CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
416 W. Congress St., Suite 100
Tucson, Arizona 85701
520-770-3500
http://www.azgs.az.gov
inquiries@azgs.az.gov

TAB

AZ - Popago Central

Geophsics

Vernon Smith, Mining Advisor - Papago Tribal Council.
ph. 299-6276

12/11/68 V Smith says that his office does not have a copy of the Stebbins Mineral Survey report of the Papago Ind. Reserv. Project.

He says to contact Mr. Joe Lecano, Superintendent of the BIA (Bur of Ind. Affairs) office in Sells that they have a copy. The copy had been loaned to people several years ago but VS does not know about now.

VS also said some material had been given to the U of A

A call to Dean Forrester of the Coll of Mines determined that Dr. Lacy had some material.

A call to Dr Lacy determined that all the photographs, B&W, Color, transparencies, mosaics, etc had indeed been given to the U of A and are held in the Special Collections of the Map Library - Main Library, U of A.

Notice:

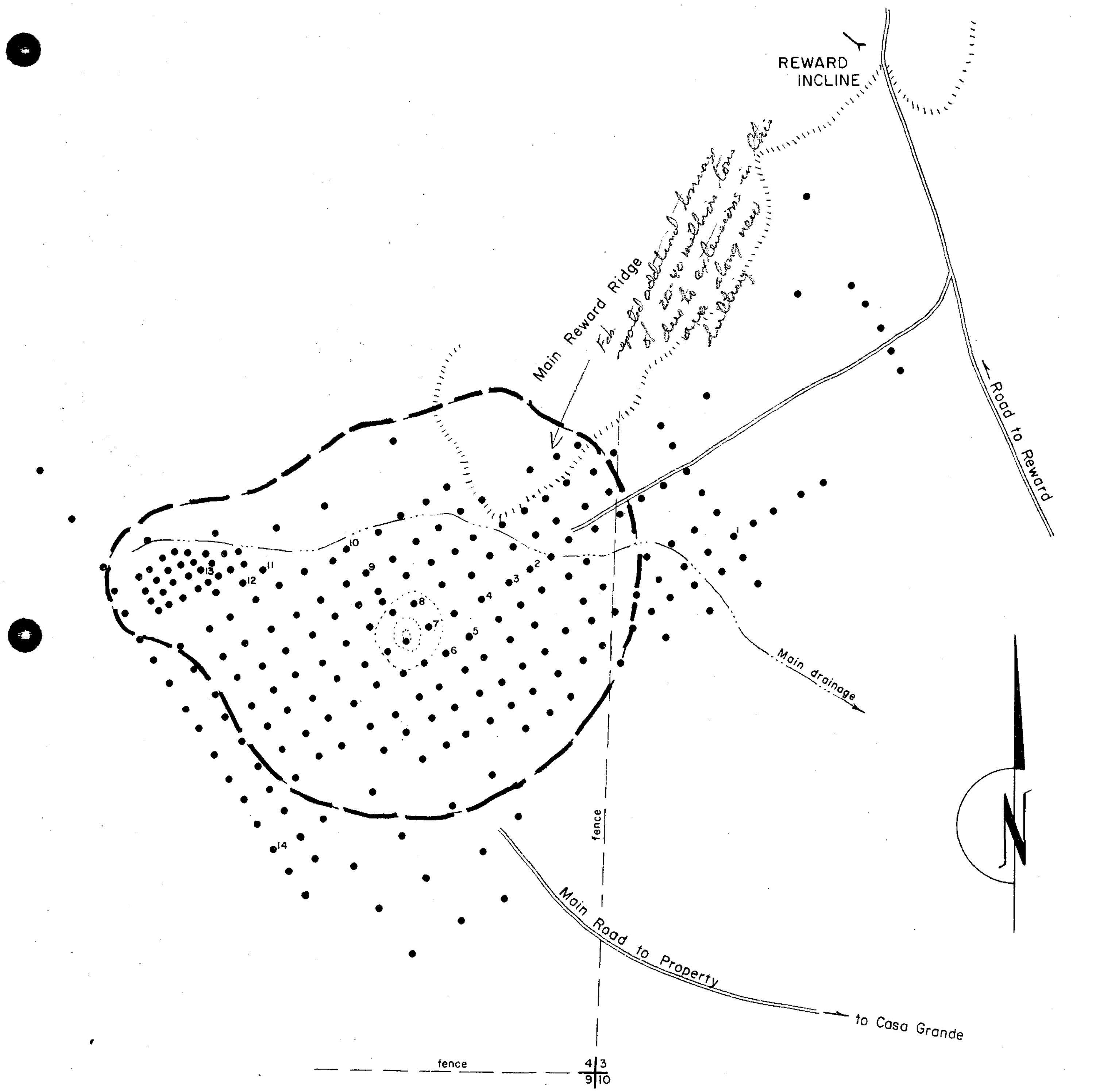
The ASARCO Prospecting Permit for working on the Papago Indian Reservation is number H54-10-66.

The permit is probably good through ~~the middle~~ ~~of~~ February 6, 1969.

Extended?

ATTACHMENT A

Cooper Aerial Surveys
Photo: FL 1-2, 10-20-67



•7 Drill Hole with Core Specimen Number

"Outcrop Hill"

Outline of Proposed Pit

Approx. Scale
1" = 1000'

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

January 10, 1969

FILE MEMORANDUM

Suggestions for Mapping and Sampling
Papago Central Project

Attention should be brought to the ASARCO file copy #13.19.7C (Guidelines for the Use of Color, Symbols, and abbreviations in Mapping, Note, and Core Logging. Memo to W.E. Saegart, April 25, 1968), as a guide to conformity in field mapping.

Rock units most likely to be encountered include:

1). Post-mineral volcanics, QTv and Tv (violet 742)
2). Laramide intrusives, Li & Tgr (vermilion 750)
3). Premineral volcanics, Lv (orange 737)
4). Younger Precambrian through Mesozoic Sediments, Sed (ultramarine 740)
   4a). Or Younger Precambrian, A, (grey 734½)
   Paleozoic, P, (ultramarine 740)
   Mesozoic, M, (True Green 751)
5). Precambrian intrusives, granite, diorite plutonics, gr, di, (golden brown 755) with diabase, db (golden brown 755)

6). Precambrian metamorphics, gn, sch (lead pencil)
faults in dark ultramarine blue (740) with mineralization in Carmine red (745). Alteration limits outlined with Carmine red (745) or outlined as overlay shown in Guideline section.

Samples taken should use the code initial of Papago Central-Samplers Last Initial-Area Initial- followed by continuous numbers. (To save some confusion, Karvinen might use R for Ron so as not to miss K for Kinnison). Area Initials include L for Lakeshore area, R for Santa Rosa range, S for Sheridan area, and C for Copperosity area. This will help track down areas and sampler when questions come up on plotting data. Example: PC-RL-15 suggests that the sample belongs to the Papago Central Project, was cut by Ron Karvinen in the Lakeshore area and was sample number 15. Two handy forms for keeping track of the samples are: 1) NW Mexico Exploration form and, 2) Hawley and Hawley form (Copies are attached). Naturally all samples and lines must be placed on topo sheets with notes on intervals etc. Copper-moly will be determined for each sample with other values as deemed suggestive. Samples should be composited in groups and re-assayed for Cu-Mo-Au-Ag. Some composites or new composites should be listed for spectrographic analysis.

There is a very low probability that a direct lead will be found during this reconnaissance geologic-geochemical study, but close attention should be given to subtle changes in alteration intensity, geochemical values, dike and fault trends, mineral and alteration trends, checking valley side conglomerates, etc, with the constant emphasis on development of the regional geologic and mineralization history of the study region. The development of permissive target areas for more detailed study, geochemical, and geophysical work should develop from the reconnaissance study.

Initial concept is to completely tie together all knowledge of the area, including present material in the files, so each field partly should be prepared to write up his particular study area for incorporation into the final report.

James D. Sell

James D. Sell

N. W. MEXICO EXPLORATION PROGRAM

Zone No. ______ Observer ______
Photo No. ______ Date ______

Sample No.	Rock Type	Alteration						MINERALIZATION																		Composite Group for		REMARKS
		Sil	Ser	Kao	Chlor	Prop	Other	TYPE												DISTRIBUTION						Assay.	Spec.	
								Oxides							Sulfides					Diss	Vlts & Frac.			VNS				
								Cu		Fe			INTR. % Sul.	Other	Cu	Fe	Mo	Other	TOT. %	% of Total	% of Total	Attitude	Width	Attitude	Width			
								Trans.	Residual	Trans.	Residual	L. Lim.																

Monuments:

Workings:

Evaluation:

No further interest ☐
Low priority interest ☐
High priority interest ☐

To: **HAWLEY & HAWLEY**
Assayers and Chemists, Inc.

(For Customer's Use)

From: ....

....

....

☐ Single Analysis
☐ Verified Analysis*
☐ Geochemical Analysis
☐ Spectrographic Analysis

*Verified Analysis will be run unless otherwise specified

....196 ....

Page..........of..........pages

Interval	Sample No.	Au	Ag	Pb	Cu	Zn	Mo		

Aa-16.0.16

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

February 4, 1969

TO: J.H. Courtright

FROM R.D. Karvinen

Progress Report
Papago Central Project
North Santa Rosa Mtns.

Field investigation of subject area began January 27, 1969, and was conducted with S.R. Davis, and L.J.Jansen. As noted in J.D.Sell's letter of January 9, a subparallel system of northeast trending dikes occur in the north end of the Santa Rosa Mountains. These dikes are monzonite porphyry intrusions in a granite host considered to be of Laramide age, but is not the typical Coolidge Granite as seen in the Slate Mountains.

Dikes of significant size and continuity occur about five to the mile, strike about N50E, and are near vertical. The dikes are arranged in en echelon pattern so that the overall outcrop expression trends N80E. Only the more prominent and continuous dikes were sampled, however, adjacent exposures of the granite were simultaneously sampled since alteration features, though weak, were more evident in the granite than in the dikes. The major dikes range from 10 to 40 feet in thickness maintaining their thickness uniformly along strike. Sample spacings are at roughly 500 & 1000 feet, with sample lines on about one-half mile intervals.

The samples have not been submitted for analyses pending completion of three more sample lines.

Megascopic observations show a slight increase in alteration and mineralization in the dikes toward the northeast. Frequent showings of chrysocolla have been mined along these dikes, mostly at the north end where they disappear under the alluvial cover.

Alteration is neither intense nor pervasive but local sericite is evident as is chloritization, and kaolinization. Epidote is also abundant throughout the area. A covered area to the north is large enough to conceal a sizeable ore body and further work is warranted if the geochem analyses confirm enrichments trending northward.

The south portion of the area does not appear attractive. The dikes and the granite are fresher and lack signs of mineralization.

Three more lines are planned in the north area, following which will be investigations of several coloration changes on the southwest and south end of the range. Efforts are underway to obtain information resulting from exploration drilling in the southwest sector of the Santa Rosa Mountains. The east central sector of the mountains and the southern peaks will be more fully investigated when a helicopter is utilized.

R.D. Karvinen

RDK:lzb

cc: JDSell
JEKinnison

AMERICAN SMELTING AND REFINING COMPANY
Tucson   Arizona

March 11, 1969

FILE MEMORANDUM

Papago Central Exploration
Copperosity Area
Drew Spring Manganese
Sheridan - Cimarron Mtns.
Pima County, Arizona

Mr. Sell has noted that the Drew Spring area has been a major Arizona manganese producer, and he proposed consideration of possible zonal change to a silver environment---in accordance with a theory postulated recently by DF Hewitt of the USGS.

Accordingly, Mr. R.D.Karvinen and I sampled concentrates, crushed mill products, tails, and stocked crude mill feed at the abandoned Drew Spring mill site, and assayed them for gold, silver, and manganese, which same see appended. Complete absence of silver in the samples suggest that these manganese deposits are not the upper zonal "cap" of a silver deposit at depth. No further work is recommended.

John E. Kinnison
John E. Kinnison

JEK:lzb

cc: JDSell
JHCourtright
RDKarvinen
SRDavis

DREW SPRING MILL SITE ASSAYS

Sample	Au oz/ton	Ag oz/ton	Mn %	Description
PC-KS-6	Nil	0.01	6.00	Crude Manganese Ore
PC-KS-7	Nil	Nil	26.65	Concentrate
PC-KS-8	Nil	Nil	21.39	Minus 1/8" crushed mill product
PC-KS-9	Nil	Nil	20.98	Minus 1/8" crushed mill product rejected as tails

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

April 7, 1969

FILE MEMORANDUM

Baboquivari Mountains
Reconnaissance of
West Flank

Reconnaissance of the west flank of the Baboquivari Mountains was conducted in latter February and early March with Tony Dalla Vista.

Particular note was made to determine the alteration characteristics where Laramide and pre-Laramide rocks became overlain by post-Laramide sediments and/or volcanics. Since these were best exposed in drainage channels, a study of the float was also afforded. Frequency of examination was $\pm\frac{1}{2}$ mile.

The entire 25 (plus) mile range front was examined on the ground and a flight in a fixed wing aircraft was also made.

Essentially, no coloration zones could be noted, nor did the surface examinations or geochem sampling indicate favorable areas. The intrusives seem to have been relatively "dry", i.e., devoid of mineralizing (or hydrothermal) solutions, and suggest same to be the result of deep-seated plutonic activity.

The post-Laramide volcanics also appear fresh and barren of ore minerals.

Attached assay results are discouraging, the only high being from the samples taken from the ore bin at the Allison Mine, now abandoned but once a gold-silver producer and once a source of silica flux for P-D at Ajo, and from selected quartz veins showing minor $CuSiO_3$ (up to 630 ppm Cu). Also attached are maps showing sample locations.

All of the above is on the Papago Indian Reservation. No further work is recommended.

R.D. Karvinen

RDK:lzb

cc: JHCourtright
JDSell
JEKinnison

HAWLEY & HAWLEY

HAWLEY & HAWLEY — SINCE 1916 — Registered Assayers

ASSAYERS AND CHEMISTS, INC.

1700 WEST GRANT ROAD - TELEPHONE 622-4836 - POST OFFICE BOX 5934

TUCSON, ARIZONA 85703

THE SOUTHWEST'S LEADING ASSAYERS AND REPRESENTATIVES

Branch Representatives at Buyer's Plants:
Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

K.V.D.S.
MAR 10 19[illegible]

IDENTIFICATION	Gold ozs. ppm	Silver ozs. ppm	Lead %	Copper % ppm	Zinc %	Mo. % ppm
Lgr Bab - 1 Sec 9, T.22S, R.7E.	Nil	2				
Mp Bab - 2 Sec 1, T.17S., R.7E.				138		10
M Bab - 3 Sec 12, T.17S., R.7E.				48		< 5
Qtzt Bab - 4 Sec 21, T17S., R7E.	Nil	2				
Sch. Bab - 5 Sec 19, T.17S., R.8E.	Nil	2				
Well Cttgs Bab - 6 Sec 31, T.17S., R8E.				30		< 5
Qtz Vn Bab - 7 Sec 32, T.17S., R8E.	Nil	2		228		15
Volc or Arg ? Bab - 8 Sec 31, T.17S., R.8E.	Nil	1		22		< 5
Qtz Vn Bab - 9 Allison Mine	2.7	43				

6 Au & Ag, Geochem @ $2.50	$ 15.00
5 Cu, Geochem @ $1.00	5.00
5 Mo, Geochem @ $1.50	7.50
9 samples dried, crushed, split, pulverized @ $1.10	9.90

CC: American Smelting & Refining Company
ADD: PO Box 5795 - Tucson, Arizona 85703
CITY: Attn: R. D. Karvinen
ADD:
CITY:

REMARKS:

Analysis Cert. By

REGISTERED ASSAYER — CERTIFICATE NO. [illegible] — H. E. [illegible] — Date Signed ...... — Ariz. U.S.A.

Preparation $ 9.90
Analysis $ 27.50

HAWLEY & HAWLEY

Registered Assayers

ASSAYERS AND CHEMISTS, INC.

1700 WEST GRANT ROAD - TELEPHONE 622-4836 - POST OFFICE BOX 5934

TUCSON, ARIZONA 85703

THE SOUTHWEST'S LEADING ASSAYERS AND REPRESENTATIVES

Branch Representatives at Buyer's Plants:
Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

K.V.D.S.
MAR 17 1969

IDENTIFICATION	Gold PPM	Silver PPM	Lead %	Copper PPM	Zinc %	Mo. PPM		
Qtz Vn BAB-10 Sec. 7, T.20S., R6E.	0.3	4		630		5		
" " BAB-11 Sec 25, T.20S., R6E.	< 0.2	< 1		38		10		
" " BAB-12 " " "	< 0.2	< 1		306		5		
MOR- 1	< 0.2	< 1		32		< 5		
MOR- 2	< 0.2	< 1		14		< 5		
MOR-3	< 0.2	< 1		40		< 5		

6 Au & Ag, geochem, @$2.50	$ 15.00
6 Cu, geochem, @$1.00	6.00
6 Mo, geochem, @$1.50	9.00
6 samples prepared @$.85	5.10

CC: American Smelting & Refining Company
ADD: Attn: Mr. R. Karvinen
CITY: Box 5795
ADD: Tucson, Arizona 85703
CITY:

REMARKS:

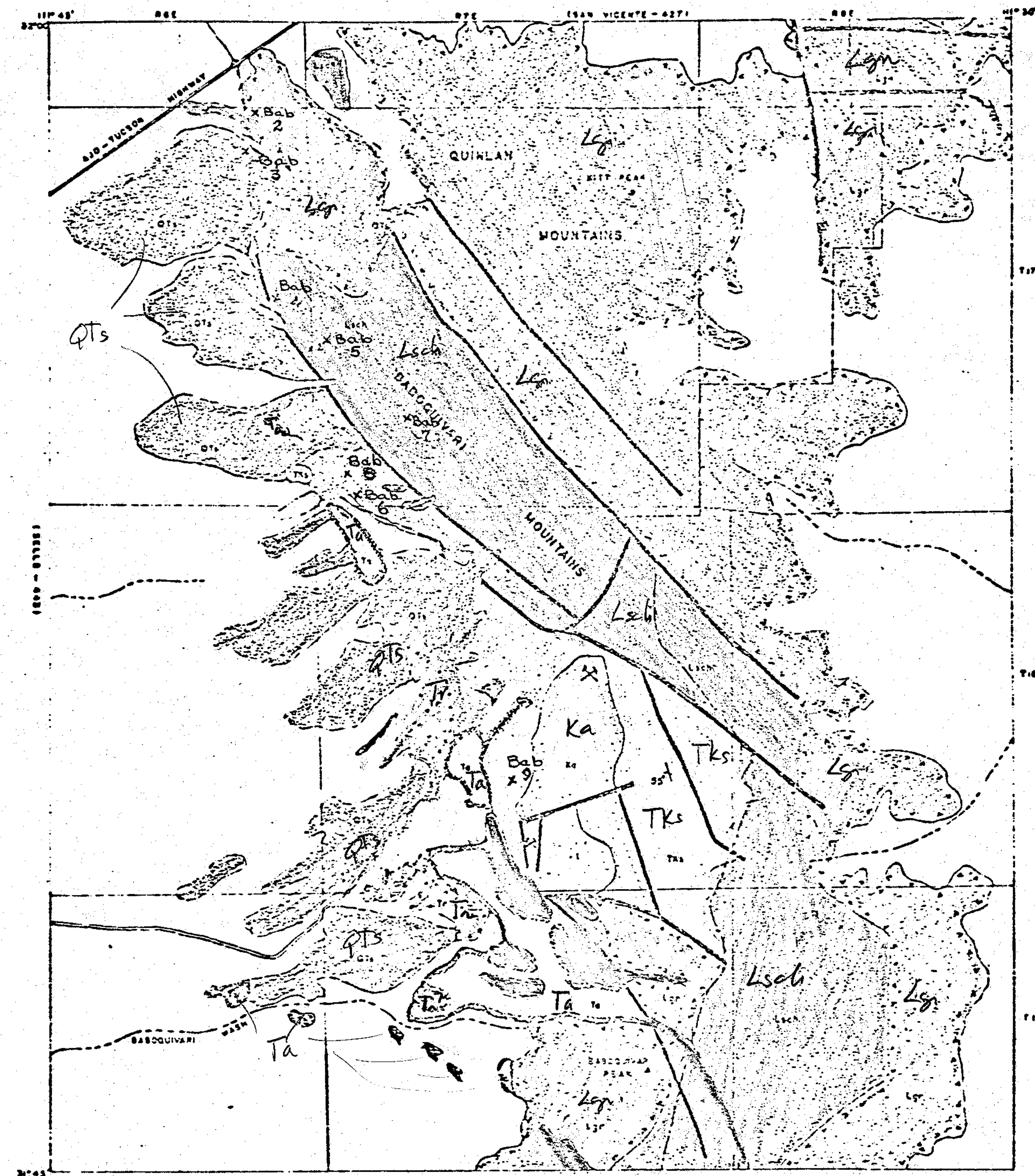
Analysis Cert. By

REGISTERED ASSAYER CERTIFICATE NO. 5794 H. E. RICHARD Arizona U.S.A.

Preparation $ 5.10
Analysis $ 30.00

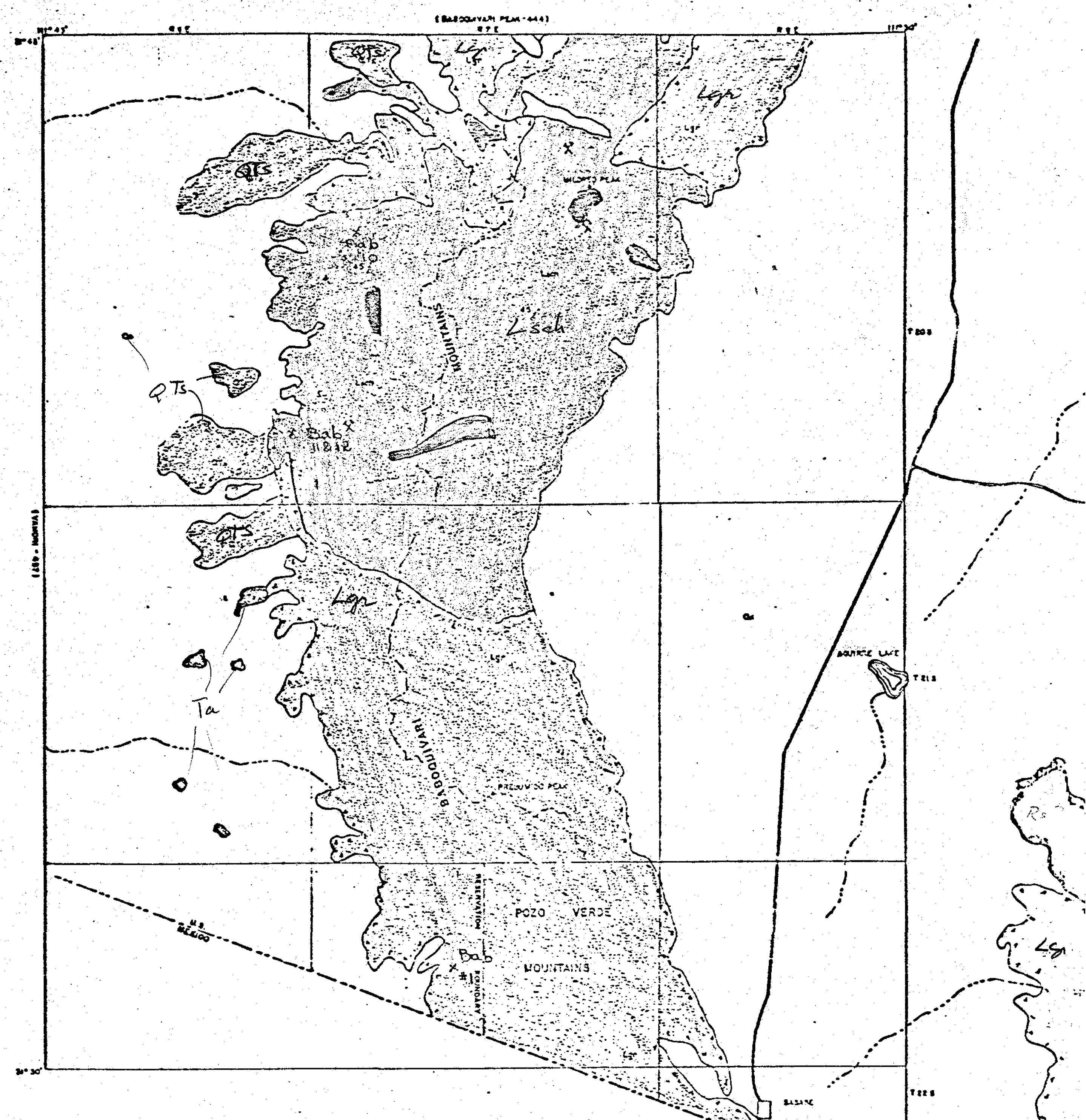
ACC: AMERICAN ...

Date Spl ... Date



BABOQUIVARI PEAK

(444)



PRESUMIDO PEAK

(458)

AMERICAN SMELTING AND REFINING COMPANY
NORTHWESTERN UNITED STATES
EXPLORATION DIVISION

KEITH WHITING
MANAGER

EAST 920 WOLVERTON COURT
(HAMILTON AT NEVADA)
SPOKANE, WASHINGTON 99207
509-489-78

RECEIVED
NOV 27 1972
S. W. U. S. EXPL. DIV.

J. H. C.
DEC 1 - 1972

November 24, 1972

W. L. K.
NOV 30 1972

Mr. W. L. Kurtz
ASARCO - Tucson

Dear Bill:

In talking with Hardy Schmidt of Cyprus Mines, I learned a few things you may or may not know.

Hardy looked at the Ramrod claims, Pinal County, and didn't think much of them. CONOCO, however, staked a couple of hundred claims near the Ramrod claims on the west end of the Table Top Mountain pediment, ran I.P., and drilled a hole. The hole encountered post mineral volcanics. The program was directed by Dick Moores of CONOCO.

Cyprus had optioned, last year, the area east of Mt. Grayback around Zellerback (something like that) Wash. This was the area drilled by Tipperary Exploration. Cyprus drilled a hole, was not encouraged, and had dropped the property. It is currently available. This is an intriguing property, with alteration and mineralization similar to Red Hills.

