and an auto can be driven directly to the workings.

On the death of the owner, as the mine had not yet been brought to a producing stage after some years of exploration-development work, with three shafts, under very able advice and direction, it was closed (1924) and there have been no operations since. It is now again available for final development and it would appear that a relatively small amount of work remains to be done to prove the property.

Shaft-sinking on the wide and extensive fracture zone to 800' is estimated to require but around 100' more to pass below the last evidence of oxidation as a great change occurrdd at about 750' and at 770'-800' the water level was reached. The rock was completely mineralized throughout with pyrite, chalcopyrite and specks and film of chalcocite. This portion of the mainvein varies between 15 and 25 feet wide. already a fairly large quantity of ore has been developed, largely in waterpockets sealed off by kaolin accumulations against further oxidation and where primary ore has been preserved, attesting to the expected condition that will be found below the zone of oxidation. In addition, there could be expected increased values from secondary enrichment.

The apparent area of mineralization is some 5000 feet long and about 3000 feet wide, of which the main fault zone or lode, is the axis with wide, mineralized parallel fault zones of fracture on each side. These, in turn are crossed by a secondary series of fractures, on one of which the outcrops show the minerals bornite, native copper and the oxide carbonates for some 1½ miles on its strike. Copper carbonates are found staining the rocks over the entire area. At 400' in the main shaft a shattered zone of silica and calcite contained an injected network of ore seams consisting of bornite and tetrahedrite, samples of which assayed 18% copper and 64 oz.silver. Other results from this 400' level (average of 3 samples) gave 4.78 copper, 11.5 oz. silver; average assay over a total length of 96 feet returned 4.3 copper, 9.3 oz.silver, and 0.03 oz. gold.

An acid intrusive was encountered on the 400'level at the point where the cross-faults would approximate each other in depth. It is a highly important factor in connection with the prospect of a deep-seated deposit and was undoubtedly instrumental in bringing in the copper. This rock appears to be a quartz monzonite.

A limited number of drill holes, put down to test out some of the structural and ore conditions found in the shaft work, or elsewhere, would seem to be the logical method of present proceedure. Later, the deep working shaft (800') could likely be repaired and made ready for work. There is no machinerynor any habitable buildings remaining.

In addition to the possibility of developing much commercial shipping ore, the geological conditions would seem to point to the additional development of extensive blocks of mill ore making off as disseminations from the main fractures.

Sampling of ROADSIDE during progress of work. Shaft No. 1

Date: 1915	Depth :	Location & Character	Gold Oz	Silver Oz	Copper %
June 16	132-6'	Shaft; Seam 18" wide, altered andesite, malachite, chalcocite ore mostly oxidized and red.	Tr.	12.10	6.83
June 29	155'	Shaft, "blue ground" kaolinized, andesite, mostly soft, shows chalcopyrite in seams & granules	0.04	5.80	2.84
July 2	Dump	"Blue ground"	Tr.	3.40	1.76
" " "	162'	South side of shaft, 5' foot wall to hanging wall: "Blue ground"	Tr.	8.80	0.60
" " "	162'	North side, Ditto	0.04	5.60	2.64
" " "	162'	Hanging wall side shaft, 8' blue andesite and red streaks	Tr	1.20	1.11
ly 22	168'	Peacock colors, some bismuth minerals, finely disseminated chalcopyrite.	Tr	5.40	3.67
" " "	168'	Bottom of shaft, cinnabar, tetrahedrite, drusy vugs, cuprite, and sooty chalcocite.	Tr	3.90	3.08
" " "	168'	Side of shaft, soft, kaolinized, dark blue, sooty chalcocite, bismuth minerals	Tr	14.10	4.64
g. 2	180'	N. drift, 1st 3'. Blue some cinnabar	Tr	11.00	3.45
" " "	180'	Same place, cinnabar streak assay for mercury 0.20% Hg	Tr	5.20	2.27
Dec. 1	Dump	Oxidized ore from North drift about 4 tons	00	4.60	1.48
" " "	N. Drift	West side, blue ground 1st 6'	00	2.40	1.37
" " "	N. drift	West side, blue ground 2nd 6'	Tr	5.20	1.94
" " "	N. drift	West side, N. of cross-cut 10'	00	4.80	1.81
" " "	N. drift	West side, N. of cross-cut, 5' from last	00	0.20	0.09
" " "	N drift	Oxidized ground, native mercury	Tr	6.30	1.96
Dec. 1	W Xcut	Blue ground, soft, 3 ft.	Tr	6.20	2.29
" " "	E. Xcut	Blue ground, soft, 5'	00	0.60	0.26
" " "	E. Xcut	Blue ground, soft, 5'	00	3.90	1.47
" " "	E. Xcut	Oxidized ground, 10'	00	0.80	0.56

Copy -- Roadside Mine
40 W Congress St.
Tucson, Ariz.
Courtesy De Malb, Consulting engineer.

DeKALB REPORT

ST. FRANCIS COPPER MINE

COMMONLY KNOWN AS THE

ROADSIDE MINE

GEOLOGIC

REPORT BY

COURTENAY DE KALB

Mining Engineer

TUCSON

ARIZONA

SEPTEMBER SIXTH

1928

ST. FRANCIS COPPER MINE

The St. Francis Copper Mine, locally called the Roadside Mine, is situated on the Ajo Road, 36 miles west-southwest from Tucson, in Pima County, Arizona.

The main workings lie on the western edge of Section Eleven, Township 16 South, Range 8 East, G. and S. R. B. and M. The property also extends over parts of Sections 10, 3, 2, 11, 15, 14, 21 and 20 in the same township and range.

TOPOGRAPHY

The principal number of claims is comprised within an elliptical area defined by a broken rim of andesite hills. There is evidence to the effect that this group of hills was originally a laccolite from which the cover has been almost entirely removed. The area formerly had been overlaid by ancient sedimentary rocks, including conglomerates of undetermined age, together with limestone. These sediments had been deposited upon a floor consisting of an ancient orthoclase granite of normal type. Subsequently occurred the intrusion of the great Coyote massif, which now rises to a height above the present plain of more than 5,000 feet. Great masses of pre-Cambrian schist (Pinal-?) are exposed at the base of the sedimentary series. Topographically the mountain is exceedingly abrupt. From the central portion of the Roadside basin, which is surrounded by the andesite hills previously mentioned, the elevation toward the south, i. e., toward the Coyote Mountains, is 1000 feet to the end of the group of claims in that direction. From that point southward the mountain rises as a series of scarps, attaining the full elevation of 5,000 feet within another mile and a half. The northern front of the mountain has been subjected to deep erosion, resulting in an extensive embayment on that face. This effect has been produced by the splitting up of the faulting movement into a number of components, followed by other notable

geological phenomena. For example, west of this series of faults the mountain has been subjected to shearing, while the area involved in the faulting movement is quite free from this effect. The elliptical group of andesite hills, representing a probable laccolith, is about two miles long in the direction of the major axis, which happens to coincide with the north-south direction of the main fault on which occurs the St. Francis Copper Mine (the Roadside Mine). Northward from the mine there is a gradual descent for about 250 feet to the base of Saddle Mountain, a peak of andesite about 500 feet high, constituting the northern boundary of the elliptical area. The saddle is formed by a depression produced where the faulted zone crosses the mountain. Between the mine and the base of Saddle Mountain is an extensive gravel fill, where the surface is now covered by wash from Coyote Mountain. The outlet for the waters that had carried the debris is toward the northwest through a gap a quarter of a mile wide.

Toward the west of this area there is no sign of andesite, and the plain extends for many miles, at first rising gently, and then following a general depression toward the base of the Comobabi Mountains, a distance of 20 miles.

Eastward from the elliptical area previously mentioned there is a gradual decline from this dissected ridge in which the mine occurs, down to Bowley's Wash, which is the main drainage line between the Coyote Mountains and the Sierrita range.

THERE IS A FURTHER STRIKING OCCURRENCE TO the northeast of the area, consisting of Tertiary erruptives intercalated with beds of tuff. These end abruptly on a north-south course, as if they had been faulted up to their present position, and then had suffered erosion toward the east. It is worthy of note that the line of scarps formed by the upturned layers of tuff and lava-beds parallels the great Roadside Lode, at a distance of less than a mile. This line of scarps

becomes involved in the Rosruge Range, beginning at San Pedro Indian village, three miles north of the St. Francis Mine.

Therefore, the mine is in a restricted basin of andesite hills, which basin occupies the top of a ridge that opens southward to the lofty Coyote Mountains and is enclosed northward by Saddle Mountain, which is part of the elliptical area of andesite hills. The area thus enclosed is roughly fifteen hundred acres. The mine itself stands on a slight elevation within the enclosed area.

STRUCTURE

The strike of the Roadside Lode is North 15° West. As stated before, it occupies a central position with reference to the ellipse of andesite hills. It is not a simple fracture but is paralleled on each side of the main lode by wide zones of fracture, which had been mineralized by pyrite and chalcopyrite, as indicated by copper carbonate and heavy iron-oxide (limonitic) staining in the accompanying soil and rocks. There are two principal zones of such staining to the west of the Roadside Lode, and another a quarter of a mile east of it. They extend only across the basin, and do not involve the rocks lying beyond it.

The area is crossed by a secondary series of fractures which have the peculiarity of dipping toward the Roadside Mine where they occur on the north side thereof, and of dipping similarly toward the mine where they cross on the south side.

In detail: The first one of these cross-lodes is found on Saddle Mountain, beginning west of the main lode and continuing for a distance of a mile and a half in an easterly direction, showing copper throughout its length. This lode crosses at a distance of two claim lengths northward from the Roadside Mine, and maintains a general direction of East 20° South.

Where opened to view at the Allanite shaft, 69 feet deep, this lode has a dip of 60° toward the south, which is toward the Roadside Mine. It crosses the following claims from north to south: COWSLIP, LARKSPUR, SAUSSURITE, EPIDOTE, ALLANITE, ZORRA and GUIPUZCOA. The further extension of this lode toward the east has not been taken up.

The second cross-lode lies between the Allanite and the Roadside Mine, crossing the AZOGUE, GILA, Hydrargyrum, MERCURY, ARMION, PALO VERDE, PLATA, VIZCAYA and ASTORGA claims. It is particularly well developed on the Azogue and Gila, and again on the Ocotillo, Plata and Vizcaya. The true dip has not been fully established, but seems to be from 45° to 60° toward the south. This is known as the Bacon fault.

On the south side of the Roadside Mine, as previously stated, the cross-lodes all dip northward. The first of these is the Waycross Lode which is especially well developed between the Trident and the Cholla claims, four full claim-widths. On the Cholla claim a shaft, about 45 feet deep, shows the dip to be approximately 60° to the north. Following the fault westward another excellent development of the dip is seen on the Marqueta claim, about five claim-widths west of the Cholla claim.

The second cross-lode extends across the Santa Tomás, Trejo and Tazota claims. It distinctly dips toward the north, but has not been developed.

The third cross-lode, which is very promising for ore, is found on the Alamo II, extending across the entire area.

The fourth cross-lode, crossing the Alamo VII, VIII and IX, also extends for a great distance beyond the limits of the ground under consideration. It dips at a very steep angle, more than 70°, toward the north.

Another feature already referred to is a division of the faulting system into a number of branches where it enters the great Coyote Massif.

These branches constitute a fan-shaped group of mineralized fractures, on all of which copper is found in varying degrees, including one important mine on the south side of the front ridge of the mountain. From this mine considerable shipments of ore have been made to the El Paso smelter. This is known as the Calvillo Mine, and is in line with the main Roadside Lode, about 3½ miles distant to the south.

The width of the group of connected faults which forms the fan-shaped, deeply eroded area in the Coyote Mountains, is about one and a half miles. It begins at an elevation of about 1000 feet above the Roadside Mine, and continues to the summit of the Coyote Range, 4000 feet higher. The altitude of Coyote Peak, the highest point, is 7,500 feet. The Calvillo Mine, which is on a continuation of the main fault on the south side of the front range, is about 2,500 feet higher than the Roadside Mine. By reason of its position on a surface undergoing active erosion, all of the outcrops in the mountains encounter the original sulphides at comparatively shallow depths.

The circumstance that the cross-lodes dip respectively north and south toward the Roadside Mine lends further interest to the fact that an acid eruptive is found in Shaft No. 3 and also appears on the surface at the Trident shaft, from which point it continues, following the general direction of the main lode, southward to the Santo Tomás claim. The converging dips were evidently connected with the intrusive rock which is found at this point.

SURFICIAL INDICATIONS OF COPPER

Copper carbonates are found staining the rocks over the entire elliptical area of andesite. They follow the line of the series of north-south faults which parallel the central Roadside Lode. On the outlying zones occurs much sericite and some epidote, which carry as an invariable accessory

considerable quantities of bornite and sometimes native copper. On becoming oxidized the bornite is converted to copper carbonates. The saussurite with bornite also occurs prominently on the Alamo II, parallel and adjacent to the cross-lode on its northern side. This is one of the most promising veins, outside of the main Roadside vein, that exists on the property.

Saddle Mountain, lying at the northern end of the property, is conspicuous for the great amount of saussurite containing bornite and native copper. It is found in great abundance over the entire hill, a mile in length by about a half-mile in width and 500 feet high. At the western end of the hill are considerable masses of andesite altered into saussurite that has acquired a bronze hue from the minute specks of native copper disseminated throughout. This is at a distance of half a mile from the point where the Roadside Lode forms the wide saddle in the summit of the hill. Saussurite with accompanying copper and bornite is so abundant that the assessment work for holding the LARKSPUR claim, at the western end of Saddle Mountain, is performed entirely in that mineral.

The extent of the saussuritization may be gained from the circumstance that the distance from Saddle Mountain, which is covered from end to end by this mineral, to the notable occurrence on the Tortugas vein that crosses the Alamo II, is exactly two miles. It should be noted also that these seem to be the limits for the occurrence of native copper and bornite with the saussurite, and the Roadside Mine is at mid-distance between them.

In the Coyote Mountain the copper is accompanied by epidote and garnet. Epidote is closely allied to saussurite, but all of its iron exists in the ferric state, while in saussurite a portion of the iron is present in ferrous form. The garnet is almandite, and, where it accompanies the Calvillo Mine

on the southern extension of the Roadside Lode, these two minerals constitute a dike(metamorphic) thirty feet in width. Here also copper staining is a feature of these minerals, although less pronouncedly than on the Roadside area.

At the CRUCERO claim, belonging to the Roadside group, epidote is likewise a prominent feature. It lies well up in the Coyote Mountains, following a steeply tilted mass of limestone that has also become the locus of an acid dike, which brought in an interesting vein of copper. The limestone has been more than half altered to epidote. At this point the blue and green copper carbonates are very strikingly developed, but are succeeded at the shallow depth of 14 feet by chalcopyrite. The vein is exposed on the surface for about 600 feet, forming the comb of the ridge between the main Coyote Arroyo and a parallel branch at a slightly higher elevation.

The outcrop of the Roadside vein at Shaft No. 1 makes a brilliant display of blue and green carbonates. These form the crest of a low ridge extending North 15° West, which coincides with the strike of the Roadside vein. There is also a characteristic "caliche" capping of lime carbonate, developed from the calcite accompanying the quartz in the vein.

The Bacon fault also displays these minerals at many points on its eastern extension, and an elongated area , deeply stained with red, to the east, on the Azogue claim, accompanied with the same wide 'caliche' capping as that found covering the Roadside vein.

It is worthy of note that the accompaniment of epidote and its closely allied saussurite is a striking feature of two prominent mines in the Southwest, viz: The Morenci Mine of the Phelps Dodge Corporation in Arizona, and the Santa Rita Mine in New Mexico, where the association is very intimate. The occurrence of bornite and native copper disseminated through these minerals over so great an area at the Roadside Mine indicates

simultaneity of origin. They were manifestly formed at the same time that the copper was introduced into the system of veins. Even in detached fragments, or "float" the saussurite holds the fresh bornite in small masses, intimately dispersed along the borders with the fresh saussurite, becoming pure massive grains of bornite at the center. Likewise, the particles of native copper never occur filling seams, but are involved in the massive saussurite, embedded in it the same as any accessory mineral in a rock. The gradual decomposition of the saussurite exposes the bornite to oxidation, giving rise to the stains of copper carbonate, which are so conspicuous over the Roadside ground. Saussurite is a high-temperature mineral, and in this case it has undoubtedly derived its lime and soda from the andesite. The favorite position in which the saussurite has been formed has been in minor fault-planes. Furthermore, the trend of these fault-planes is commonly toward the Roadside fault, i. e., toward the west on the east side of the Roadside fault, and toward the east on the west side of that fault.

