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Arizona Geological Survey
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Phoenix, AZ, 85012
602-771-1601
http://www.azgs.az.gov
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KNOX-ARIZONA CORP.
8967 LADUE ROAD
ST. LOUIS, MO. 63124

Jan. 28, 1972

Mr. J. B. Imswiler
International Minerals & Chemical Corp.
Exploration Division
400 Smith Wells Ave. Suite 133
Reno, Nevada 89502

Dear Mr. Imswiler:

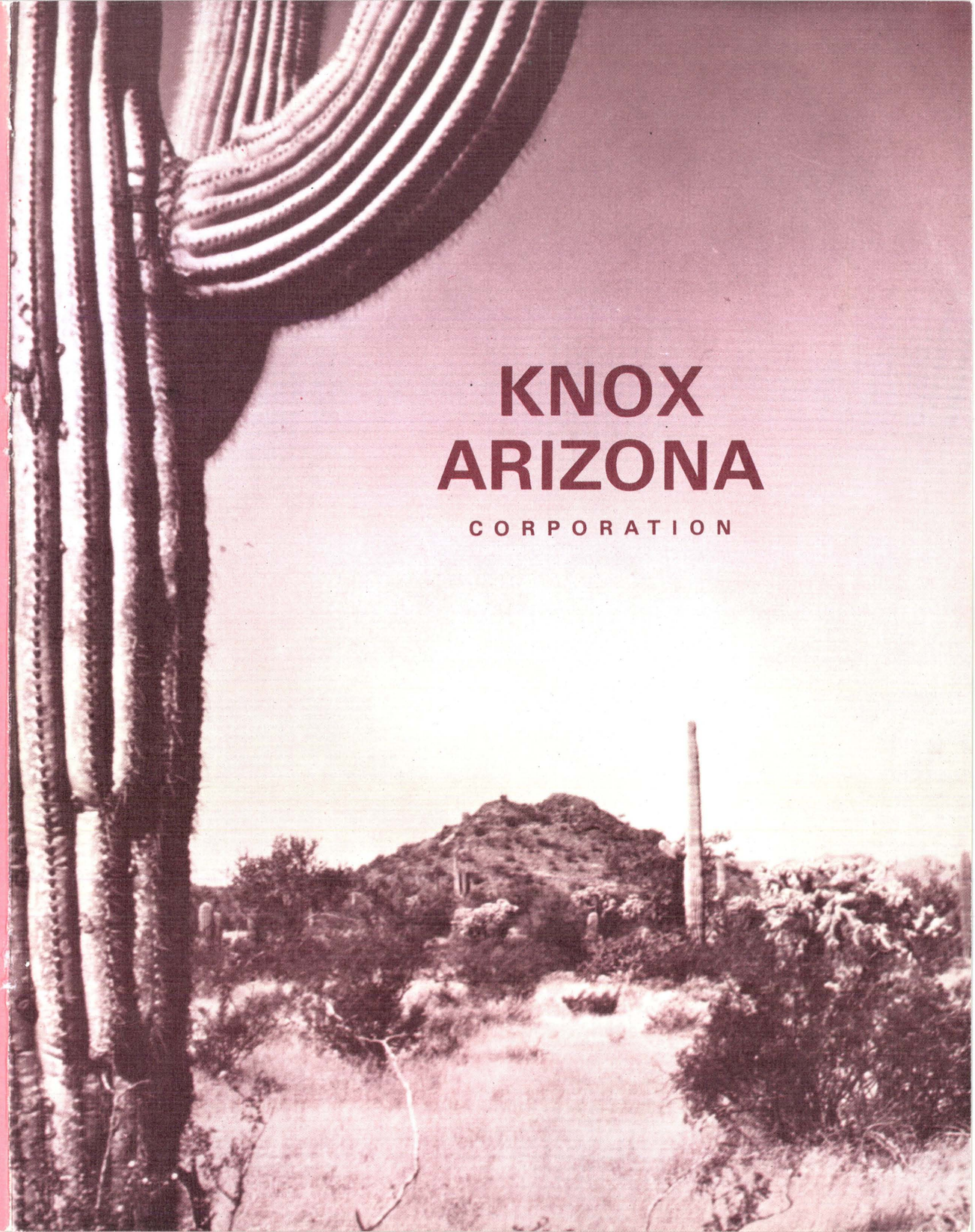
Thought your Company might be interested in our brochure on Knox-Arizona.

Sincerely,

We are aware of our place in society and the environment. Our role, first of all, is economic, basic and fundamental in the discovery of minerals for industry and the making of a profit for our shareholders. Since 1913, this company's holdings were founded with claims on Arizona lands under the 1872 mining law. Through the years of exploration, there was disappointment and heartbreak, but with never-ending hope and determination, we are finding ore. In all of these years, in no instance, was anything of beauty on the land or to the viewer destroyed. We seek to supply the needs of free people.

KNOX-ARIZONA CORPORATION

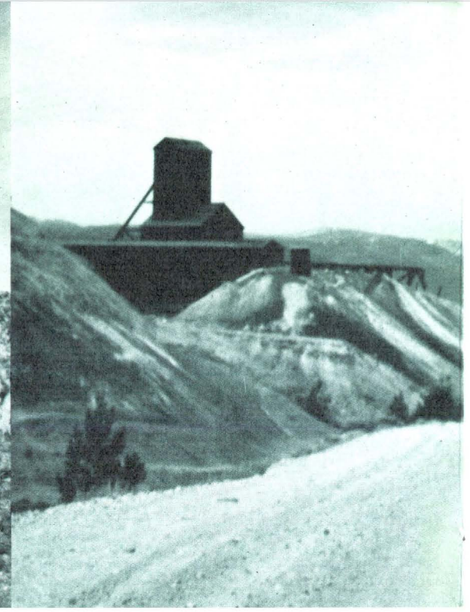
8 Paseo Redondo Suite 2D Tucson, Arizona 85705 602-624-0355



KNOX ARIZONA

CORPORATION

Silverhill Mine in the Waterman Mountain.



Mikado shaft on Commerce property.