Bob Lehner is working for Tom Walthier (St. Joe Minerals) in the Prescott-Jerome area. Humble Oil also has a program in that area.

Best regards.

Sincerely,

John

John C. Balla

JCB/ir

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

July 10, 1973

TO: J. D. Sell

FROM: B. E. French

Monthly Report - June 1973
East Roskruge Mountains
Mapping Project
Pima County, Arizona

Geologic and alteration mapping at 1:24,000 is nearly complete in the East Roskruge Mountains. The study area is a strip about 2 miles in width. Beginning at the easternmost outcrop of the Roskruge Mountains, it extends northwestward about 8 miles along the northeastern edge of bedrock to include Cocoraque Butte.

The area consists of rocks mapped previously by Bikerman and Heindl as the Cocoraque formation, which is equivalent to the Cretaceous Amole arkose. The present study identified Amole-type arkoses and interbedded mudstones but found that they are limited to about one third of the previous outcrop area of this formation. The remainder of the area consists of a Silver Bell-type mudflow overlain in places by a chaos unit. It was also found that the previously mapped, plug-like Cocoraque Butte intrusive (dated as Laramide, 69 m.y.) is only the northern exposure of an elongate body which extends some 4 miles southward from Cocoraque Butte, crosscutting the clastic and volcanic units.

The Amole-type clastics occur along the northeasternmost edge mapped area. In general, they strike northwest and dip steeply southwest. The base of this unit is not exposed. Silver Bell-type volcanics unconformably overlie the clastics, but have the same general trend. They probably have a similar dip to the southwest but this could not be measured. The overlying chaos unit contains large blocks of quartzite which dip steeply southwest. The above section forms an angular unconformity with the overlying, gently south dipping welded tuffs of the Roskruge volcanics. These have been dated as Laramide and are equivalent to the Cat Mountain rhyolite. Near the northwestern end of the mapped area a small Mid-Tertiary ashflow forming Recortado Mountain overlies the Roskruge volcanics.

Two intrusive rocks are present. One is a fine-grained, latitic type which occurs as small dikes and sills scattered throughout the Laramide and Pre-Laramide rocks. The other is an overall fine-grained dioritic or granodioritic rock which forms Cocoraque Butte and extends south-southeast. It also intrudes all the Laramide and older rocks. Just south of Cocoraque

Butte it is apparently in a sill-like relationship with the Amole-type clastics, but further south it is dike-like dividing the mapped area roughly in half.

Southeast of the Cocoraque intrusive the section is cut by several prominent northeasterly trending mineralized fissures, with apparently little displacement. Northwest of the intrusive the Roskruge volcanics and the younger Recortado ashflow are separated from the older units by a northwest trending, high-angle reverse fault. If present, this structure is not obvious southeast of the intrusive.

Except for the above-mentioned mineralized faults, the area contains no other observable metal deposits. There are about 5 prospects containing oxide copper, all located along these structures. The best economic potential exists under the valley gravels east of the easternmost outcrop. This is based primarily on alteration in the "Amole" clastics and "Silver Bell" volcanics southeast of the dioritic intrusive.

The alteration consists of pervasive epidotization associated with garnetization, and hydrothermal quartz and specularite. The strongest alteration is in the "Silver Bell" rocks at the easternmost edge of the range. The garnet in general is restricted to the zone of pervasive epidote. Locally strong, but not pervasive epidote, with some quartz and specularite fringes the pervasive zone for about a mile to the northwest. This zone of spotty epidote occurs in the "Amole" clastics as well as the "Silver Bell" unit and the chaos unit. Farther northwest the epidote decreases rapidly and except for local scattered occurrences is very weak or absent.

The mudstones about a mile north of the pervasive epidote have been metamorphosed to a hornfels or flintstone. The Roskruge volcanics to south, however, show very little to no alteration. This could perhaps be explained by their being acidic and silicic in composition as opposed to the more susceptible andesites of the "Silver Bell".

Also of interest is the absence of epidote (or any other alteration) in the Laramide dioritic intrusive or in any of the adjacent host rocks. This would indicate that, if a concealed intrusive does exist under the gravels east of the altered outcrops, there is a possibility that it is a mineralized porphyry or that a Mission-type deposit could exist.

Since gravity work in Avra Valley shows a relatively shallow and gradually sloping pediment east of the altered bedrock, my final report will recommend several reconnaissance drill holes approximately a mile from bedrock. I think that with this alteration pattern and the proximity of the Silver Bell and Mission orebodies that such a test would be justified.

Several more days of field work will be needed to complete mapping at the northwest end of the study area. Also planned is a closer look at the

Roskruge volcanics southwest of the altered zone and some geochemical sampling along this unit to see if any increase in base metal content occurs to the southeast toward the hypothetical source of the epidote alteration.

B. E. French

B. E. French

BEF:lb

3/17

FROM: F. T. GRAYBEAL

To: WLK / JHC / JDS ✓ PAPAGO

Jerry Montgomery has run into a number of USGS people - staff + technicians doing geologic mapping, geochem sampling, geophysics throughout Quijotoa - Lakeshore area. Says Denver Office is managing and they are essentially mapping the reservation looking for exploration targets

Also ran into a very large I.P. Truck which operators said belonged to mining company they wouldn't identify.

ASARCO

Southwestern Exploration Division

April 6, 1978

TO: F. T. Graybeal

FROM: J. D. Sell

Possible Papago Policies
Papago Indian Reservation
Pima and Pinal Counties, AZ

In conversations with a number of U.S.G.S. and U.S.B.M. personnel in the past few months, the following appears to be the thrust of the Papago program:

(1) A general-to-detailed reconnaissance of the geology of the entire reservation with detailed evaluation of mineralized areas. This has been in progress for several years. Age-dating is one phase.

(2) A general geophysical program of the pediments with special emphasis off the known mineralized areas. Seismic is being run in an attempt to delineate bedrock pediments as well as deeper basin configuration (as an aid to understanding the water potential) (sic).

(3) The claim situation is again being rectified by an evaluation of valuable, marketability of mineral. To date only a few claim owners have come forth to argue the point and only one(?) brought samples and a lawyer with him. The Indians are proceeding on the premise that if you are not mining and selling at a profit, then the claims are null and void. They expect to have nearly all the land back under their direction within the next several years which is being held by non-patented claims.

(4) The Indians are now inquiring how they might secure the patented claims and one way is by stricter control on access and road use tax, etc.

(5) They also have put out feelers to the U.S.B.M. (& others?) to drill a number of holes throughout the reservation. Water testing is the motive mentioned but mineral evaluation is known to have priority. (One group mentioned that since Asarco was going to drill on the NE corner of the reservation, then they could spend their money elsewhere because they would get the drilling information upon completion of the program.)

James D. Sell

James D. Sell

JDS:lb

ASARCO

Southwestern Exploration Division

May 1, 1978

TO: F. T. Graybeal

FROM: J. D. Sell

Comments--Papago Policies
Papago Indian Reservation
Pima and Pinal Counties, AZ

On April 18-19, I travelled with Dr. Donald W. Peterson, U.S.G.S. Menlo Park, to the Globe area where Don was the guest speaker (Hawaiian Volcanoes) at the Pinal Mountain Section AIME meeting.

Don is presently mapping the volcanics, mainly in the western half, of the Papago Indian Reservation. Some comments and verificiation items follow:

(1) The pre-volcanic mapping is nearly complete. After P. Blacet dropped out of the project mapping, the U.S.G.S. tossed in every available man onto the project in order to complete the necessary quadrangles by January 1, 1977, as was scheduled under the USGS-BIA-Papago Indian contract. This was accomplished in time and essentially covers the eastern half of the reservation.

(2) One such map is the MF-769, Reconnaissance Geologic Map of the San Vicente and Cocoraque Butte 15-minute quadrangle (Keith, 1976) (1:62,500). With the rush of mapping and the vast number of geologists involved in this phase it will be of interest to see the quality and validity of the product.

(3) Only one pre-volcanic geologist (Gordon Haxell[sp]) is now on the project and he is cleaning up some details, doing some follow-up on mineralized areas, and working the west half along with Don. Apparently Gordon is a very competent structural-mineral investigator type.

(4) Although only Don and Gordon, with an assistant each, are left to do the mapping, it seems that no strings are attached to the expenditures as to age dates, assaying, and helicopter time.

(5) The Indians wanted a "private" report and maps but the U.S.G.S. said No. The mapping will probably be continued to be published as the MF-series reconnaissance format.

(6) The final map and report are yet to be determined but will probably be compiled as 1:125,000 scale (instead of the 1:250,000 scale that the San Carlos Indian Reservation map (Bulletin 1027-N, by Bromfield, 1956). Don has not thought far enough down the road as to the production of the AMS 1°X2° coverage but felt the work would be recompiled from this coverage.

(7) The geochemists (and Howard McCarthy, Denver, chief-in-charge specifically) are the big pushers toward exploration and have been trying to coordinate the geophysics and the geologic follow-up into areas of mineral interest.

McCarthy has also called for a meeting of all participants for early May and this will involve the USBM and the NURE people as well. Both Gordon and Don are "too busy" to attend the meeting as they will terminate their work around May 15th. Privately Don believes the meeting is strictly addressing the problem of follow-up mineral exploration and feels that the U.S.G.S. should not get involved in this end of the business. He does feel that they should supply what data they can accumulate but not go after specific targets of mineral potential.

(8) The Indians have asked the U.S. Bureau of Mines to conduct drilling programs for them.

(9) When I asked Don if he thought the U.S.G.S. is or would be going into the mineral exploration end of things his immediate reaction was No. However, when I confronted him with some points to the contrary, he modified his thoughts to say that he was unaware of any official directive being handed down to do such, but that yes, some people within the Survey were asking and receiving funds to do limited drilling.

(10) Don did agree that Federal Agencies could probably get by with drilling in areas which have essentially been withdrawn from the private sector exploration, such as wilderness areas, administrative Forest Service areas, Indian reservations, etc.

James D. Sell

James D. Sell

JDS:lb

FROM: W. L. KURTZ

To: TCO/RLB

The enclosed memo by Sell on the Papago – USGS work again points up the fact that the USGS is becoming more involved in actual mineral exploration — rather than just providing basic data.

FTG
cc. JDS
JCBalla with memo

ASARCO

Southwestern Exploration Division

October 20, 1978

FILE MEMO

USBM Funded Drilling
Papago Indian Reservation
<u>Pima & Pinal Counties, Ariz.</u>

Wallaby Enterprises of Tucson, Arizona (Rich Lundin) has landed a $207,000 contract with the U.S. Bureau of Mines to follow up the USGS-USBM study of the Papago Indian Reservation. The contract is for a Class 3 Survey and may include examination, geochemistry, geophysics, and mapping as well as drilling. Rich says that most will be put into drilling of at least seven sites. The first is a scheduled 1500-foot test north of the Roadside Mine in the "native copper in epidote" andesites of the Silver Bell type.

As noted in the Newsletter attached to the Wallaby Enterprises file memo, the group funded Mr. Bill Hirt on a thesis (U of A) entitled "Native Copper Mineralization in the Silver Bell Andesite at Las Guijas, Pima County, Arizona."

James D. Sell
James D. Sell

JDS:1b

FTG had note which said drill rig just SW of Silver Bell
now drilling or getting ready 11/1/78.

ASARCO

Southwestern Exploration Division

October 20, 1978

FILE MEMO

Wallaby Enterprises
R. J. Lundin
Arizona General

Rich Lundin was in last week to bring to my attention several of his projects, which will be mentioned in separate memos, i.e., Papago Indian Reservation and silver at the Alabandite Group, Cochise County.

Attached with this memo are his Newsletter of October 13, 1978, his 1978 Price List, the Data Base Sources (June 17, 1975), and the Data Base Availability (July 1, 1978), plus an Arizona map showing completed districts (50) and districts in progress (20). As shown, much of southern Arizona is completed or will be within the next year and he plans on completing the State within the next several years.

He has completed several special projects including the "Mazatzal" for the government, which he says will put the expanded Wilderness proposal in limbo and leave the area open for exploration. Another project is the "Western Arizona" completed for the Department of Defense.

Rich presently has a $207,000 USBM grant for study, evaluation, and drilling of at least seven areas of the Papago Indian Reservation (see separate memo).

James D. Sell

James D. Sell

JDS:lb
Atts.

WALLABY ENTERPRISES

3425 W. BARDOT STREET, TUCSON, AZ 85704

Residence and Office
Ph. (602) 744-1722

R. J. LUNDIN
Mineral Exploration Consultant
and Archaeologist

October 13,1978

Mr. James Sell
ASARCO Inc.

Dear Jim:

A lot has happened here at Wallaby since our last newsletter of June, 1977. During this period, we have successfully completed two major government projects; one for the U.S. Bureau of Mines and one for the Department of the Army, Corps of Engineers. In addition, we have completed 12 Mining District Data Bases in our ongoing project of examination, evaluation, and documentation of the mineral resources of Arizona.

In October of 1977, I gave a paper at the fall meeting and exhibition of AIME. The paper was well received, and, I understand, is now out of print. The paper outlined the need for increased use of literature research in the exploration process, and how our particular programs have proved useful to our clients. I have enclosed a copy of this paper for those of you that may have missed it.

This paper, and our government projects, brought Wallaby Enterprises into national and international attention. Articles on our organization and it's activities appeared in the Washington Post, Phoenix Republic, Engineering and Mining Journal, Mining Engineering, and Paydirt. As a result of this, we have received inquiries about our services from as far away as Botswana, France, and England.

As a result of current trends in industry, we have been seeking more work from the government in the form of projects that allow us input in the decision making process as to what government lands have mineral potential. We think that this is extremely important if we are to have a viable mineral industry in the 1980's. It is thought that the industry is not effectively combatting those protectionist forces that currently have so much influence in the government. What it all boils down to is that the mineral industry has very few advocates in government and it is not spending enough money to combat the well organized and "well-heeled" environmental protectionist effort to influence public opinion and sway government policy. It is our thought that our efforts might be a way by which the government can obtain the other side of the story. This approach has proven to be partially effective, in that, our recommendations that large areas of the Mazatzal Wilderness remain open to mineral entry pending intensive U.S.B.M. and U.S.G.S. studies in the area have been followed.

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Currently, we are negotiating for $356,000.00 in contracts with the Offices of Wilderness Management and Mineral Studies of the U.S.B.M. In addition, we have been selected as a part of a proposed team of consultants that will advise the Secretary of the Interior on matters relating to issues in the "hard rock" mineral industry. We hope that these efforts will bear fruit and that we can aid in turning the conservationist tide that is currently running so strong in government.

Wallaby has not been idle close to home and has been active in mineral research and development. Towards this end, we have funded Mr. William Hirt's thesis in Geological Engineering from the University of Arizona. Mr. Hirt's thesis, "Native Copper Mineralization in the Silver Bell Andesite at Las Guijas, Pima County, Arizona" was done as part of Wallaby's ongoing program to look for low sulphur copper resources. A paper on this topic is planned for the February meeting of the Arizona Geological Society. Mr. Hirt will be joining our staff this fall and will bring to our organization additional talents in Geological Engineering and Metallurgy, both areas where he has graduate degrees and considerable experience.

A new program that we have recently instituted is our Commerce Business Daily Mining Abstract Service. This program has proven very useful to our consulting, construction, research, and educational institution clients in obtaining government contracts.

Our Combined Surveys and Comprehensive Drilling Programs have gained industry-wide acceptance and are now being seriously considered for extensive use in industry and government.

We have successfully completed projects for 27 major mining and consulting firms and 3 government agencies. If you have a project in mind or any information for our Mining District Data Base Program, feel free to give me a call at 602-744-1722.

Sincerely,

Richard J. Lundin
Wallaby Enterprises

P.S. Please find enclosed information on our current programs and activities

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R. J. LUNDIN
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and Archaeologist

1978 Price List

(Effective January 15, 1978)

I. Personnel:

Geological Evaluation & Exploration Work:

A. Senior Technical Personnel	$15.00/hr.*
B. Junior Technical Personnel	10.00/hr.*
C. Non-technical Personnel	7.50/hr.*

Archaeological Examination & Evaluation Work:

A. Senior Technical Personnel	$15.00/hr.*
B. Junior Technical Personnel	10.00/hr.*
C. Non-technical Personnel	7.50/hr.*

Land Acquisition Work:

A. Senior Technical Personnel	$15.00/hr.*
B. Junior Technical Personnel	10.00/hr.*
C. Non-technical Personnel	7.50/hr.*

Drafting Work:

$15.00/hr.

Library and Court House Research Work:

$15.00/hr.

Computer Programing Work:

$15.00/hr.

*Minimum 10 hour day, overtime rates will apply for over 10 hours in any given day

II. Other Charges:

Company vehicle: 25¢/mile (home base to home base)

Expenses for client's project to be charged to the client at actual cost

Per Diem: $30.00/day/person

Claim validation, drilling and geophysical work will be bid on an individual basis

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Tucson, Az. 85704

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R. J. LUNDIN
Mineral Exploration Consultant
and Archaeologist

June 17, 1975

Data Base Sources

When putting together a data base on a mining district, all sources of possible information on that area are carefully examined. This research procedure is carried out via a number of steps which are outlined below:

1. The general area of the district to be researched is located on one of the appropriate mining district compilation bases that are available from state, federal and private sources. Topographic and orthophotographic coverage of the area to be studied is then obtained.
2. Using the District Name, Names of the mines located on the topographic coverage of the area, quadrangle names, and the names of the various physical features in the area under study, a careful but preliminary search of the Bibliography of North American Geology 1848-present is done to obtain general works on the district and specific mines in the district.
3. Titles of theses & dissertations pertaining to the district are then located from an up-to-date series of maps of the southwest which show what theses have been done where by whom. These are then ordered from Interlibrary Loan and when obtained, checked for additional references.
4. A visit to the various Federal, State and County offices which deal in land matters is then done so as to ascertain the land situation in the district being studied and to expand the list of mining properties in the district.
5. With a preliminary bibliography and list of mining properties at hand, visits are then made to the various State and Federal agencies which might have additional file or private report data on the district. At this time, inquiries are made as to the aerial photo coverage of the district and from where it may be obtained.
6. Afinal check of the Bibliography of North American Geology 1848-present is made, checking all entries under the subheading "Arizona" for anything additional on the area or pertaining to the are under study.
7. A check of the various remote sensing indices is then made to find out what of this material is available for the area being studied. Order forms and acquisition information is obtained at the same time.
8. If the information thus obtained is not deemed sufficient by the compiler for productive exploration and evaluation of the area, then field examination of the properties and contacting of present and past claim holders might be warranted so as to fill in the holes in the compiled record.
9. All the information thus gathered is then copied and bound into loose-leaf binders which are the master copies. Clients receive exact duplicates of these masters which include topographic maps of the area under study.

It is hoped that this is the type of service which will be of value to our clients; as it allows much more of a geologist's time to be spent in the field doing the job he is being paid to do. Namely, finding ore deposits. We, here at Wallaby use it to that end.

Richard Lundin

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and Archaeologist

Data Base Availability

July 1, 1978

District	Map Ref. No.	Number of Volumes	Status
Santa Rosa	195	1	Available
Casa Grande & Silver Reef	202 & 225	6	Available
Cimmarron	51	1	Available
Quijotoa & Horshoe Basin	172 & 103	2	Available
Comobabi	31	3	Available
Cedar Valley	42	3	Available
Maynard	124	2	Available
Aquarius	8	1	Available
Bagdad (Eureka)	72	7	Available
Baboquivari	14	3	Available
Cerro Colorado	44	3	Available
Las Guijas	113	3	Available
Oro Blanco	146	7	Available
Arivaca	10	3	Available
Pajarito	151	2	Available
Camp Wood	33	1	Available
Coyote	59	2	Available
Papago (Sierrita)	153	5	Available
Roskruge	186	3	Available
Waterman	234	3	Available
Silverbell	200	8	Available
Gunsight	92	3	Available
Ajo	4	9	Available
Growler	91	2	Available
Quitobaquito	173	1	Available
Montezuma	136	2	Available
Agua Dulce	1	1	Available
Amole	6	10	Available
Redington	175	3	Available
Rincon	181	3	Available
Canada del Oro	35	2	Available
Catalina	40	3	Available
Old Hat	149	6	Available
Teviston	212	11	Available
Dos Cabezas	63	11	Available
California	32	8	Available

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District	Map Ref. No.	Number of Volumes	Status
Empire	71	5	Available
Greaterville	87	9	Available
Old Baldy	144	5	Available
Payson	88	4	Available
Mazatzal Mtns.	125	3	Available
Sunflower	208	4	Available
Lone Star	114	8	Available
Clark	52	2	Available
Gila River	79	2	Available
Mohawk	135	2	Available
La Posa (Wellton)	111	3	Available
Fortuna	76	3	Available
Muggins	138	3	Available
Plomosa	169	3	Available
Rosemont	185	?	Being Compiled
Helvetia	102	?	Being Compiled
Pima	162	?	Being Compiled
Squaw Peak	204	?	Being Compiled
Bloody Basin	25	?	Being Compiled
Squaw Creek	205	?	Being Compiled
Magazine	120	?	Being Compiled
Camp Creek	41	?	Being Compiled
Webb	235	?	Being Compiled
Neversweat	140	?	Being Compiled
Tank Mtns.	211	?	Being Compiled
Alamo	5	?	Being Compiled
Sheep Tanks	197	?	Being Compiled
Castle Dome	39	?	Being Compiled
Silver (Eureka)	199	?	Being Compiled
Trigo Mtns. (Cibola)	218	?	Being Compiled
Laguna (Las Flores)	112	?	Being Compiled
Yuma	246	?	Being Compiled
Dome	62	?	Being Compiled
Eagletail	67	?	Being Compiled

District Data Bases will be available upon completion for the cost of $100.00/ volume/Mining District. (e.g. a typical 4 volume set will cost $400.00)

This price includes the updating of the material at the client's request from material in Wallaby Enterprises' files.

Allow from 4-6 weeks for delivery of available District Data Bases.

~~FIG~~ → RBC 1/10/80
Papago Res.

Addison Smith called & asked if we would be interested in Reviewing the Geological, Geochemical & Geophysical work completed on the Reservation. Bill Lundby will be in town next week & he could arrange meeting. Work has not been published, and is stored in Denver. He mentioned Ag & Au geochem anomalies.

Yes we are interested

cc: JDS ✓
WLK

FTG-JDS

1/28/80
Papago Res

Bill Lundby USGS
303-234-6161

Called back to Denver
prior proposed mtng w/ASARCO
re Papago Lands.

He is to Receive permission
from Addison Smith to Release
information to Certain Companies.
Lundby's office is close
to Doug Smith's - he may
contact Doug.

-RBC

I Alerted Doug.

Aa-16.0.16

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

June 19, 1969

TO: J.H. Courtright

FROM: R.D. Karvinen

Papago Central Project
Pima - Pinal Cos., Arizona

SUMMARY

On January 9, 1969, J.D. Sell suggested the above program, the purpose of which was to examine several attractive prospect areas in the Papago Indian Reservation in a manner to best utilize the time granted by permit from the B.I.A. Most of the geological field work commenced in mid-January and was essentially concluded in mid-March. This work was intermittent and was done by J.D. Sell, J.E. Kinnison, S.R. Davis, L.J. Jansen and R.D. Karvinen. The nature of the program was one of reconnaissance geology and extensive geochemical sampling. Detailed reports of the various areas are appended.

The south Slate Mountains were sampled to determine if any surficial indicators existed which could be used in locating wholly concealed mineral deposits, such as the newly discovered Lakeshore porphyry copper deposit. Evaluation of the data compiled to date shows a lack of surface indicators to the existence of the Lakeshore porphyry.

A very weakly altered area in the south Slates shows no definitive geochemical anomalism and to date the only geophysics response has been an aeromagnetic low.

A monzonite porphyry dike swarm in Laramide granite in the north Santa Rosa Mountains was mapped and sampled. A nebulous geochemical indication of enrichment trending to the northeast under alluvial cover did not have an I.P. response.

Reconnaissance peripheral to all but the east central portion of the Santa Rosas was negative, though some exotic copper mineralization was noted in the southwest sector. This was deemed insignificant by Kinnison. Minor clay alteration is noted in the southeast sector in the volcanics and granites that have subdued outcrops through the alluvium, but no indicators of mineralization were evident. The east central sector was not accessible and a helicopter flight there has yet to be programed.

The Sheridan - Drew Springs area in the Cimarron Mountains offered no indications of porphyry copper mineralization. The manganiferous deposits of the Drew Springs area were examined for possible zonal changes to argentiferous environments. Silver assays returned nil and no further work is warranted.

Weak alteration and moderate geochemical anomalism in the Greenback Mine area provided the best exploration target, but a complex and conflicting land and mineral ownership status precludes further work at this time.

The area between the Papago mine and the Copperosity mine has yet to be examined.

A copy of the Stebbins Mineral Survey report on the Papago Reservation was secured and is on file.