UNDERGROUND WORKINGS

Three separate shafts have been sunk in the course of exploration. the first one reached a depth of 200 feet, with levels driven at depths of 30 feet and 180 feet. It was sunk on the incline of the vein. This shaft was ultimately abandoned for reasons of safety, and shaft No. 2, at a distance of 111 feet toward the north, was sunk and was connected with the 180 ft. level. This was a vertical shaft, with a hoisting compartment, 5 ft. 2 in. by 5 ft. 2 in. in the clear, with a 3½ by 5 ft. 2 in. pump and manway, heavily timbered throughout and provided with a cribbed collar ten feet deep. It was subsequently continued to a depth of 380 feet, and a level, as shown by the mine maps, was extended in a general south-southeast direction about 200 feet. The shaft was started on the hanging-wall side of the vein, and apparently cut a minor vein lying on the hanging-wall side of the main deposit at that

depth (330 ft.) which must have been well mineralized, judging from the material on the dump that was uncovered subsequently for use as road-metal. Had shaft No. 2 been continued another 20 ft. it would have reached the larger deposit that later was found on the 400-ft. level of Shaft No. 3.

Shaft No. 3 was started on the south side of the road 180 feet South 30° East from shaft No. 2 and 140 ft. South 45° East from Shaft No. 1. It was also located on the hanging-wall side of the vein. It was started without a cribbed collar, which later caused some difficulty, but the most important developments in the mine have been made in this and in No. 1 shaft.

The outcrop of the main vein can be traced easily some distance west of the location of the shaft. It is here extremely different from the outcrop over No. 1 shaft, only 130 ft. away. Instead of the brilliant carbonates seen at No. 1, the rock has little resemblance to the outcrop of an ore. Only by comparison with similar material in depth does its relationship to the ore become apparent. It now consists of fissured andesite, filled with seams of iron oxide and occasional mixtures of the characteristic quartz-calcite accompaniment of the veins from which the copper has been almost completely removed. Traces of the copper are present, however, as cuprite. Underground, exactly similar material is found having the seams filled with a network of bornite, tetrahedrite and quartz-calcite, and others that are oxidized, grading into those that have copper. The outcrop lies behind the adobe engine house. Exploration has revealed a dip of approximately 65°, continuing along the outcrop for about 100 ft, conforming to the strike of the main lode.

Shaft No. 3 has a depth of 800 feet, with a crosscut west to the vein at 200 feet; another level at 400 feet, with crosscut east and west; an

unfinished crosscut toward the vein at the 500-ft. level, and a crosscut to the vein and beyond, 329 ft. long, on the 700 ft. level. The vein on the 700-ft. level was cut at 294 ft. from the shaft, where it was well developed and varied from fifteen to twenty-five feet wide, being thoroughly oxidized. Also, before cutting the main vein, a zone 125 ft. wide was traversed which also carried copper and silver in amounts ranging from 0.25% to 0.72% copper, and from 0.12 to 0.35 oz. silver.

The dip on the vein, measured from where exposed by the crosscut, to the average line of dip encountered where the shaft crosses at the 400-ft. level, was found to be 62°.

The section of the shaft from 700 ft. to 800 ft. brought an important change in the water situation. It was recognized that the depth to water was a crucial point in connection with this property, since the oxidation had been deep. Although something over approximately 40,000 tons of ore had been developed by the work done, no attempt had been made to do more than prove a proper warrant for continuance of the exploration in depth, at least during the final campaign of development. In effect, the property was oxidized to the lowest depth attained, except in the last 30 feet of shaft, and except for ore contained in water-pockets, so called because upon reaching them great quantities of water were suddenly tapped and drawn off until the pent up waters were exhausted. This usually required from a few days to a couple of weeks. The explanation of the cause of the water-pockets will be dealt with in the discussion of the ore bodies.

The seepage of the surface water has left the country without any accessible water table. The wells in this district of Arizona are exclusively close beside the watercourses, being actually derived from the waterflow, which is merely part of the seasonal run-off. As a consequence nearly all the wells

run dry in the late spring and early summer. The rainy season comes in July and August, and again in January and February. At the San Vicente Ranch, a few miles west of the Roadside Mine, an elaborate attempt to secure water by drilling was made, and finally abandoned. The ranch was forced to depend upon a well beside a watercourse in one of the deep canyons in the Coyote Mountains for domestic water, and upon an artificial lake or "bolsa" for supplying the cattle.

It was expected that the Roadside vein itself would have served as an underground watercourse, but that hope finally had to be abandoned. That the Gila water-table would be the determinant was then fairly certain. Apparently the drainage from the Roadside Mine would flow in that direction. The horizontal distance between the two points is exactly 60 miles. Allowing for resistance to flow, and taking the elevation of the mine above Gila Bend as a basis for the calculation (2064 ft.) it was believed that water level in the Roadside Mine should be somewhere between 700 and 800 feet. This is based on a gradient of 15 feet per mile. The amount of water hoisted daily from the mine was averaging 30 buckets of 60 gallons each when sinking was started from the 700-ft. level. The sump below the 700-ft. was then 15 ft. deep. This was emptied and sinking was begun. Almost at once an increase in the quantity of water was observed, which soon became so marked as to interfere greatly with the work. The increase is best shown by the monthly per diem averages, as follows:

Normal daily inflow at the beginning. . .	2,700 gallons
June average daily	4,680. "
July " "	5,580 "
August" "	6,300 "
Sept. " " first 15 days	12,030 "

On that day in 1924 the own owner of the mine died, and the work of exploration was halted. But for this circumstance, pumps would have been ordered to facilitate sinking. A depth of 800 feet had been reached, and it was evident that a moderate advance of perhaps 100 ft. or a little more would have been sufficient to have passed below the last evidences of oxidation. The rock has been completely oxidized down to a depth of 750 ft. Below that point occasional pyrite was seen, and during the last 15 or 20 feet the centers of the blocks blasted out remained wholly unoxidized, and were filled with disseminated pyrite that carried both chalcopyrite and secondary chalcocite. Also, the blocks were divided by a network of oxidized seams presenting identical characteristics with the ore found in the "water-pockets" in other parts of the mine. It must be recalled that the bottom of the 800-ft. level is on the footwall side of the lode, the shaft having passed through the lode between the depths of 350 ft. and 425 ft.

The main vein lies about 344 ft. east of the bottom of the shaft. The rock in which the shaft stopped was a locustrine-sorted tuff, extremely permeable to gaseous solutions. In this connection the fact should be recalled that the entire area had been penetrated by high-temperature solutions, as evidenced by the existence of the saussurite carrying bornite and native copper.

DEVELOPMENT

Development was carried on chiefly from shafts No's. 1 and 3. No records exist of the work done below the 200-ft. level in shaft No. 2 but ore was encountered outside of the main vein as proved by the buried ore accidentally uncovered on the dump which came from that shaft. According to the map of these workings which has been left, none of the development

done at that time penetrated the main Roadside vein.

Shaft No. 1 was started about 1880. A considerable amount of carbonate of copper was taken out at that time. At a depth of 30 feet the vein contained less quartz, which had been responsible on the outcrop for holding up the ridge and for enclosing the copper. A few feet below that point the leaching was almost complete. However, almost all the characteristics of the deposit were in evidence on and within the first 15 feet. Even considerable remnants of the copper sulphides were present, embedded in dense quartz. The shaft, in that period of work, in addition to the upper level at a depth of 30 feet, was carried down to a depth of 84 ft. and ~~shaft~~ drifts were run, 20 ft. north and 19 ft. south from the shaft. These were also in ground so thoroughly oxidized as to be disappointing at that period, when only high-grade shipping ore could possess a value. However, the vein possessed a fawn color highly characteristic of the former presence of copper. This, coupled with the tremendous amount of sericite, and of kaolin derived from it by the action of the ~~acid~~ acid waters that could have resulted from the leaching of so wide a vein that had been rich in sulphides of copper, as indicated by the outcrop, encouraged the re-opening of the shaft many years afterward (1912). The deposit was of great size, measuring 24 ft. between walls at the end of the north drift of the 20 ft. level and 30 ft. at the end of the south drift. The total length of the two drifts was 89 feet. The walls were highly ~~white~~ slickensided, and there was abundant evidence of extensive movement and of high temperatures.

The shaft chanced to go down directly into a "water-pocket". Ore averaging between 6 and 7 per cent copper and from 14 to 15 ozs. silver, was encountered at 137 feet. In this part of the mine quicksilver was also present, to the extent of 0.79%, and was a feature of the deposit to a depth

of more than 200 feet. The occurrence of the mercury was traced to decomposition products from the mineral Schwatzite, the mercurial variety of tetrahedrite. Large masses of cinnabar were found, and in parts of the 180-ft. level native quicksilver occasionally could be dipped up with a spoon. The Schwatzite is a feature of the original injection of deep seams of an intimate intergrowth of bornite and tetrahedrite, unaccompanied by metasomatism, into fracture-planes in the andesite. These seams are often enclosed between perfectly fresh walls of rock. Following this original injection came the phenomena of extensive substitution of copper, accompanied by sericitization, which produced the main volume of the deposit.

Following the 180-ft. level toward the north a change occurred within 40 ft. The ground had been extemely soft throughout, consisting of Kaolin discolored with sooty chalcocite, which the miners called "blue mud." Occasional fragments of rock were seen containing remnants of the bornite-tetrahedrite seams, but for the most part the rock was very thoroughly decomposed, and assayed from 1.5% to .3% copper and from 3 oz. to 7 oz. and 8 oz. silver. The shaft had been in similar material for a considerable distance. Within a couple of rounds of shots the character of the drift was changed. The ground became oxidized, containing copper as carbonate and cuprite, assaying less than 1%. Quicksilver was present in native form. On reaching this point the "water-pocket" drained off. The ground also changed from its bluish tint to a deep rusty brown.

Crosscuts were driven east and west about 45 feet, showing a width of orebody of 30 feet, and a series of glickened walls with deep brownish to bluish decomposed material between.

The shaft was deepened, and within another ten feet passed below the sooty colored chalcocite into fawn-colored rock with a great deal of massive

malachite. Samples assayed from 3 to 4% copper and from 8 to 10 oz. silver. The next ten feet passed through this zone of oxidized ground, and again reached water, which proved to be the beginning of another "water-pocket."

Approach to the 180-ft. level of shaft No. 1 was next had by means of a crosscut from shaft No. 2, 25 ft. long. Where it entered, the leaching had been very great. The width of the mineralized ground was about 40 feet, fawn-colored, with seams of copper carbonate throughout. Cinnabar and native mercury were also present in notable quantity.

At this point it may be well to introduce certain notes relative to the geology of shaft No. 2, for which purpose see blue-print marked "ROADSIDE MINE: GEOLOGY, MAIN SHAFT," on a scale of 1 in. = 10 ft. The scale applies to the shaft section, 7½ ft. by 11 ft. outside dimensions, shown in the column marked "Plans" the depth in the shaft being the depth, on the same basis, in the lettered lines, "A", "B", "C", etc. The "crib" was excavated in the characteristic "caliche" capping, which, as said before, is derived from the contributions of lime from the decomposition of the calcite-silica veinlets throughout the vein. It consists of series of amorphous lime crusts interspersed with vein-detritus, strongly resembling travertine. The depth of the "caliche" capping was about 18 ft. The shaft proved to have passed through an intensely shattered zone. The series of faults is extremely complex, and sericitization, as revealed by the large amount of kaolin, has been very great. The fawn colored ground came in nearly at the same elevation as in shaft No. 1. At the same time copper was found, and continued for a distance of nearly 20 ft. The rocks were so completely fractured that no vein walls were clearly distinguishable, but this is evidently the same ore-zone that was cut on the 330-ft. level, on the hanging-wall side of the main vein. The central portion of the orebody cut at 115 ft. in shaft No. 3 showed, by assay, copper 1.62%, silver and gold not reported. Ten feet

higher up, on first entering the mineralized ground, the ore assayed copper 0.51%, silver 1.00 oz. and gold 0.02 oz. It may be stated that the gold content of the ore has quite uniformly been found to be round about 0.02 oz. to 0.03 oz. per ton. The gold has remained after all the sulphides of copper and of iron have disappeared. The persistence of small quantities of sooty chalcocite, giving a bluish color to the kaolinized remnant of the vein in shaft No. 2 is to be noted.

Shaft No. 3, being the deepest, has revealed the greater amount of evidence. From the mine plans it will be seen that the ore was found all the way from the end of the crosscut west to the bottom of shaft No. 1, and it there stopped in ore. The width of the mineralized ground ranged from 15 to 20 feet. I re-opened these workings in part, and found a width of 18 ft. at the end of the crosscut west. The ore coming from this part of the mine, as shown by sampling the ore-dump, averaged 3.8% copper, 11.4 oz. silver and 0.02 oz. gold. This measured approximately 500 tons. The larger amount of the ore had been thrown on the waste dump, and by measurement amounted to about 1000 tons, also apparently of high grade, and containing a great deal of cinnabar, schwatzite and bornite.

Both levels 2 and 3 had had the timbers drawn, rendering them inaccessible. The expense of drawing the timbers was so much greater than their original cost, and they were so entirely valueless after being knocked to pieces and brought to the surface, that the only plausible explanation of this extraordinary performance seems to have been that of trying to discourage the absentee owner by concealing the evidence of some important showing below ground. The mine yard retained these old timbers, sufficient to account for several hundred feet of underground workings at the time of my inspection about two years later. At the same time that this act of vandalism was perpetrated all but one of the structures for housing the men, including one

almost new 40 ft. by 20 ft. adobe bunk house, and all the smaller houses, about ten in number, were completely demolished, and the headframe of No. 3 shaft had been taken down. This was deeply resented by the owner, who soon thereafter reconstructed the buildings and re-opened the mine. By that time the underground workings had collapsed. That the ore in the 300-ft. level was similar to that found above was revealed by the material that flowed like a viscous mass from the portal of the level, a bluish mud discolored by sooty chalcocite, and which furthermore brought out fragments of undecomposed vein-filling containing films several centimeters in width of the characteristic mixture of bornite and mercurial tetrahedrite. Therefore the persistence of the ore from the 200-ft. to the 400-ft. level is demonstrated by the ore actually taken out, corresponding to about 2000 feet out of 2640 feet of workings that, according to the plans of these levels, might have yielded ore, in addition to which ore was found coming down to the shaft at 350 ft., extending down to 425 ft., and was revealed also by a raise driven up from the 400-ft. level on the vein, following the footwall, 40 feet in the direction of the 300-ft. level.

The foot-wall of the vein at the 400-ft. level lies just west of shaft No. 3. The mineralization, after the first 10 ft. of active replacement and injection, extends into the hanging wall on the opposite side of the shaft, for an additional 12 to 15 feet. Accordingly, the deposit here is from 22 to 25 ft. wide. At the shaft the ore was being leached and considerable carbonate was seen. At this point, also, a different type of rock was observed, which appeared to be intrusive. A discussion of this occurrence will be given under the heading of "GEOLOGIC NOTES."

The 400-ft. level was an unfortunate position to turn off a level.

The ground was soft, and contained much kaolin and sericite. It was essential to drive toward the hanging wall for some distance before venturing to drift. Accordingly a loop was made, returning to the footwall at a distance of 70 ft. north of the shaft. At this point the ground was quite dry, and was oxidized to a fawn color, streaked with the green copper carbonate. The width of the mineralized ground had been 20 feet, with diffusion of iron staining beyond the workings into the hanging wall. The amount of limonitic oxide of iron was very great. It was of a brownish yellow hue, and the oxidation had been distinctly of the cloistral type. The seams of carbonate extended over a width of about ten feet, with patches of the same mineral throughout the entire width of the lode.

During the next 15 feet there was found an increasing amount of sulphides along the zone of higher mineralization, and the injected films of bornite- tetrahedrite, partly oxidized and stained with carbonate, extended to a considerable distance toward the hanging wall.