Property No. 3—ROSEMONT-HELVETIA AREA

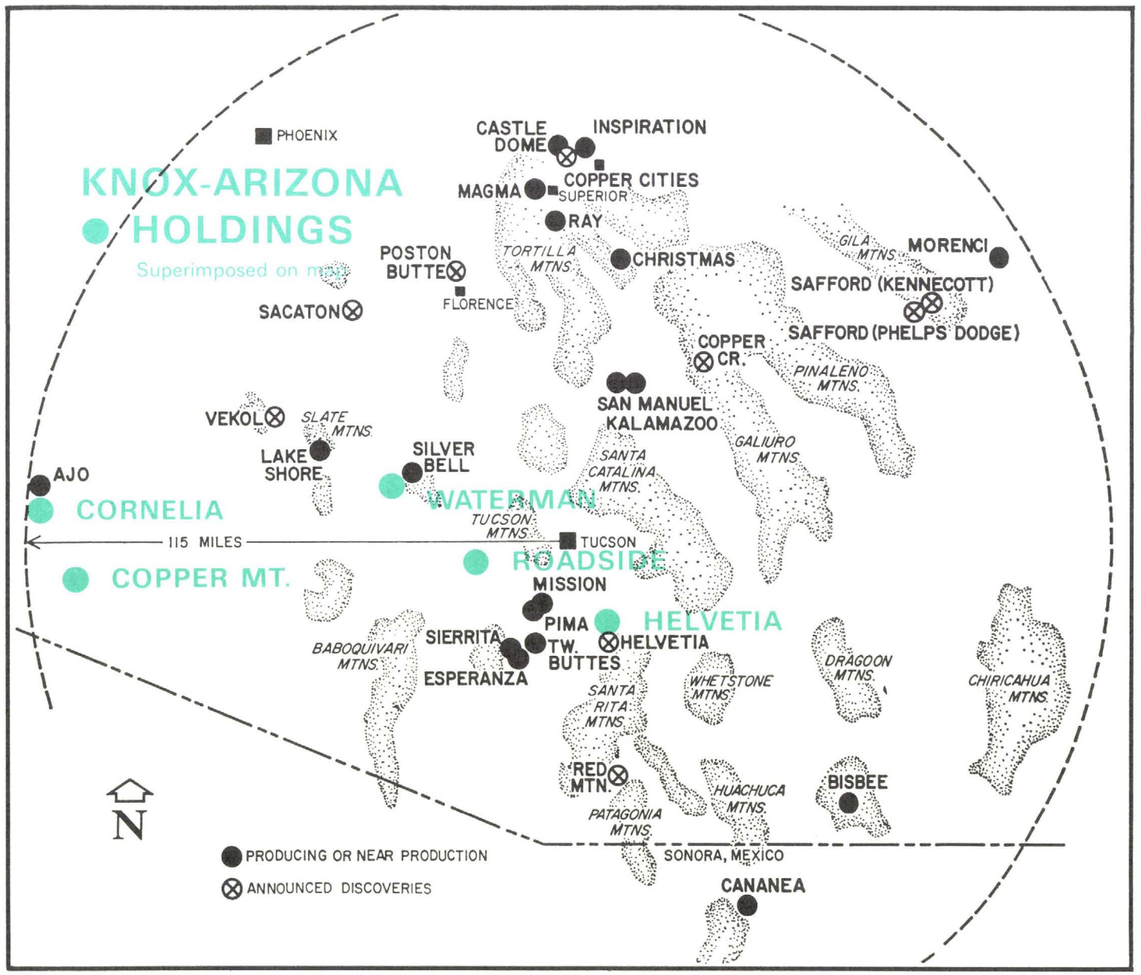
There are 54 unpatented mining claims in this group, 40 of which are contiguous and are known as the Falcon, Kent Group. The other 13 are contiguous to each other and situated nearby and are known as the Fox Group. The claims are located approximately 20 miles east and 14 miles south of Tucson. They are flanked by the holdings of Anaconda Corporation. All assessment work has been completed for these 53 claims until September 1, 1971. Lease and Option payments are current. The next option payment in the amount of $6,000 falls due on November 18, 1971. An agreement on 1080 acres has been concluded with a major mining company for cash plus a royalty of 2% of net smelter returns.

Property No. 4—COMMERCE

This property consists of 7 patented mining claims located in Lake County near Leadville, Colorado on the east slope of the Masquito Range. Production has been derived primarily from mining sulphide replacement ore bodies in dolomite. Ore minerals include pyrite, ferriferous, sphalerite, argentite, tetrahedrite, chalcopyrite, covetlite. Gold and native silver have been found locally. "The Leadville district has been one of the principal contributors of metallic ores and indications are that vast Ore bodies still exist in this area." The above quote is from Thomas I. Sharp, Project Engineer, Colorado School of Mines Research Foundation, Incorporated, Golden, Colorado.

REPRINT FROM TUCSON DAILY CITIZEN, FRIDAY, MAY 7, 1971

Tucson Is Center Of Copper "Treasure Hunt"



Tucson's Magic Copper Circle

Where the copper is—within a 115-mile radius of Tucson—and where more of it might be found nearby is indicated on the map. Worth billions of dollars in gross value in their lifetime are the ore bodies producing, near production and recently discovered. In various unmarked other areas within the circle, secretive exploration men from 40 companies based here are vying to come up with another huge copper deposit. The map was prepared by Spencer R. Titley, professor in the University of Arizona's geosciences department. Associate Professor John M. Guilbert says all but one of the marked copper deposits were formed in Late Cretaceous times, at about the time of extinction of the dinosaurs, in general from 59 million to 67 million years ago. Bisbee's deposit is even older—about 163 million years.

KNOX-ARIZONA CORPORATION

BALANCE SHEET

JULY 31, 1971

ASSETS		
Cash in Bank		$ 19,916.00
Mining Claims		
Knox-Arizona Corporation	$ 400,000.00	
Helvetia Property	191,000.00	
Roadside Property	120,000.00	
Silver Hills	136,250.00	
Arizona Indians (Western)	1,413,382.00	
Meyer District	15,000.00	
Commerce Property—Colorado	400,000.00	
TOTAL MINING CLAIMS		2,675,632.00
Development Costs—Knox-Arizona Corp.		136,003.00
Option—Greenway Property		20,000.00
Deferred Expenses		53,476.00
Equipment		35,000.00
TOTAL ASSETS		$2,940,027.00
LIABILITIES-CAPITAL		
Due William J. McKay-Madeline Riley	182,000.00	
Dawn Notes—Southern Arizona	132,500.00	
Western Minerals, Inc.	16,293.00	
Accrued Expenses—Knox-Arizona Corp.	1,405.00	
Officers' Loans		
Mary West	25,576.00	
William Knox	48,536.00	
	74,112.00	
Deposit—Sale Helvetia Property	50,000.00	
Deferred Income	1,292.00	
TOTAL		457,602.00
CAPITAL STOCK		2,482,425.00
TOTAL		$2,940,027.00

August 25, 1971

Knox-Arizona Corporation
Tucson, Arizona

Attention Board of Directors

Gentlemen:

In accordance with our verbal agreement a report of the assets and liabilities and net worth of Knox-Arizona Corporation as of July 31, 1971 has been prepared.