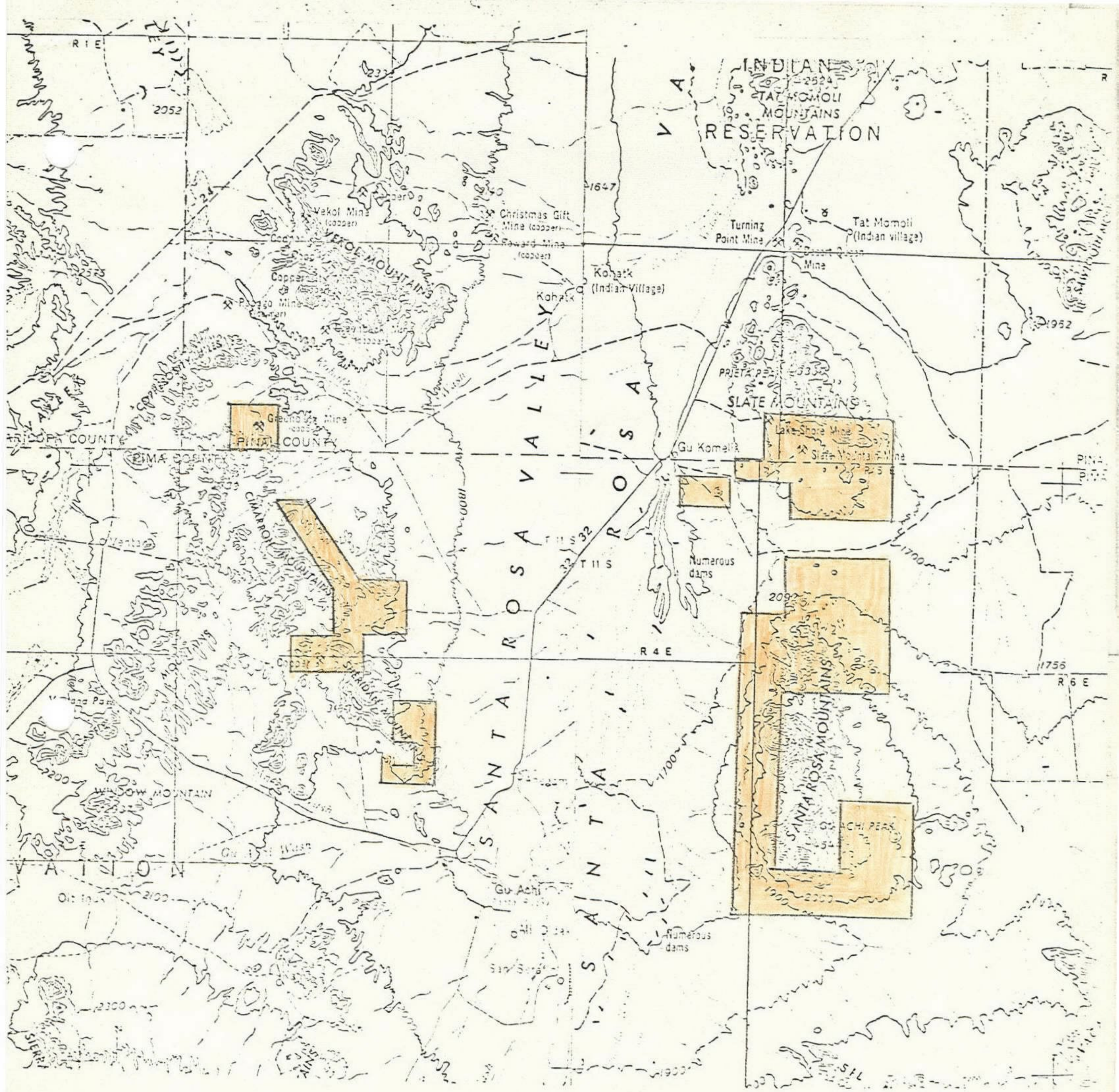
Some of the attachments are interim reports and memoranda that have been previously submitted, but are herein included to incorporate all project data into one package.

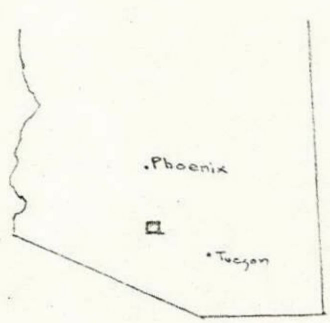
Only a minor portion of the total land area was examined and at least one of the sites (Greenback) merits continued surveillance.

RDKarvinen

R.D. Karvinen

RDK:lzb
Encl.





INDEX MAP

PAPAGO CENTRAL PROJECT

EXAMINED AREAS

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona
January 9, 1969

TO: J.H. Courtright

FROM: J.D. Sell

Papago Central Project
Pima-Pinal Counties, Arizona

The Papago Central Project is established to thoroughly check four areas near the Lakeshore area. The study will be reconnaissance geology coupled with extensive geochemical sampling and study of alluvial contact areas.

A fixed-wing reconnaissance on January 8, 1969, with R.D. Karvinen, indicated that most of the projected work can be accomplished without the involvement of a helicopter. Features noted and to be followed-up include:

1). The Tertiary intrusive granite exposed east of Lakeshore appears to plunge to the southeast and may extend under the surface rock units in this direction. From the air very little color effects are noted at the granite-schist contact zone.

2). On the north end of the Santa Rosa Mountains the banding or parallel dikes striking northeast are very evident and some workings have been placed along them. The area has a mottled color effect. Several other color zones were noted along the east side further south. On the southwest side a color zone has been ringed by a road system taking off from a new road constructed south from the village of Gu Komelik.

3). The Sheridan-Drew Springs area on the east side of the Cimarron Mountains is not impressive from the air. East of the Montazona Mine an intrusive granite is well exposed and also noted were numerous east-wes striking dikes from the granite. The east face of the long ridge northward from the Montazona Mine shows very little color whereas the basin area to the north on the west side of the ridge shows abundant but week color changes.

4). At the Greenback area the alteration-mineralization features are very poorly expressed from air observations. The middle of the valley to the north and northwest shows an increased brownish tone suggesting more pyritic values. The increased coloration to the northwest before passing under good volcanics may be from colored volcanic units rather than granitic rocks but all leads should be checked. Northeastward, across Kahatk Valley, in the basin northwest of the Copperosity Mine, the color tones are heavy oranges and brownish-reds in sedimentary units ranging from Precambrian to Cretaceous.

James D. Sell

JDS:ir
cc: RDKarvinen

Notice:

The ASARCO Prospecting Permit for working on the Papago Indian Reservation is number H54-10-66.

The permit is probably good through the middle of February 5, 1969.

Southern Slate Mountains

A study should be made in the area east and southeast of the Lakeshore property. The schist needs to be included as the sericite content might be misleading. Elsewhere the extension of the poorly mineralized tactite limestones, occurrence of pyrite in volcanic sediments of the Silver Bell type, and the southeast trending contact of the Lakeshore granite outcrop, suggest continued reconnaissance.

Silver Reef 15' Quad.
Santa Rosa Mountains 15' Quad.
Tucson AMS Sheet
Pinal County Geologic Map.
Pima County Geologic Map.

ASARCO Files 16A.19.8 House Group
ASARCO Files 16A.22.15 Lakeshore folders.
Lakeshore Copper deposits RI 4706 (1950).
Files of Bur. Ind. Affairs, Sells, Arizona on all work done by Hunting Group.
Spec. Collect of Map Library-U of A. All photos used by Hunting Group.
Recon. of the Casa Grande Mining Dist, by J.B. Tenney. (1934, C.G. Chamber of Commerce).

Others include:

USBM RI. 3975 . Exploration for lead-zinc--copper at Vekol (Reward).
ASARCO File Aa-16A.22.22 Vekol (Reward).
ASARCO File Aa-16A.10.18 Reward Mine. Newmont-New Jersey Results.

Santa Rosa Mountains

The range contains multiple intrusive types. It has a NE-trending quartz dike swarm w/minor copper reported on the northeast side. The range could be the offset portion from the Slate Mountains based on the concept of a regional fault going between the two.

Santa Rosa Mountains 15' Quad.
Tucson AMS Sheet
Pima County Geologic Map.

ASARCO Files 16A.3.3G. Copper Mountain Group.
ASARCO Files 16.17.0 Quijotoa District, general.
Files of BIA (See Southern Slate Mountains note).
Photo collection at U of A (See So. Slate Mtn note).

Cimarron Mountains (Sheridan Prospect).

On the east side, Blucher mapped part of an intrusive mass containing weak alteration features. With alluvium to the east and some late volcanic cover on the west, the edges should be carefully studied.

Gu Achi 15' Quad.
Ajo AMS Sheet
Pima County Geologic Map.

ASARCO Files As-16.19.20A. Sheridan District
Blucher's report, dated July 10, 1957, in above file.
ASARCO File Aa-16.3.H. Copper Union Mining Co. (So. of Drew Springs).
Files of BIA. (See So. Slate Mtn).
Photo Collection at U of A. (See So: Slate Mtn.)

Note: Drew Springs area is in the altered area zone, see Drew Springs reference section for items on manganese.

Copperosity (Greenback).

The property has been under study by El Paso Nat. Gas in recent years. It has also been drilled by several companies in the past but only low-grade values found. The alteration is weak and the dominant phase is silicification. During the helicopter program it was noted that an increase in color-alteration features was somewhat evident just before the exposed granite passed under volcanics on the Northwest side. Preliminary work also suggests that the volcanics are near the base of the post-mineral sequence.

Gu Achi 15' Quad.
Vekol Mtns. 15' Quad.
Ajo AMS Sheet
Pima County Geol. Map
Pinal County Geol Map
Maricopa Geol. Map.

ASARCO Files 16A.3.7B. Greenback Mining Company
ASARCO Files 16A.3.16A. Papago Mine.
ASARCO Files 16A.10.16 Pinal Grande Group.
RH Carpenters PhD thesis on Vekol Mtns (Stanford 1947)
J.B. Tenney Geol. Report of C.G. Mining Dist. (1934) in ASARCO file Aa-16A.3.0.

Drew Springs Manganese

In the southern part of the Cimarron Mtns. (Sheridan Prospect) area is a strong vein of high-grade manganese. Although no specific study has yet been made on the deposit, it is undoubtably a primary hypogene manganese deposit.

The limestones in the area are metamorphosed probably as a result of the nearby intrusive. Some study of the area is proposed to possibly gleam some thoughts on the possibility of a silver-area being present as suggested in Hewett's manganese barite-silver concept (USGS Circular 553).

Gu Achi 15' Quad.
Ajo AMS sheet
Pima County Geol Map.

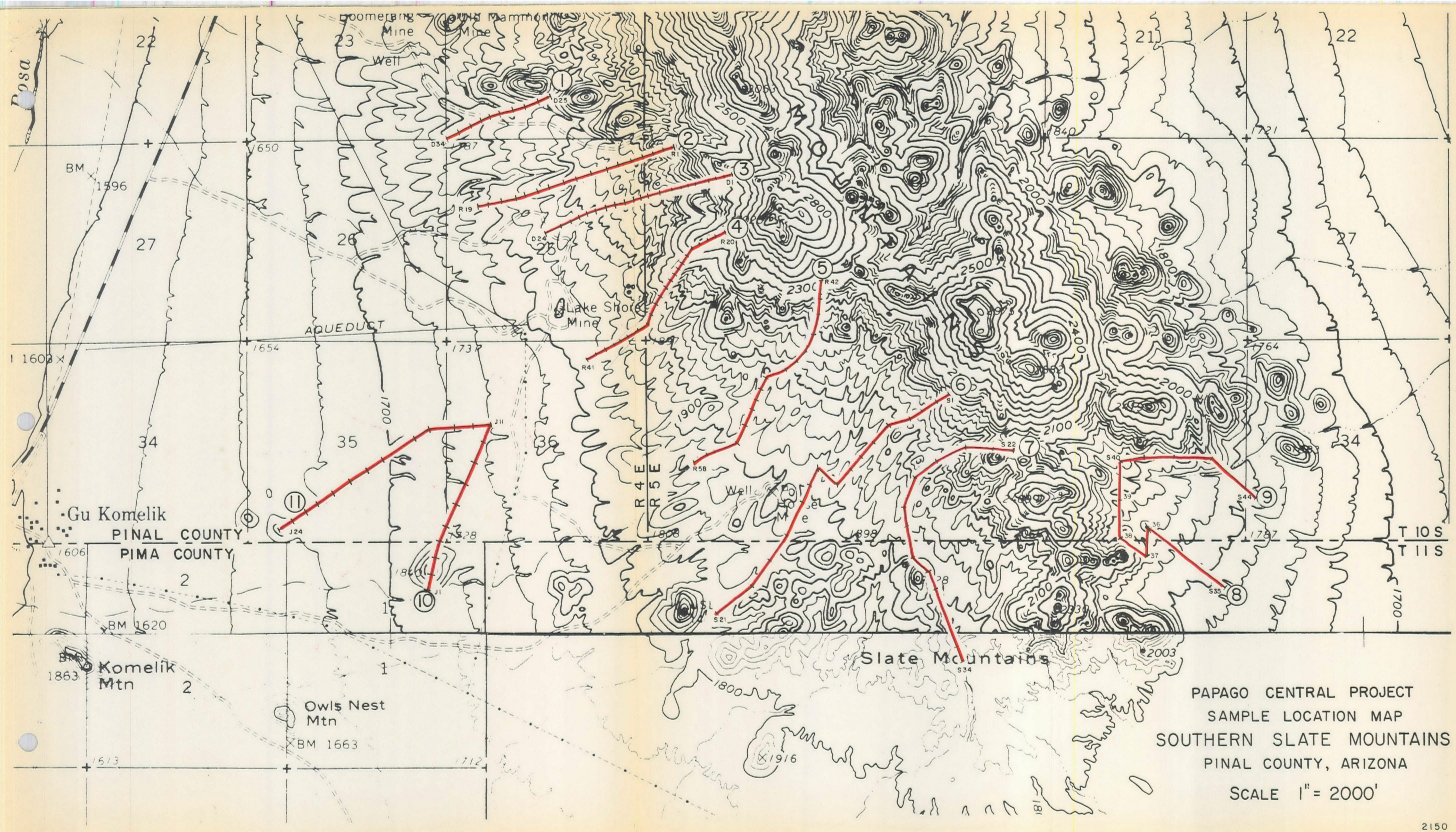
USGS Circular 553. Silver in Veins of Hypogene Manganese.
Oxide, by D.F. Hewett (1968).

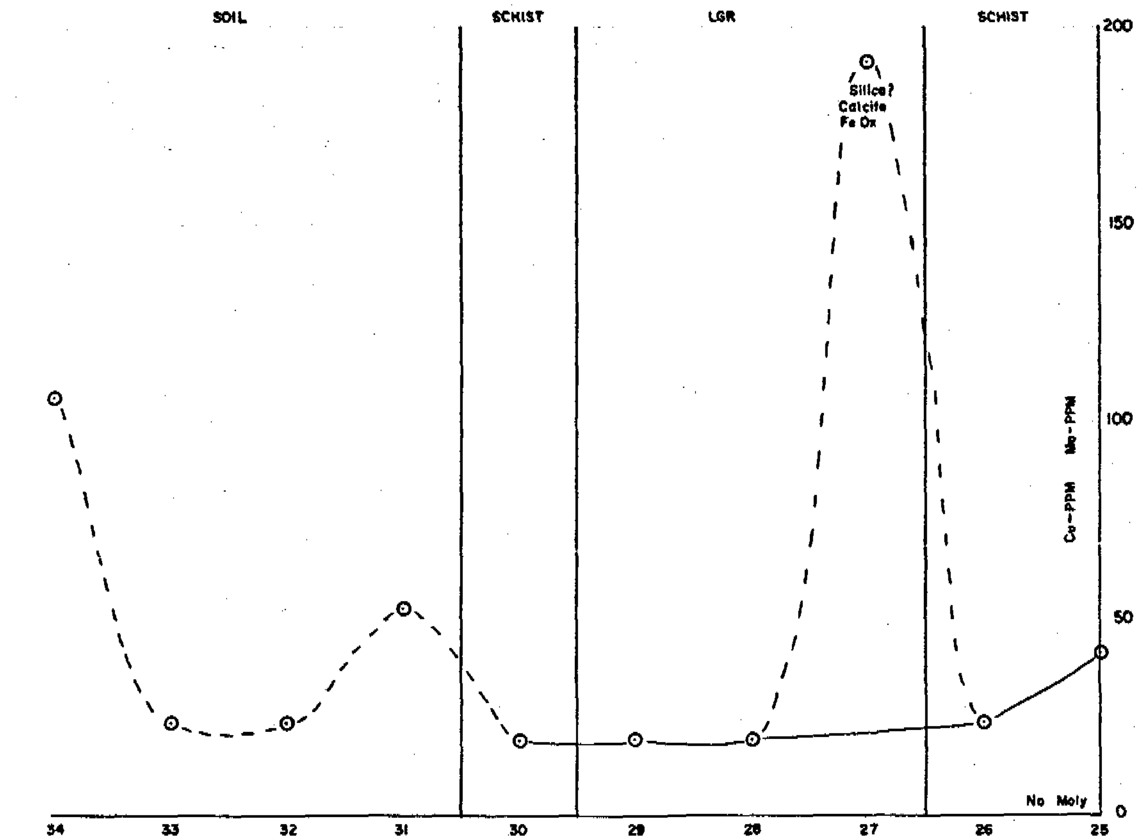
D.F. Hewett, Veins of Hypogene Manganese Oxide Minerals in the SW United States. Econ. Geol., Vol. 59, No. 8, p. 1429-1472 (1964)

D.F. Hewett. Deposits of the Manganese Oxides. Econ. Geol. vol. 55, no. 1, p. 1-55 (1960).

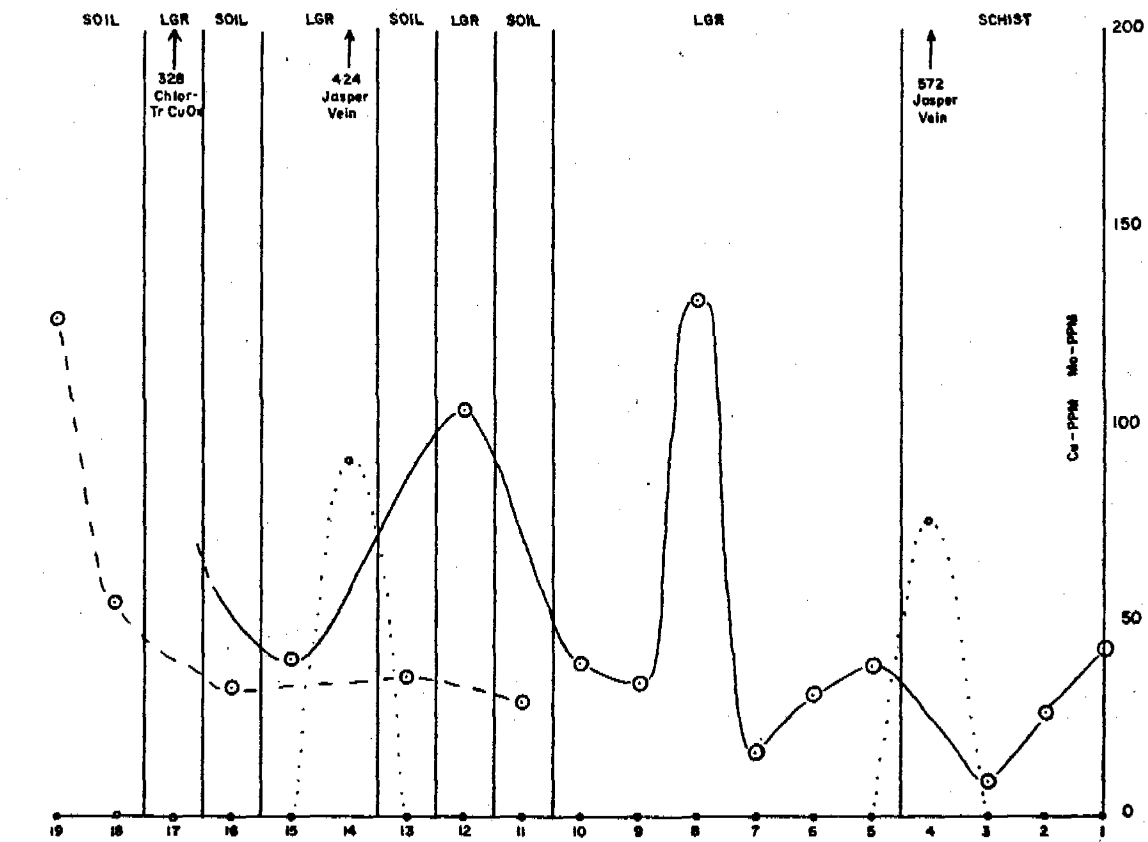
D.F. Hewett. Deposits of the Manganese Oxides _ A Supplement. Econ. Geol, vol. 58, no. 1, p. 1-51 (1963).

L.L. Farnham. Manganese deposits of Eastern Arizona. USBMIC 7990 (1961).


PAPAGO CENTRAL PROJECT
SAMPLE LOCATION MAP
SOUTHERN SLATE MOUNTAINS
PINAL COUNTY, ARIZONA
SCALE 1" = 2000'
Slate Mountains
Gu Komelik
PINAL COUNTY
PIMA COUNTY
Komelik Mtn
Owls Nest Mtn
BM 1663
BM 1620
BM 1596
Lake Shore Mine
Mine
Well
AQUEDUCT
R4E
R5E
T 10 S
T 11 S
Rosa
2150

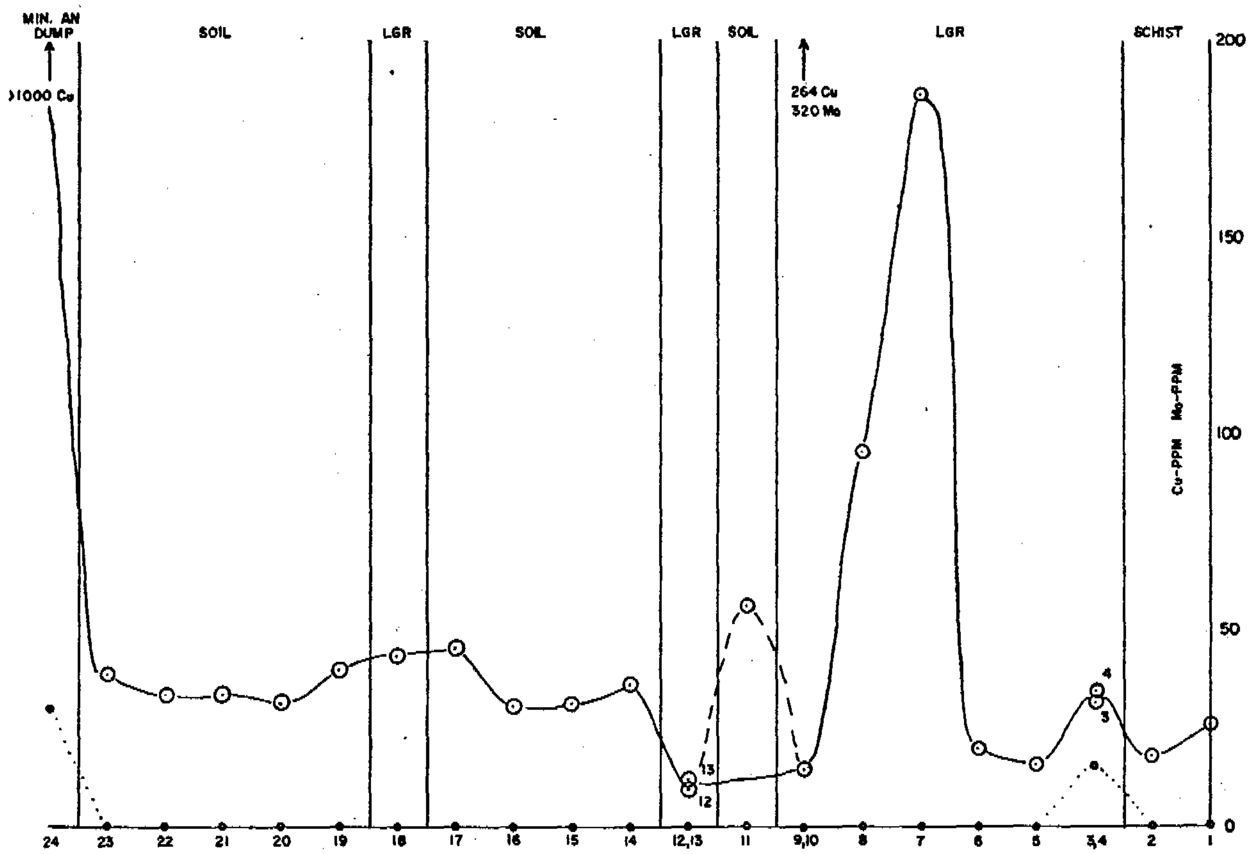


LINE NO. 1
Sample No's. (PC-DL)
looking Northwest



LINE NO. 2
Sample No's. (PC-RL)
looking Northwest

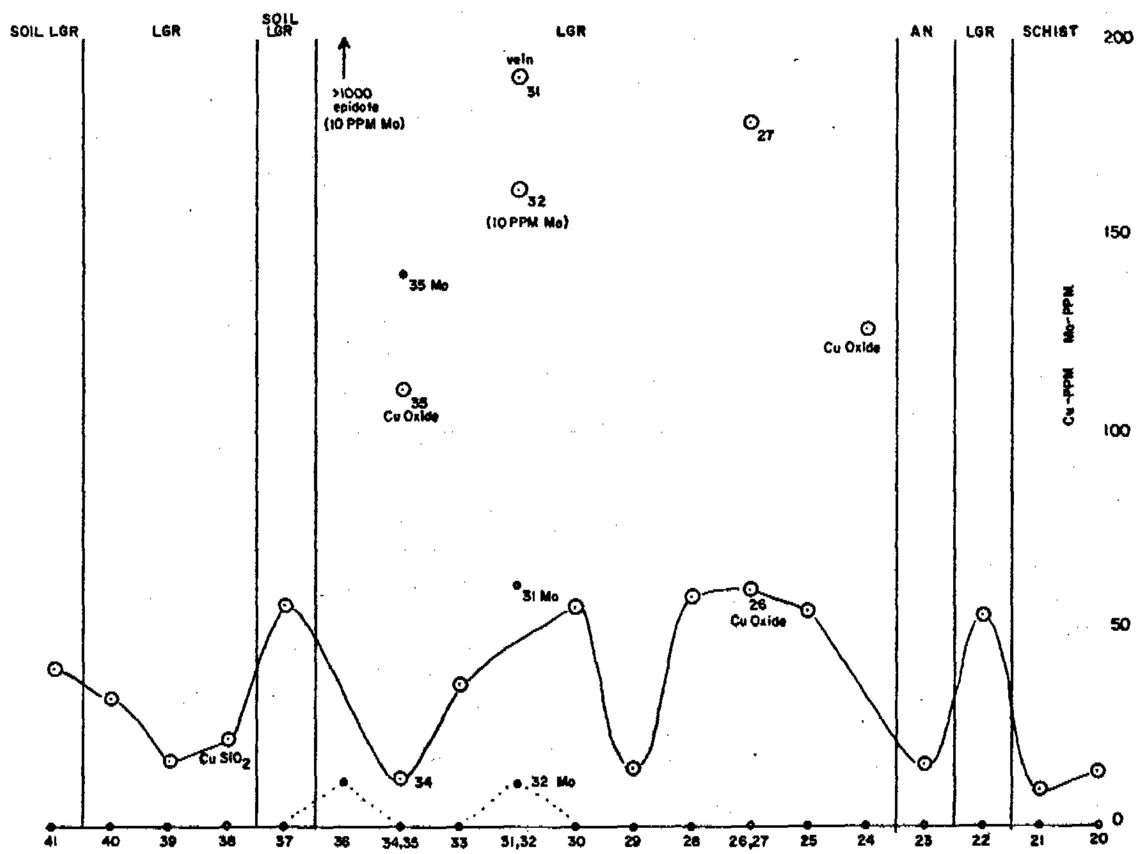
PAPAGO CENTRAL PROJECT
S. Slate Mtns. (Lakeshore)
NO HORIZONTAL SCALE