It was at this point on the 400-ft. level that the workings broke into a water-pocket. The seams were slimy from kaolin, which seemed to have sealed off the water. Within a few feet the quantity of water increased to such an extent that it was deemed best to allow the ground to drain. This required several days. On resuming work the water-pocket proved to present the unoxidized primary minerals such as had been seen on the dump coming from the 200-ft. level. There was also considerable secondary chalcocite, but there was also a large amount of primary chalcocite enclosed in the injected masses of quartz-calcite. Some of these masses of chalcocite were a foot long by three inches wide.

Another interesting feature of this part of the deposit consisted of a network of seams of ore, entirely distinct from the enclosing altered andesitic

rock. These were from less than a half inch in width to more than three inches wide, consisting of a mass of bornite and tetrahedrite intermingled with a gangue of mixed silica and calcite. The seams lay in every direction, and had evidently been injected into the confusedly shattered rock. The miners likened them to fossil snakes.

Samples of these injected masses assayed copper 18% and silver 64 oz. The intermediate rock was also mineralized, and assayed from 3 to 5% copper, and from 8 to 12 and 15 oz. silver.

It may be well to mention the fact that an identical injection has taken place on the cross-lode on the claim known as Alamo II, where there has been the following order of events, proceeding from north to south: (1st) A zone about 40 ft. wide paralleling the cross-lode, consisting of saussuritized andesite containing bornite in great abundance. (2nd) A zone 12 ft. wide that had been mineralized, and is now seamed with canary-colored iron oxide. (3rd) A soft yellowish rock irregularly seamed by injected matter, 10 ft. wide, having the characteristic dull yellowish color of the oxidation product of the network of veins seen on the 400-ft. level of the Roadside Mine. (4th) A zone of blocky andesite 16 ft. wide. (5th) Another vein in successive and nearly vertical parallel bands of deeply stained rusty colored streaks alternating with bands of a paler yellow mixture of silica and calcite, 12 ft. wide.

Returning to the Roadside Mine, the network of veinlets on the 400-ft. level is also found in the oxidized ground as well as in the water-pockets. They had not been recognized at first, but, after having become familiar with the characteristics of the brilliant peacock-colored injections in the water-pockets, they were readily recognizable when oxidized. They retained the carbonate color longer than the rest of the ore.

On becoming leached, the bornite decomposes earlier than the tetra-

hedrite, leaving the iron behind as a yellowish oxide. In specimens partly etched in this process, the tetrahedrite often stands out in strong relief, at times revealing crystal structure.

The water-pocket opened on the 400-ft. level possessed other interesting features. Many of the films that had been injected into the andesite, similar to the films in the upper part of the mine that were unaccompanied by alteration of the host-rock, consisted here in part of a mixture of chalcopyrite and bornite, without the presence of tetrahedrite. This recalls the persistent accompaniment of films of chalcopyrite along with well developed crystals of schwatzite and massive cinnabar in No. 1 shaft and in the 180-ft. level.

It proved impossible to determine the conditions that had held back the water on the farther (north) side of the water-pocket, and also the oxidation has been very much less on that side. The ore had become rusty in appearance, but this applied chiefly to the replacements in the vein outside of the injected veinlets and the films.

In speaking of these as films, it must be explained that they were ordinarily from a sixteenth to an eighth of an inch wide, though sometimes they attained a width of more than a quarter of an inch, and again they were no more than a fraction of a millimetre. It must be noted that they showed a similar origin to the wider masses constituting the network of veinlets. The material composing them consisted of an intergrowth of bornite and tetrahedrite, but with inclusions of the gangue-mixture of quartz-calcite in the case of the wider films, and, in the case of the smaller ones, the quartz-calcite had been forced into the crevice filling the entire space for a short distance. Also, where the seam happened to be split open in breaking the specimen, the gangue-filling revealed that the quartz-calcite had been flattened out so as to occupy an approximately circular space. In the wider veins of this type (the before-

mentioned network) there was likewise so pronounced a tendency to segregation on the part of the sulphides and the quartz-calcite that in a multitude of cases it possessed the appearance of leopard spots, the quartz-calcite being the ground-mass and the sulphides the spots. Even in the richest pieces this tendency was persistent. Usually there was a banded structure along the margins of the veinlets, suggesting flow-lines.

Although the injections constitute a very important part of the vein-filling, and by reason of their richness increase the total value of the copper and silver content, the main interest of the deposit lies in the replacement-ores which are found distributed from wall to wall, and in the aggregate play much the most important role. The injections mainly occupy a position near the footwall. For that reason they were found in shaft No. 1, which was an incline following that wall. The only apparent exception to this position is at the Alamo II where the pitch of the vein, though nearly vertical on the outcrop, inclines toward the north.

At the end of the north drift on the 400-ft. level the vein was as strong as further south, and the zone of injections had widened to about 15 ft., as shown by a branching of the drift for a short distance. The length of the water-pocket, measured along the north drift of the 400-ft. level, was 55 ft. Work in this direction was stopped temporarily in order to continue sinking the main shaft.

Also a raise was driven at a distance of 39 feet north of crosscut "G" 40 ft. high, and from the end of the raise another cross-cut was driven west 40 ft., which should have crossed the 380-ft. level of shaft No. 2, but failed to connect. The only existing map of the workings of that period is a copy which may not be authentic. The raise was at first driven on the foot wall, for about 20 feet, but as the ground was very heavy and hard

to hold on the incline, it was turned vertically. This afforded an opportunity to further explore the vein, affording a diagonal cross-section of 12 feet. The average assay from three samples was, copper 4.78%, and silver 11.50 oz.

From crosscut "C" to the end of the north drift, that is, from the beginning of course "B" to the end of course "L", a total length of 96 feet 2 inches, the average assay was 4.3% copper and 9.3 oz. silver, and 0.03 oz. gold.

The south drift on the 400-ft. level was started from the east crosscut at a distance of 45 feet from shaft No. 3, and curved back to the footwall of the vein, at a distance of 44 feet, measured through the block, from the shaft. At the point where the footwall was reached there had encountered a drag-zone of fault debris leading in a direction South 30° East. The ground had been greatly disturbed for a considerable distance on approaching the intersection with the vein, and masses of copper-stained ore were found. The vein itself, where cut off by the fault, was 10 feet wide, oxidized to a deep brownish color, retaining a great amount of copper carbonate.

The rock on the hanging-wall side was exceptionally free from signs of the original movement that had been responsible for the formation of the Roadside fault. Just where the crosscut traversed the vein the massive hanging wall had been beautifully polished to a rounded form like a portal, where the debris of the vein had been dragged around it. This indicated that the movement must have been extremely slow.

The surface also shows that such a dislocation must have taken place. The vein is traceable clearly from the Trident shaft southward to the

Santo Tomás, and thence onward to the Alamo II. This indicates a throw of 312 feet to the east. However, there are surfical signs that the Roadside vein may have been subjected to a much more complicated movement between the place where it was cut off on the 400-ft. level and where it has been demonstrated to exist at the Trident shaft. There is an extensive outcrop on the southern portion of the Ocotillo claim, almost at right angles to the course of the Roadside fault, which has never been investigated.

Proceeding down the No. 3 shaft below the 400-ft. level, samples were taken at intervals down to a depth of 450 feet. These assayed from a fraction of one to as much as three per cent copper for the first few feet, and then became so oxidized as to show no copper, although silver still persisted in quantities up to one ounce per ton. At 490 feet a small vein was cut, having a dip of 63° toward the east, which assayed copper 1.81% , silver 3.12 oz., and gold 0.015 oz.

At 500 feet another level was turned off and driven 50 feet, which by calculation lacked 20 feet of entering the vein.

At a depth of 628 feet below the surface the bottom of the andesite was found. The line of division had been, at this point, a watercourse, carrying boulders of the potash granite forming the ancient floor on which had accumulated the earliest sediments of the region. Remnants of similar flesh-colored orthoclase granite are found underlying the pre-Cambrian (Pinal ?) schist on the east side of the Coyote arroyo where it issues from the Coyote Mountains at the top of the clinoplain, two miles directly south of the Roadside Mine. On one side of the mass of boulders existed about three feet of argillaceous material with a slaty structure, which evidently had contained substances that became carbonized from the heat of the lava. The miners dubbed it "coal". The ancient stream-bed stood at an angle of nearly forty degrees from the horizontal, indicating that the andesite had probably been disturbed from its original position. It may be

mentioned further that the apparent course of the stream-bed was from the south-southwest.

Immediately after passing the bed of boulders a strong fault was encountered, the color of Venetian red. It was also as soft as paint, and was 14 inches wide, dipping S 83° E 81°. The fault crossed the shaft easily and, on account of its position, caused much trouble from the tendency to cave in. It also made great difficulty in turning off the 700-ft. level, since the fault lay just inside the portal. Subsequently the same fault was found in the 400-ft. crosscut to the west, on the west side of the shaft. It there straddled the wedge-shaped point of an intrusive, i. e., there was a similar fault on each side of the intrusive.

A description of the igneous intrusive from a sample submitted to Dr. Joseph T. Singewald, Jr., of Johns Hopkins University, will be found under the heading of "GEOLOGIC NOTES". The intrusive lay 44 feet from the mouth of the cross-cut.

From the ancient stream-bed downward for some distance came an unidentified rock, which was succeeded by the water-sorted tuff already mentioned.

The 700-ft. level has already been partly described. The first copper was found at a distance of 81 feet from the shaft, on the hanging-wall side of a fault dipping N 70° E 62°. From that point the entire distance to the next fault, 125 feet, contained small quantities of copper and silver, never reaching one per cent copper nor an ounce in silver. Decomposition of the ore had taken place throughout, and the color was rusty. It had the appearance of having been a zone of dissemination from which the copper had been mostly removed by oxidation. The rusty color proved to be due to small points and specks of copper sulphide that had been largely leached out without removal of the iron (clostral oxidation). It is to be noted that the series of faults in this portion of the 700-ft. level all dip in the same general direction in harmony with

the series of faults and slips found in the vein itself. The intermediate fault at 150 feet, N 5° W/55° encouraged the belief, while the level was being driven, that water was not distant, but after passing this fault it was seen to have been only a seepage line. On the theory that it might denote the proximity of another water-pocket, the drift on the vein encountered at 294 feet was driven to the point of intersection between the vein and the fault mentioned. The entire vein was moist but yielded no flowing water. It was a mass of oxide of iron (limonite) with quartz predominant, and exceedingly porous. The width was from 15 to 30 feet. No sample was taken. The rock at the end of the drift was andesite, again proving that it (the andesite) had been disturbed from its normal position.

The rock from the last 25 or 30 feet of the shaft, i. e., from 770 to 800 feet, was below water level. A great change occurred at about 750 feet. Nevertheless, the water level had evidently been fluctuating in height, and the material from the shaft was still in process of oxidation, especially along the seams which had been filled with sulphides. In the blocks between the seams there was no vestige of oxidation. The rock had been completely mineralized throughout with pyrite, chalcopyrite, and there were also specks and small films of calcocite. It seems quite certain that the next 100 or 200 feet would bring one into completely unoxidized ground.

The Fairbanks-Morse gas engine installed in the engine-house, is good for that depth. The No. 4 Cameron sinking pump, also on the property, would undoubtedly suffice for handling the water to a station pump on the 700-ft. level, from which the water could be lifted to the surface. The only equipment that would be required to begin operation would be such a pump, and the necessary pipe-line, and an auxiliary air-compressor. The compressed-air line is adequate for both pumps and for two air drills.

OUTLYING PROPERTIES

ALLANITE SHAFT: One of the promising properties connected with the Roadside Mine is the Allanite claim. The shaft is situated on the south flank of Saddle Mountain, 700 feet east of the Epidote shaft. It is on one of the longest cross-lodes on the property, and one that displays a larger amount of copper carbonate than any other. The carbonate is seen chiefly at the eastern end of the cross-lode, but the shaft is sunk on the widest and most interesting outcrop. The vein at this point is 14 ft. wide, consisting of a similar mixture of quartz-calcite to that which enclosed so much primary chalcocite on the north drift of the 400-ft. level of the Roadside Mine. At the Allanite shaft the outcrop is white, with casts of sulphides that have yielded yellow to reddish stain. Prospect pits were sunk revealing the same character of material. They disclosed that the dip was about 60° to the south. Accordingly a shaft was started in the hanging wall, and it has penetrated to a depth of 69 feet. It entered the vein at 65 feet. The material was similar to the outcrop, except that along the sides were seams of beautiful crystals of calcite. The casts continued in the vein in the shaft, and the color of the staining was buff.

EPIDOTE SHAFT: This shaft was about 100 ft. deep. The ground was soft and was said to have revealed a zone of secondary chalcocite. The management was changed and the timbering was drawn from top to bottom of the shaft, as explained by neighbors who witnessed what was done, and the shaft collapsed to within about 40 feet from the surface.

BACON SHAFT: The only shaft opened on the first cross-lode north of the Roadside Mine is the Bacon shaft. It is on the Plata claim and is near the junction of the strong lode, extending all the way from the Astorga on the west to the Azogue claim on the east with the north-south lode that parallels the Roadside lode on the east. The Bacon shaft is only 14 feet deep, showing copper

carbonate in considerable abundance. The north-south lode is signalized by the long, powerful outcrop of a calcitic vein on the Jara claim where the lode crosses the Ajo Road.

TRIDENT SHAFT: This is a few feet south of the junction of the Roadside Lode with the Chella cross lode. It was found by observing an outcrop of a light-colored rock which contrasted strongly with the liver-colored andesite. The outcrop was twenty-two feet wide, and revealed no hint of the enormous amount of bright canary yellow oxide of iron that was disclosed with the first shovelful taken from it. On opening it up, the dike proved to have well developed walls, dipping N 60° W:60°. No specimen was secured that was fresh enough for identification, but it was distinct in habit from the enclosing andesite. The mineralization offered a remarkable example of what Augustus Locke terms "cloistral" oxidation, which from all levels of the Roadside Mine has been a pronounced characteristic of this deposit. There was nothing, however, to equal what is seen in the Trident shaft. The rock has been thoroughly impregnated with sulphides that on oxidizing have had no tendency to diffusion of the oxide of iron, which, on the contrary, has remained to a great extent as a pulverulent filling of the cavities, without staining the enclosing rock or gangue. Some of the cavities have been as large as eight or ten inches long by two inches wide, filled with scaly dust of a brilliant canary, shading into light brown which latter, on being scratched, gave a canary colored streak. The walls had been altered for some distance into sericite, largely changed into kaolin. It is fair to assume that only copper sulphides rich in that metal could have produced the phenomena here observed.

The Trident shaft was sunk vertically 53 feet and thence followed the dip of the vein another 20 feet. It was intended to re-timber this shaft, providing a proper collar for sinking on the dip of the vein to a sufficient depth

to obtain a better idea of the character of the deposit at this point. This shaft lies on the faulted offset of the Roadside vein, and from this point onward to the Santo Tomás and the Alamo II the vein continues clearly marked on the surface.

CHOLLA SHAFT: The Cholla shaft, so named from the name of the claim, is down 40 feet on the incline, which dips irregularly toward the north from 50° to 70°. It was the result of doing assessment work to hold the claim. Small amounts of copper carbonate were frequently found and a peculiar type of oxide staining that was much in evidence for the last 20 feet above the ore encountered at 137 feet in the old incline shaft of the Roadside Mine where the first discovery was made.

TORTUGAS SHAFT: This is the development work done on the Alamo II. It is on the north side of the Tortugas cross-lode, sunk wholly in saussuritized andesite carrying abundant bornite, adjacent to the vein, which is one of the strongest on the property. The saussuritized andesite is 40 feet wide, followed by 50 feet of vein, which has exactly the same kind of caliche cap that covered the outcrop of the Roadside vein at the discovery point. The active stream erosion where the stream crosses the lode, had exposed the series of caliche crusts, forming small caves, which were inhabited by tortoises, whence the name of Tortugas.

Considering that the Tortugas vein is at an altitude of about 300 ? feet above the Roadside Mine, and that there is constant drainage from the Coyote Mountains, it is fair to assume that the depth to unoxidized sulphides would be considerably less at this point. The evidences of copper at a shallower depth make this one of the most favorable locations for a prospect shaft. There exists an admirable site for such a shaft, with dump room for workings to any depth, adjacent to the vein.