This report shows the assets acquired from the Knox-Arizona Copper Mining Corporation; Western Minerals Corporation; Commerce Mining Company; Hunter-Albert Corporation and Mr. William Knox.

In our opinion the Balance Sheet accompanying this report presents fairly the status of the Knox-Arizona Corporation as explained in detail elsewhere.

Charles A. Williams
CHARLES A. WILLIAMS
Certified Public Accountant

McPhar Geophysics, Limited, Toronto, Canada, issued a report on the prospects for locating rich mineralized deposits. An excerpt from this report, the full text of which is available, is given below:

"The Southwestern United States, in particular the State of Arizona and adjacent parts of New Mexico and Nevada, is the greatest copper producing area of the world and currently is the scene of intensive mineral exploration. At least ten major discoveries have been made in the past several years. Some of these deposits are now in production, or are being currently prepared for production, several are being developed as future reserves, while others have been discovered too recently for their full potential to have been determined.

"It is our opinion that this region represents the most favourable exploration area in North America today.

"Recent figures indicate that 80% of the world's copper production emanates from four regions—the Southwestern United States, the Andean Belt, the Canadian Shield and the South African Belt, of which the Southwestern United States is the biggest producer. It has been estimated that the greatest concentration of copper in the world centers in Arizona and adjacent parts of the United States and Mexico.

"The bulk of the production from the Southwestern United States and the Andean Belt comes from large low-grade deposits generally known as Porphry Copper Deposits . . . These deposits have certain features . . . They are of such magnitude and shape that they can be mined by large scale, low cost methods; i.e., open pit, block caving and leaching."

Knox-Arizona property—looking east from Copper Mountain.

William A. Knox inspecting core from Knox-Arizona diamond drill hole No. 1.

President's Report to the Shareholders of the 1970-1971 activities

July 1, 1971

Dear Shareholder:

To those of you who could not attend our annual meeting I wish to report our activity this past year. I need not remind you, the year of 1970 was not the best, however, your company was most active and progress was substantial.

1. The acquisition of the Silverbell property from Western Minerals Corporation was completed. This property consists of 20 patented mining claims and 39 unpatented mining claims or approximately 1,180 acres of land located some 40 miles northwest of Tucson, Arizona. Reports from mining engineers indicate this property has developed ore reserves of some 30,000 tons of Copper, Silver, Zinc and Lead ores of substantial grade also another 110,000 tons of probable ore. A new electric power line, ample water supply for a small milling operation, and some $35,000.00 worth of mining equipment.

The acquisition of this property was on a share per share basis with Western Minerals Corporation. The potential of this area is still in the early stages of development. It joins the property of American Smelting & Refining Company where two open pit copper mines are operating and adds to the economic value of our Company.

2. We have acquired 841 acres of mining property located some 35 miles west of Tucson in the Papago Indian Reservation with a reported 40,000 tons of ore blocked out on the 200 foot level that has an assay value of three and one-half percent Copper and over 3 ounces of Silver per ton. This was purchased for 120,000 shares of Knox-Arizona stock.

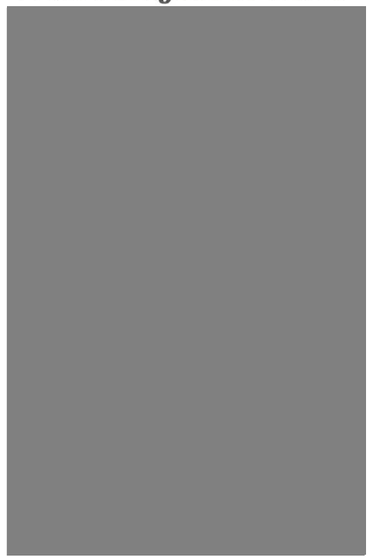
3. Your company has acquired 1,060 acres of mineral land located some 45 miles southeast of Tucson called the Rosemont-Helvetia Area. Last May 6, 1970 your company entered negotiation with a major mining company for the sale of this property. We are happy to announce at this time a sale has been completed. The details of this sale will be reported jointly at some later date between the two companies due to circumstances regarding the Forest Service where this property is located.

4. Knox-Arizona has taken an option to purchase some 68 mining claims located some 2½ to 3 miles south of the Ajo open pit copper mine of the Phelps-Dodge Corporation with a leaching potential that could be exciting and profitable. More work needs to be done before we shall know the full extent of this copper deposit.

Articles of Interest

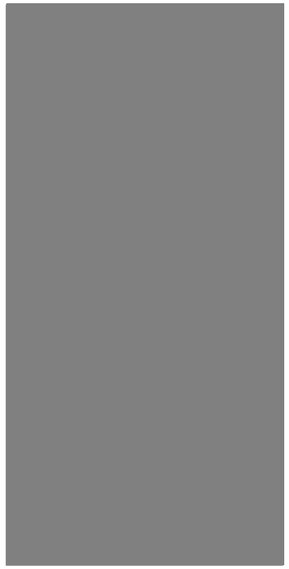
from FORBES, June 15, 1971

From Shotguns to Rifles



from TUCSON DAILY CITIZEN
Monday, July 26, 1971

Knox-Ariz. Gets Mine In Colorado



from THE INDIANAPOLIS STAR
Tuesday, August 3, 1971

U.S. Said Facing Dire Shortage Of Minerals

Lerin - Roadside - Pima Co

KNOX•ARIZONA CORP.
P.O. BOX NO. 5663 - TUCSON, ARIZONA 85703 TEL. (602) 624-0355

Feb. 20, 1970

Mr. J. B. Imsweiler
International Minerals & Chemical Corp.
Exploration Division
Reno, Nevada 89502

Dear Mr. Imsweiler:

First I won't to apologize for the delay in answering your letter. I was in Arizona and the letter came to the Western Minerals office, and I did not receive it until sometime later.