LINE NO. 3

Sample No's. (PC-DL)

looking Northwest



LINE NO. 4

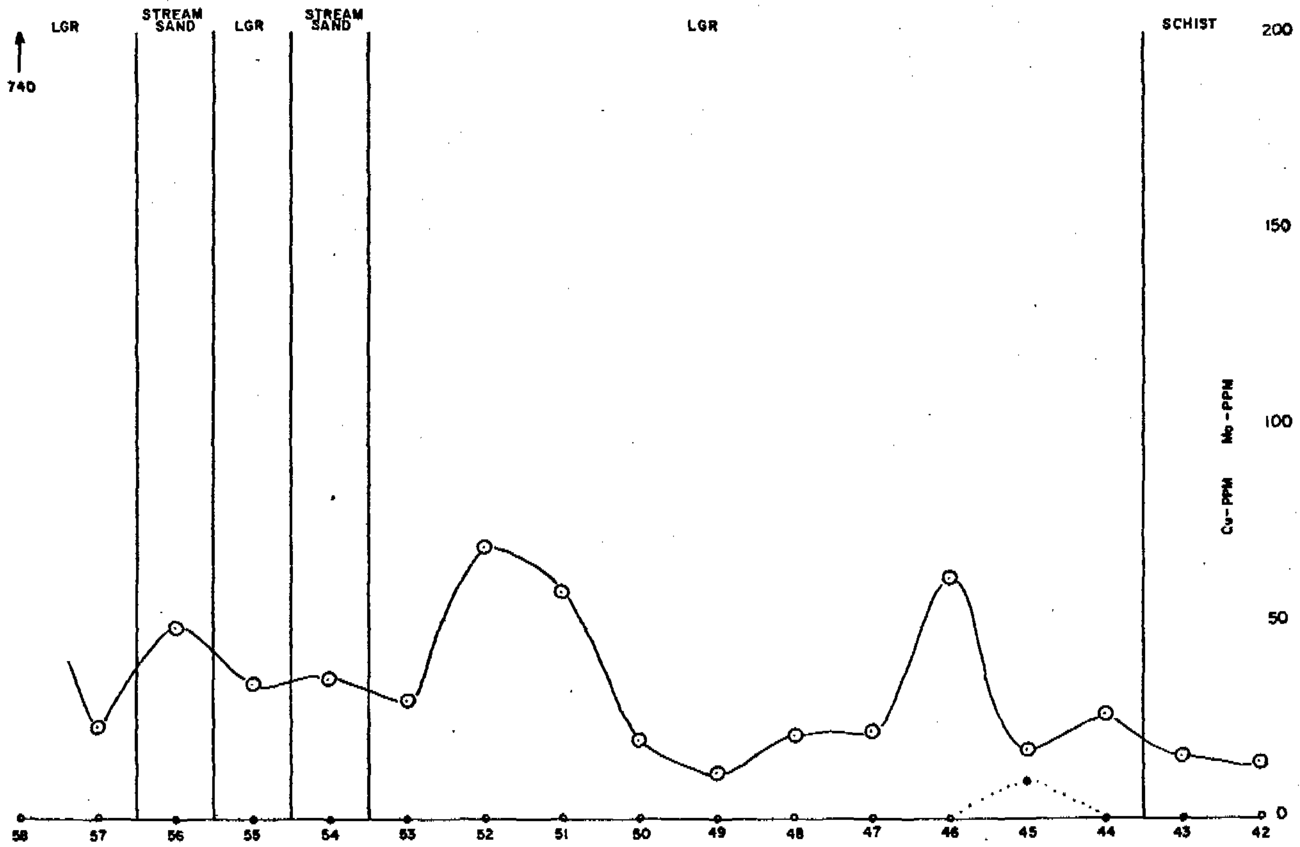
Sample No's. (PC-RL)

looking Northwest

PAPAGO CENTRAL PROJECT

S. Slate Mtns. (Lakeshore)

NO HORIZONTAL SCALE



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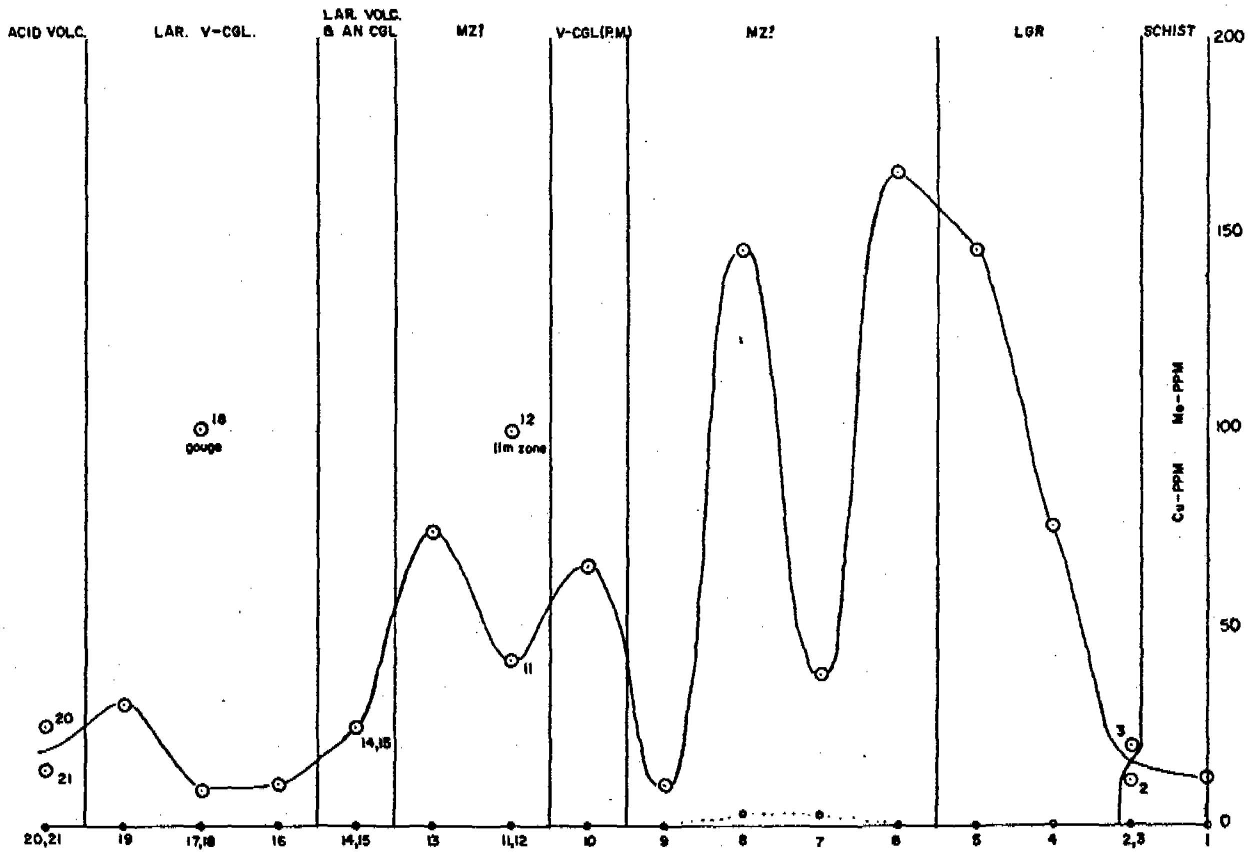
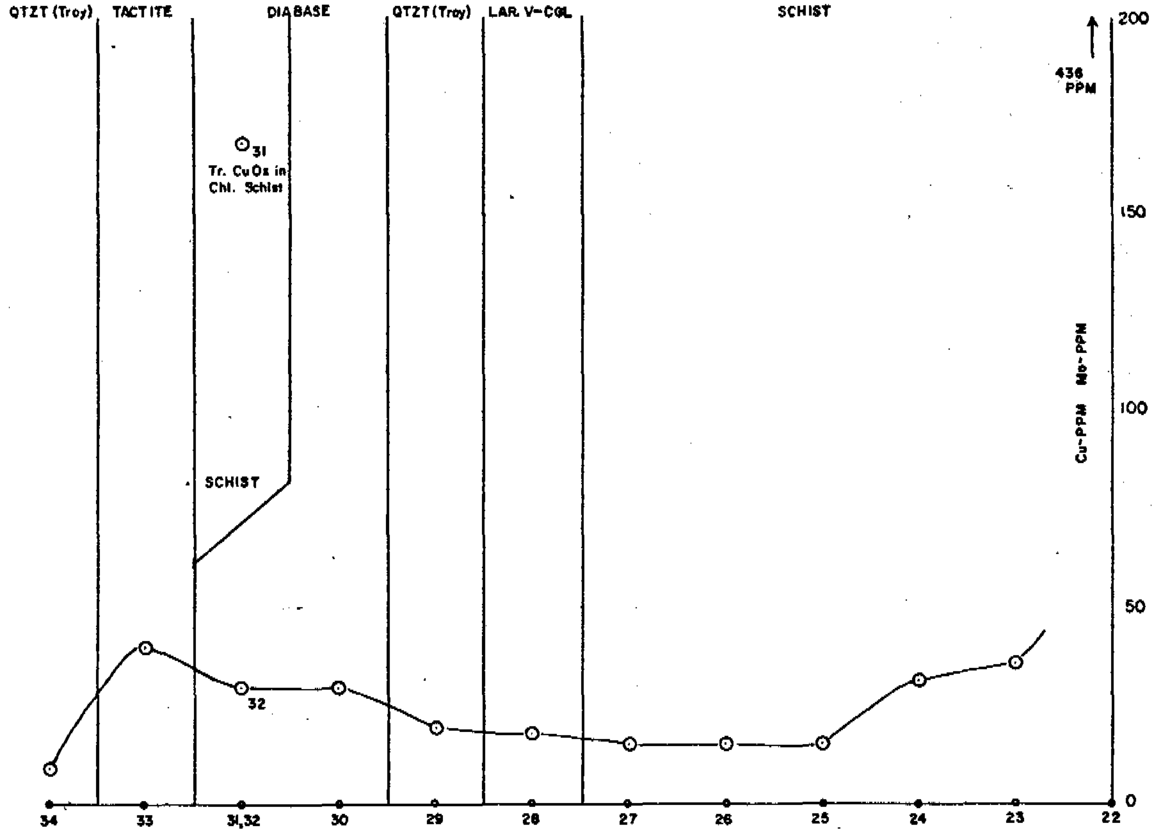
looking Northwest

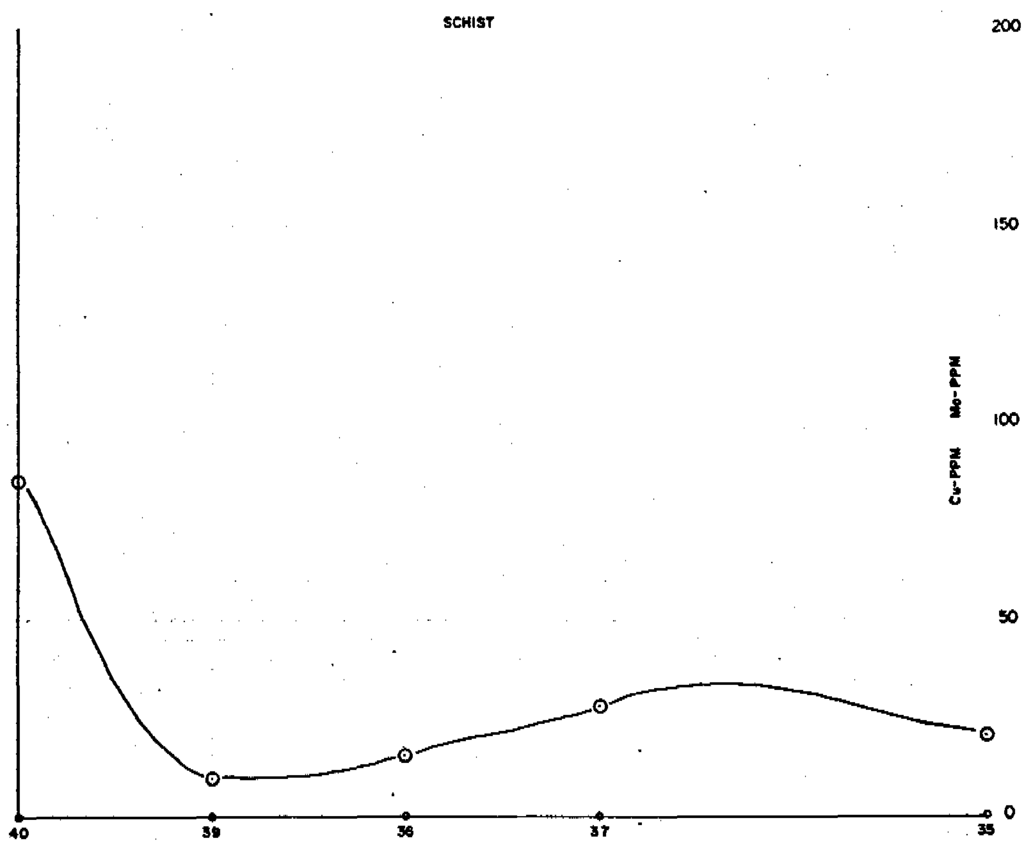


LINE NO. 6
Sample No's. (PC-SL)
looking Northwest

PAPAGO CENTRAL PROJECT
S. Slate Mtns. (Lakeshore)
NO HORIZONTAL SCALE

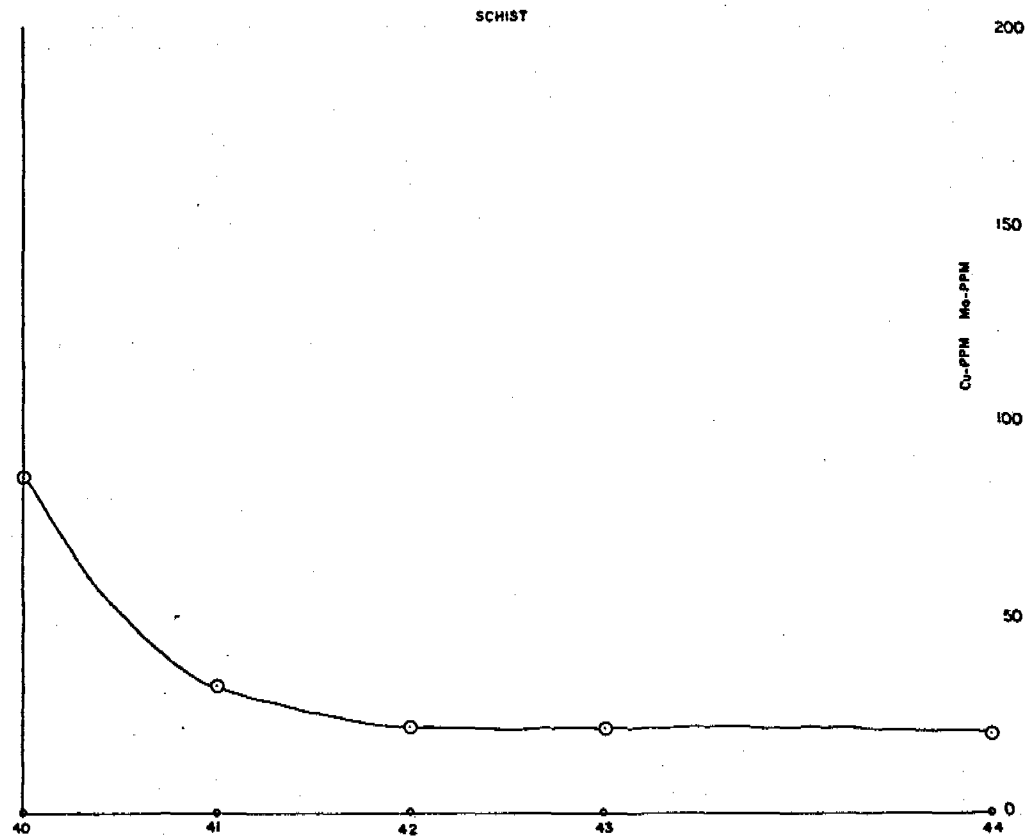


LINE NO. 7
Sample No's. (PC-SL)
looking Northwest

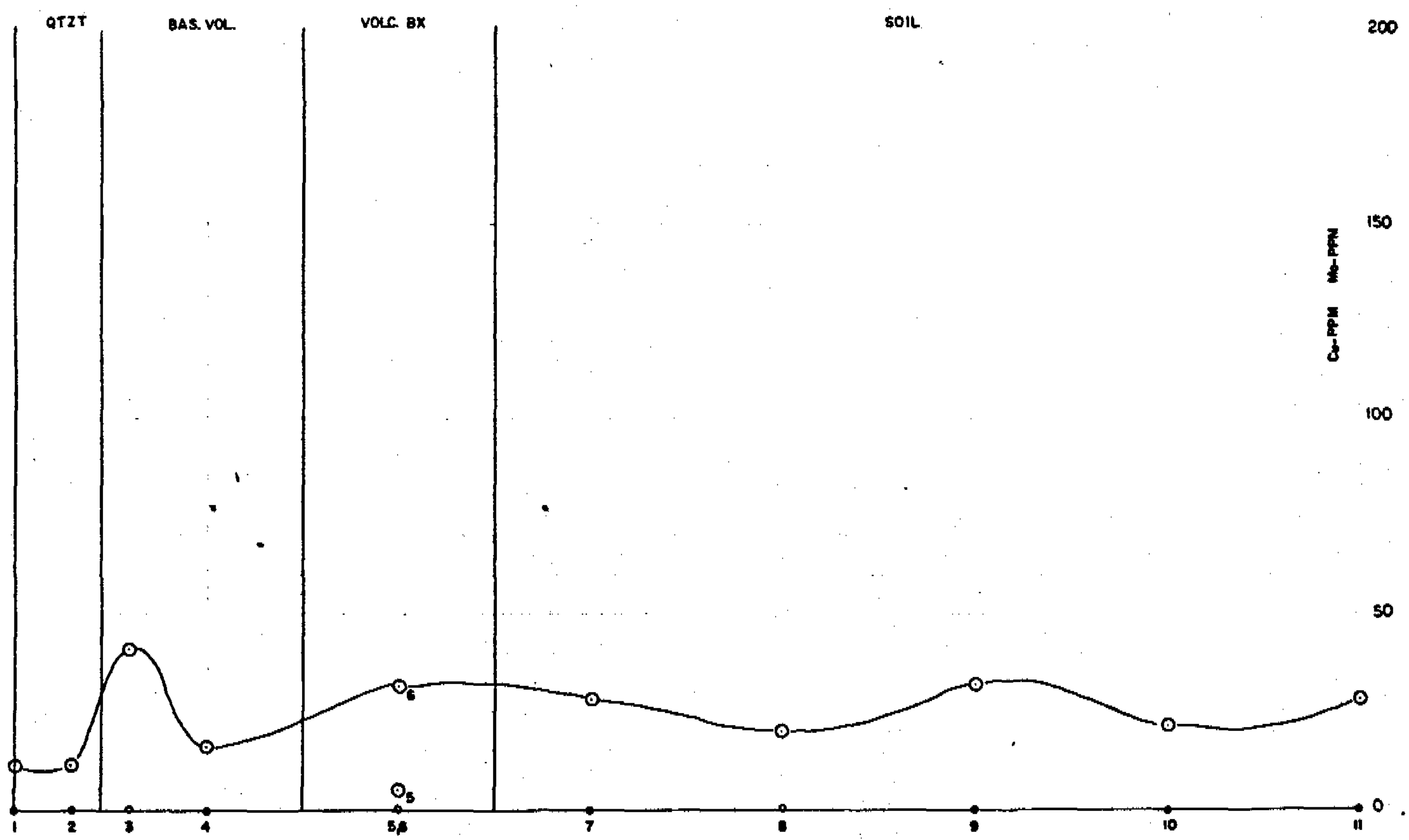


LINE NO. 8
Sample No's. (PC-SL)
looking North

PAPAGO CENTRAL PROJECT
S. Slate Mtns. (Lakeshore)
NO HORIZONTAL SCALE

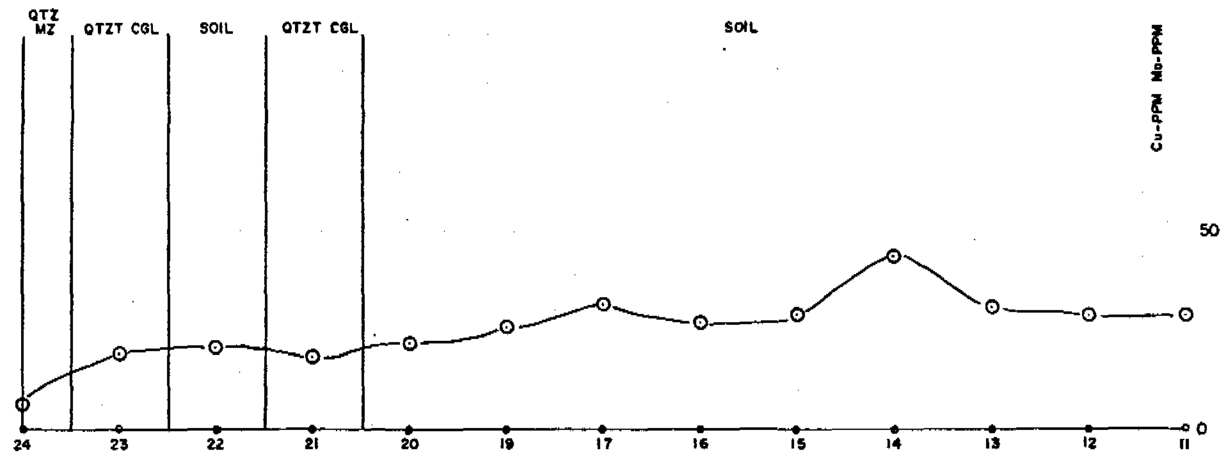


LINE NO. 9
Sample No's. (PC-SL)
looking North



LINE NO. 10
Sample No's. (PC-JL)
looking Northwest

PAPAGO CENTRAL PROJECT
S. Slate Mtns. (Lakeshore)
NO HORIZONTAL SCALE



LINE NO. 11
Sample No's. (PC–JL)
looking Northwest

PAPAGO CENTRAL PROJECT
S. Slate Mtns. (Lakeshore)
NO HORIZONTAL SCALE

Aa-16.2.0

J.H.C.

FEB 10 1969

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

February 7, 1969

TO: J.H. Courtright

FROM: R.D. Karvinen

Papago Central Project
Southern Slate Mountains
Summary Report

Geologic reconnaissance and geochem sampling was conducted in the subject area in mid-January with Asarco's J.D. Sell, J.E. Kinnison, S.R. Davis and L.J. Jansen.

Prime consideration was given to sampling of the rock exposures northeast of what is now the new porphyry copper deposit at Lakeshore. The intent of this work was to determine if any trace element analyses would indicate the existence of the Lakeshore ore body. Interpretation of the results must acknowledge the post-ore fault which terminates the ore body to the east and therefore clouds the spacial relationship of the sampled area when equated to its position at time of mineralization. Another factor to be considered is the distance (+½ mile) of nearest outcrops to the east edge of the ore zone.

Appended are maps and assay profiles of the sampled areas. The profiles are mostly on copper results, and as can be noted no discernible trend is indicated. Values shown at the same location but with differing results are the result of special sampling of some unique (limonite veinlets, epidote, etc.,) feature at or near a standard rock chip sample.

An assay-plan map is also appended and is so presented because of the random spacing of sample sites over the newly found alteration zone mentioned below.

At the south central extremity of the Slate Mountains, J.E. Kinnison discovered a zone of alteration and iron oxide concentrations which appear to have been derived from sulphide mineralization. A window of this zone is exposed for about 1000 feet N-S and 500 feet E-W. The host rock is thought to be Clafflin Ranch Conglomerate. Mineralization, if present, would be delimited to the north and the east where barren, unaltered sediments and volcanics are exposed. West and southwest of the exposure, the zone, if greater than in outcrop, could extend under alluvial cover and/or under the possible post-ore* volcanics which lie to the west.