CRUZADO SHAFT AND TUNNEL: Mention has already been made of the finding of sulphide ore at the depth of only 14 feet on the outcrop of the Cruzado

vein. A tunnel had been started to serve the double purpose of proving this vein and of developing water. The tunnel would crosscut the vein at a depth of 130 feet from the surface. There is a good possibility of tapping a stream of water in the shallow arroyo 15 feet beyond. This arroyo possesses an extensive drainage reaching to the summit of the mountains at one of the loftiest points, and it should carry water. The eastern side of the arroyo is steep, rising suddenly to a height above the tunnel of three thousand feet and is made up of a long series of profoundly fissured rock standing normal to the longer axis of the range. Accordingly there must be a very considerable drainage to be tapped by a crosscut tunnel. There are permanent water holes in the two arroyos that together drain the great amphitheatre which has been hollowed out by the erosion of the front of the mountain.

GEOLOGIC NOTES

Essentially this report deals from first to last with geologic conditions. It may be desirable to summarize the leading features and to add confirmation of important points.

The Roadside Mine is situated on a great fault-zone, having a width never less than 200 feet. Secondary faulting has occurred at two places on the zone, viz. (1) at the central portion, where three parallel faults are found west of the main fault and one east of it, extending for about 1½ miles across the andesite area on each side of the Roadside Mine, and, (2) another series dipping toward the main fault, lying on the west side of it in the Coyote Range, which has formed, by further erosion, the deep amphitheatre just mentioned, which was determined primarily by such faulting. Mineralization is found on the surface accompanying all these faults, the great majority of them showing copper.

The chief interest in the zone of faults is at the Roadside Mine, where occurs another striking phenomenon consisting of a series of cross-faults,

two of which, north of the Roadside, dip southward, while another series of faults, south of the Roadside, also cut the main Roadside fault and its associated faults, maintaining a dip toward the north. All these cross-faults show copper and in some cases under conditions that promise important amounts at no great depth.

An acid intrusive has been found in the Roadside Mine and at the Trident shaft, at the point where the cross-faults would approximate each other in depth. This is the only intrusive rock found outside of the series of complementary dikes comprising the border-phase of the Coyote massif, two miles distant. It was undoubtedly instrumental in bringing in the copper and is of the utmost importance in connection with the prospect of a deep-seated deposit.

Typical specimens of the intrusive from the 400-ft. level of the Roadside Mine were sent to Dr. Joseph T. Singswald, Jr., of Johns Hopkins University, one of the ablest petrologists in America, and in a letter from him on the subject he says: "Q1 and Q2 are both holocrystalline rocks that are made up of quartz, orthoclase and plagioclase. They are notable for the small amount of black minerals that they contain. There is a very little hornblende, magnetite and chlorite. Their texture and appearance suggest aplite or pegmatitic intrusion rather than a large mass of true granitic texture, that is, they look like an apophysis of a granitic massif rather than like part of the massif itself. From the standpoint of the very small amount of accessory constituents the rock might be called an alsazite, but an objection to this name lies in the large quantity of plagioclase which the specimens contain. It may well be, however, that there are facies not represented in the specimens that might be properly called alaskite. Further, with regard to nomenclature, I would be inclined to call the specimens granites rather than quartz monzonites.

In the first place the rock contains a very high percentage of quartz. In the

second place , although the quantity of plagioclase is large, it is not quite abundant enough to bring the plagioclase/orthoclase ratio within the monzonite limits. On the other hand the amount of plagioclase is larger than the amount that is common in granites. We call attention to the fact, the rock might be called a monzonite granite. The plagioclase in these specimens is of the oligoclase-andesine composition."

It is of interest also to call attention to Mr. Singewald's remarks regarding another specimen, confirming the contemporaneity of the bornite and calcite in the ore. He says: " There are no specimens in the suite marked Q1 and B2 but there are three or four unnumbered specimens with veinlets of copper ore. One of the labels calls attention to a veinlet of contemporaneous calcite and bornite as described for B1 in your letter. All of the veinlets contain some calcite which is contemporaneous with the sulphide and they are in part fillings of small fractures and in part replacements of the wallrock of the fractures.. The sulphide mineral is not all bornite, but I have had no opportunity to make polished sections and determine what other sulphides are in the ore. For this it would be better to have wider veinlets. The host rock of the veinlets is highly altered andesite."

It may be well to call attention again to the statement made earlier in this report with reference to the injections that the vein fillings are, as Dr. Singewald says, partly fillings and partly replacements. The fillings of the veinlets, however, was independent of and prior to the general mineralization along the fault which was responsible for the greater part of the deposit. This action has undoubtedly been the cause of the replacements over so wide an area of the vein as twenty to thirty feet. It has been due to this cause that the extensive alteration of the outlying veins to saussurite, carrying bornite and native copper, has been accomplished. It seems most probable that the parallel veins accompanying the Roadside Lode across the elevated elliptical andesite basin are

definitely related to the main fault forming that lode. This, taken in conjunction with the dissemination of small amounts of copper through the water-sorted tuff, gives warrant for suspecting that copper may be present in workable quantities over a considerable area outside of the Roadside Mine. The following minerals are found in the Roadside Lode and associated with it in the same area, with the exception of garnet, all of these are present in the Roadside Mine itself:

NATIVE COPPER. In vein and in epidote and saussurite in float, abundant.

MALACHITE. Characteristic of outcrop. Abundant in float everywhere.

Azurite, Characteristic of outcrop, abundant in float everywhere.

CHALCOCITE. Abundant, both primary and secondary.

BORNITE. Abundant, chiefly primary, in "water-pockets."

COVELLITE.

CHALCOPYRITE. Abundant.

CUPRITE.

TENORITE.

TETRAHEDRITE. With bornite intergrowths, characteristic of injected veinlets.

SCHWATZITE. (Mercurial variety of Tetrahedrite). Intergrown with bornite in veinlets.

CINNABAR. Abundant in upper part of lode.

NATIVE MERCURY. Alteration product from cinnabar.

GOLD. Universally present in small amount.

SILVER. Present in the proportion of about 3 oz. to the unit of copper in primary ores.

NATIVE SILVER.

PYRITE.

AIKINITE (Lead-copper-bismuth-sulphide). Frequent.

VEIN QUARTZ. Universally present, associated with vein calcite.

CHERT. Frequent vein accompaniment.

VEIN CALCITE. Associated with vein quartz.

EPIDOTE. Abundant; increasing in Coyote Range.

Saussurite. Characteristic with the inclusions of bornite and native copper, all over the Roadside andesite area.

GARNET (Almandite). Rare in the vicinity of the mine; abundant along with veins accompanying limestone in the Coyote Range, as at the Crucible claim.

CHLORITE. Abundant in the wall rocks of the Roadside Lode.

Only those minerals which have some significance in connection with the vein formation are included in the above list.

CONCLUSION

The Roadside Mine was a privately owned and operated mining venture. On the death of the owner, as the mine had not yet been brought to a producing stage, it was closed. It is now again available for final development. A relatively small amount of work remains to be done to prove the property. Already a fairly large quantity of ore has been developed, largely in water-pockets, where it has apparently been sealed off by accumulations of kaolin against further oxidation. Accordingly, in these pockets primary ore has been preserved, giving a good idea of the condition that will be found below the zone of oxidation. In addition, there is certain to be an accumulation of secondary copper sulphides below water-level, which will add to the value of the deposit. The average tenor in copper, even allowing for some secondary enrichment in the water-pockets, is approximately 3% copper, and the experience gained in the exploration of the unaltered portions of the ore has been that a very constant ratio of silver, in the proportion of about 3 ounces to the unit of 20 pounds of copper, is maintained. Gold has been present at the rate of about 40 cents to 60 cents per ton. With copper at 14 cents per pound, and silver at 50 cents per ounce, the total gross value of the ore would be $13.30 per ton. In addition there would be the increase from secondary enrichment. This does not take into account the indicated extension of the zone of productivity

MAR 1960
RECEIVED

EDWIN A. STONE
1622 EAST HAWTHORNE
TUCSON, ARIZONA
TELEPHONE MAIN 2-2613

February 29, 1960.

Bureau of Land Management
P. O. Box 148
Phoenix, Arizona.
Att: Mr. John Brixious

Dear Mr. Brixious:

Enclosed herewith is a claim map of the Roadside Group of claims which I promised to send to you. Also enclosed is a brief summary of the geology of the property and adjacent areas which you requested that I prepare for you.

You and Mr. Reed gave a very informative talk before the small Mine Operators Group, on February 22nd, which I am sure was appreciated by all concerned. I tried to promote a more detailed discussion of recent legislation pertaining to mining as I think that this is of greater importance to the mining industry than is generally realized. We have previously discussed some of these laws, particularlly Public Law 47, and I still believe that if these laws were applied to all mining claims it would invalidate 75% of the titles and as a result would curtail or completely shut down every major mining operation throughout the state of Arizona.

It appears to me that these recent laws go back almost 100 years and ignore possessory rights (the only right under which a mining claim can be acquired) which the courts have upheld time and again. Many years ago the courts also recognized the fact that the 1872 laws were noy applicable to present day mining, particularlly the disseminated orebodies, which in many cases were evidenced only by the geological features. As a result possessory rights were held involiate pending discovery of mineral requisite to obtaining title through patent. Both the courts and the Land Office recognized that a discovery of mineral in one drill hole was sufficient evidence for patent of a reasonable group of claims in these wide-spread areas of mineralization. As an illustration, patent was granted to me on 19 claims on the basis of discovery of ore in one drill hole. This ore laid under 1500-ft of conglomerate, post mineral in age.

Under recent legislation, as interpreted by the Bureau of Land Management, title to the heart of the New Cornelia Mine could never be acquired. The footwall zone of the San Manuel ore deposit would not qualify for a valid location. The large ore deposits near Safford, some lying under as much as 2600 ft of barren volcanics could never have been developed. An illustration of how the recent laws restrict mining is at the Christmas Mine where, it is reported, that your office has contested the title to one claim. The purpose of this claim, as I understand it, is to furnish a site for a $5,000,000.00 shaft. Naturally,

no responsible operator would consider placing his working shaft in the orebody, but under present laws he may be compelled to depart from sound engineering practice in order mine the ore.

As previouly stated, it appears to me that recent legislation carries us backward almost 100 years and nullifies possessory rights which the courts have held inviolate for many years. Undoubtedly this is going to restrict development of new ore reserves, which is essential to the mining industry, in order that it can supply metal to the future generations. Under recent laws, as presently interpreted and without reagrd to court decisions, an operator could develop a major orebody and not be able to acquire title to ground in the heart of it making it impossible to exploit the deposit. Under Public Law 47 the Bureau can declare titles invalid to the whole orebody since it does not take into consideration, geological evidence as grounds for possessory rights. This is a short sighted sighted concept and contrary to all laws as heretofor defined by our Supreme Courts. It completely ignores the fact that many of our major ore deposits were developed solely on geological evidence and that all future ore deposits will be found through geological study and application of new techniques, and not from some from some minor mineralization on the surface which may not be present.

This letter is in no manner intended as criticism of your office. I know that you are not responsible for these laws or the interpretation of them by the Interior Department. Also, I recognize the fact that you are confronted with many problems, particularlly with the location of mining claims by those who intend to use them for purposes not related to mining. Such abuses could be, were corrected under the old laws as evidneced by the Government vs Sam Clark, at Ajo, about 1920 where possessory rights were annuled. I am afraid that in trying to correct the abuses, Congress and the Interior Department may destroy the mining industry. The nation has about 30 years supply of copper on which titles have been established, as well as sizable reserves of other metals; therefore the present generation will not suffer from the mistakes that may be made, now. Upon depletion of these reserves, the next generations may be dependent upon foreign sources for its metal and as a result will pay dearly for our short sightedness. Inflation and restrictive laws put the small mine operator out of business some years ago and they are now beginning to squeeze the big operators. If this trend sontinues, the exploration and develop of new ore reserves will not keep pace with consumption, and as a result the mining industry will be doomed to extinction.

Very truly yours,

Edwin C. Pistorius

MAR 1960
RECEIVED
BUREAU OF LAND MGMT.
STATE OFFICE
PHOENIX
ARIZONA

EDWIN A. STONE
1622 EAST HAWTHORNE
TUCSON, ARIZONA
TELEPHONE MAIN 2-2613

March 2, 1960.

Bureau of Land Management
P. O. Box 148
Phoenix, Arizona.
Att: Mr. John Brixius

Dear Mr. Brixius:

In accordance with your suggestion I herewith submit a brief summary of the geology of the Roadside Property and adjacent areas. Prior to undertaking development of the Roadside property, I devoted 103 days, in the field, in mapping the region on a scale of 2" : 1 mile and covered on the order of 100 square miles. I later had approximately 16 sqaure miles of the local area flown to a scale of 1" : 1000' and enlargements made of these pictures to a scale of 1" equals 500 ft. With the aid of these pictures a more detailed geological study was made of the Roadside Mine property area and the information recorded on the larger scale pictures.

The structural geology is of major importance and was the chief factor upon which exploration of the area was undertaken. There are two zones of major adjustment:
(1) The Ajo Road Fault system which strikes N 75° W and dips at a moderate angle to the north.

(2) A deep seated major fracture system which strikes N 10° E and dips rather steeply to the east.

These two zones of adjustment are hereafter referred to as the E-W and N-S structures. The E-W structure is the oldest but we do know that it is post paleozoic in age. The formations on the north side of it were faulted downward and at the surface Cretaceous formations are in contact with the pre-Cambrian granite which is present on the south side of the fault. In the displaced block deformation ~~deformation~~-was rather intense and supplementary adjustments developed more than 3 miles north of the footwall of this structure. We believe that the paleozoic section is present in the Roadside property lying on the north side of this adjustment zone as evidenced by remnants (roof pendants) of paleozoic limestone resting upon the granite and the numerous drag blocks that are exposed along the fault zone.

The N-S zone of adjustment developed at a much later date and its age is Tertiary, somewhat later in the geological sequence than the volcanics which were laid down in late Cretaceous or early Tertiary time. This N-S zone of disturbance is over 5000 ft wide at the Roadside property and it furnished the channelways to the source of ore bearing media.

These two systems of adjustment created intense deformation and developed certain structural patterns, which are covered by the Roadside claims, insofar as possible. The later volcanic rocks, and perhaps the Cretaceous formations were not present in the initial stage of adjustment along this E-W structure and therefore were not shattered and prepared to the same extent as lower horizons. When the country was reopened by the N-S structure ore reservoirs were more readily created in these lower horizons and would not be fully reflected in the upper volcanic horizon by alteration and mineralization. Mineral deposition in the volcanics is confined to fractures and shears, related to the later N-S system of adjustment, which offered the only available reservoirs for mineral deposition. This type of mineral occurance is wide-spread throughout the property consisting of oxidized minerals of copper in many of the vein structures and a great abundance of mineralized epidote which is present within fracture and shear elements at innumerable places on the property.

The stronger vein systems on the property are oxidized and leached to considerable depth as evidenced by exploration through No 3 shaft and by some diamond drilling. Oxidized copper has been mined and shipped from the Roadside Mine, intermittently, since 1880. Some sulfide ore was encountered in tight sections of the vein where the process of oxidation and leaching was restricted and in the course of exploration some 40,000 tons of ore was developed with an average metal content of 3% copper and 9 oz silver. These mineralized veins are shear zones or tension zones between elements of the N-S system. Where penetrated, they range from 12 to 30 ft wide, striking from N 15° W to N 30° W and dipping steeply to the east. An attempt was made by the last operator to reach the sulfide zone where it is almost certain that secondary enrichment occurs below these wide leached outcrops.

Supplementing the geological work, geophysical surveys were made on the property and adjacent area using magnetic, resistivity and I.P methods. The results of this work confirmed geological observations which indicated a wide zone of alteration and mineralization trending N 75° W through the north central part of the property, in conformity with the direction of the E-W structural disturbance, but within the zone of the N-S fracture system. This structure is 6600 ft in length and at least 2000 ft wide.

Present plans now provide for exploration of this major E-W striking structure and drilling equipment is now being assembled and will be set up on the property for this purpose. Two types of ore occurances are expected to occur in this area:

1. Replacement ore in paleozoic limestone.

2. Dessiminated copper orebodies.

The extensive block of limestone which outcrops to the north of this structure dips at a moderate angle to the south which is indicative that it will be encountered within the structure at depth. There is much evidence that the late intrusive porphyry

rocks have invaded the formations at the Roadside area lying below the volcanics which form the outcrops. Alteration of the volcanic rocks and the abundance of metamorphic contact minerals is indicative of the presence of an intrusive in close proximity. The volcanic section at the shaft is 628 ft thick and it is assumed to be of somewhat lessor thickness in the north central part of the property as indicated by geological studies. At the Silver Bell Mine, 30 miles north of the Roadside, the dessiminated orebodies now being mined occur in the intrusive porphyry rocks and copper minerals were also introduced into the paleozoic sediments which were mined in the earlier operations. These same intrusive rocks are again exposed at the surface north of the Roadside Mine where they have envaded the Cretaceous formations.