Mr. Thorp D. Sawyer our Vice President has the information I think you would be interested in. This is a property that needs some good sound work done and I think the work could be rewarding. You may contact Mr. Sawyer at our Tucson office as listed above. I hope to return to Tucson, soon after the middle of March.

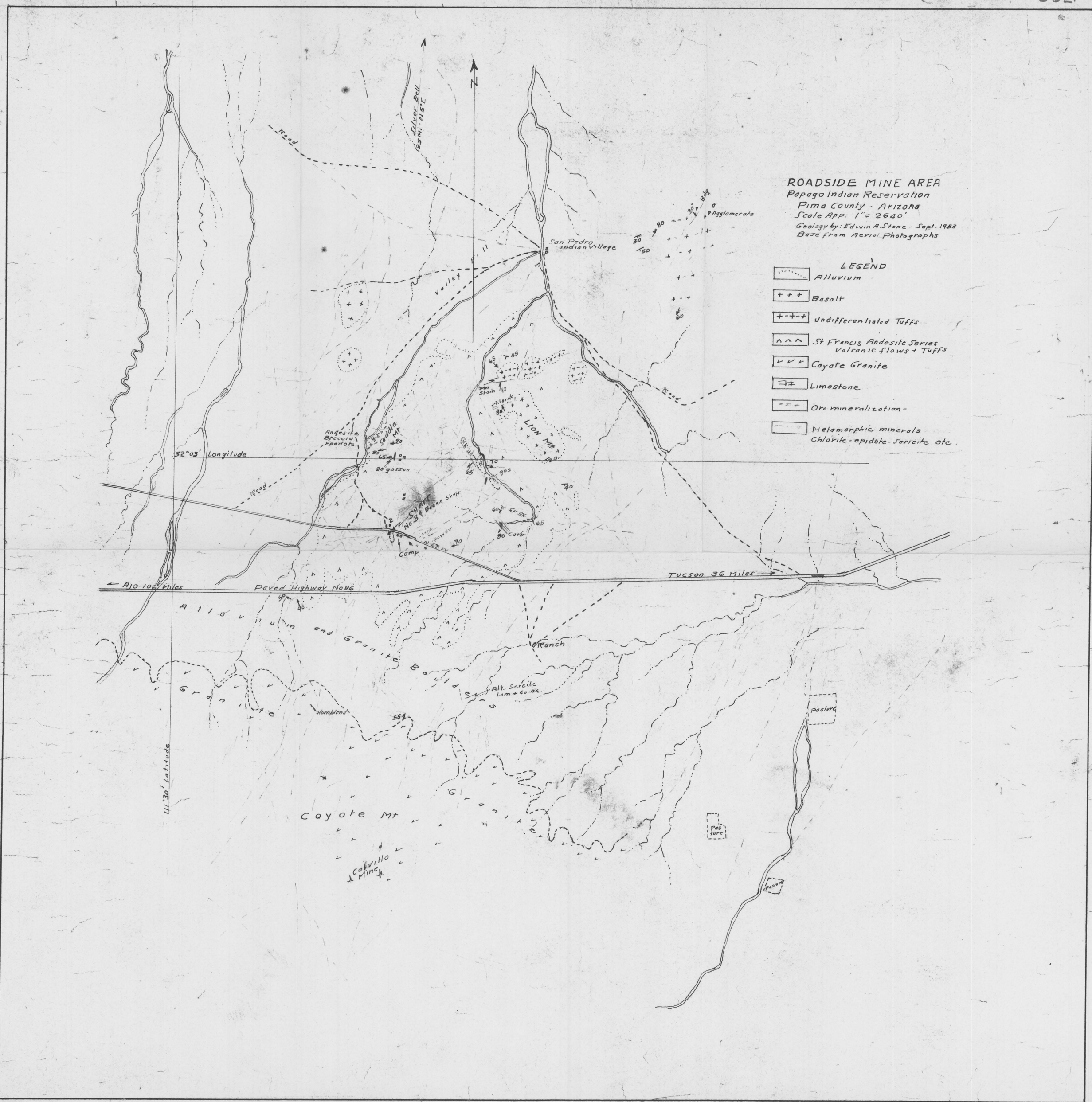
Sincerely,

[signature]

P.S. I shall contact Mr. Sawyer re: my letter to you.
W.L.