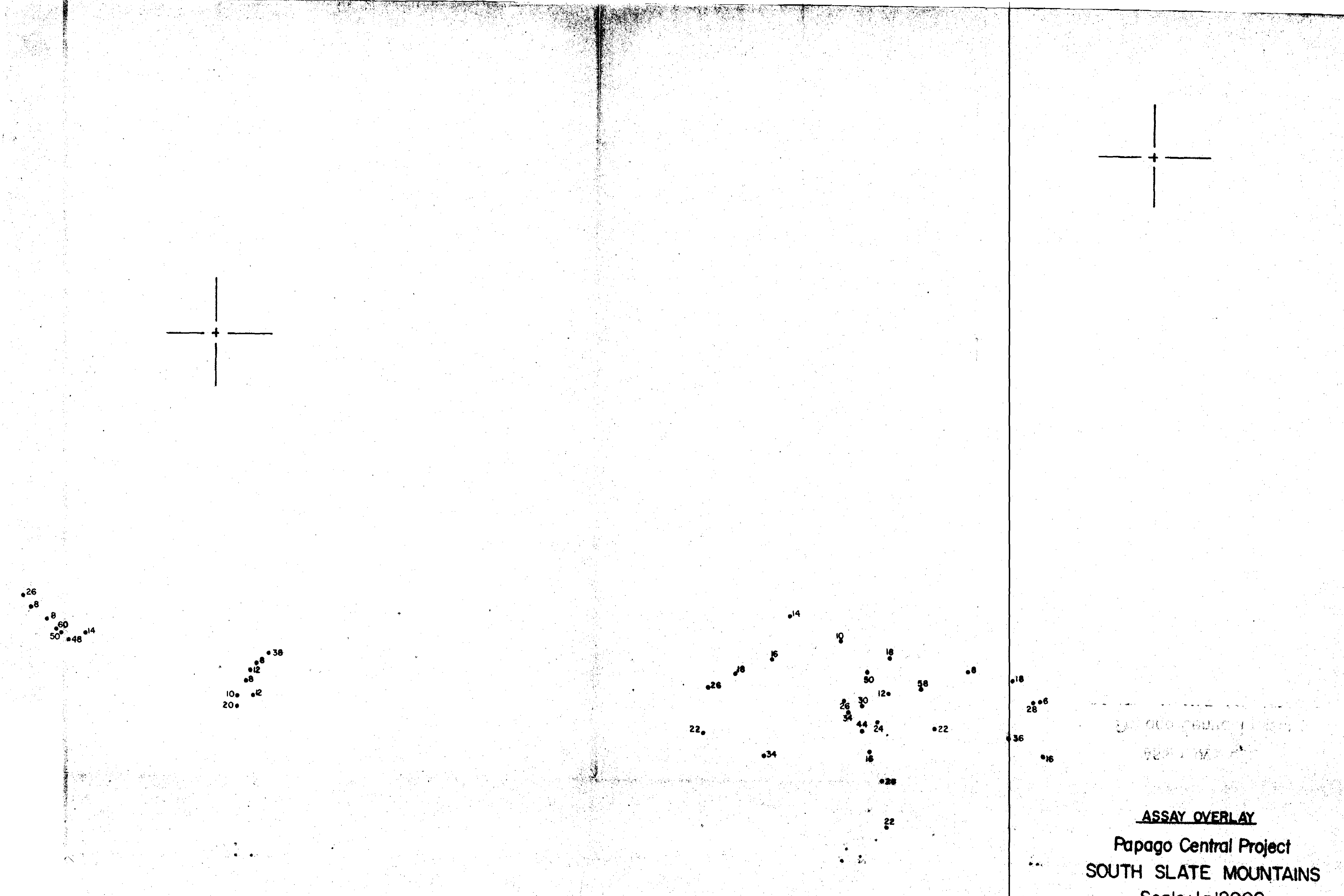
* Kinnison believes the unmineralized volcanics and conglomerates to the north and west are pre-ore.

Geochem results are not encouraging for this area, in that maximum Cu-Mo returns were 50 & 20 ppm, respectively, which is not much above background. Other negating features are 1) weak, spotty alteration and indicated low total sulphides; 2) lack of any copper staining, and 3)the limonites which appear to be derived only from pyrite. However, the possibility of this being a fringe area of a mineralized zone still exists and the covered area warrants some type of sub-surface exploration. Judging from the relatively poor assay showings, this prospect deems only second rate priority.

R.D. Karvinen

RDK:lzb
Encl.

cc: WESaegart
JEKinnison
JDSell



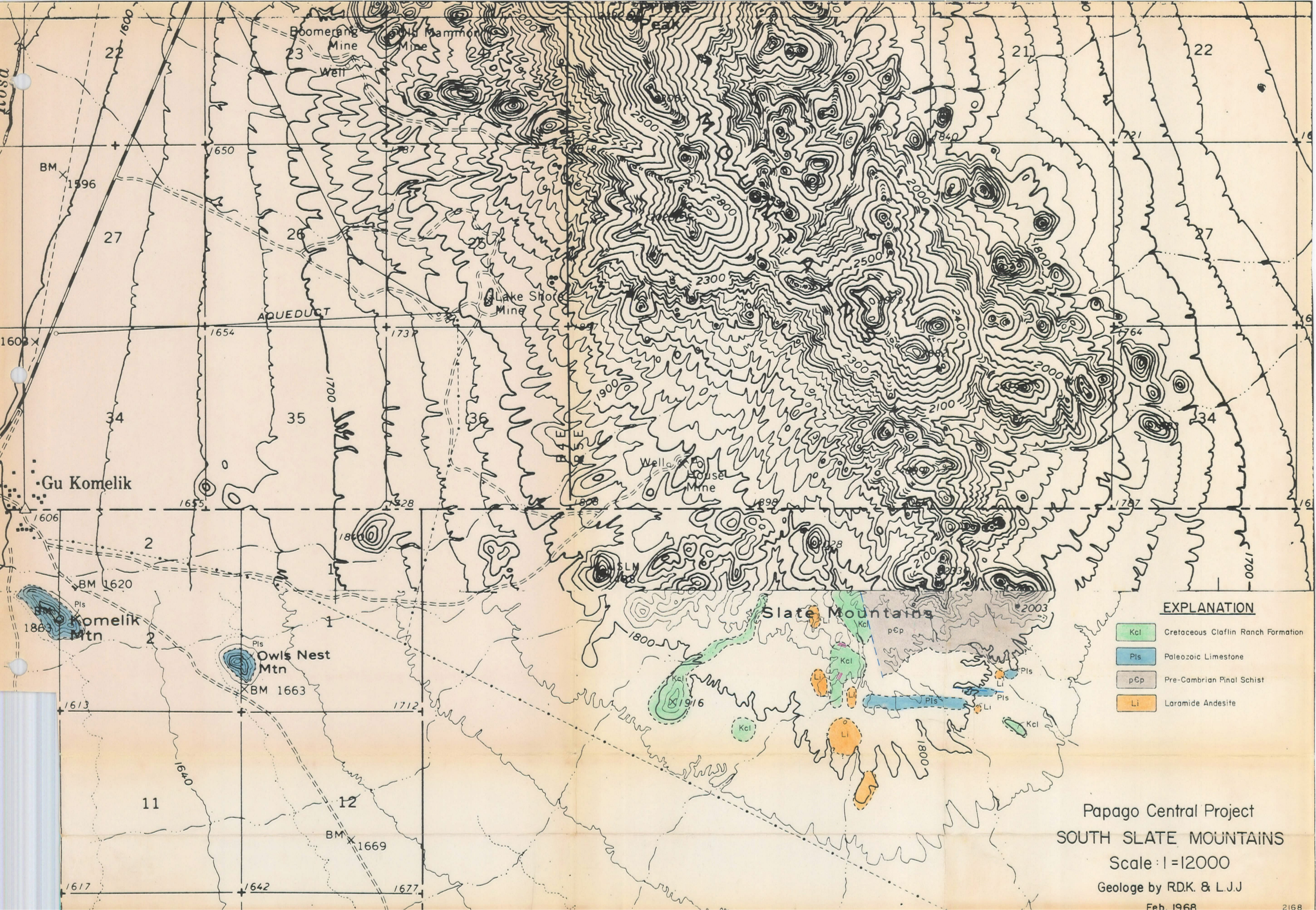
Note: Copper Assays in ppm

ASSAY OVERLAY

Papago Central Project

SOUTH SLATE MOUNTAINS

Scale: 1 = 12000


Boomerang Mine
Old Mammoth Mine
Well
Lake Shore Mine
AQUEDUCT
Gu Komelik
Well
House Mine
BM 1596
BM 1620
Komelik Mtn
Owls Nest Mtn
BM 1663
BM 1669
Slate Mountains
EXPLANATION
Kcl Cretaceous Claflin Ranch Formation
Pls Paleozoic Limestone
p€p Pre-Cambrian Pinal Schist
Li Laramide Andesite
Papago Central Project
SOUTH SLATE MOUNTAINS
Scale: 1 =12000
Geologe by R.D.K. & L.J.J
Feb. 1968
2168

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K.v.D.S.
FEB 20 1969

THE SOUTHWEST'S LEADING ASSAYERS AND REPRESENTATIVES

Branch Representatives at Buyer's Plants:
Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %
				ppm		ppm
PD-DR Series						
1				212		< 5
1S				338		< 5
1N				162		< 5
2				> 1000		< 5
3				> 1000		< 5
3S				> 1000		< 5
3N				242		< 5
4				180		< 5
4S				120		< 5
4N				116		< 5
5				80		< 5
5S				224		< 5
5N				134		< 5
7				126		< 5
8				> 1000		< 5
9				> 1000		< 5
10				152		< 5
11				238		< 5
12				202		< 5
13				86		< 5
14				582		< 5
15				52		< 5
16				> 1000		< 5
17				148		< 5
18				672		< 5

Pima [illegible]

CC: American Smelting & Refining Co.
Attn: Mr. Steven R. Davis
ADD: P. O. Box 5795
CITY: Tucson, Arizona 85703
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Branch Representatives at Buyer's Plants:
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IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %		
				ppm		ppm		
PD-DR Series								
19				100		< 5		
20				> 1000		< 5		
21				214		< 5		
22				> 1000		< 5		
23				212		< 5		
24				196		< 5		
25				48		< 5		
26				562		< 5		
27				50		< 5		
28				70		< 5		
29				54		< 5		
30				154		< 5		
31				52		< 5		
32				282		< 5		
33				60		< 5		
34				50		< 5		
35				16		< 5		
36				16		< 5		
37				22		< 5		
38				38		< 5		
39				38		< 5		
40				112		< 5		
41				92		< 5		
42				78		< 5		
43				92		< 5		

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IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %			
				ppm		ppm			
PD-DR Series									
44				154		< 5			
45				38		< 5			
46				92		< 5			
47				80		< 5			
48				82		< 5			
49				62		< 5			
50				80		< 5			
51				64		< 5			
52				100		< 5			
53				102		< 5			
54				98		< 5			
55				74		< 5			
56				762		< 5			
57				406		< 5			
58				114		< 5			
59				46		< 5			
60				56		< 5			
61				58		< 5			
62				56		< 5			
63				48		< 5			
64				50		< 5			
65				48		< 5			
66				48		< 5			
67				46		< 5			
68				44		< 5			

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Branch Representatives at Buyer's Plants:
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IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %		
				ppm		ppm		
PD-DR Series								
69				712		< 5		
70				76		< 5		
71				52		< 5		
72				46		< 5		
73				562		< 5		
74				54		< 5		
75				62		< 5		
76				362		< 5		
77				> 1000		< 5		
78				> 1000		< 5		
79				82		< 5		
80				84		< 5		
81				108		< 5		
82				32		< 5		
83				46		< 5		

90 samples crushed, split, Pulverized @ .85	76.50
90 Geochem Cu @ 1.00 = 90.00 - 18% discount	73.80
90 Geochem Mo @ 1.50 = 135.00 - 18% discount	110.70
	261.00

CC: American Smelting & Refining Co.
ADD: Attn: Mr. Steven R. Davis
CITY: P. O. Box 5795
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Analysis Cert. By H. C. Richard

Preparation $ 76.50
Analysis $ 184.50

ACC: AMERICAN SMELTING & REFINING CO | Date Spl. Received 2/14/69 | Date Compl. 2/19/68 | TUC 342367 | $ 261.00

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ASSAYERS AND CHEMISTS, INC.
1700 W. GRANT RD. • BOX 5934 • 622-4836
TUCSON, ARIZONA 85703

BRANCHES: DOUGLAS, ARIZONA; HAYDEN, ARIZONA; EL PASO, TEXAS; AMARILLO, TEXAS

IDENTIFICATION	GOLD OZS	SILVER OZS	LEAD %	COPPER %	ZINC %	MO. %	IRON %		
				ppm		ppm		Research Spectrograph	
GR Cgl Composite PC - RL 81, 83, 71, 68 PC - KL 8, 9, 10, 11, 12	None	None		34		< 5		**	

9 samples composited @ .20 — 1.80
1 Verified Au & Ag — 6.50
1 Geochem Cu — 1.00
1 Geochem Mo — 1.50
** to follow — 10.80

CC: American Smelting & Refining Company
ADD: P. O. Box 5795
CITY: Tucson, Arizona 85703
ADD: Attn: Mr. R. D. Karvinen
CITY:

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Geochem
Verified

ANALYSIS CERT. BY

Compositing 1.80
PREPARATION $
ANALYSIS $ 9.00

ACC: AMERICAN SMELTING & REFINING CO - TUC | DATE SPL. RECEIVED 1/24/69 | DATE COMPL 1/31/69 | TUC 342153 | $ 10.80

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THE SOUTHWEST'S LEADING ASSAYERS AND REPRESENTATIVES

Branch Representatives at Buyer's Plants:
Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %		
				ppm		ppm		
PC - RL 1				42		< 5		
PC - RL 2				26		< 5		
PC - RL 3				8		< 5		
PC - RL 4				572		75		
PC - RL 5				38		< 5		
PC - RL 6				30		< 5		
PC - RL 7				16		< 5		
PC - RL 8				132		< 5		
PC - RL 9				34		< 5		
PC - RL 10				38		< 5		
PC - RL 11				28		< 5		
PC - RL 12				104		< 5		
PC - RL 13				36		< 5		
PC - RL 14				424		90		
PC - RL 15				40		< 5		
PC - RL 16				34		< 5		
PC - RL 17				328		5		
PC - RL 18				54		< 5		
PC - RL 19				126		< 5		
PC - RL 20				14		< 5		
PC - RL 21				10		< 5		
PC - RL 22				54		< 5		
PC - RL 23				16		< 5		
PC - RL 24				126		< 5		
PC - RL 25				54		< 5		
PC - RL 26				60		< 5		

CC: American Smelting & Refining Company
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IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %		
				ppm		ppm		
PC - RL 27				178		< 5		
PC - RL 28				58		< 5		
PC - RL 29				14		< 5		
PC - RL 30				56		< 5		
PC - RL 31				190		60		
PC - RL 32				162		10		
PC - RL 33				36		< 5		
PC - RL 34				12		< 5		
PC - RL 35				110		140		
PC - RL 36				> 1000		10		
PC - RL 37				56		< 5		
PC - RL 38				22		< 5		
PC - RL 39				16		< 5		
PC - RL 40				32		< 5		
PC - RL 41				40		< 5		
PC - RL 42				14		< 5		
PC - RL 43				16		< 5		
PC - RL 44				26		< 5		
PC - RL 45				18		10		
PC - RL 46				62		< 5		
PC - RL 47				22		< 5		
PC - RL 48				22		< 5		
PC - RL 49				12		< 5		
PC - RL 50				20		< 5		
PC - RL 51				58		< 5		
PC - RL 52				68		< 5		

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Branch Representatives at Buyer's Plants:
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IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %		
				ppm		ppm		
PC - RL 53				30		< 5		
PC - RL 54				36		< 5		
PC - RL 55				34		< 5		
PC - RL 56				48		< 5		
PC - RL 57				24		< 5		
PC - RL 58				740		< 5		
PC - RL 59				16		< 5		
PC - RL 60				28		< 5		
PC - RL 61				22		< 5		
PC - RL 62				442		15		
PC - RL 63				22		< 5		
PC - RL 64				18		< 5		
PC - RL 65				8		5		
PC - RL 66				58		< 5		
PC - RL 67				56		< 5		
PC - RL 68				24		< 5		
PC - RL 69				12		< 5		
PC - RL 70				18		< 5		
PC - RL 71				44		< 5		
PC - RL 72				34		< 5		
PC - RL 73				22		< 5		
PC - RL 74				26		< 5		
PC - RL 75				18		< 5		
PC - RL 76				34		< 5		
PC - RL 77				26		5		
PC - RL 78				16		< 5		

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Branch Representatives at Buyer's Plants:

Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %		
				ppm		ppm		
PC - RL 79				14		< 5		
PC - RL 80				10		< 5		
PC - RL 81				50		< 5		
PC - RL 82				30		20		
PC - RL 83				106		< 5		
PC - RL 84				8		< 5		
PC - RL 85				12		< 5		
PC - RL 86				8		15		
PC - RL 87				12		< 5		
PC - RL 88				10		< 5		
PC - RL 89				20		< 5		
PC - RL 90				38		< 5		
PC - RL 91				14		< 5		
PC - RL 92				48		< 5		
PC - RL 93				50		< 5		
PC - RL 94				60		< 5		
PC - RL 95				8		< 5		
PC - RL 96				8		< 5		
PC - RL 97				26		< 5		
PC - RL 98				84		< 5		
PC - RL 99				36		< 5		
PC - RL 100				16		< 5		
PC - RL 101				28		< 5		
PC - RL 102				6		< 5		
PC - SL 1				12		< 5		
PC - SL 2				12		< 5		

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Branch Representatives at Buyer's Plants:
Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %			
				ppm		ppm			
PC - SL 3				20		< 5			
PC - SL 4				76		< 5			
PC - SL 5				146		< 5			
PC - SL 6				166		< 5			
PC - SL 7				38		5			
PC - SL 8				146		5			
PC - SL 9				10		< 5			
PC - SL 10				66		< 5			
PC - SL 11				42		< 5			
PC - SL 12				100		< 5			
PC - SL 13				74		< 5			
PC - SL 14				24		< 5			
PC - SL 15				24		< 5			
PC - SL 16				10		< 5			
PC - SL 17				8		< 5			
PC - SL 18				100		< 5			
PC - SL 19				30		< 5			
PC - SL 20				24		< 5			
PC - SL 21				14		< 5			
PC - SL 22				436		< 5			
PC - SL 23				36		< 5			
PC - SL 24				32		< 5			
PC - SL 25				16		< 5			
PC - SL 26				16		< 5			
PC - SL 27				16		< 5			
PC - SL 28				18		< 5			

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IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %		
				ppm		ppm		
PC - SL 29				20		< 5		
PC - SL 30				30		< 5		
PC - SL 31				168		< 5		
PC - SL 32				30		< 5		
PC - SL 33				40		< 5		
PC - SL 34				10		< 5		
PC - SL 35				22		< 5		
PC - SL 36				16		< 5		
PC - SL 37				28		< 5		
PC - SL 38				22		< 5		
PC - SL 39				10		< 5		
PC - SL 40				86		< 5		
PC - SL 41				32		< 5		
PC - SL 42				22		< 5		
PC - SL 43				22		< 5		
PC - SL 44				22		< 5		
PC - DL 1				26		< 5		
PC - DL 2				18		< 5		
PC - DL 3				32		15		
PC - DL 4				34		< 5		
PC - DL 5				16		< 5		
PC - DL 6				20		< 5		
PC - DL 7				186		< 5		
PC - DL 8				96		< 5		
PC - DL 9				264		320		
PC - DL 10				14		< 5		

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THE SOUTHWEST'S LEADING ASSAYERS AND REPRESENTATIVES

Branch Representatives at Buyer's Plants:
Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %		
				ppm		ppm		
PC - DL 11				56		< 5		
PC - DL 12				20		< 5		
PC - DL 13				22		< 5		
PC - DL 14				36		< 5		
PC - DL 15				32		< 5		
PC - DL 16				32		< 5		
PC - DL 17				46		< 5		
PC - DL 18				44		< 5		
PC - DL 19				40		< 5		
PC - DL 20				32		< 5		
PC - DL 21				34		< 5		
PC - DL 22				34		< 5		
PC - DL 23				38		< 5		
PC - DL 24				> 1000		30		
PC - DL 25				42		< 5		
PC - DL 26				24		< 5		
PC - DL 27				192		< 5		
PC - DL 28				18		< 5		
PC - DL 29				18		< 5		
PC - DL 30				18		< 5		
PC - DL 31				52		< 5		
PC - DL 32				24		< 5		
PC - DL 33				24		< 5		
PC - DL 34				106		< 5		
PC - JL 1				12		< 5		
PC - JL 2				12		< 5		

CC:
ADD:
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CITY:

REMARKS:

Geochem
Page 7

Analysis Cert. By

Preparation $
Analysis $
$

ACC:
AMERICAN SMELTING & REFINING CO -TUC

Date Spl. Received 1/24/69

Date Compl. 1/29/69

TUC 342151

HAWLEY & HAWLEY
Registered Assayers
HAWLEY & HAWLEY SINCE 1914

HAWLEY & HAWLEY

ASSAYERS AND CHEMISTS, INC.

1700 WEST GRANT ROAD - TELEPHONE 622-4836 - POST OFFICE BOX 5934

TUCSON, ARIZONA 85703

THE SOUTHWEST'S LEADING ASSAYERS AND REPRESENTATIVES

Branch Representatives at Buyer's Plants:
Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %		
				ppm		ppm		
PC - JL 3				42		< 5		
PC - JL 4				16		< 5		
PC - JL 5				6		< 5		
PC - JL 6				32		< 5		
PC - JL 7				28		< 5		
PC - JL 8				20		< 5		
PC - JL 9				32		< 5		
PC - JL 10				22		< 5		
PC - JL 11				28		< 5		
PC - JL 12				28		< 5		
PC - JL 13				30		< 5		
PC - JL 14				44		< 5		
PC - JL 15				28		< 5		
PC - JL 16				26		< 5		
PC - JL 17				30		< 5		
PC - JL 18	No sample							
PC - JL 19				24		< 5		
PC - JL 20				22		< 5		
PC - JL 21				18		< 5		
PC - JL 22				20		< 5		
PC - JL 23				18		< 5		
PC - JL 24				6		< 5		
PC - JL 25				86		< 5		
PC - JL 26				10		< 5		
PC - JL 27				12		< 5		
PC - JL 28				18		< 5		

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REMARKS:
Geochem
Page 8

Analysis Cert. By

Preparation $
Analysis $
$

ACC: AMERICAN SMELTING & REFINING CO -TUC

Date Spl. Received 1/24/69

Date Compl. 1/29/69

TUC 342151

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ASSAYERS AND CHEMISTS, INC.

Registered Assayers

1700 WEST GRANT ROAD - TELEPHONE 622-4836 - POST OFFICE BOX 5934

TUCSON, ARIZONA 85703

THE SOUTHWEST'S LEADING ASSAYERS AND REPRESENTATIVES

Branch Representatives at Buyer's Plants:
Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %			
				ppm		ppm			
PC - JL 29				30		< 5			
PC - JL 30				26		< 5			
PC - KL 1				8		< 5			
PC - KL 2				8		< 5			
PC - KL 3				16		< 5			
PC - KL 4				38		< 5			
PC - KL 5				12		< 5			
PC - KL 6				22		< 5			
PC - KL 7				22		< 5			
PC - KL 8				16		< 5			
PC - KL 9				16		< 5			
PC - KL 10				48		< 5			
PC - KL 11				8		< 5			
PC - KL 12				30		< 5			
PC - KL 13				16		< 5			
PC - KL 14				54		< 5			
PC - KL 15				36		< 5			
PC - KL 16				66		< 5			
PC - KL 17				44		< 5			
PC - KL 18				18		< 5			
PC - KL 19				16		< 5			
PC - KL 20				10		< 5			

CC:
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CITY:

REMARKS:
Geochem
Page 9

Analysis Cert. By

Preparation $
Analysis $
$

ACC: AMERICAN SMELTING & REFINING CO -TUC

Date Spl. Received 1/24/69

Date Compl. 1/29/69

TUC 342151

HAWLEY & HAWLEY
Registered Assayers

HAWLEY & HAWLEY

ASSAYERS AND CHEMISTS, INC.

1700 WEST GRANT ROAD - TELEPHONE 622-4836 - POST OFFICE BOX 5934

TUCSON, ARIZONA 85703

THE SOUTHWEST'S LEADING ASSAYERS AND REPRESENTATIVES

Branch Representatives at Buyer's Plants:
Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %	Research Spectrograph
				ppm		ppm	
Granite Composite PC - SL 4, 5 PC - DL 5, 6, 7, 8 27, 28, 29 PC - RL 5 thru 10 25 thur 20 44 thur 53	None	None		50		< 5	**
Schist Composite PC - RL 1, 2, 20, 21, 42, 43 PC - SL 1, 2, 26, 27, PC - DL 1, 2, 25, 26	None	None		16		< 5	**

** to follow

229 samples pulverized @ .60 = 137.40	137.40
45 samples composited @ .20 = 9.00	9.00
231 Geochem Cu @ 1.00 = 231.00 - 30% discount	161.70
231 Geochem Mo @ 1.50 = 346.50 - 30% discount	242.55
2 Verified Au & Ag @ 6.50 = 13.00	13.00
	563.65

CC: American Smelting & Refining Company
ADD: P. O. Box 5795
CITY: Tucson, Arizona 85703
ADD: Attn: Mr. R. D. Karvinen
CITY:

REMARKS:
Geochem
Verified
Page 10
30% discount

Analysis Cert. By H.C. Ford

Cmpositing	9.00
Preparation $	137.40
Analysis $	417.25

ACC:	Date Spl. Received	Date Compl.		$
AMERICAN SMELTING & REFINING CO - TUC	1/24/69	1/31/69	TUC 342151	563.65

838-5939
870-3749

PACIFIC SPECTROCHEMICAL LABORATORY, INC.

CHEMICAL AND SPECTROGRAPHIC ANALYSIS

RESEARCH

2558 Overland Avenue

Los Angeles, California 90064

K.v.D.S.
FEB 18 1969

February 13, 1969

Report of semiquantitative spectrographic analysis of samples submitted by

Hawley & Hawley
P. O. Box 5934
Tucson, Arizona 85703

	342151-231 Granite Comp.	342151-232 Schist Comp.	342152 P-79(1000)	342153 CR Cgl Comp.
Silicon-	24.%	22.%	24.%	19.%
Aluminum-	8.9	11.	8.9	11.
Sodium-	4.4	2.9	5.2	3.9
Iron-	1.4	2.5	1.1	2.0
Magnesium-	1.0	1.2	0.75	1.1
Calcium-	2.1	0.40	0.55	3.1
Potassium-	11.	11.	10.	13.
Barium-	trace	trace	trace	trace
	less than 0.05-------------------------------------			
Titanium-	0.58	0.92	0.98	0.93
Lead-	not detected	trace	not detected--------	
	less than 0.01--------------------------------------			
Gallium-	0.0069	0.0082	0.0058	0.0082
Manganese-	0.074	0.068	0.031	0.036
Chromium-	0.0074	0.028	0.0082	0.018
Nickel-	0.0018	0.0068	0.00099	0.0014
Vanadium-	0.0089	0.012	0.011	0.012
Copper-	0.0080	0.0040	0.12	0.0058
Zirconium-	0.018	0.033	0.027	0.035
Cobalt-	0.0044	0.0079	not detected	0.015
			less than 0.001	
Ytterbium-	not detected	0.0078	not detected	trace
	less than 0.004		less than 0.004-----	
Rhenium-	not detected--------------------------------------			
	less than 0.005------------------------------------			
Strontium-	0.084	0.076	0.063	0.077

continued - Page 2.