Exploration of the Roadside Mine is based primarily upon the study of the structural geology of the region which indicated a favorable environment for the presence of large ore reservoirs within the property. Of course other factors were studied, such alteration and mineralization, and taken into consideration in arriving at a decision. Some of the major orebodies which occur in central and southern Arizona lie within strong E-W zones of structural adjustment. Some of which the writer has mapped, Twin Buttes Copper Mines, Silver Bell, San Manuel and Ray Mines all occur within major E-W zones of adjustment, the orebodies being localized within these zones where they have been reopened by strong N-S zones of fracturing.

March 2, 1960.

Edwin A. Stone

Edwin A. Stone

May 29, 1960.

JUN 1960
RECEIVED
BUR. OF LAND MGMT.
STATE OFFICE
PHOENIX
ARIZONA

Mr. John Brixius
Bureau of Land Management
P. O. Box 148
Phoenix, Arizona.

Dear Mr. Brixius:

In accordance with your request I am submitting the following covering the history and development of the Roadside Mine.

Initial work was started on the Roadside Mine in 1880 at Shaft No 1 which was sunk on a rather inconspicuous highly silicious outcrop which showed a small amount of oxidized copper. This work was carried to a depth of 30 ft and copper ore was mined and shipped from lateral workings on the vein part of which was stoped through to the surface. Below 30 ft the vein was oxidized and leached so the shaft was extended to 84 ft and drifts run from it but all of the vein material was oxidized and completely leached containing no high-grade shipping ore essential to make a profit in this period. The rocks were intensely kaolinized and there was an abundance of sertcite indicating the intensity of alteration.

In 1912, No 1 Shaft was reopened and sunk to 137 ft where ore was again encountered. This ore zone was quite wide measuring 24 ft between walls on the north drift and 30 ft on the south drift. The ore averaged between 6% and 7% copper and 12 to 15 oz silver. This ore shoot was mined to 180 ft in depth where the shaft passed into leached material again which assayed less than 1% copper.

Shaft No 2 was lost due to stoping ore too close to it and Shaft No 2 was sunk, vertically in the hanging wall. At 115 ft it cut the vein which assayed 1.62% copper and was continued on to a depth of 380 ft with developement drifts run from it on the 280 and 380 for a distance of about 280 ft. The vein was stoped from these levels and ore was mined and shipped from it until 1917- 1918.

In 1919 Courtenay DeKalb, E.M examined the property for C. P Huntington and recommended that an investigation be made of it. Mr. DeKalb sunk No 3 shaft to 400 ft and from it drove under the old working and reopened much of them and sampled the ore zones. From near the bottom of No 1 shaft he crosscut the vein which was 18 ft wide and assayed 3.8% copper and 11.4 ox silver and 0.02 oz gold. On the 400 level between No 2 and 3 shafts he encountered sulfide ore for a distance of 96 ft in length and varying from 12 to 18 ft wide with an average content of 3% to 5% copper and 8 to 15 oz silver. At the end of the north drift on the 400 level he encountered an ore shoot 55 ft in lenght. He raised to the 380 level and crosscut it where it was found to be 12 ft wide and assayed 4.78% copper and 11.5 oz silver. The vein in the mined section ranged from 12 to 30 ft wide and all of the ore that was shipped was oxidized. The sulfide ore encounteres by Mr. DeKalb was in narrow sections of the vein

in which free folw of oxidizong solutions was retarded and leaching was incomplete. The wider, more open sections of the vein are completely oxidized and practically all of the copper leached from it.

Upon sufficient examination of the old workings, Mr. DeKalb proceeded to sink No 3 shaft to the sulfide zone in order to get below the leached gossan where he expected to encounter secondary enrichment of the copper and silver values. At 450 he started to cut through the vein which was leached and contained only remnants of copper and silver assaying 1% or less in copper and 1 Oz in silver. At 490 he cut a small vein which assayed 1.81% copper and 3.82 Oz silver. From this point to 700 the shaft was in the footwall of the vein and it cut only minor seams of oxidized mineral but at 750 veinlets of pyrite and chalcopyrite were cut quite frequently. A crosscut was driven, at this time, from the 700 level, easterly 320 ft. It encountered the vein 81 ft east of the shaft and for the next 125 ft passed through throuroughly oxidized and leached material containing minor amounts of copper and silver, the copper never assaying more than 1%. At. 294 ft a parallel vein was cut which was 15 to 20 ft wide. It containd and abundance of limonite and porous quartz which was completely oxidized and leached showing only minor amounts of copper.

From this point work was resumed in the shaft where Mr. DeKalb planned to sink to 900 before again crosscutting to the vein. He continued it to a few feet below the 800 where the rock contained many small fractures completely filled with pyrite and chalcopyrite and films of chalcocite. He was confident that 100 or 200 ft more would carry the shaft to a point where the vein would be in sulfide.

In the year 1927 Mr. DeKalb had a stroke which incapacitated him and as a result all exploration was stopped. He lived until Jine 1931 at which time he died as a result of another stroke. Francis De DeKalb, his widow, held the property (69 claims) intact for a number of years maintaining a watchman and assistents to look after the improvement and equipment and to preform the annual assessment work. She is now 89 years old and retains her interest in the property.

In 1953, at the request of Mrs. DeKalb and her children, the writer took over all of the property and revised the holdings and has carried on a considerable amount of study and exploration which is later tabulated herein.

There are no available records of ore shipments but by figuring the area mined and balancing the dumps against total displacement it indicates that ore shipments were on the order of 10,000 tons. Mr. DeKalb made no attempt to mine and ship ore but devoted his efforts to reaching the sulfide zone before initiating any ore extraction. In the course of development he estimated that he blocked out some 40,000 tons of ore, now remaining in place in the mine, which contains 3-3½% copper and 9 oz silver and 0.02 to 0.03 oz gold.

Workings

Workings comprise three shafts:

No 1 - 190 ft deep on the incline of the vein (70o)
No.2 - 380 ft vertical
No 3 - 800 ft vertical

From these shafts there are 2640 ft of drifts, crosscuts and raised to the 400 level and a 320 ft crosscut on the 700 level.

Recent Work

In 1953 the writer mapped the geology over approximately 100 sq. miles in order to obtain the regional structural pattern and the relationship of the Roadside mineralized zone to it. This work was done on aerial photographs of the Pima- Papago Flight on a scale of 1" equals 2 miles. Subsequently he had the Roadside and adjacent areas flown by Fairchilds Aerial Surveys, Inc., the contacts on a scale of 1" equals 1000' and enlargements of these to a scale of L" equals 500' in order to carry out the local geological in greater detail. 103 days of field work was spent in mapping the regional and local areas.

Follwoing the preliminary geological study the writer drilled four drill holes to check the vein structure and the mineralization reported by Mr. DeKalb, the depths ranging from 69 ft to 457 ft. This work was done in the fiscal year of 1954-1955 and served the purpose of also preforming the annual assessment work.

In 1956 a portion of the present property was optioned to Messrs. Kenyon, Salvatori and Machris who were interested in developing the shaft area with the purpose of sinking to the sulfide zone to develop and mine the secondary enriched copper which should be present. During this period No 3 Shaft was unwatered and retimbered to 450. The reopening of the shaft became more expensive than anticipated and it was decided to first drill the vein to the required depth In 1956-1957 Hole No 5 was drilled to a depth of 1103 ft vertical but due to flattening of the structure below 700 it cut the vein at 871-914 which was found to still be oxidized.

The detailed geology of the local area confirmed the initial work shwoing a large area of structural deformation in the north central portion of the property in which the rocks are intensely altered and contain widespread copper mineralization st the surface. In 1957 the writer secured the services of the Western Geophysical Company of America to run a magnetic survey on the property and adjacent areas. This work showed an anomaly in this north central area conforming almost exactly to the outline based upon the geological study. This structure is much larger than the structure in the south part of the property which is partially beveloped by the underground workings; therefor it became of primary interest to drill it as greater volume could be indicatad here per dollar spent than elsewhere on the property. Personal finances were insufficient to do this work, therefore the writer, with the consent of Mrs. DeKalb and children brought in the Hoagland-Dodge Drilling Co. as a thrid partner. Dr. Theodore A. Dodge, Ph D in geology, who as executive vice president directs the mining operations and drilling for Hoagland-Dodge entered into a deal to furnish part of the finances to carry out the required exploration. Subsequent to Mr. Dodge's entry into the partnership we have applied for patent on 31 claims, incorporated under laws of Arizona, conducted additional studies of the area and laid out a consistent development program. In this period Phelps-Dodge Corp ran geophysical surveys on the property using magnetic,

resistivity and induced polarization methods, the results of which conform closely to previous geophysical work and to the geological observations.

Current Work

The corporation consists of three stockholders, Francis D. DeKalb, Hoagland-Dodge Drilling Co. and Edwin A. Stone each of whom holds an equal number of shares. No shares are for sale in the corporation.

The corporation has initiated drilling and is now engaged in exploring the structure in the north central part of the property. The present stockholders are supplying funds to carry on the work and will continue to do so with the hole in progress. When this cuts the ore zone and we have more information on the character of the ore deposit and the costs of drilling it we plan to set up a much more extensive drilling campaign.

Costs

Personal Investment:

103 days of field work in initial study	---------
Surveying and work in setting up claims	6500.00
Initial diamnond drilling	5500.00
Assessment cost above explorations costs	1800.00
Patent expenditure	3500.00
Cost of aerial photographs	700.00
Miscl Car exp, legal, maps & photos, office expense and contigencies	2100.00
Total	$20,100.00
Hoagland-Dodge committments	15,000.00
P. D. Cost geophysical work	2,500.00
Kenyon, Salvatori & Machris costs	55,000.00
Total expenditures	$92,600.00

This cost includes appropiated money for drilling but to complete patent and finish this present drill hole additional funds will be required bringing total expenditures to about $100,000.00.

We believe that this expenditure if fully justified from the geologicl evidence. The volcanics are intensely altered and contain wide-spread copper mineralization but they have not been as intensely shattered as the lower horizons where we expect to get a greater concentration of mineralization. Much of the copper introduced into the volcanics is now leached out and iron residue in the form of limonite remains as the only evidence together with some chalcocite which is distinguish able only under the microscope. Much of the danser rocks still contain some copper carbonate. This is further confirmed by the wide spread occurance of epidote all of which contains some copper in the form of sulfide, carbonates and native. The epidote is probably a late phase of mineralization and it was introduced into the same shears and

fissures occupied by the original copper sulfides. It replaced tha adjacent rock and enclosed the copper minerals that were present . The epidote is very dense and hard and not readily broken down by oxidozing agents; therefore th copper enclosed within it has, in most cased remained and has not been leached as it was in the more open volcanic rocks. This is more representative of the copper content that was present in the original form of sulfide, in the volcanic outcrops before oxidation and leaching oxidized and disolved them and they were transpotted downward.

Very truly yours,

Edwin A. Stone

Edwin A. Stone

Form 4-802
(February 1958)

Serial Number
P-10310-P-10331 incl.
P-10302-P-10309 incl.
P-10371
P-10450
P-10511
P-6786
P-6939
P-6936
P-10523
P-17109
P-10222
P-10466
P-10471
P-10509 10509?
P-17110
P-10355
P-6919
P-6923
P-6881
P-6891
P-6880
P-10491
P-16684
P-10386
P-16685
P-10517
P-10490
P-10354
P-10510
P-10337
P-10476
P-16996
P-10473
P-10384
P-10358
P-10470
P-10364

X-Ref: PA-96

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Area Arizona

MINERAL REPORT

Papago Indian Reservation

involving

Validity of Mining Claims

owned by

Roadside Mines Co., Inc.

(Title)

LANDS INVOLVED
Pima County, Arizona
Gila and Salt River Meridian
T. 16 S., R. 8 E.
Parts of secs. 1,2,3,10, 11, 12,14 & 15

July 23, 1962
(Date)

By
L. S. Zentner
Valuation Engineer (Mining)

Orig: LO
cc: LSM
2 cc: BIA
cc: USGS

bks

Approved SEP 18 1962
Chief, Division of
Lands and Minerals

31748

GPO 864666

Introduction:

The lode mining claims included in the Roadside group were examined initially in conjunction with a mineral patent application filed for 31 of the claims.

Since all of the claims are located on the Papago Indian Reservation and the Bureau is currently examining all claims on the reservation, the entire group of 65 was examined at one time.

The field examination was carried on during the spring of 1962 and on three occasions (March 23, 26, and 28, 1962) Mr. Edwin A. Stone, claimant, accompanied the examining engineer.

Subsequent to the initial examinations of the claims, the Roadside Mines Co., Inc. withdrew the patent application for the 31 claims. However, the examination was continued for the purpose of determining which of the claims had valid discoveries.

Status Record Data:

The Papago Indian Reservation was created by Executive Order No. 2300 on January 14, 1916. It was open to mineral entry under general mining laws until October 28, 1932, when the Interior Departmental Order of that date temporarily withdrew reservation lands pending Congressional legislation. The Act of June 18, 1934 (43 Stat. 984; 25 U.S.C. 461-479), restored said lands to exploration, location and purchase under the general mining laws, with the additional provision that mining locations be registered with reservation authorities and an annual advance rental of 5¢ per acre, or fraction thereof, be made.

The foregoing regulations were in effect until May 27, 1955, at which time the passage of Public Law 47 again withdrew the reservation lands from mineral entry, and authorized them to be held in trust by the United States for the Papago Indians. All valid claims located prior to May 27, 1955, are not subject to the provisions of Public Law 47.

Land Office Records:

Mineral Survey No. 4486 embraces 31 claims of the group and was accepted by the Bureau on February 25, 1960

History:

The Roadside group consists of 65 claims owned by the Roadside Mines Co., Inc, Edwin A. Stone, President. Because the respective claims were located on different dates during a 40-year interval, some are subject to the provisions of the Act of June 18, 1934.

The early history of the area is not known but field evidence indicates that there was prospecting and mining on what is now the Coyote No. 3 lode mining claim prior to 1910.

During 1914 and 1915 Courtenay DeKalb and Frances Douglas DeKalb, his wife, located numerous mining claims in this vicinity, and in 1916 sold some of them to Arabelle D. Huntington (Exhibit "A"). From the time the claims were sold until after Mrs. Huntington died on September 16, 1924, Mr. DeKalb acted as Mrs. Huntington's agent with respect to the claims at least part of the time. (On page 27 of Book 21 of Misc. Volumes, Pima County records, is an agreement signed by DeKalb as agent.)

After Mrs. Huntington's death, Mr. DeKalb was employed by the estate to appraise the claims (Exhibit "B").

Subsequent to this, beginning in 1926 Frances DeKalb relocated some of the older claims and also located new claims in the same general area.

Beginning in 1953 Edwin A. Stone began locating mining claims in this vicinity. Prior to May 27, 1955 he had located all of the Bell and Coyote lode mining claims. In 1956 Mr. Stone began obtaining quit claim deeds from Mrs. DeKalb, in both his name and the Roadside Mines Co., Inc. The last of these quit claim deeds is dated July 1, 1960 (see Exhibits "C" through "H", inclusive).

Mr. Stone has prepared a map showing the location of the claims the Roadside Mines Co., Inc. purports to own (see Map 1). Since the claims cannot be located in the field from the description in the location notices, the claim locations as shown on the map were accepted by the examining engineer.