Rec. 2-24-70
JH

Ans Mail

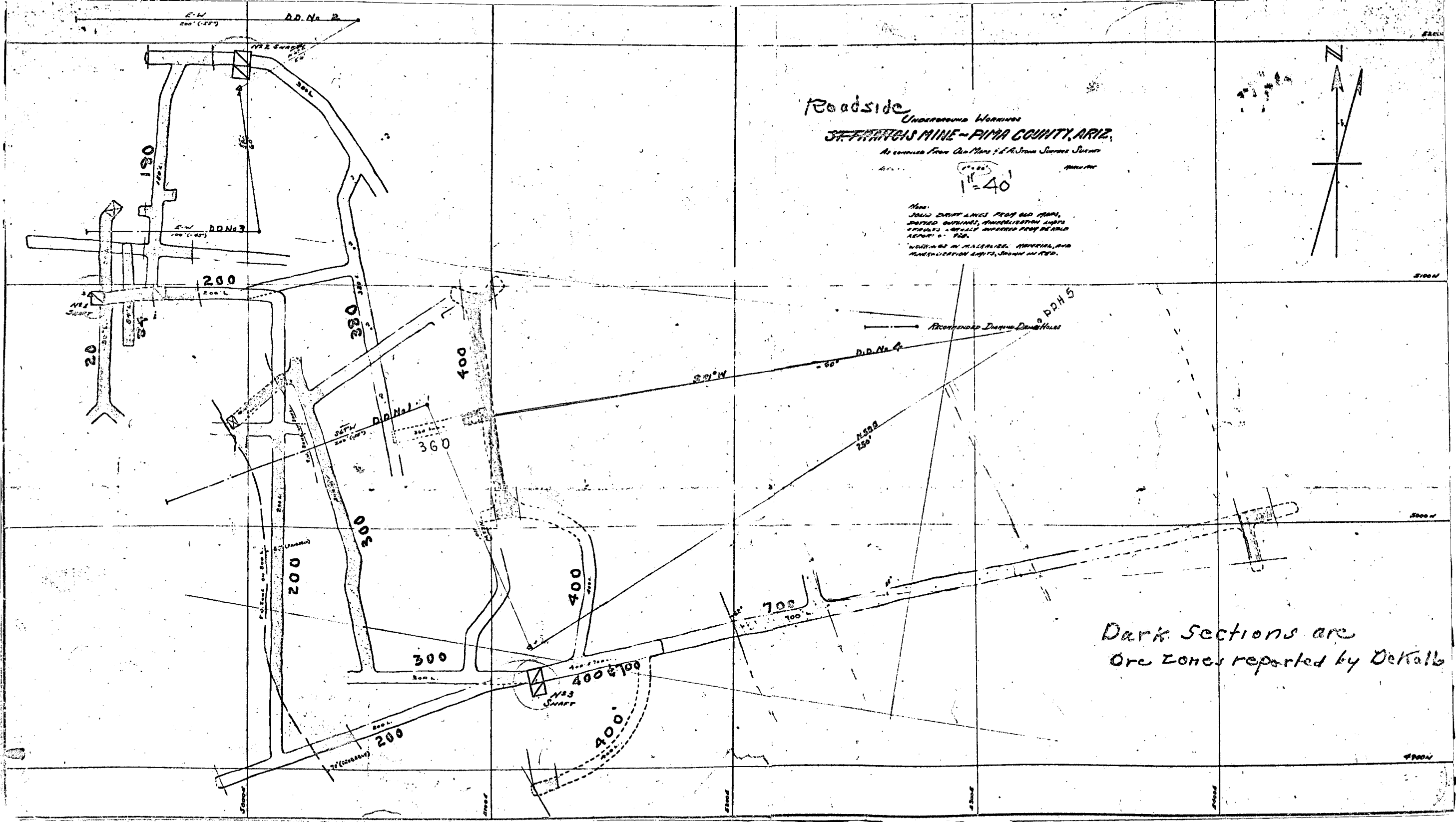

ROADSIDE MINE AREA
Papago Indian Reservation
Pima County - Arizona
Scale App: 1" = 2640'
Geology by: Edwin A. Stone - Sept. 1953
Base from Aerial Photographs
LEGEND.
Alluvium
Basalt
Undifferentiated Tuffs
St Francis Andesite Series Volcanic flows + Tuffs
Coyote Granite
Limestone
Ore mineralization -
Metamorphic minerals Chlorite - epidote - Sericite etc.
Silver Bell 25 Mi. N 5° E
Road
San Pedro Indian Village
Valley Fill
Agglomerate
Mn Stain
Chlorite
LION Mt
Andesite Breccia Epadote
Saddle Mt
20 gossan
32°03' Longitude
Road
SHAFT No 3 Beacon Shaft
Camp
Cu ox
Carb.
Road
Tucson 36 Miles
A10-106 Miles
Paved Highway No 86
Alluvium and Granite Boulders
Ranch
Alt. Sericite Lim + Cu ox
Granite
Hornblend
Pasture
Pasture
Pasture
111°30' Latitude
Coyote Mt
Granite
Calvillo Mine

EXPLANATION

- QAL — Quaternary alluvium
- ELUV — Eluvium
- AN — Andesite: largely flow-breccia but locally w/o inclusions (Cretaceous)
- ARK/GW — Arkose/Graywacke (Cretaceous)
- LS — Limestone (Cretaceous)
- Epidote as float + in place
- Silicification
- CuOx. Always assoc. w. EP; includes MAL, CUP, Cu°, + rarely AZ + CHRYS.
- FeOx along some veins + frax
- Contacts
- Fault
- Pebble dikes (?). Contain frags of various acidic extrusive + intrusive rx, QTZT, some LS.
- Vein. Gen consist of SIO, QZ (including opaline QZ), CAL, + locally a little LIM.
- Joint
- Sheeting
- Flow structure
- 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.16 S., R.8 E.
DATA BY: RWS & AWT	DRAWN BY: RWS	DATE: 15 DEC 1966	MAP NO.: B-1669
0' 100' 200' 400' 600' 800'			PLATE NO.

302³


Roadside
Underground Workings
ST. FRANCIS MINE - PIMA COUNTY, ARIZ.
1" = 40'
Recommended Diamond Drill Holes
D.D. No 2
D.D. No 3
D.D. No 1
D.D. No 4
No 2 Shaft
No 1 Shaft
No 3 Shaft
N
Dark Sections are
Ore zones reported by DeKalb

KNOX-ARIZONA CORP.
P.O. BOX NO. 5663 - TUCSON, ARIZONA 85703 TEL. (602) 624-0355

April 6, 1970

Mr. J. Bruce Imswiler
International Minerals & Chemical Corporation
400 South Wells Avenue Suite 133
Reno, Nevada 89502

Dear Mr. Imswiler:

This will acknowledge receipt of your letter of April 1st indicating your interest in receiving information on the ROADSIDE MINE, in Pima County, Arizona which Knox-Arizona presently controls.

The enclosed is all that we are able to forward at the moment and which consists of:

(1) Two U. S. G. S. quadrangles on which is shown the outside boundaries of the 41 valid claims.

(2) Xerox copy of the claims and the filing data.

(3) Copy of a Geologic Report by Courtenay De Kalb date September 6, 1928.

(4) Copy of a report by an unknown author also dated September 6, 1928.

(5) Copy of a report by Edwin Stone dated September 14, 1953 to which is attached a summary report by H. O. Hammond dated October 1, 1948.

(6) Xerox copy of the underground workings presumably made by DeKalb dated March 1935 (or 1955) The three shafts are caved in and would need to be retimbered for access to the various levels.

Mr. J. Bruce Imswiler
International Minerals & Chemical Corporation

(7) Map on a scale of 2" to the mile showing the geology as interpreted by Stone in 1953.

(8) Geological map by the Duval Corporation on a scale of 1" to 200' of the area. The claims are not shown on this map and a little field work would be needed to spot them definitely.

We would be glad to show you or your representative the property anytime, but would appreciate a few days advance notice.

Sincerely yours,

KNOX-ARIZONA CORPORATION

Thorp D. Sawyer

Thorp D. Sawyer,
Vice President

TDS/lpf
Enclosures

cc: William A. Knox
Anthony Lane
File 302

9/65

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 proceedures 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 36 miles from the city of Tucson.

History

3

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

302.10

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 amajor 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 Pa leozoic 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 Roadsid e property lies within the down faulted block.