K.V.
FEB 18 1969

February 13, 1969

Hawley & Hawley

342151-231, 342151-232, 342152, and 342153

Antimony-	not detected -	less than	0.008%	- all samples
Arsenic-	"	"	0.05	"
Beryllium-	"	"	0.0003	"
Bismuth-	"	"	0.001	"
Boron-	"	"	0.002	"
Cadmium-	"	"	0.006	"
Cesium-	"	"	0.20	"
Columbium-	"	"	0.02	"
Germanium-	"	"	0.003	"
Gold-	"	"	0.001	"
Hafnium-	"	"	0.05	"
Indium-	"	"	0.007	"
Lithium-	"	"	0.02	"
Mercury-	"	"	0.09	"
Molybdenum-	"	"	0.002	"
Platinum-	"	"	0.002	"
Phosphorus-	"	"	0.50	"
Ruthenium-	"	"	0.01	"
Rubidium-	"	"	0.20	"
Silver-	"	"	0.0001	"
Tantalum-	"	"	0.05	"
Tellurium-	"	"	0.04	"
Thallium-	"	"	0.10	"
Tin-	"	"	0.003	"
Tungsten-	"	"	0.05	"
Zinc-	"	"	0.03	"
Other Rare Earths-				nil

Respectfully submitted,

Hal W. Johnson

PACIFIC SPECTROCHEMICAL LABORATORY, INC.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

April 11, 1969

FILE MEMORANDUM

Papago Central Project
North Santa Rosa Mountains
Pima County, Arizona

SUMMARY AND RECOMMENDATIONS:

Reconnaissance geology and wide-spaced geochemical sampling have indicated a considerable zone of weak to moderate alteration and mineralization in the north Santa Rosa Mountains, 35 miles south of Casa Grande. The zone is approximately two square miles in area, being one mile northerly and two miles easterly.

Although not intense, the type and size of alteration could be the propylitic zone of a porphyry type deposit lying nearby but under cover. Extension of this zone under shallow cover appears best to the north and northeast. With the exception of a small topographic re-entrant to the northwest, the west face of the mountains appear to be bordered by a frontal fault with possibly deep alluvial cover.

Principal alteration products are chlorite, epidote and specularite. Sericite and clay alteration were also observed, but in very limited occurrences. Specularite occurs in the southern half of the zone with increasing amounts as the southern limit is approached. Ninety per cent of the weakly altered rock is granite, intruded by parallel northeast dikes of monzonite porphyry--generally very weakly altered. Pyrite was identified in only one area and there is generally little evidence to indicate the presence of sulfides. The iron staining at and near the surface seems to be transported.

Copper mineralization is principally chrysocolla, malachite and undetermined copper oxides. Rock chip assays ran as high as 0.56% Cu, with an average geochemical content of $\pm$400 ppm in the granite. (Background count in the granite is approximately 80 ppm, in the monzonite porphyry is approximately 50 ppm). Extension of the anomalous values appears best under alluvium to the north and east. Less mineralized granite lies on the south and west.

Probably the most beneficial means of further exploring this area would involve reconnaissance I.P. in the shallow areas to the north and northeast of the area of anomalous copper values and weak alteration. Pending results of the I.P., the area should be assigned a low priority.

SUMMARY OF WORK:

Investigation of the area was undertaken by L.J.Jansen and S.R.Davis on January 27, 1969. Geochemical sampling was carried out on January 28, 29 and 30 and after a review of the collected data, several additional samples were taken on February 12. Sample lines were spaced at approximately 1,500 to 2,000 feet and paralleled the northeast structure pattern. Samples were collected at 500 and 1,000 foot intervals.

Geochemical analyses were run by Hawley and Hawley of Tucson for copper and molybdenum. Attachment "A" is a contoured overlay showing copper values in ppm; solid contours represent Cu in granite, dashed contours are copper in soils. No molybdenum anomalies were found. Attachment "B" is a simplified geological map with control based on contours from the Santa Rosa Mountains 15' Quadrangle.

GEOLOGIC DESCRIPTION:

Area geology consists of a presumably Laramide, medium grained, granite stock, intruding Mesozoic sediments which are now metasediments, chiefly quartzite and quartzite pebble conglomerate. Later intrusive activity has injected monzonite porphyry dikes into what are presumably joint or fault oriented northeast trending fractures. The monzonite porphyry dikes vary from 10 to 40 feet wide, are near vertical and generally trend N50°E. However, due to an en echelon emplacement pattern the topographic expression is that of a N 70°-80°E dike swarm.

The granite has undergone a greater degree of alteration and mineralization than the blocky weathering, rather fresh, monzonite porphyry. Epidote and chlorite are usually oriented along at least three joint sets, the predominant two sets being N50°E and N80°E, both near vertical. Concentrations of epidote and chlorite are usually weak to moderate with occasional strong zones in the granite and generally very weak to weak in the monzonite porphyry dikes. Specularite as seen in the southern half of the stock is limited to the granite, occurring as veins of up to 6 inches width and being most abundant within 1,000 feet of the southern contact.

Pyrite and sericite in association with a small zone of secondary orthoclase, were found in one instance, but they represented less than one per cent of the subject area. Strong clay alteration was limited to a single 8 by 30 foot zone. Hematite and limonite occurred rarely and were predominately transported rather than residual.

Copper mineralization is largely chrysocolla and malachite with probable other copper present as unidentified oxides. No live limonite was found and in general all copper mineralization appears to be transported. None of the several old prospect pits and small mines in the area appear to have penetrated below the oxide zone.

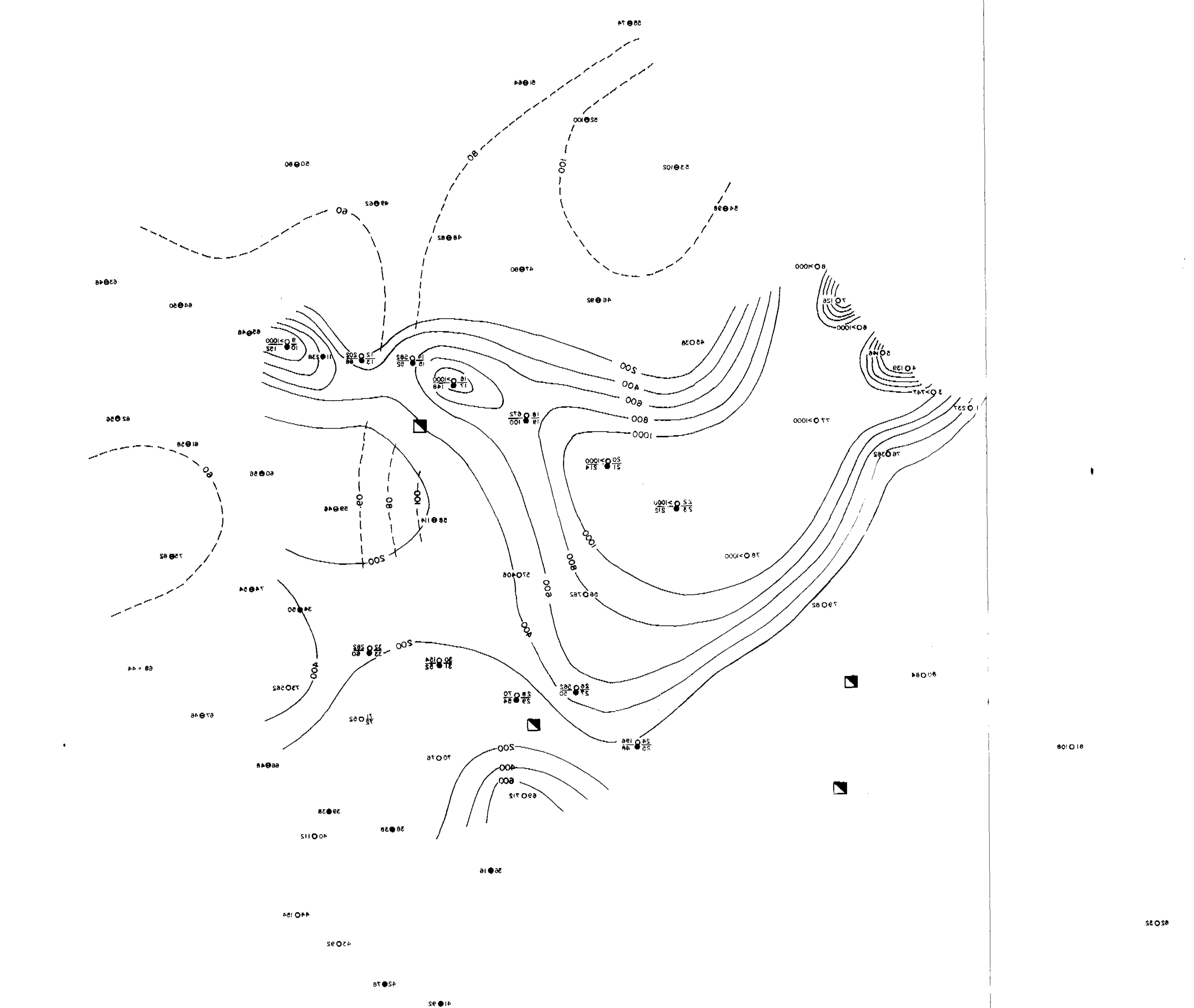
S.R. Davis

S.R. Davis

SRD:lzb
Encl.
cc: JHCourtright,w/encl.
JDSell, w/encl.
JEKinnison,w/encl.
RDKarvinen, w/encl.
LJJansen, w/encl.

Attachment B

Attachment A



EXPLANATION

LINES OF EQUAL COPPER CONCENTRATION

—200— In Granite

– – 80 – – In Soil

Sample Numbers — 32/33 282/62 Cu ppm in Granite
Cu ppm in Monzonite Porphyry Dikes

40 66 Cu ppm in Soil

Geochemical Overlay (ppm Copper)

PAPAGO CENTRAL PROJECT

NORTH SANTA ROSA AREA

PIMA COUNTY, ARIZONA

T. 11 S., R. 5 E. (Unsurveyed)

S.R.D. & L.J.J. March 1969

2157

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

May 12, 1969

FILE MEMORANDUM

Papago Central Project
Santa Rosa Mountains

Reconnaissance peripheral to most of the Santa Rosa Mountains did not disclose significant targets for further mineral exploration. Primary attention was given to bedrock exposures near the alluvium contacts. No leach capping or primary mineralization was encountered.

In the southwest sector of the mountains, coatings of copper silicate minerals were found locally on some Cretaceous (?) sediments. A Mr. Clarence Black of Fremont, California, has 4 claims in the area which are pre-Indian Reservation. Collars of three drill holes were noted, the relic cuttings of which did not show sulfide mineralization. Mr. Bob Holt, Tucson Consultant, was reported to have directed drilling. Kinnison examined these showings and deemed them insignificant.

Light colored exposures in the south foothills of the Santa Rosa Mountains proved to be locally bleached zones in an extensive outcropping of Pinal(?)schist. No other alteration-mineralization features existed.

Coloration changes in the southeast area were due to rock changes rather than alteration halos. The more orange exposures reflected a fresh rhyolite whereas the darker red rocks were conglomerates with a rhyolitic matrix. Prospect pits were localized on ferruginous quartz seams.

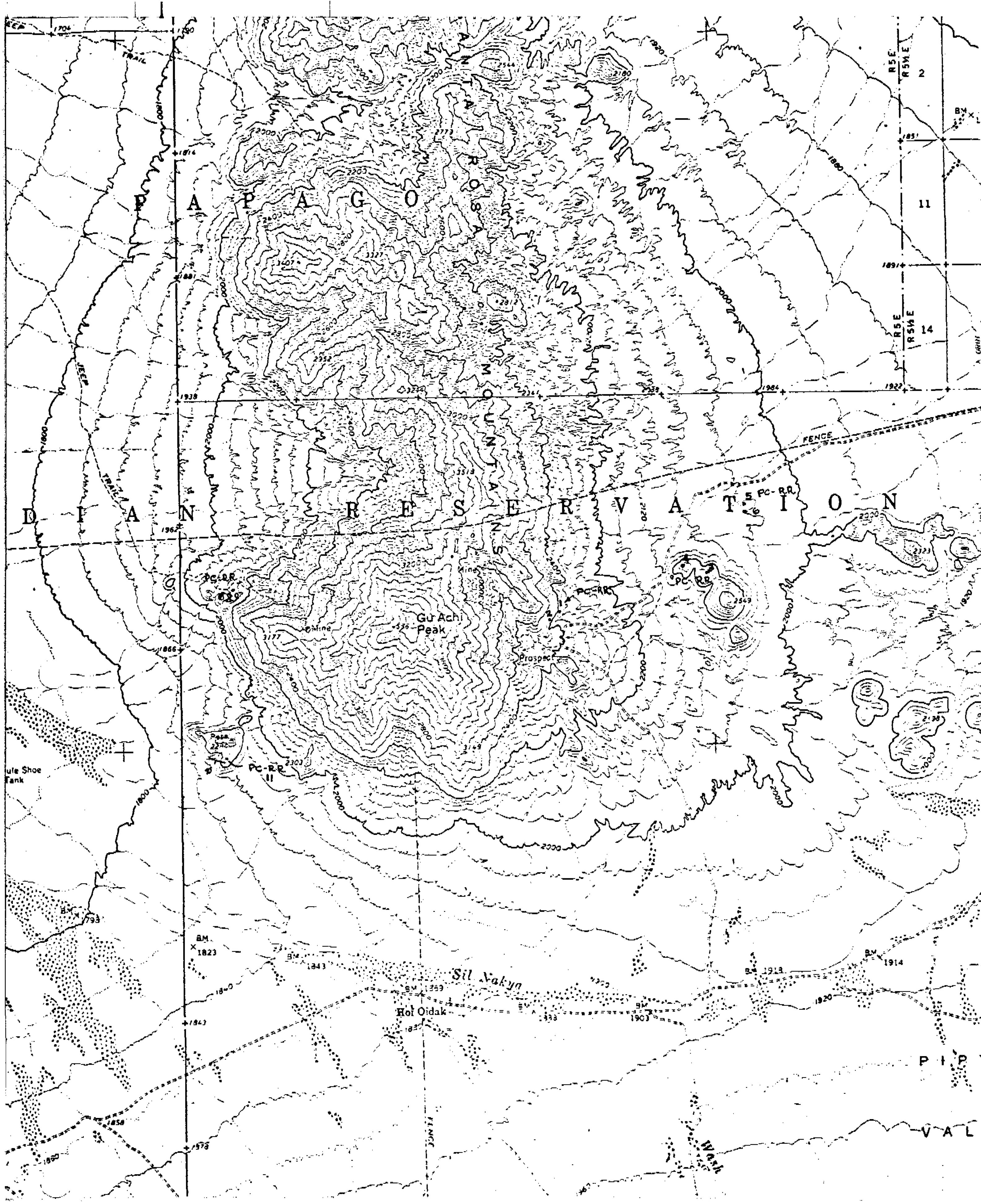
Somewhat removed to the southeast, andesites are exposed which appear relatively fresh. Thence, about one-half mile north, subdued exposures of granite can be found. Slight clay alteration could be noted but no evidence of mineralization was seen.

An exposure of quartzite protrudes the alluvium some 3 miles east of the north end of the Santa Rosas. No evidence of mineralization could be seen though a geochem sample was taken.

The east central sector of the Santa Rosas was not accessible to 4 wheel drive vehicles. Tentative programs schedule helicopter reconnaissance for the area at some future date.

RDKarvinen

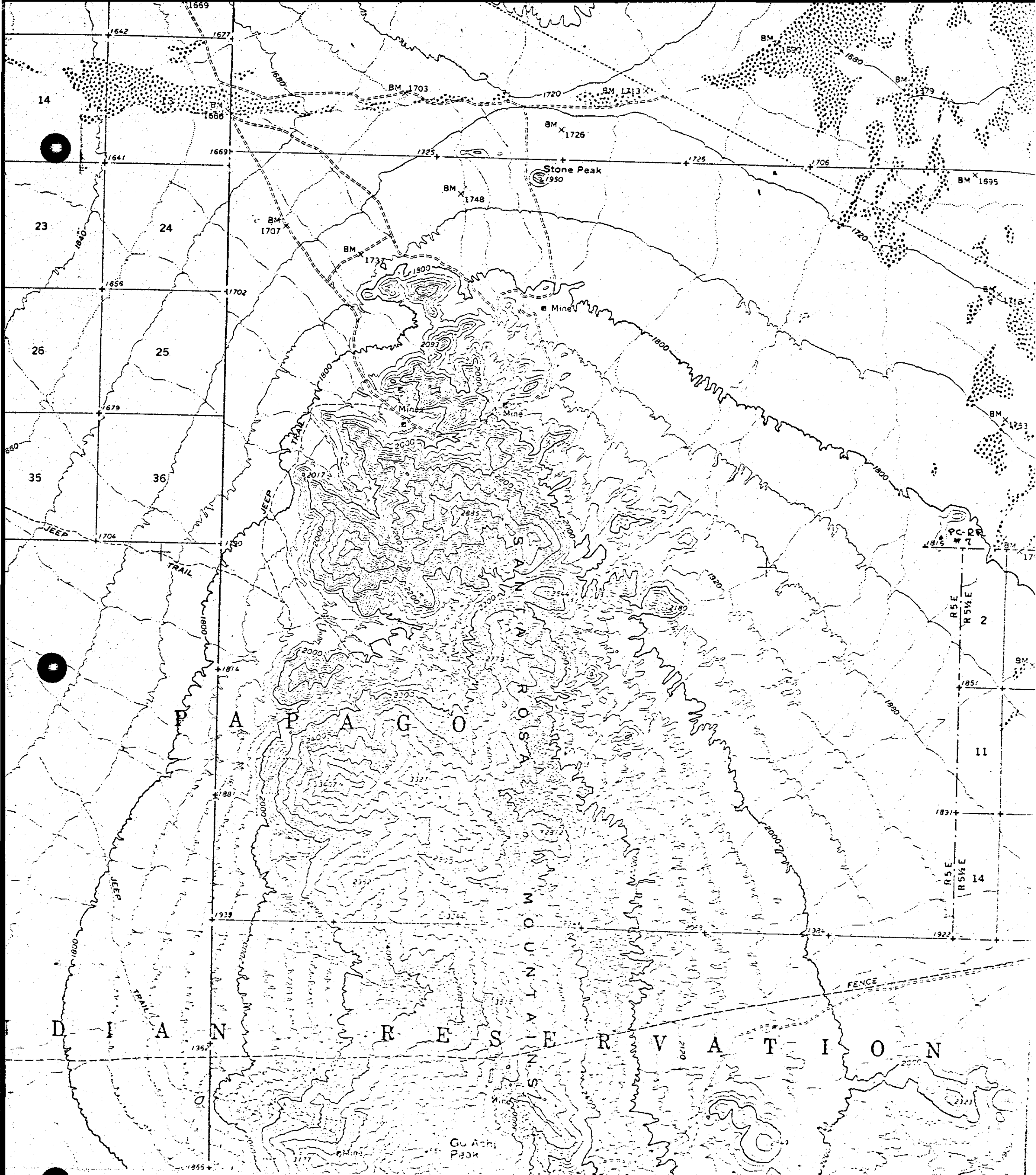
RDK:lzb R.D. Karvinen



Papago Central Project

Sample Locations

S. Santa Rosa Mtns



Papago Central Project
Sample Locations
Santa Rosa Mtns

HAWLEY & HAWLEY

Registered Assayers

ASSAYERS AND CHEMISTS, INC.

1700 WEST GRANT ROAD - TELEPHONE 622-4836 - POST OFFICE BOX 5934

TUCSON, ARIZONA 85703

K.V.D.S.

APR 3 1969

IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %		
PC - DR Series:								
2				8.22				
3				0.13				
3S				0.56				
8				0.11				
9				0.39				
16				0.22				
20				0.11				
22				0.34				
77				0.45				
78				0.24				

CORRECTED COPPER RESULTS

CC: American Smelting & Refining Company
ADD: P. O. Box 5795
CITY: Tucson, Arizona 85703
ADD: Attn: Steven R. Davis
CITY:

REMARKS:

Singles

Analysis Cert. By

REGISTERED ASSAYER CERTIFICATE 7573 Date Signed Arizona U. S. A.

Preparation $
Analysis $

ACC: AMERICAN SMELTING & REFINING COMPANY

Date Spl. Received 2/24/69

Date Compl. 4/1/69

TUC 342415-A

$ N/C

HAWLEY & HAWLEY

ASSAYERS AND CHEMISTS, INC.

HAWLEY & HAWLEY SINCE 1914

Registered Assayers

1700 WEST GRANT ROAD - TELEPHONE 622-4836 - POST OFFICE BOX 5934

TUCSON, ARIZONA 85703

THE SOUTHWEST'S LEADING ASSAYERS AND REPRESENTATIVES

Branch Representatives at Buyer's Plants:

Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %		
	ppm	ppm						
PC - DR Series								
2	0.010	0.24		0.01				
3	None	None		0.02				
3 S	None	None		< 0.01				
8	None	None		0.11				
9	None	0.03		0.39				
16	< 0.005	None		0.22				
20	None	None		0.11				
22	None	None		0.34				
77	< 0.005	0.10		0.45				
78	< 0.005	0.04		0.24				

10 Au - Ag geochem @ 2.50 = 25.00

10 Cu single @ 1.75 = 17.50

42.50

CC: American Smelting Refining Company

ADD: P. O. Box 5795

CITY: Tucson, Arizona 85703

ADD: Attn: Mr. Karvinen

CITY:

REMARKS:

Geochem

Single

Analysis Cert. By H. E. Richard

Preparation $

Analysis $ 42.50

ACC: AMERICAN SMELTING & REFINING CO. Date Spl Received 2/24/69 Date Compl. 2/27/69 TUC 342415 $ 42.50

HAWLEY & HAWLEY

Registered Assayers

HAWLEY & HAWLEY SINCE 1914

ASSAYERS AND CHEMISTS, INC.

1700 WEST GRANT ROAD - TELEPHONE 622-4836 - POST OFFICE BOX 5934

TUCSON, ARIZONA 85703

K.V.D.S.
FEB 20 1969

THE SOUTHWEST'S LEADING ASSAYERS AND REPRESENTATIVES

Branch Representatives at Buyer's Plants:
Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %		
				ppm		ppm		
PD-DR Series								
1				212		< 5		
1S				338		< 5		
1N				162		< 5		
2				> 1000		< 5		
3				> 1000		< 5		
3S				> 1000		< 5		
3N				242		< 5		
4				180		< 5		
4S				120		< 5		
4N				116		< 5		
5				80		< 5		
5S				224		< 5		
5N				134		< 5		
7				126		< 5		
8				> 1000		< 5		
9				> 1000		< 5		
10				152		< 5		
11				238		< 5		
12				202		< 5		
13				86		< 5		
14				582		< 5		
15				52		< 5		
16				> 1000		< 5		
17				148		< 5		
18				672		< 5		

CC: American Smelting & Refining Co.
Attn: Mr. Steven R. Davis
ADD: P. O. Box 5795
CITY: Tucson, Arizona 85703
ADD:
CITY:

REMARKS:
Page 1
Geochem

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Preparation $
Analysis $

ACC: AMERICAN SMELTING & REFINING CO. Date Spl. Received 2/14/69 Date Compl. 2/18/69 TUC 342367 $

HAWLEY & HAWLEY
SINCE 1914
Registered Assayers

HAWLEY & HAWLEY

ASSAYERS AND CHEMISTS, INC.

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TUCSON, ARIZONA 85703

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Branch Representatives at Buyer's Plants:
Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %		
				ppm		ppm		
PD-DR Series								
19				100		< 5		
20				> 1000		< 5		
21				214		< 5		
22				> 1000		< 5		
23				212		< 5		
24				196		< 5		
25				48		< 5		
26				562		< 5		
27				50		< 5		
28				70		< 5		
29				54		< 5		
30				154		< 5		
31				52		< 5		
32				282		< 5		
33				60		< 5		
34				50		< 5		
35				16		< 5		
36				16		< 5		
37				22		< 5		
38				38		< 5		
39				38		< 5		
40				112		< 5		
41				92		< 5		
42				78		< 5		
43				92		< 5		

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Page 2
Geochem

Analysis Cert. By

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Analysis $

ACC: AMERICAN SMELTING & REFINING CO. | Date Spl. Received 2/14/69 | Date Compl. 2/19/69 | TUC 342367 | $

HAWLEY & HAWLEY
SINCE 1914
Registered Assayers

HAWLEY & HAWLEY

ASSAYERS AND CHEMISTS, INC.

1700 WEST GRANT ROAD - TELEPHONE 622-4836 - POST OFFICE BOX 5934

TUCSON, ARIZONA 85703

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Branch Representatives at Buyer's Plants:
Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %		
				ppm		ppm		
PD-DR Series								
44				154		< 5		
45				38		< 5		
46				92		< 5		
47				80		< 5		
48				82		< 5		
49				62		< 5		
50				80		< 5		
51				64		< 5		
52				100		< 5		
53				102		< 5		
54				98		< 5		
55				74		< 5		
56				762		< 5		
57				406		< 5		
58				114		< 5		
59				46		< 5		
60				56		< 5		
61				58		< 5		
62				56		< 5		
63				48		< 5		
64				50		< 5		
65				48		< 5		
66				48		< 5		
67				46		< 5		
68				44		< 5		

CC:
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REMARKS:
Page 3
Geochem

Analysis Cert. By

Preparation $
Analysis $

ACC: AMERICAN SMELTING & REFINING CO. | Date Sp Received 2/14/69 | Date Compl. 2/19/69 | TUC 342367 | $

HAWLEY & HAWLEY

Registered Assayers

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ASSAYERS AND CHEMISTS, INC.

1700 WEST GRANT ROAD - TELEPHONE 622-4836 - POST OFFICE BOX 5934

TUCSON, ARIZONA 85703

THE SOUTHWEST'S LEADING ASSAYERS AND REPRESENTATIVES

Branch Representatives at Buyer's Plants:
Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %
				ppm		ppm
PD-DR Series						
69				712		< 5
70				76		< 5
71				52		< 5
72				46		< 5
73				562		< 5
74				54		< 5
75				62		< 5
76				362		< 5
77				> 1000		< 5
78				> 1000		< 5
79				82		< 5
80				84		< 5
81				108		< 5
82				32		< 5
83				46		< 5

90 samples crushed, split, Pulverized @ .85 — 76.50

90 Geochem Cu @ 1.00 = 90.00 - 18% discount — 73.80

90 Geochem Mo @ 1.50 = 135.00 - 18% discount — 110.70

261.00

CC: American Smelting & Refining Co.
Attn: Mr. Steven R. Davis
ADD: P. O. Box 5795
CITY: Tucson, Arizona 85703
ADD:
CITY:

REMARKS: Page 4
Geochem

Analysis Cert. By

Preparation $ 76.50
Analysis $ 184.50

ACC: AMERICAN SMELTING & REFINING CO | Date Spl Received 2/14/69 | Date Compl. 2/19/68 | TUC 342367 | $ 261.00

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

March 11, 1969

FILE MEMORANDUM

Papago Central Exploration
Copperosity Area
Drew Spring Manganese
Sheridan - Cimarron Mtns.
Pima County, Arizona

Mr. Sell has noted that the Drew Spring area has been a major Arizona manganese producer, and he proposed consideration of possible zonal change to a silver environment---in accordance with a theory postulated recently by DF Hewitt of the USGS.