The claims shown on the map can be placed in three categories:

A. <u>Claims located by Edwin A. Stone prior to May 27, 1955:</u>

P-10310	Coyote No. 1	P-10321	Coyote No. 12
P-10311	Coyote No. 2	P-10322	Coyote No. 13
P-10312	Coyote No. 3	P-10323	Coyote No. 14
P-10313	Coyote No. 4	P-10324	Coyote No. 15
P-10314	Coyote No. 5	P-10325	Coyote No. 16
P-10315	Coyote No. 6	P-10326	Coyote No. 17
P-10316	Coyote No. 7	P-10327	Coyote No. 18
P-10317	Coyote No. 8	P-10328	Coyote No. 19
P-10318	Coyote No. 9	P-10329	Coyote No. 20
P-10319	Coyote No. 10	P-10330	Coyote No. 21
P-10320	Coyote No. 11	P-10331	Coyote No. 22

P-10302	Bell No. 1	P-10306	Bell No. 5
P-10303	Bell No. 2	P-10307	Bell No. 6
P-10304	Bell No. 3	P-10308	Bell No. 7
P-10305	Bell No. 4	P-10309	Bell No. 8

lode mining claims

B. Claims located by Mrs. DeKalb and later transferred to Edwin A. Stone and the Roadside Mines Co., Inc.

P-10371	Boulder	P-10355	Arizona
P-10450	Los Alamos	P-6919	Guadalupe
P-10511	Tortuga	P-6923	Hidalgo
P-6786	Ammion	P-6881	El Sol
P-6939	Larrea	P-6891	Fray Marcus
P-6936	La Estrella	P-6880	El Conquistador
P-10528	Zorra	P-10491	San Pedro
P-17109	Diabase	P-16684	Chalcos
P-10222	St. Francis	P-10386	Connecticut
P-10466	Ocotillo	P-16685	Argentum
P-10471	Palo Verde	P-10517	Virginia
P-10509	Tom	P-10490	Rosiclar
P-17110	Diorite	P-10354	Arena

lode mining claims

C. Claims located by Mrs. DeKalb and quitclaimed to A. Huntington and subsequently quitclaimed by Mrs. DeKalb to E. Stone and the Roadside Mines Co., Inc. For these claims there is no record of transfer of the claims from A. Huntington to F. DeKalb.

P-10510	Tortola	P-10384	Cintarren
P-10337	Aguila	P-10358	Azogue
P-10476	Petanque	P-10470	Pajaro Verde
P-16996	Marquota	P-10364	Bollo
P-10473	Paso		

lode mining claims

Geology:

Rocks:

Andesite Flows and Andesite Conglomerate:

Andesite flows and andesite conglomerate (Cretaceous to Tertiary according to C. L. Fair) are the principal rock types found outcropping in the vicinity of the Roadside mining claims. The conglomerate consists of ill sorted sub-angular particles having the same composition as the matrix. The two types were mapped as one unit in the field.

Limestone:

A large outcrop of grey limestone (age unknown) trending N. 35° W. is located near the corner common to sections 1, 2, 11 and 12. Rounded cobbles of quartzite are associated with the limestone.

Arkosic Sandstone:

Fragments of red sandstone (possibly Red beds, Cretaceous (?)), composed primarily of quartz and feldspar showing some gradation, were found on the dump near shaft No. 3. The rock is supposed to have come from the 800-foot level in shaft No. 3.

Epidote:

Epidote is associated with much of the andesite on the claims. In some instances these epidote bodies are over 80 feet in diameter. Associated with the epidote is secondary copper mineralization (cuprite, malachite and chrysocolla).

Structure:

The Ajo Road fault, a normal fault, marks the contact between the gneissic rocks of the Coyote Mountains and the younger andesite to the north (normal fault strike - northwesterly; dip- steeply to the east).

Roughly parallel to the Ajo Road fault are possibly two more normal faults, one passing just west of shaft No. 3 and the second just east of the limestone outcrop in the vicinity of the corner common to sections 12, 11, 1 and 2. These faults strike N. 35° to 45° W. and dip steeply to the east.

A secondary system of vertical faults, mapped in the nearby Roskruge Mountains by C. L. Fair, strike east-west. There is a possibility that faults parallel to these pass through the Roadside claims.

Mineralization:

Secondary copper mineralization occurring with the epidote can be found on many of the mining claims of the Roadside group. In some instances the copper content runs as high as 3.71% of the host rock. While the shafts located on the Coyote Nos. 1 and 3 were not accessible, secondary copper mineralization was associated with rocks on the dumps.

A report written by Ed Stone, Consultant Geologist, indicates that there are remnant protore copper sulfide zones remaining along the leached vein on which the shafts were sunk.

Although the copper content of the epidote exposed at the surface is significant, it represents only a very minute percentage of all the surface material.

There is, however, a strong possibility that this oxidized mineralization is the surface expression of a disseminated ore body located at depth.

Sampling:

Three samples were taken on the claims.

Sample No. 1 was a grab sample taken from a small stockpile of oxide ore located on the north side of shaft No. 3. The sample assayed a trace of gold, 3.60 ozs. of silver, and 1.75% copper per ton.

Sample No. 2 was a channel sample taken across a 4-foot width in a pit located 300 feet south 15° East of the northwest corner of the Coyote No. 6 lode mining claim. The sample assayed 0.95 oz. of silver and 1.93% copper per ton.

Sample No. 3 was a chip sample of copper bearing epidote located 225 feet south of the north end of the lode line on the Coyote No. 15 lode mining claim. The sample assayed 0.30 oz. of silver and 3.71% copper per ton.

Recommendations and Conclusions:

Field examination of the Roadside group of lode mining claims disclosed "valid discoveries" of valuable minerals (copper) on each of the following mining claims. In coming to this conclusion, much use is made of geologic inference. In the event that a patent application for these claims is initiated by the Roadside Mines Co., Inc., stronger evidence of mineralization will be required to substantiate a "valid discovery" on each of the claims (A 23511, January 1, 1943; A 23829, August 8, 1944).

Recorded Owner: Roadside Mines Co., Inc.

Field No.	Name of Claim	Field No.	Name of Claim
P-10310	Coyote No. 1	P-10321	Coyote No. 12
P-10311	Coyote No. 2	P-10322	Coyote No. 13
P-10312	Coyote No. 3	P-10323	Coyote No. 14
P-10313	Coyote No. 4	P-10324	Coyote No. 15
P-10314	Coyote No. 5	P-10325	Coyote No. 16
P-10315	Coyote No. 6	P-10326	Coyote No. 17
P-10316	Coyote No. 7	P-10327	Coyote No. 18
P-10317	Coyote No. 8	P-10328	Coyote No. 19
P-10318	Coyote No. 9	P-10329	Coyote No. 20
P-10319	Coyote No. 10	P-10330	Coyote No. 21
P-10320	Coyote No. 11	P-10331	Coyote No. 22

Recorded Owner: Roadside Mines Co., Inc.

Field No.	Name of Claim	Field No.	Name of Claim
P-10302	Bell No. 1	P-10511	Tortuga
P-10303	Bell No. 2	P-6786	Ammion
P-10304	Bell No. 3	P-6936	La Estrella
P-10305	Bell No. 4	P-10528	Zorra
P-10306	Bell No. 5	P-10355	Arizona
P-10307	Bell No. 6	P-6919	Guadalupe
P-10308	Bell No. 7	P-6923	Hidalgo
P-10309	Bell No. 8	P-6881	El Sol
P-10371	Boulder	P-10491	San Pedro
P-10450	Los Alamos		

Field examination of the following mining claims did not disclose valid discoveries on the following mining claims. Adverse proceedings should be initiated against these claims. The following charges should be used:

1. That the land involved is nonmineral in character.

2. That no discovery of a valuable mineral has been made in the described claim.

Field No.	Name of Claim	Type	Recorded Owner
P-6939	Larrea	Lode	Roadside Mines Co., Inc. c/o Edwin A. Stone, 2120 North Norton, Tucson, Ariz.
P-17109	Diabase	"	"
P-10222	St. Francis	"	"
P-10466	Ocotillo	"	"
P-10471	Palo Verde	"	"
P-10569	Tom	"	"
P-17110	Diorite	"	"
P-6891	Fray Marcus	"	"
P-6880	El Conquistador	"	"
P-16684	Chalcos	"	"
P-10386	Connecticut	"	"
P-16685	Argentum	"	"
P-10517	Virginia	"	"
P-10490	Rosiclar	"	"
P-10354	Arena	"	"
P-10510	Tortola	"	Estate of A. Huntington
P-10337	Aguila	"	"
P-10476	Petanque	"	"
P-16996	Marqueta	"	"
P-10473	Paso	"	"
P-10384	Cintarren	"	"
P-10358	Azogue	"	"

Field No.	Name of Claim	Type	Recorded Owner
P-10470	Pajaro Verde	Lode	Estate of A. Huntington
P-10364	Bollo	"	"

Lewis S. Zentner

Lewis S. Zentner
Valuation Engineer (Mining)

APPENDIX

Exhibit	1	Claim Location Map, Roadside Mines Co., Inc. (attached to L&M copy only)
	2	Map of Exterior Boundaries, Roadside Group of Valid Lode Mining Claims
	A	Quitclaim Deed, DeKalb to Huntington
	B	Probate of A. D. Huntington
	C	Quitclaim Deed, DeKalb to Stone
	D	Quitclaim Deed, DeKalb to Stone
	E	Quitclaim Deed, DeKalb to Stone
	F	Quitclaim Deed, DeKalb to Roadside Mines Co., Inc.
	G	Quitclaim Deed, DeKalb to Roadside Mines Co., Inc.
	H	Quitclaim Deed, DeKalb to Roadside Mines Co., Inc.

Reference: Southern Arizona Guidebook II

EXHIBIT A

QUITCLAIM DEED

Pima County Recorders Docket 28, pages 164 thru 172, dated February 10, 1916, filed and recorded September 29, 1916.

From Courtenay DeKalb and Frances Douglas DeKalb, his wife, to Arabella D. Huntington, for consideration of $10.00, the following lode mining claims:

	Recorded Locations	
Epidote	WW	83
Populus	WW	84
Larrea	WW	85
Saussurite (Reloc WW 371)	WW	317
Cowslip	WW	372
Hydragyrum	WW	373
Mercury	WW	374
Larkspur	WW	375
Ammion	WW	376
Zoisite	WW	377
Piedmontite	WW	378
Allanite	WW	379
Red Rock	WW	380
Andesite	WW	381
Cholla	WW	382
Alkinite	WW	383
Chloropal	WW	384
Swale	WW	386
Joya	WW	387
Diorite	WW	388
Trident	WW	389
Telegraph	WW	390
Nickel	WW	391
Diabase	WW	316
Relocated	WW	392
Cruz Sahuaro	WW	393
Gila	WW	394
Ocotillo	WW	395
Lizard	WW	396
Zorra	WW	397
Brea	WW	398
Monument	WW	399
Alamo No. 1	WW	474
Alamo No. 2	WW	475
Alamo No. 3	WW	476
Alamo No. 4	WW	477
Alamo No. 5	WW	478
Alamo No. 6	WW	479
Alamo No. 7	WW	480
Alamo No. 8	WW	481

	Recorded Locations	
Alamo No. 9	WW	482
Alamo No. 10	WW	483
Alamo No. 11	WW	484
Alamo No. 12	WW	485
Paso	WW	486
Boulder	WW	487
Cerro	WW	488
Plata	WW	489
Crucero	XX	18
Aguila	XX	19
Marqueta	XX	20
Petanque	XX	21
Tortola	XX	22
Azoque	XX	23
Bollo	XX	24
Cintarron	XX	25
Pajaro Verde	XX	26
Pozo	XX	27

Abstracted
L&M 4-26-62

EXHIBIT B

A review of microfilm cases 3588 thru case 3556, Box 28R, Office of Probate Court, Tucson, Arizona, on April 24 thru 26, 1962, discloses the following:

ANNABELLE D. HUNTINGTON, Deceased September 16, 1924.
Executors: Archer Milton Huntington and Henry E. Huntington

Section II
That said deceased at time of her death was a resident of the County of Los Angeles, State of California, and left estate in the State of California, New York, West Virginia and Kentucky, and also estate in the County of Pima, State of Arizona, which property in said county of Pima consists of unpatented mining claims, and certain lands, mining equipment and other personal property.

Section III
That the character and probable value of the property within the State of Arizona is at least the sum of $10,000.00.

Section IV
That the character and description of said property within the State of Arizona is as follows:

The following described mining claims situate in the Coyote Mining District, in the County of Pima, State of Arizona, to-wit:

	Pima County Recorded Locations	
Populus	WW	84
Boulder	WW	487
Crucero	XX	18
Penasco	HHH	215
Hydro	HHH	213
Aguazal	HHH	216
Cal	HHH	214
Pegmatite	HHH	212
Alamo No. 1	WW	474
Alamo No. 2	WW	475
Alamo No. 3	WW	476
Alamo No. 4	WW	477
Alamo No. 5	WW	478
Alamo No. 6	WW	479
Alamo No. 7	WW	480
Alamo No. 8	WW	481
Alamo No. 9	WW	482
Alamo No. 10	WW	483
Alamo No. 11	WW	484
Alamo No. 12	WW	485
Santo Tomas	GGG	448
Trejo	HHH	218
Aguila	XX	19
Petanque	XX	21
Tortola	XX	22
Marqueta	XX	20
Scale	WW	386
Chella	WW	382
Diorite	WW	388
Larrea	WW	85
Trident	WW	389
Cerro	WW	488
Powder	GGG	625
Jojer	GGG	624
Telegraph	WW	390
Nickel	WW	391
Chloropal	WW	384
Andesite	WW	381
Diabase	WW	392
Roadside	VV	499
Cruz Sahuaro	WW	393
Paso	WW	486
Ephedra	GGG	621
Joya	WW	387
Alkinite	WW	383
Jara	GGG	623

EXHIBIT B

Anoque	XX	23	Bollo	XX	24
Gila	WW	394	Cintarron	XX	25
Hydrargyrum	WW	373	Pajaro Verde	XX	26
Mercury	WW	374	Brea	WW	398
Ammion	WW	376	Red Rock	WW	380
Apollo Verde (Palo Verde)	VV	498	Zoisite	WW	377
Ocotillo	WW	395	Piedmontite	WW	378
Plata	WW	489	Monument	WW	399
Vizcaya	GGG	626			
Astorga	GGG	620			
Pozo	XX	27			
Lizard	WW	396			
Cowslip	WW	372			
Larkspur (Larkspar)	WW	375			
Saussurite	WW	371			
Epidote	WW	83			
Allanite	WW	379			
Zorka	WW	397			
Guipuzcoa	GGG	622			

Total valuation $640.00

A possible interest in certain other mining claims in Pima County, Arizona, the description of which at present cannot be given, if such interest exists:

Total valuation $10.00

Also the N½ of SE¼ of Sec. 10, T. 16 S., R. 8 E., G&SRB&M, Arizona, containing 80 acres more or less

Total valuation . . . $240.00

Also the following personal property, to wit: improvements on possessory rights, mining machinery and equipment, one Dodge automobile

Total valuation . . . Unknown

The foregoing mining claims are all unpatented, only partially developed, and their possible value is purely problematical. To develop them so as to demonstrate that they have or have not value would require expenditure of a large amount of money, and under such circumstances only a nominal value is to be placed upon them. In their present condition they are unsalable and if they have merit it can only be demonstrated by interesting someone who is willing to make large expenditures in development for the purpose merely of ascertaining whether the property can be made productive.

The Desert patented mine is an isolated mine situate in what is now the Papago Indian Reservation, and is entirely surrounded by that reservation. It is a mine only in the sense that it has been patented and possesses no value as such, and is therefore given a nominal valuation.