The N-S structure developed in Terhiary 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 6600 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 accasional 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 1005 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 EX 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 NE 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 strusture 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 orebodies 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 now 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 Linement) well into the Sierrla Mt. range and believes that the major ore occurance

in the Twin Buttes Mining District lie with in this linement 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 linement 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 occurredd 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 fracture.

Fault

H.O. Hammond. Mining Engineer

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
July 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
Aug. 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.
Courtenay De Kalb, Consulting engineer.

Tucson

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P
Y

(Orig. report 9/6/28)

MINE REPORT

ROADSIDE MINE
Pima County, Arizona

Summary

BY ED STONE ?

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.

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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 lavel; 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.

ST. FRANCIS COPPER MINE

COMMONLY KNOWN AS THE

ROADSIDE MINE

GEOLOGIC

REPORT BY

COURTENAY DE KALB

Mining Engineer

TUCSON

ARIZONA

SEPTEMBER SIXTH

1928

302.10

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, AMMION, 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 Tezota 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 ~~vista~~ 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 sa~~m~~usurite and some epidote, which carry as an invariable accessory ~~necessary~~

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 $3\frac{1}{2}$ 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 (380 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 feet, 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 alaborate 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 "belsa" 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 90 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 90 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.16 days	12,060 "

On that day in 1924 the man 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 lacustrine-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 (1812). 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 slick ~~slick~~ensided, 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 glichened 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 380-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 ~~and~~ 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 o.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 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 (cloistral 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 un-oxidized 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 auxilliary 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 ~~the same~~ mixture of quartz-calcite ~~as~~ 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 Cholla 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 ~~scene~~ 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 ~~sandy~~ 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 56 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.

CRUZARO 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 Cruzaro

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 alsakite, 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 B1 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 Cruc~~ing~~ero 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 ~~positions~~ 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

beyond the main lode into the tuff beds, which is a fair possibility. The geologic argument favors the opening of a great mine at this point. No mine is proved until it has been developed, but it is my judgment that the Roadside Mine offers one of the best opportunities for bringing in a premier mine that exists in the State of Arizona.

Respectfully submitted,

Courtenay De Kalb.

3619 Front St
San Diego, Cal.

April 14, 1970

Mr. Thorp D. Sawyer
Vice President
Knox-Arizona Corporation
Post Office Box 5663
Tucson, Arizona 85703

Dear Mr. Sawyer:

Thank you very much for the material you sent on the Roadside Mine.

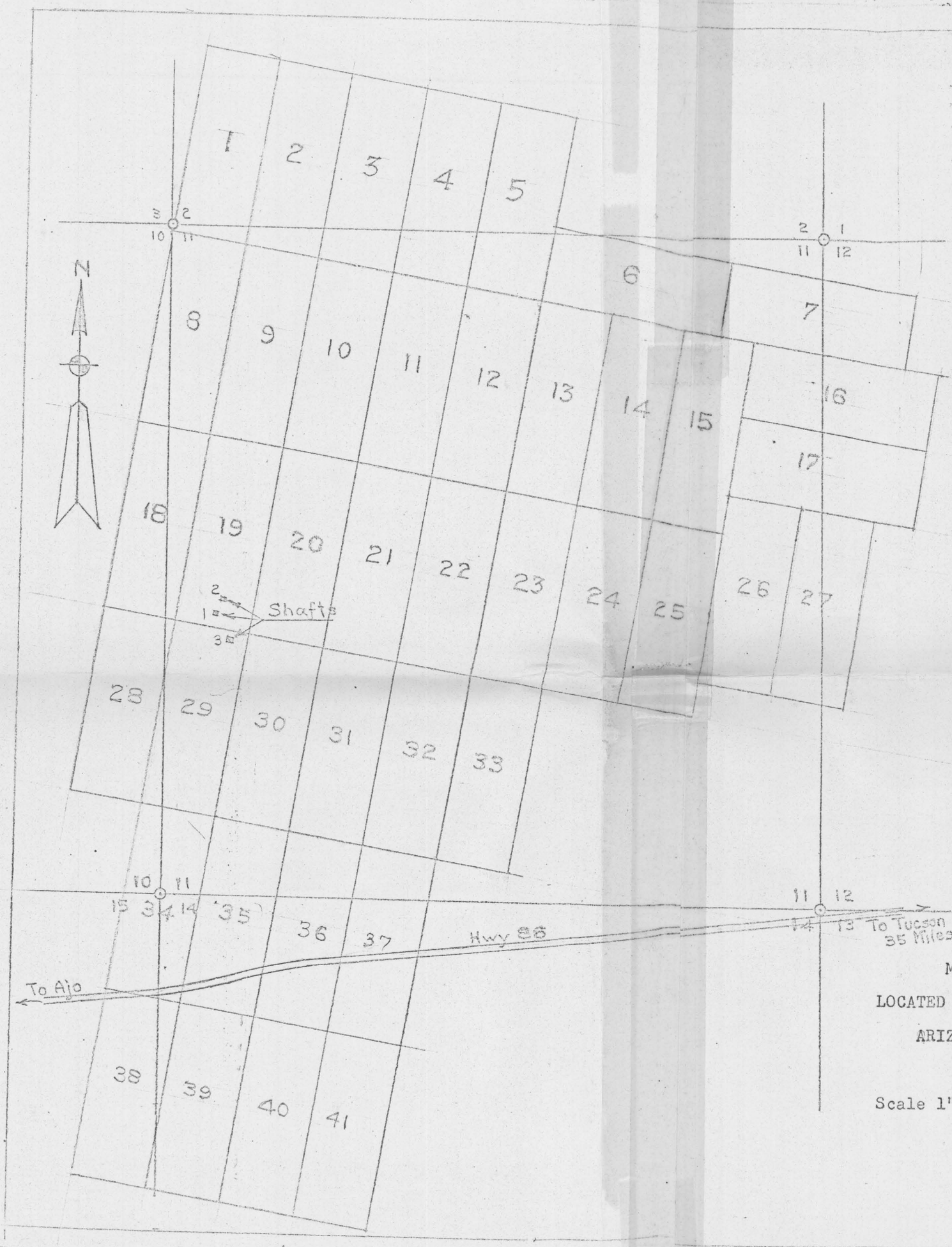
Since our field season here in Nevada is just beginning to roll, it may be fall before I get a chance to examine the property. However, I will give this information careful consideration and will be in touch with you at a later date.