Accordingly, Mr. R.D.Karvinen and I sampled concentrates, crushed mill products, tails, and stocked crude mill feed at the abandoned Drew Spring mill site, and assayed them for gold, silver, and manganese, which same see appended. Complete absence of silver in the samples suggest that these manganese deposits are not the upper zonal "cap" of a silver deposit at depth. No further work is recommended.

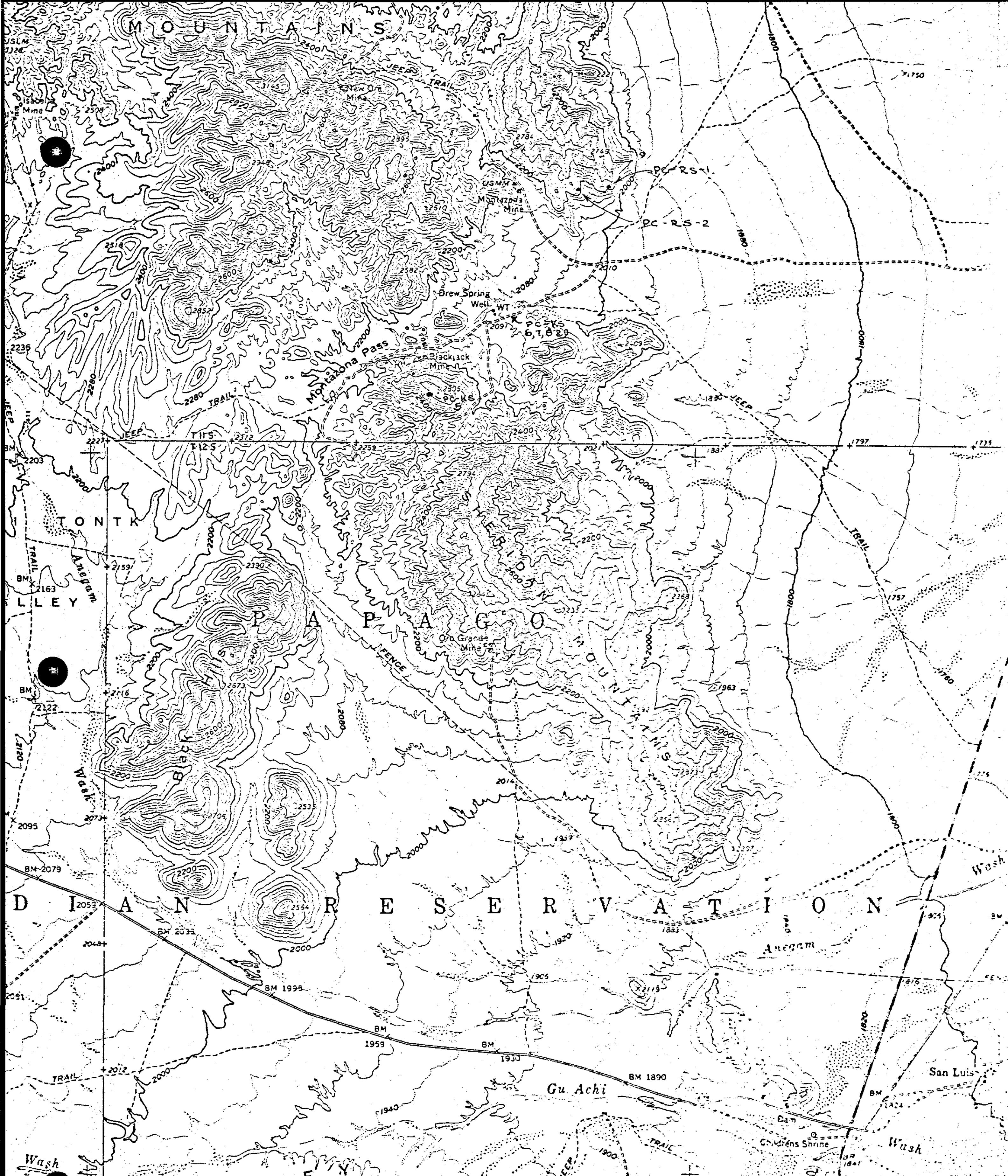
John E. Kinnison

JEK:lzb

cc: JDSell
JHCourtright
RDKarvinen
SRDavis

DREW SPRING MILL SITE ASSAYS

Sample	Au oz/ton	Ag oz/ton	Mn %	Description
PC-KS-6	Nil	0.01	6.00	Crude Manganese Ore
PC-KS-7	Nil	Nil	26.65	Concentrate
PC-KS-8	Nil	Nil	21.39	Minus 1/8" crushed mill product
PC-KS-9	Nil	Nil	20.98	Minus 1/8" crushed mill product rejected as tails



Papago Central Project

Sample Locations

Sheridan Mtns

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

June 9, 1969

TO: J.H. Courtright

FROM: S.R. Davis & J.E. Kinnison

Papago Central Project
Greenback Area
Pinal County, Arizona

SUMMARY AND RECOMMENDATIONS

The subject property, located approximately 35 miles southwest of Casa Grande, has been known to have a moderate sized zone of weak alteration, mineralization, and exotic copper staining for several years. It had remained as a very low-priority prospect for copper and possibly gold-silver. During the course of reconnaissance on the Papago Reservation, it was mutually agreed by Messrs. Sell, Saegart and Kinnison that a detailed study was now appropriate.

The known alteration and mineralization zone had not been interpreted to have derived from ore grade mineralization; however a possible extension of the two square mile zone under cover could have concealed significant mineralization. Alluvium and post-mineral volcanics lie to the northwest, north and northeast, and alluvium limits exposure to the east. Essentially unaltered Pinal schist and andesite porphyry lie south and west of the altered zone.

The limits of alteration, rock types, and leached capping were mapped by Knnison and Davis, and geochemical samples were cut by Davis, Karvinen and others. Gravity and magnetic geophysical traverses were run under Mr. Farley's supervision. This work has shown that no extension into covered areas is probable, and that the only exploration lead open is a wildcat speculation that the grade of copper would increase with depth. At the conclusion of field work, Mr. Bowditch and Mr. Saegart determined that the block of claims covering the mineralized outcrops was in disputed ownership with several other parties (refer to S.I.Bowditch's memo dated March 25, 1969) and the prospect was dropped. No further recommendations are now offered.

LOCATION

The subject area is located approximately 35 miles southwest of Casa Grande and lies in sections 28, 29, 30, 31, 32 and 33, T10S, R2E, Pinal County. Relative to other known mineral occurrences, the

Greenback area lies 8 miles southwest of the Newmont-Superior Oil Vekol porphyry copper deposit and 16 miles west of El Paso Natural Gas Company's new Lakeshore copper deposit.

Access is by way of the Papago highway south from Casa Grande to the Kohatk Indian Village road and thence west approximately 15 miles on graded dirt roads to the old Greenback Camp and Pinal shaft. The graded roads are subject to seasonal changed and washouts, but in their present condition can be driven at reasonable speeds, averaging approximately one hour and fifteen minutes from Casa Grande to Greenback.

GENERAL

On the basis of company correspondence records and earlier sampling and reconnaissance by ASARCO personnel which indicated low grade assays of gold and silver, a program of bulk sampling was initiated in the central area occupied by massive silicified zones. With Messrs. R.D. Karvinen, J.E. Kinnison, S.R. Davis and L.J. Jansen, sampling and mapping began February 12 on a 300' coordinate grid. Five to ten pound samples were taken through March 16 and fire assayed for gold, silver, copper and molybdenum. February 16 through February 19 were devoted to collecting one pound geochem samples in the surrounding area. By February 20, the central area had been mapped and sampled, and the samples were submitted to Hawley & Hawley for analysis on February 19, 20 and 21.

Results of the assays and geochemical analysis indicated lack of gold or silver, most of the samples assayed nil, the highest being 0.02 Oz gold and 0.06 Oz silver. A pronounced copper-moly anomaly existed over the area of strongest alteration and silicification, a second and weaker anomaly was open-ended at the west end of the sampled area and outside the mapped area. Copper values ranged from a low of 12 ppm to a high of 1.65% and averaged 1,000 ppm within the two anomalies. Background copper averaged approximately 50 ppm. Molybdenum values varied from 5 ppm to 90 ppm, the average in the anomalous areas being approximately 15-20 ppm. Background molybdenum averages 5 ppm.

As a follow-up to the west anomaly being open-ended and outside the mapped area, S.R. Davis returned to the area on March 3, and mapped further south and west also taking additional geochemical samples of the extended area. By March 14, sufficient mapping and sampling had been done to close off the area on all sides. Gravity and magnetic geophysical surveys were recommended for the surrounding area as a further means of determining any possible extension. The geophysical surveys were carried out by D.Hedricks and under the supervision of W.G. Farley, shortly after the completion of mapping. Attachment "A" shows the location of samples and sample numbers, Attachment "B" shows values in ppm of copper and molybdenum and contours of the two principal anomalies. The geophysical surveys revealed a low over the central area of alteration and a weaker low about one mile northwest in section 29, both within the disputed property. (Refer to W.G.Farley's first quarter report dated April 9, 1969).

GEOLOGY, ALTERATION AND MINERALIZATION

Geology, along with strength of alteration and mineralization is shown on Attachment "C". Rock types consist of a latite-monzonite porphyry complex, andesite and andesite porphyry, intruding essentially unmineralized Pinal schist and in very limited occurrences Pre-Cambrian granite. The best alteration and mineralization occurs in the latite-monzonite porphyry and the entire zone is restricted to the latite monzonite porphyry, andesite and andesite porphyry and in one small area, the Pinal schist. Alluvium and volcanics of the Copperosity Hills overlie the area to the north, west and east, Pinal schist forms the hills to the south. The breccia zones shown in the southwest corner of the altered zone are apparently post-mineral and do not reflect increased mineralization.

The zone of alteration described is one mile wide by two miles long, striking west. The alteration is akin to,but does not have some features of a porphyry copper deposit. It is, however, a pervasive zone of low total sulfides and propylitic alteration. The principal area, west of the old Greenback Mine, is strongly silicified and contains in one central area, copper stains. This central area of capping is indicated also by the main geochemical anomaly of copper and molybdenum, but is not interpreted to have been formed from ore-grade copper sulfides. Bulk samples in this area were fire assayed for gold and silver with essentially negative results. Several small zones within the larger pyritic zone displayed hematite resembling live limonite, but assay values discounted any anomalous copper content.

Gravel cover laps around the very weak peripheral alteration on the east and north, while the west end, although containing some better silicified capping, is spotty and appears to be "breaking up". Unmineralized schist is on the south. Magnetic and gravity profiles did not indicate the presence of any strong lineations through or from the altered zones. Thus, no extensions under cover or outside the disputed property are indicated.

S.R. Davis

S. R. Davis

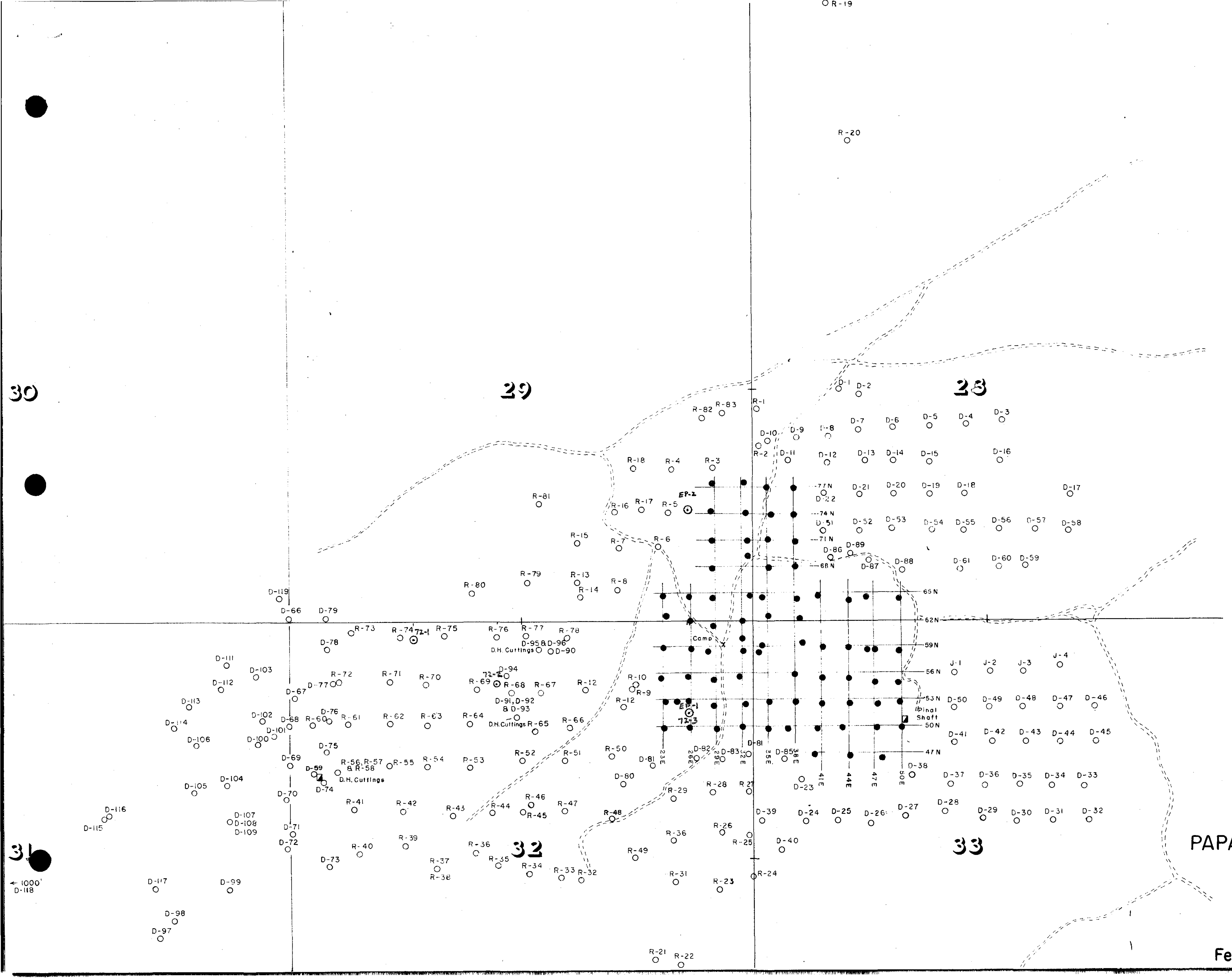
J.E. Kinnison

ORIGINAL SIGNED BY
JOHN E. KINNISON

SRD:lzb
Encl.

cc: WESaegart, w/encl.
RDKarvinen, w/encl.

ATTACHMENT A

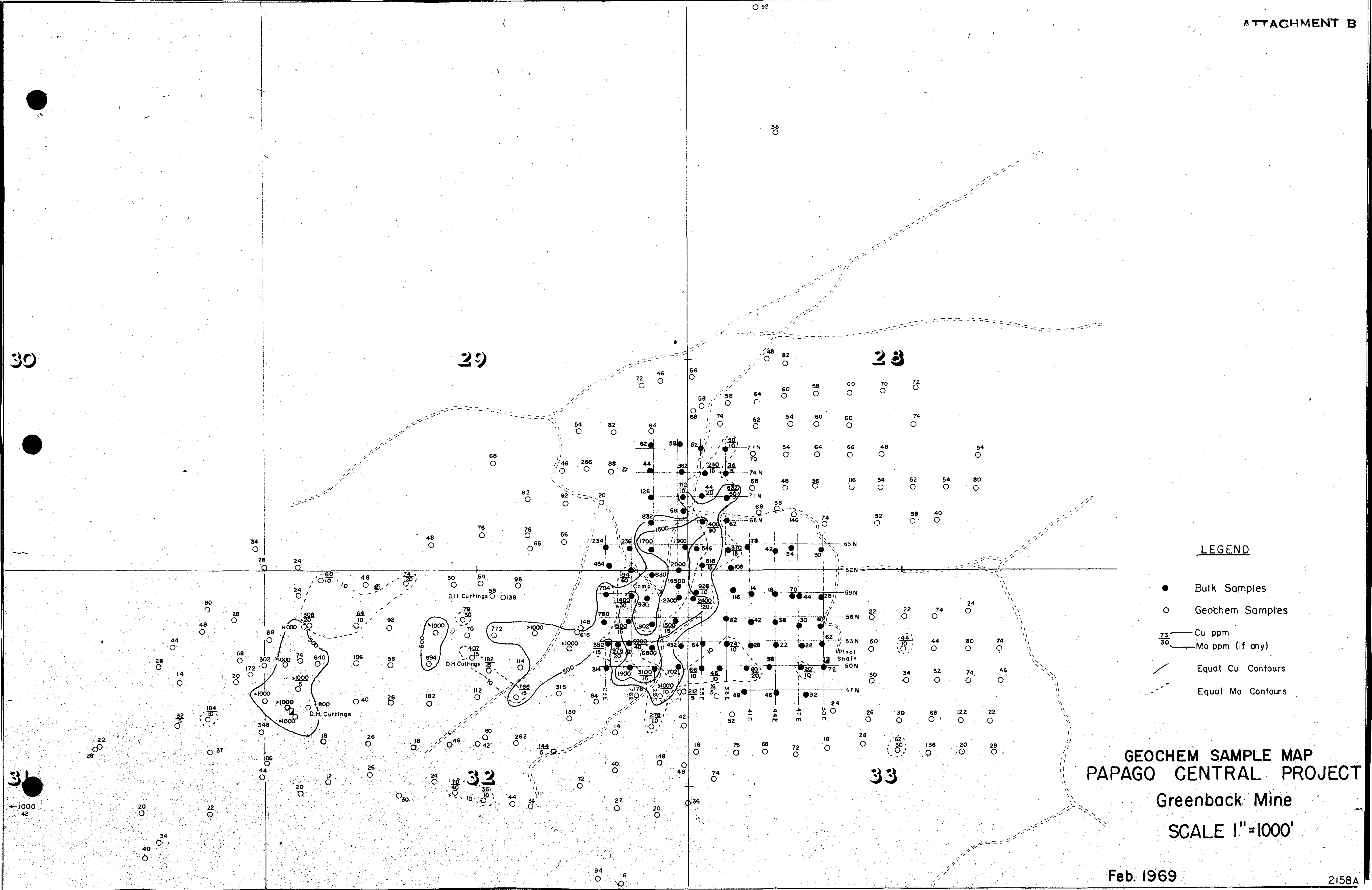


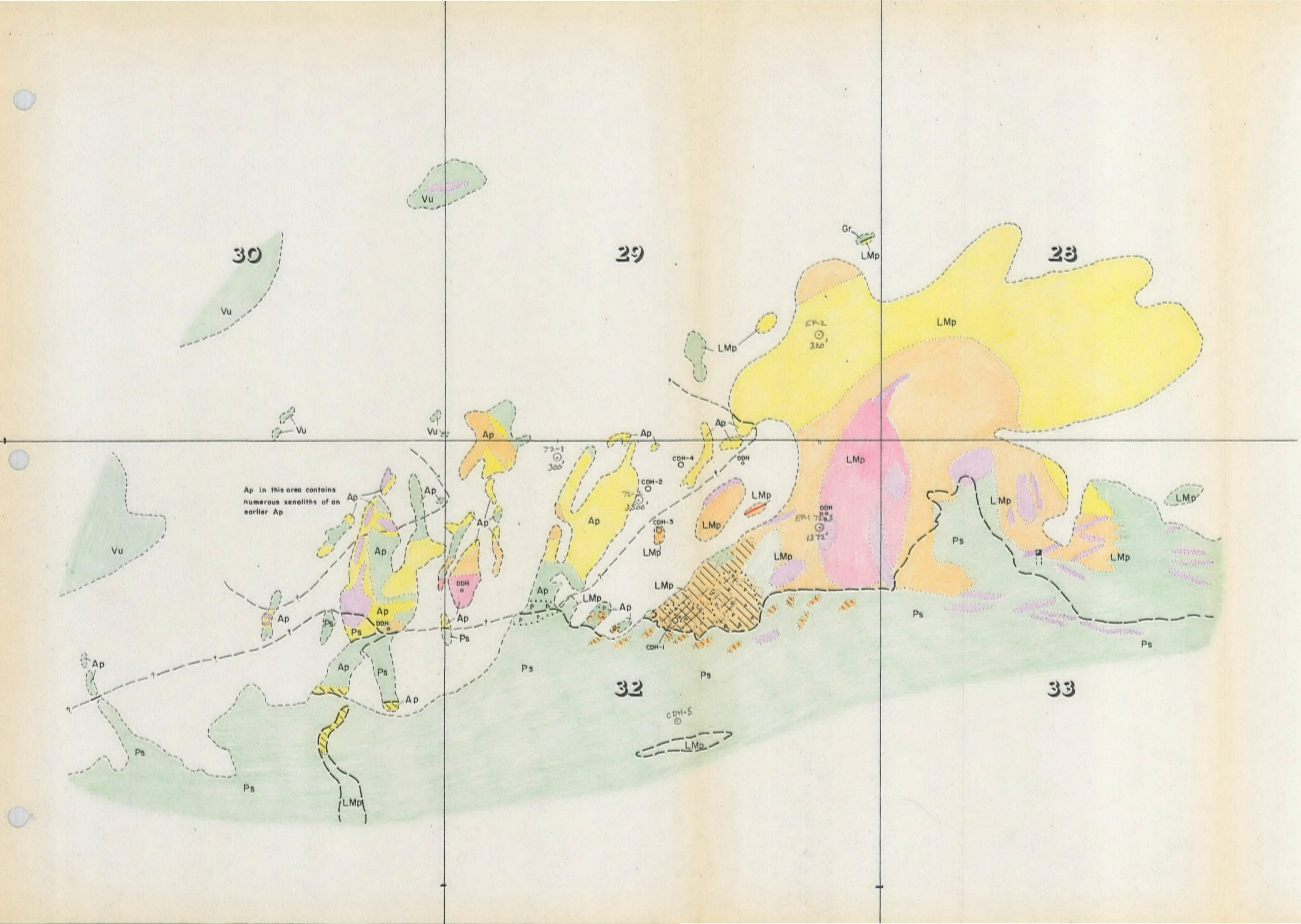
PAPAGO CENTRAL PROJECT
Greenback Mine
SCALE 1:1000

Feb. 1969

2158

ATTACHMENT B





EXPLANATION

ATTACHMENT C

Contact

Possible Contact

Limit of Outcrop

Limit of Alteration—Mineralization

CDH Churn Drill Hole by Miami Copper Co. (TW Mitchan has logs).

DDH Diamond Drill Hole

EP- El Paso

72- Pinal Copper in 1972 TW Mitchan Consultant

ROCK TYPES

Vu — Volcanics, Undifferentiated

POST MINERAL / PRE MINERAL

Ap — Andesite and Andesite Porphyry

LMp — Latite and Monzonite Porphyry Complex

Ps — Pinal Schist

Gr — Granite, Pre-Cambrian

Silicified Zone—Massive Quartz

Breccia Zone

ALTERATION — MINERALIZATION

Strong Alteration—Silicification, Pervasive CuOx Staining

Moderate Alteration—Mineralization

Weak Alteration—Mineralization

Barren Alteration—Mineralization

2-4% FeOx After Sulfides

Limonite Closely Resembles Live Limonite

GEOLOGY AND ALTERATION—MINERALIZATION

PAPAGO CENTRAL PROJECT
GREENBACK AREA

PINAL CO., ARIZONA

SCALE: 1" = 1000'

June 1969

SRD, JEK

2158 B

Papago Central Project — Greenback Area

AMERICAN SMELTING AND REFINING COMPANY
Tucson, Arizona

February 14, 1969

TO: R. D. Karvinen

FROM: J.D.Sell

COPPEROSITY (GREENBACK) BASIN
PAPAGO CENTRAL PROJECT
PINAL COUNTY, ARIZONA

Attached are three prints from mylar tracings of the color tones, indicating possible outcrop, taken from the Stebbins Papago photographs in the Copperosity Basin.

Only three outcrop areas, surrounded by alluvial material could be seen north of the northeast-trending road which cuts through the middle of Section 29 (See sheet HGS-36-196 and Vekol Mountains Quadrangle sheet). Further west on the tracing copy are outlines of three reddish tone color zones surrounded or in contact with white to light color tones.

Also attached is the listing of the photographs for the immediate area and duplicates of these can be secured through the University of Arizona map library. The color transparencies cannot be secured for field use but can be viewed at the library. The scale of the Stebbins photos are 1:10,000 whereas the high-altitude AMS photos which you presently have are 1:60,000.

A carbon-arc spec of the altered rocks which we collected from the north side on February 11, 1969 indicated detectable amounts of silver and barium. Other elements -- lead, zinc, copper, moly, mercury, and uranium -- were not detected.

James Sell

James D. Sell

Stebbins Mineral Survey -- Papago Reservation

University of Arizona Map Library Collection.

Copperosity (Greenback) Area.

Area III-G, Sheet 2.