EXHIBIT B cont'd

INVENTORY of property of the decedent in Arizona, on September 16, 1924, the date of her death:

Cash in hands of A. B. Hazeltine, Agent	$1,843.04
Personal property located at the Roadside Mine, situated in Pima County, 36 miles west and southwest from Tucson, on Ajo road: Miscellaneous tools, etc	3,500.00

Real Estate: The decedent also died seized of the following real estate in the State of Arizona, viz:

A. Mining claims (74) in Coyote Mining District, in the County of Pima, of record in the office of the County Recorder of that county, as follows:

	Book	Page		Book	Page
Populus	WW	84	Jojor	GGG	624
Boulder	WW	487	Telegraph	WW	390
Crucero	XX	18	Nickel	WW	391
Penasco	HHH	215	Chloropal	WW	384
Hydro	HHH	213	Andesite	WW	331
Aguasal	HHH	216	Diabase	WW	392
Cal	HHH	214	Roadside	VV	499
Pegmatite	HHH	212	Cruz Sahuaro	WW	393
Alamo No. 1	WW	474	Paso	WW	486
Alamo No. 2	WW	475	Ephedra	GGG	621
Alamo No. 3	WW	476	Jara	GGG	623
Alamo No. 4	WW	477	Asoque	XX	23
Alamo No. 5	WW	478	Gila	WW	394
Alamo No. 6	WW	479	Hydragyrum	WW	373
Alamo No. 7	WW	480	Mercury	WW	374
Alamo No. 8	WW	481	Ammion	WW	376
Alamo No. 9	WW	482	Palo Verde	VV	498
Alamo No. 10	WW	483	Ocotillo And	VV	497
Alamo No. 11	WW	484	And	WW	395
Alamo No. 12	WW	485	Plata	WW	489
Santo Tomas	GGG	448	Viscaya	GGG	626
Trejo	HHH	217	Astorga	GGG	620
Tezota	HHH	218	Pozo	XX	27
Aguila	XX	19	Lizard	WW	396
Potanque	XX	21	Cowslip	WW	372
Tortola	XX	22	Larkspur	WW	375
Marqueta	XX	20	Saussurite	WW	371
Swale	XX	386	Epidote	WW	83
Joya	XX	387	Allanite	WW	379
Alkinite	XX	383	Zorro	WW	397
Cholla	XX	382	Guipuzcq	GGG	622
Diorite	XX	388	Bollo	XX	24
Larrea	XX	85	Cinterron	XX	25
Trident	XX	389	Pajaro Verde	XX	26
Cerro	XX	488	Brea	WW	398
Powder	GGG	625	Red Rock	WW	380
Zoisite	WW	377	Piedmontite	WW	378
Monument	WW	399			

Total value of unpatented mining claims $ 640.00

EXHIBIT B, cont'd

B. The Roadside patented mine, situate in N½ SW¼ of Sec. 10, T. 16 S., R. 8 E., G&SRB&M, consisting of 80 acres, more or less	$240.00
C. The Desert patented mine situate in Cobabi Mining District in County of Pima, State of Arizona	10.00
Total valuation . . .	$5,348.04*

*Includes value of mining equipment located at Roadside Mine

Expenses of Administration:

September 30, 1924: Courtenay DeKalb, salary for month of September, 1924	$ 833.10
May 14, 1925: Courtenay DeKalb, for services, October, 1924 to January 1925	3,073.97
December 21, 1925: Miles M. Carpenter, for services preliminary to appraisal of the Roadside Mine	50.00

Abstracted
LSM 4-26-62

EXHIBIT C

Quitclaim Deed

Pima County Recorders Docket 996, page 116, dated June 5, 1956, filed and recorded June 11, 1956.

From Frances Douglas DeKalb to Edwin A. Stone, for consideration of $10.00 the following unpatented mining claims situated in the Santa Rosa Mining District, and recorded in office of County Recorder of Pima County, State of Arizona, under the names and at book and page as shown below:

	Book	Page
Arizona	JJJ	500
El Conquistador	JJJ	501
Fray Marcus	JJJ	502
Guadalupe	JJJ	503
Hidalgo	JJJ	504
El Sol	JJJ	505
Los Alamos	JJJ	506
La Estrella	JJJ	507
San Pedro	JJJ	508
Tortuga	JJJ	509
St Francis	JJJ	510
Ammion	NNN	566
Diabase	NNN	567
Diorite	NNN	568
Las Tortuga	NNN	569
Larrea	NNN	570
Ocotillo	NNN	571
Palo Verde	NNN	572
Tom	NNN	573
Zorra	NNN	574
Las Tortuga	OOO	115
Crucero	OOO	116
Boulder	OOO	117
Populus	OOO	118

Abstracted:
LSM 4-26-62

EXHIBIT D

Quitclaim Deed

Pima County Recorders Docket 1450, page 450, dated June 8, 1959, filed and recorded June 26, 1959.

From Eva Frances Douglas DeKalb to Edwin A. Stone, for consideration of $10.00, conveys the following unpatented mining claims situated in the Santa Rosa Mining District, and recorded in office of County Recorder of Pima County, State of Arizona, under the names and at book and pages as shown:

	Book	Page
Arizona	JJJ	500
El Conquistador	JJJ	501
Fray Marcus	JJJ	502
Guadalupe	JJJ	503
Hidalgo	JJJ	504
El Sol	JJJ	505
Los Alamos	JJJ	506
La Estrella	JJJ	507
San Pedro	JJJ	508
Tortuga	JJJ	509
St Francis	JJJ=	510
Ammion	NNN	566
Diabase	NNN	567
Diorite	NNN	568
Larrea	NNN	570
Ocotillo	NNN	571
Palo Verde	NNN	572
Tom	NNN	573
Zorra	NNN	574
Boulder	OOO	117

together with any interest set forth in last paragraph of document recorded June 15, 1957, in Docket 1141, page 464, wherein the grantor reserves a life estate in and to the above described claims by reference to its commonly called group name of the Roadside or St Francis Mines.

Abstracted:
L&M:4-26-62

EXHIBIT E

QUITCLAIM DEED

Pima County Recorders Docket 1460, page 276, dated June 15, 1959, filed and recorded July 17, 1959.

From Eva Frances Douglas DeKalb to Edwin A. Stone, for consideration of $10.00, the following lode mining claims situated in the Santa Rosa Mining District, and recorded in office of County Recorder of Pima County, Arizona, under the following names and at book and page number therewith shown:

Arizona	JJJ	500
El Conquistador	JJJ	501
Fray Marcus	JJJ	502
Guadalupe	JJJ	503
Hidalgo	JJJ	504
El Sol	JJJ	505
Los Alamos	JJJ	506
La Estrella	JJJ	507
San Pedro	JJJ	508
Tortuga	JJJ	509
St Francis	JJJ	510
Ammion	NNN	566
Diabase	NNN	567
Diorite	NNN	568
Larrea	NNN	570
Ocotillo	NNN	571
Palo Verde	NNN	572
Tom	NNN	573
Zorra	NNN	574
Boulder	000	117
Coyote Nos. 1-10, incl	661	264-273
" " 11-22 incl	669	182-193
Bell Nos. 1-8, incl	846	128-135

All the above claims are situated in Coyote Mining District, Pima County, Arizona, within Secs. 2-3-10-11-12-14-15, T. 16 S., R. 8 E., G&SRB&M

Abstracted:
L&M 4-26-62

EXHIBIT F

QUITCLAIM DEED

Pima County Recorders Docket 1536, page 295, dated December 21, 1959, filed and recorded December 23, 1959.

For consideration of $10.00, Frances D. DeKalb quitclaims the following unpatented mining claims to Roadside Mines Co., Inc:

Chalcos	WW 315
Argentum	WW 361

Abstracted:
L&M 4-26-62

EXHIBIT G

QUITCLAIM DEED

Pima County Recorders Docket 1552, page 368, dated January 6, 1960, filed and recorded January 26, 1960.

For consideration of $10.00, Frances D. DeKalb quitclaims to Roadside Mines Co., Inc. the following unpatented lode mining claims, recorded in Pima County Recorder's Office, at book and page referred to:

Aguila	XX	18
Marqueta	XX	19
Petanque	XX	20
Tortola	XX	21
Azoque	XX	22
Bollo	XX	23
Cintarron	XX	24
Pajaro Verde	XX	25
Pozo	XX	26

Abstracted:
L&M 4-26-62

EXHIBIT H

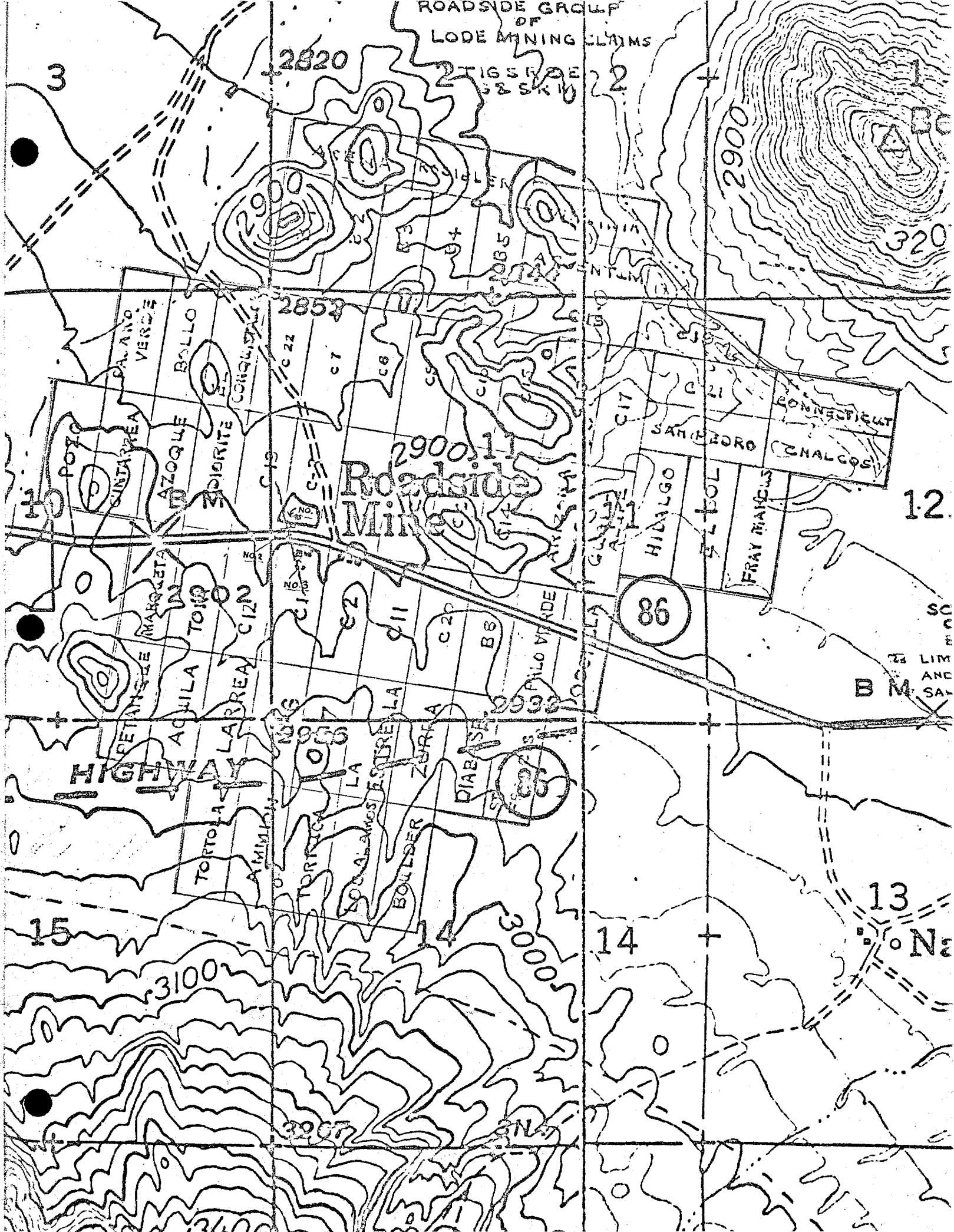
QUITCLAIM DEED

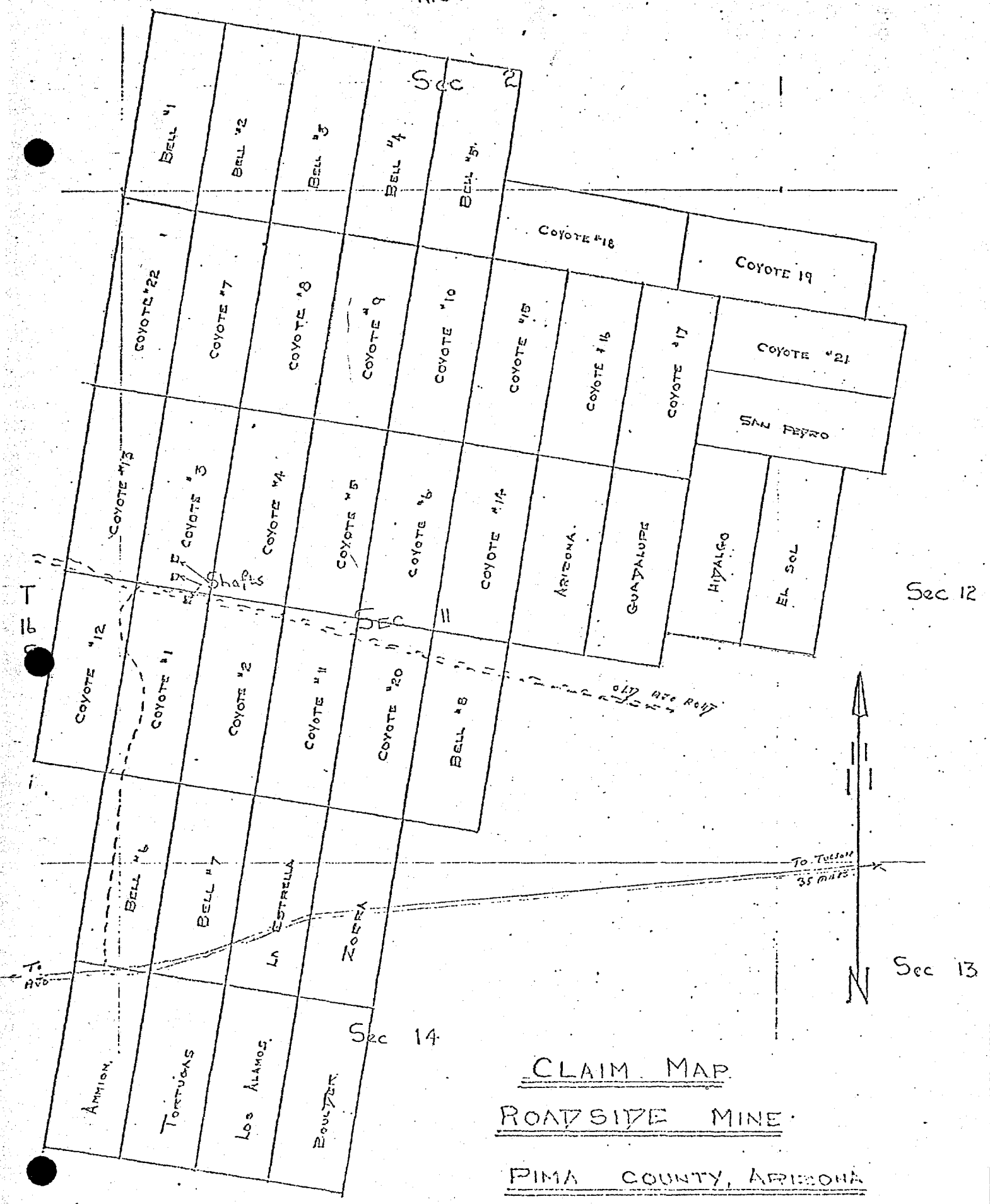
Pima County Recorders Docket 1675, page 218, dated July 1, 1960, filed and recorded September 27, 1960.