Very truly yours,

J. Bruce Imswiler

JBI:JH

Cut here



CLAIM DATA

No.	Claim	Filing Data		
1	Bell - No.1	Docket 846	pp128-135	
2	" - " 2	"	"	" "
3	" - " 3	"	"	" "
4	" - " 4	"	"	" "
5	" - " 5	"	"	" "
6	Coyote No.18	Docket 669	pp182-193	
7	" " 19	"	"	" "
8	" "" 22	"	"	" "
9	" " 7	"	661	pp264-273
10	" " 8	"	"	" "
11	Coyote No. 9	Docket 661	pp264-273	
12	" " 10	"	"	" "
13	" " 15	"	669	pp182-193
14	" " 16	"	"	" "
15	" " 17	"	"	" "
16	Coyote No.21	Docket 669	pp182-193	
17	San Pedro	Book JJJ	p508	
18	Coyote No.13	Docket 669	pp182-193	
19	" " 3	"	661	pp264-273
20	" " 4	"	"	" "
21	Coyote No. 5	Docket 661	pp264-273	
22	" " 6	"	"	" "
23	" " 14	"	669	pp182-193
24	Arizona	Book JJJ	p500	
25	Guadalupe	"	"	p503
26	Hidalgo	Book JJJ	p504	
27	El Sol	"	"	p505
28	Coyote No.12	Docket 669	pp182-193	
29	" " 1	"	661	pp264-273
30	" " 2	"	"	" "
31	Coyote No.11	Docket 669	pp182-193	
32	" " 20	"	"	" "
33	Bell - No. 8	"	846	pp128-135
34	" - " 6	"	"	" "
35	" - " 7	"	"	" "
36	La Estrella	Book JJJ	p507	
37	Zorra	" NN	p574	
38	Ammion	" NNN	p566	
39	Tortugaños	" JJJ	p509	
40	Los Alamos	" "	p506	
41	Boulder	Book 000	p117	

MAP SHOWING CLAIMS OF THE ROADSIDE MINE
(Originally known as the St. Francis)
LOCATED IN PAPAGO INDIAN RESERVATION IN PIMA COUNTY,

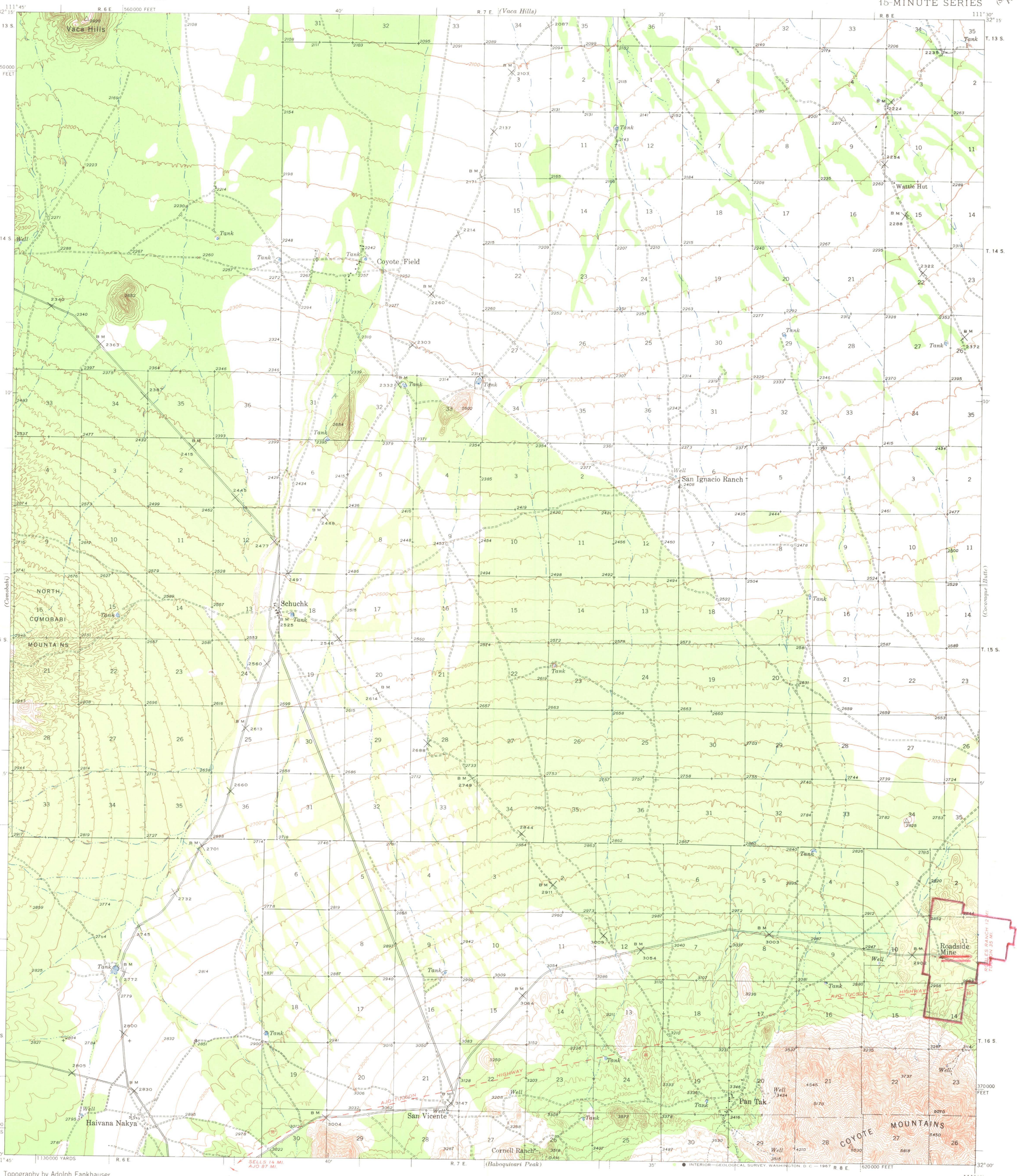
ARIZONA, IN SECTIONS 2, 10, 11, 12, 14, & 15,

T-16-S, R-6-E, G.& S.R.B.& M.

Scale 1" = 800' Dec. 1969

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ARIZONA
(PIMA COUNTY)
SAN VICENTE, ARIZ.
15-MINUTE SERIES



Topography by Adolph Fankhauser,
Frank H. Purdy, J. Mark Holmes, and
Charles W. Birdseye
Surveyed in 1938

ROAD CLASSIFICATION

HARD-SURFACE ALL WEATHER ROADS		DRY WEATHER ROADS
Heavy-duty	4 LANE 6 LANE	Improved dirt
Medium-duty	4 LANE 6 LANE	Unimproved dirt
Loose-surface graded or narrow hard-surface		

U. S. Route — State Route

TRUE NORTH — MAGNETIC NORTH 14°
APPROXIMATE MEAN DECLINATION, 1938

SCALE 1:62 500

1 ½ 0 1 2 3 4 MILES
3000 0 3000 6000 9000 12000 15000 18000 21000 FEET
1 .5 0 1 2 3 4 5 KILOMETERS

Contour interval 25 feet
Datum is mean sea level

Polyconic projection. 1927 North American datum
5000 yard grid based on U. S. zone system, F
10000 foot grid based on Arizona (Central)
rectangular coordinate system

SAN VICENTE, ARIZ.

N3200—W11130/15

1938

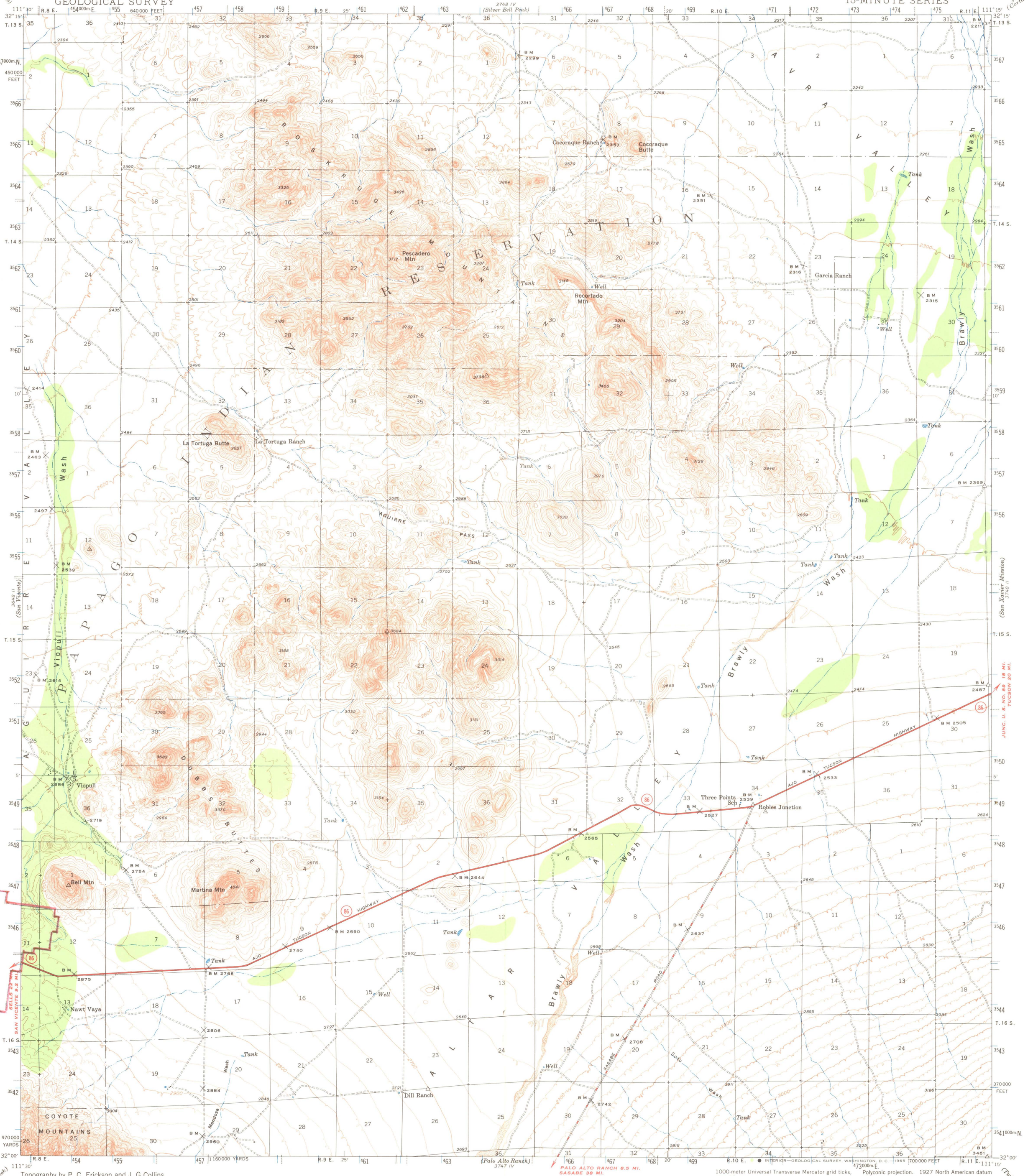
THORP D. SAWYER
Consulting Engineer
[illegible] W. Rocking Circle St.
Tucson, Arizona 85713

FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225 OR WASHINGTON, D. C. 20242
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

WAR DEPARTMENT

ARIZONA
(PIMA COUNTY)
COCORAQUE BUTTE QUADRANGLE
15-MINUTE SERIES



Topography by P. C. Erickson and J. G. Collins
Surveyed in 1940–1941

ROAD CLASSIFICATION
1947

Dependable hard-surface heavy-duty road
Secondary hard-surface all weather road
Dry weather roads
Loose-surface graded
Unsurfaced, graded
Dirt road
U. S. Route 13
State Route 26
More than two lanes indicated along road with tick at point of change 3 LANE 4 LANE

GN MN 0°12′ 4 MILS 14° 249 MILS
UTM GRID AND 1941 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:62 500

1 ½ 0 1 2 3 4 MILES
3000 0 3000 6000 9000 12000 15000 18000 21000 FEET
1 .5 0 1 2 3 4 5 KILOMETERS

Contour interval 25 feet
Datum is mean sea level

1000-meter Universal Transverse Mercator grid ticks, zone 12, shown in blue

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.—1965

Polyconic projection. 1927 North American datum
5000 yard grid based on U. S. zone system, F
10000 foot grid based on Arizona (Central) rectangular coordinate system

COCORAQUE BUTTE, ARIZ.
N3200—W11115/15

1941

AMS 3748 III—SERIES V798

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