For consideration of $10.00, Frances D. DeKalb quitclaims to Roadside Mines Co., Inc., the following unpatented lode mining claims, recorded in County Recorder's Office, Pima County, at book and page referred to:

Arena	XX	113
Rosieler	XX	114
Virginia	XX	115
Connecticut	XX	116

Abstracted:
L&M 4-26-62


ROADSIDE GROUP
OF
LODE MINING CLAIMS
Roadside
Mine
HIGHWAY
86
2820
2900
2852
3000
3100
3200
CONNECTICUT
SAN PEDRO
CINALCOS
HIDALGO
EL BOL
FRAY MARCOS
AZOQUE
MIORITE
AQUILA
LARREA
TORTOLA
AMMIL
LA
ZURREA
DIABLO
BOULDER
PALO VERDE
BM



CLAIM MAP

ROADSIDE MINE

PIMA COUNTY, ARIZONA

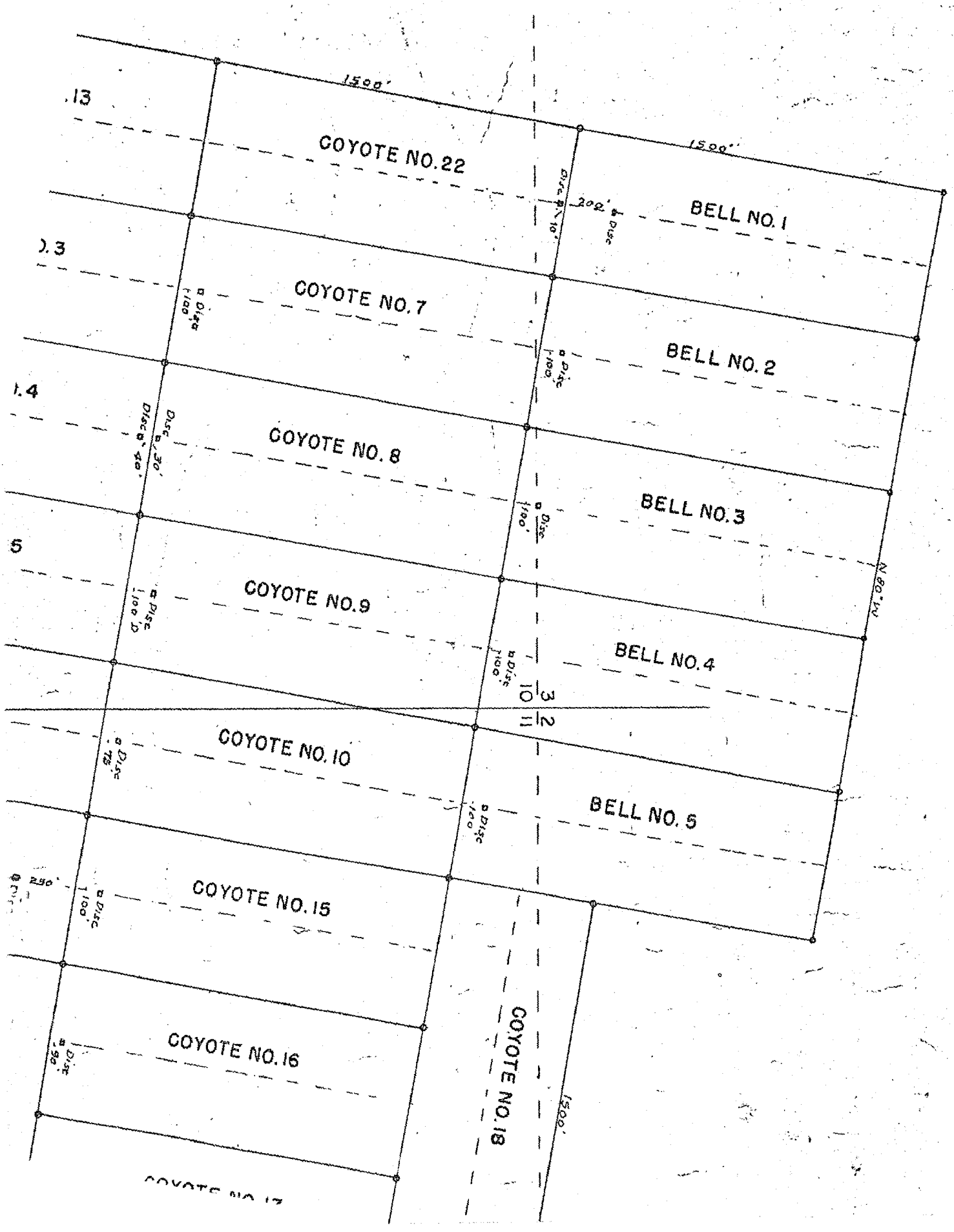
Scale 1" = 1000'

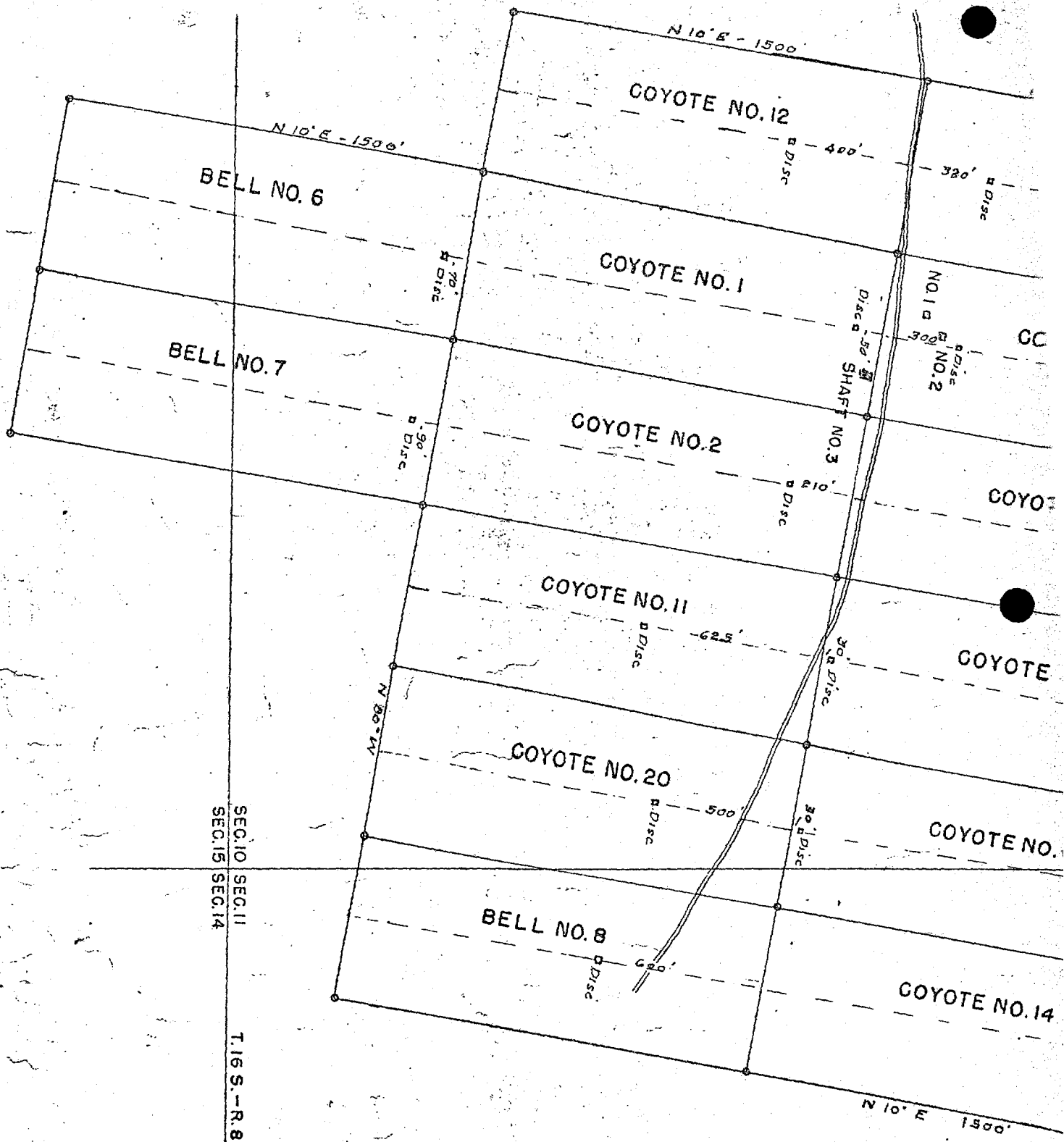
KNOX-ARIZONA CORPORATION

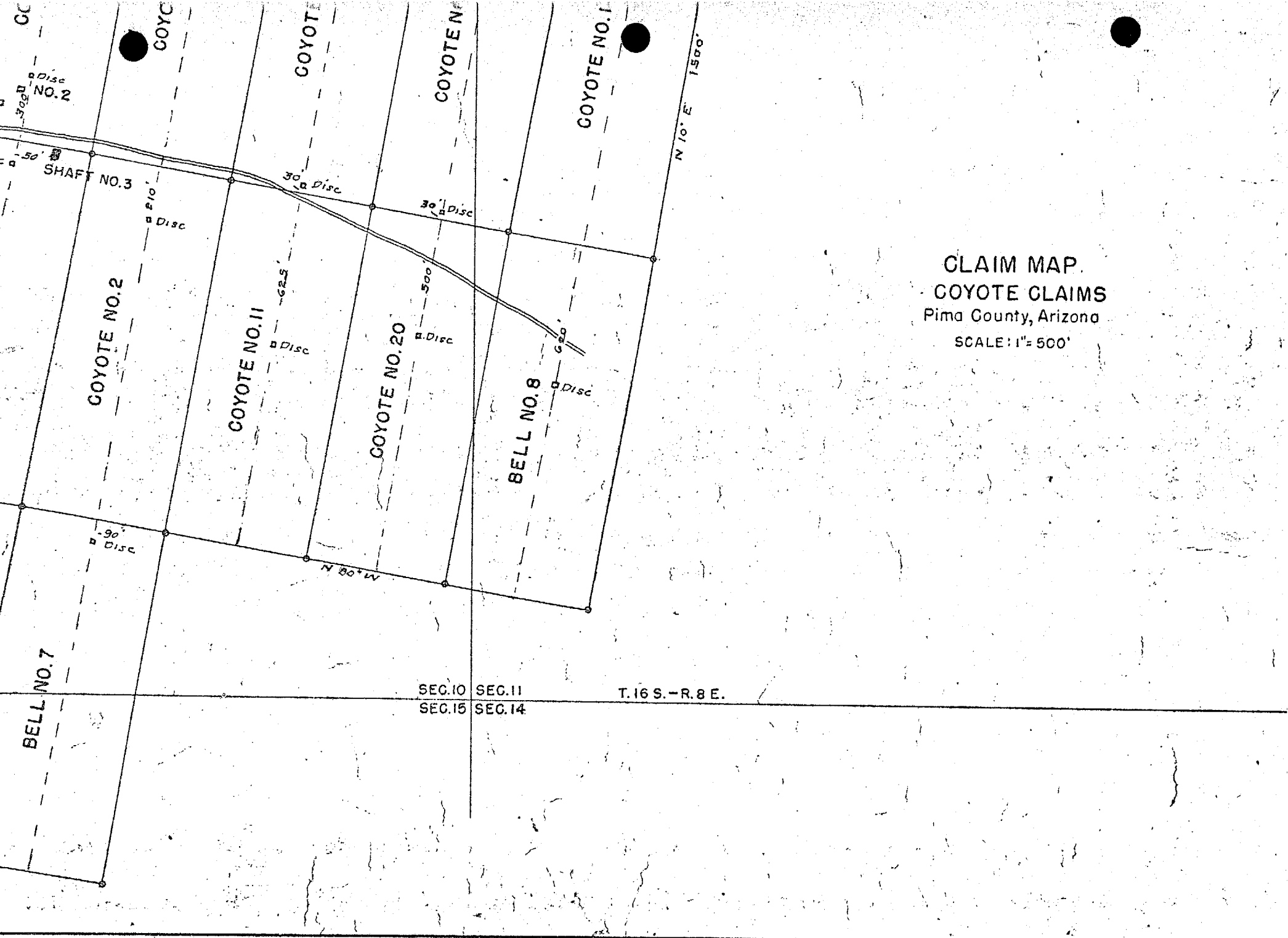
1-5-70

A. LANE & ASSOC.

COYOTE NO. 8
BELL NO. 3
COYOTE NO. 9
BELL NO. 4
COYOTE NO. 10
BELL NO. 5
COYOTE NO. 15
COYOTE NO. 16
COYOTE NO. 17
COYOTE NO. 18
COYOTE NO. 19
COYOTE NO. 21
N 80° W
1500'
7500'
480'
250'
Disc


1500'
1500'
COYOTE NO. 22
BELL NO. 1
COYOTE NO. 7
BELL NO. 2
COYOTE NO. 8
BELL NO. 3
COYOTE NO. 9
BELL NO. 4
COYOTE NO. 10
BELL NO. 5
COYOTE NO. 15
COYOTE NO. 16
COYOTE NO. 18
N 89°W
3
2
10
11
1500'


N 10° E - 1500'
COYOTE NO. 12
400'
320'
Disc
N 10° E - 1500'
BELL NO. 6
COYOTE NO. 1
70'
Disc
NO. 1
NO. 2
300'
Disc
BELL NO. 7
COYOTE NO. 2
SHAFT NO. 3
90'
Disc
210'
Disc
COYOTE NO. 11
62.5'
Disc
30'
Disc
N 88° W
COYOTE NO. 20
500'
Disc
30'
Disc
SEC. 10
SEC. 15
SEC. 11
SEC. 14
BELL NO. 8
Disc
T. 16 S. - R. 8 E.
N 10° E 1500'


CLAIM MAP.
COYOTE CLAIMS
Pima County, Arizona
SCALE: 1" = 500'
COYOTE NO.2
COYOTE NO.11
COYOTE NO.20
BELL NO.8
BELL NO.7
SHAFT NO.3
Disc
N 10° E 1500'
N 80° W
SEC.10 SEC.11
SEC.15 SEC.14
T.16 S.-R.8 E.

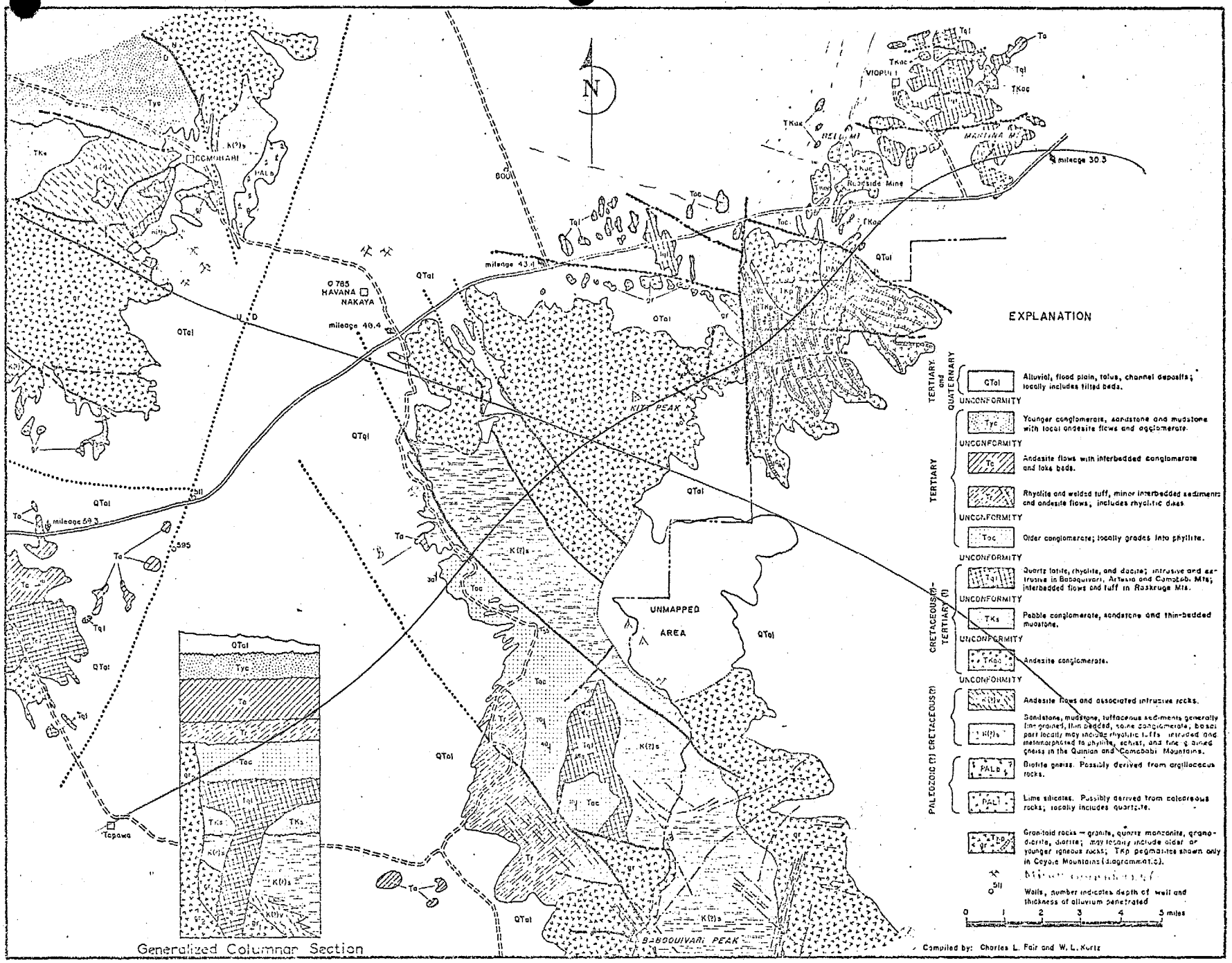


FIGURE 57. Generalized geologic map of parts of the Baboquivari, Roskruge, South Comobabi, and Artesa Mountains, Pima County, Arizona.