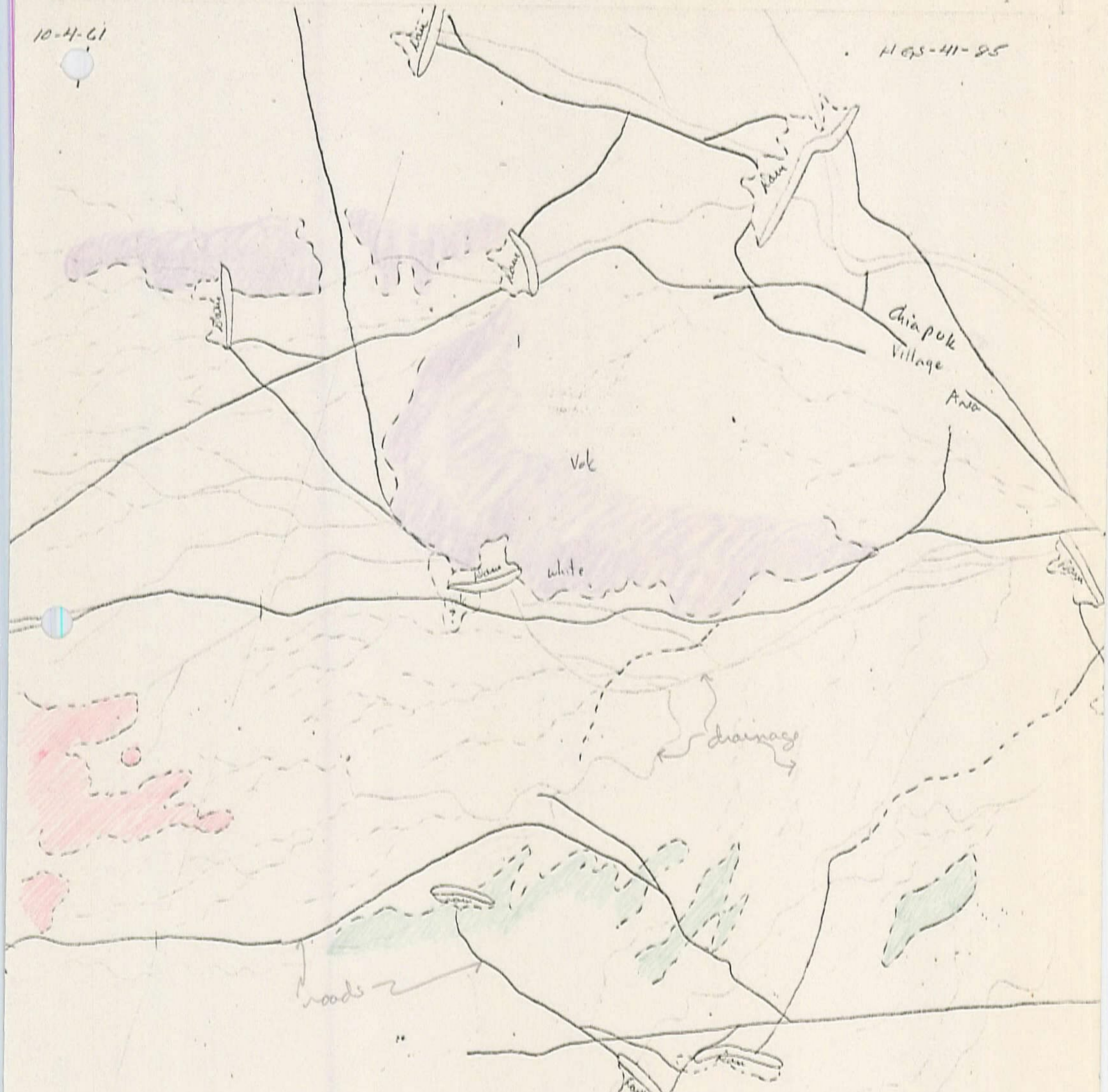
Photography Scale 1:10,000.

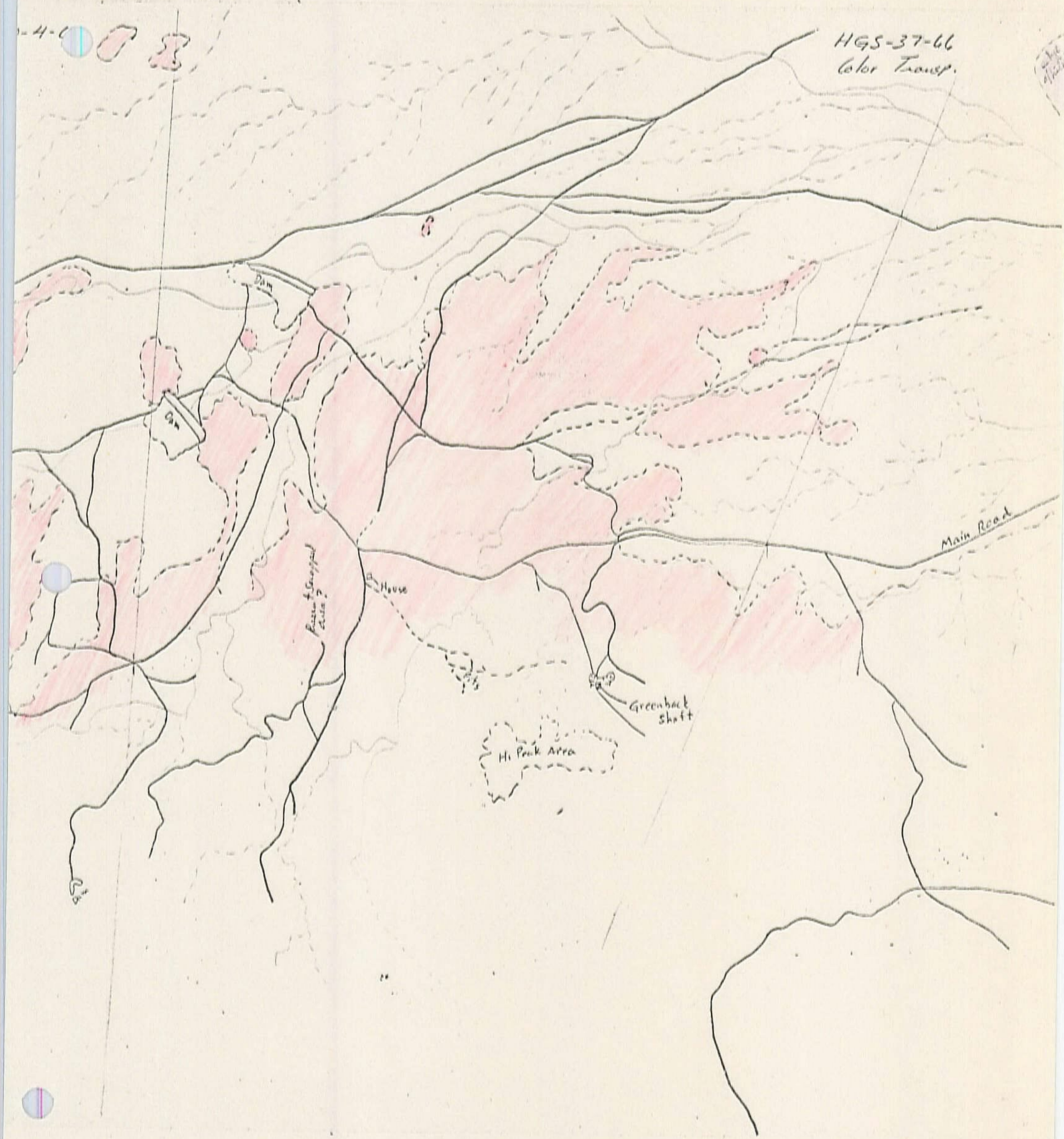
N-S flight lines — Series - HGS -

		-36-194		-41-83
		-36-195		-41-84
-36-63	-36-190	-36-196		-41-85
-36-64	-36-189	-36-197	-37-66	-41-86
-36-65	-36-188	-36-198	-37-65	-41-87

10-4-61

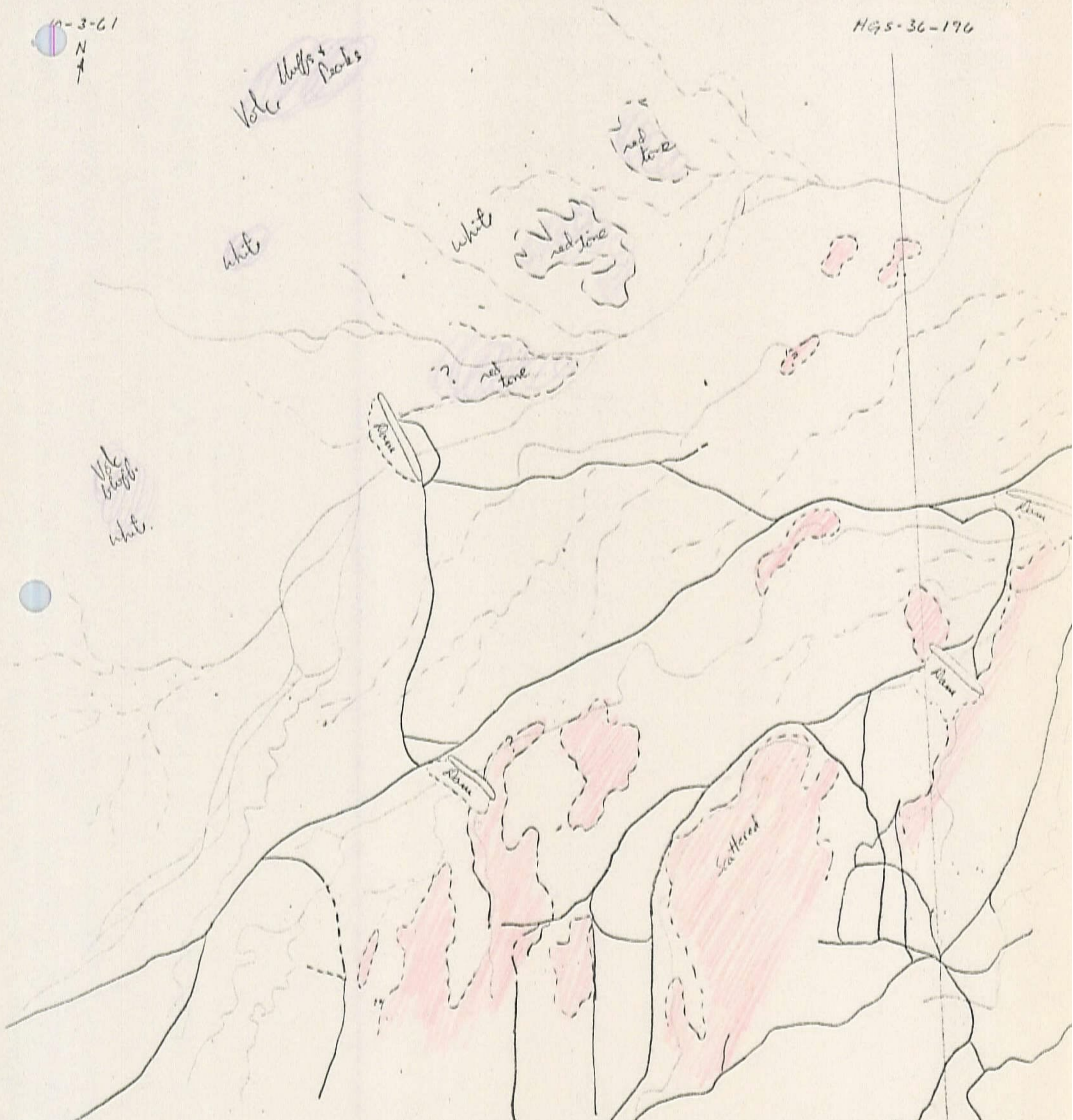
H 63-41-85




HGS-37-66
Color Transp.
Dam
Dam
House
Main Road
Greenback
Shaft
Hi Peak Area

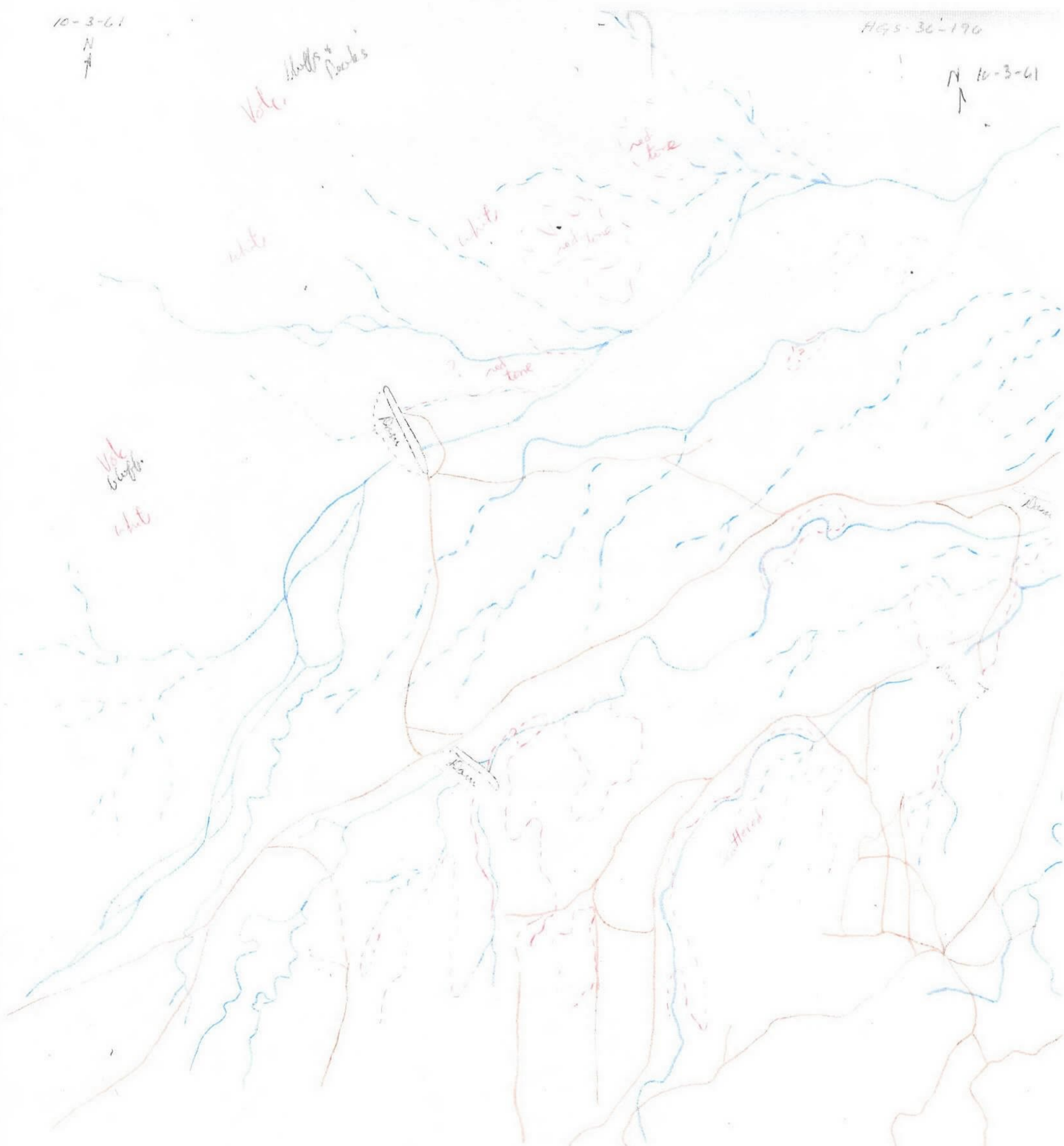
10-3-61

HGS-36-176




NORTH
PINAL CLAIM GROUP BOUNDARY
OXIDE DEPOSIT
HINSHAW PEAK
PINAL SHAFT
GREENBACK SHAFT
AIRSTRIP
MARICOPA COUNTY
PINAL COUNTY
PIMA COUNTY
TOWNSHIP LINE
EXPLANATION
QUATERNARY ALLUVIUM
TERTIARY
LATITE: INCLUDES SOME LATITE PORPHYRY BOUNDARIES INDEFINITE
BRECCIAS: MOSTLY ANDESITE AND PRECAMBRIAN ROCKS
ANDESITE: INTRUSIVE AND EXTRUSIVE
PRECAMBRIAN: PINAL SCHIST WITH INTRUDED GRANITIC ROCKS
FAULTS
QUARTZ VEINS, INTENSE SILICIFICATION
OLD DRILL HOLES
HOLES DRILLED IN 1972
PITS and SMALL SHAFTS
ROADS AS OF MAY 1, 1972
CONTOURS, INTERVAL 25 FEET
PINAL COPPER CORPORATION
GEOLOGIC MAP
PINAL COPPER PROPERTY
T.10S., R.2E. G&SRB&M
PINAL COUNTY, ARIZONA
1" = 400'
GEOLOGY: T.W. MITCHAM
BASE DRAFTED BY DON MELHADO
JULY 1972
Map B

4-61
HGS-37-66
Colo. Transp.
10-4-6
N
Dam
Dam
House
Pits
Greenback
Shaft
Hi Peak Area
Main Road


10-3-61
N
HGS-36-196
N 10-3-61
red tone
red tone
red tone
white
white
white
Dam
Dam

0-4-61
N
HGS-41-85
N 10-4-61
Dam
Chiapok
Village
Area
white

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

March 12, 1969

TO: W.E. Saegart

FROM: J.E. Kinnison

Papago Central Exploration
Greenback Area

Mr. Sell and you visited the Greenback area with me on February 11, 1969, and examined live limonite in a bleached porphyry about ½mile southwest of the Greenback town. You will recall that there was a churn drill hole at this location and that we had lunch there.

I tested the maroon limonite at the Arizona Bureau of Mines on the visual spectograph, which showed that no copper was present. Therefore, the limonite is not likely to have been derived from copper sulfide, a conclusion more in keeping with the drill hole cuttings which showed pyrite only.

John E. Kinnison
J.E. Kinnison

JEK:lzb

cc: JHCourtright
JDSell

ASARCO

AMERICAN SMELTING AND REFINING COMPANY
SOUTHWESTERN EXPLORATION DEPARTMENT
P.O. BOX 5795, TUCSON, ARIZONA 85703

J. H. COURTRIGHT
CHIEF GEOLOGIST
L. P. ENTWISTLE
ASSISTANT CHIEF GEOLOGIST
W. E. SAEGART
ASSISTANT CHIEF GEOLOGIST

1150 NORTH 7TH AVENUE
TELEPHONE 602-792-3010

March 18, 1969

Hawley & Hawley
1800 West Grant
Tucson, Arizona

Attn: Mr. Harold Richard

Dear Hal:

Please have composites made by weighing equal amounts of pulp from the individual samples as inumerated on the attached lists; all of which are pulps in storage at your office. In addition to the assays requested on these composites, please send a split from each for the spectrographic analysis ("research" or "many-element" spec.)

Regards,

John E. Kinnison

JEK:lzb

bcc: JDSell
RDKarvinen
SRDavis
LJJansen

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

April 4, 1969

TO: J.H. Courtright

FROM: J.E. Kinnison

Papago Central Exploration
Copperosity
Greenback Mine
Pinal County, Arizona

Geochemical and spectrographic results are now available for the central and east part of the Greenback altered zone. Results confirm earlier individual analysis, and add nothing new. Composite G reports $<$1000 ppm Cu, representing the central anomalous copper-silica zone. Lead and zinc are 118 and 154 ppm respectively, which is above background. Mercury is $<$1 ppm.

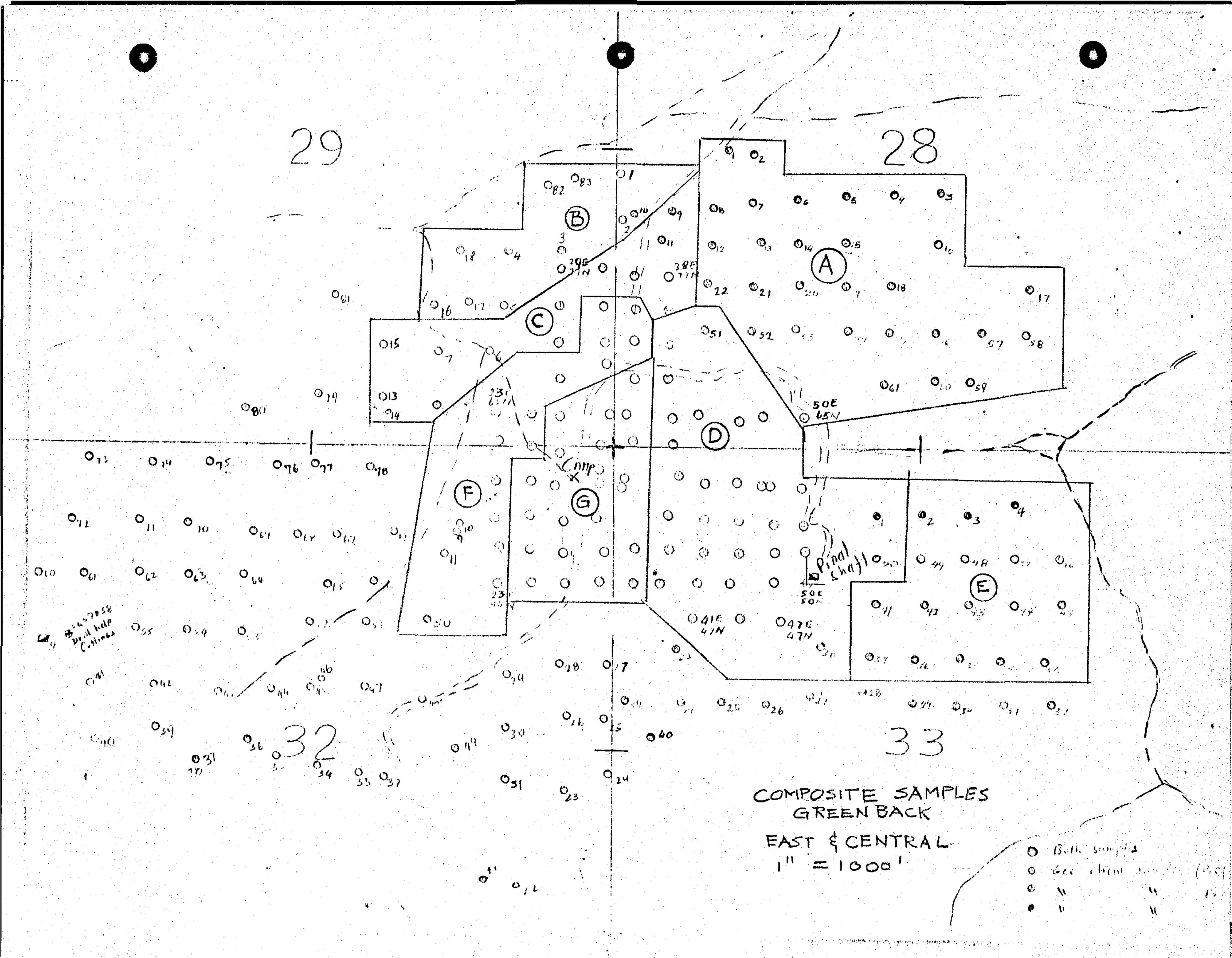
Thus, data have not been significantly changed since my verbal presentation earlier this week.

John E. Kinnison

John E. Kinnison

JEK:lzb

cc: WESaegart
SRDavis
JDSell
RDKarvinen
LJJansen


29
28
32
33
A
B
C
D
E
F
G
Comp
Pinal shaft
Drill hole Cuttings
COMPOSITE SAMPLES
GREEN BACK
EAST & CENTRAL
1" = 1000'
Bulk samples

HAWLEY & HAWLEY

HAWLEY & HAWLEY SINCE 1914

Registered Assayers

ASSAYERS AND CHEMISTS, INC.

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TUCSON, ARIZONA 85703

THE SOUTHWEST'S LEADING ASSAYERS AND REPRESENTATIVES

Branch Representatives at Buyer's Plants:
Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

J. E. K.

APR 04 1969

IDENTIFICATION | ~~Gold ozs.~~ | ~~Silver ozs.~~ | ~~Lead %~~ | ~~Copper %~~ | ~~Zinc %~~ | ~~Mo %~~

ELEMENT:	Composite A:	Composite B:	ELEMENT:	Comp A:	Comp B:
Silver *	< 0.0005%	< 0.0005%	Nickel*	< 0.01%	< 0.01%
Aluminum	3.2	3.6	Phosphorus	< 0.1	< 0.1
Arsenic *	< 0.01	< 0.01	Lead	0.03	0.02
Boron	< 0.001	< 0.001	Rubidium *	< 0.1	< 0.1
Barium	0.73	0.35	Antimony *	< 0.01	< 0.01
Beryllium *	< 0.0001	< 0.0001	Silicon	26.00	25.00
Bismuth *	< 0.001	< 0.001	Tin*	< 0.001	< 0.001
Calcium	0.85	0.63	Strontium	< 0.01	< 0.01
Cadmium *	< 0.01	< 0.01	Tantalum *	< 0.1	< 0.1
Cerium *	< 0.01	< 0.01	Tellurium *	< 0.01	< 0.01
Cobalt	0.035	0.04	Thorium *	< 0.1	< 0.1
Chromium	0.03	0.02	Titanium	0.068	0.058
Cesium *	< 0.1	< 0.1	Thallium *	< 0.1	< 0.1
Copper	0.007	0.008	Uranium *	< 0.1	< 0.1
Iron	1.6	1.3	Vanadium	0.06	0.06
Gallium *	< 0.01	< 0.01	Tungsten	< 0.1	< 0.1*
Germanium *	< 0.001	< 0.001	Zinc*	< 0.01	< 0.01
Indium *	< 0.001	< 0.001	Zirconium	0.06	0.04
Potassium *	< 1.0	< 1.0	Gold *	< 0.005	< 0.005
Lithium *	< 0.01	< 0.01	Molybdenum	< 0.001	< 0.001
Magnesium	2.3	2.2			
Manganese	0.6	0.55			
Sodium	0.85	0.73	* Not detected		
Niobium	< 0.03	< 0.03			

CC: American Smelting & Refining Company
ADD: P. O. Box 5795
CITY: Tucson, Arizona 85703
ADD: Attn: Mr. John E. Kinnison
CITY:

REMARKS:

Research Spectrograph
Page 5

Analysis Cert. By

Preparation $
Analysis $
$

ACC: AMERICAN SMELTING & REFINING COMPANY | Date Spl. Received 3/18/69 | Date Compl. 4/2/69 | TUC 342539-A

Registered Assayers

HAWLEY & HAWLEY

ASSAYERS AND CHEMISTS, INC.

1700 WEST GRANT ROAD - TELEPHONE 622-4836 - POST OFFICE BOX 5934

TUCSON, ARIZONA 85703

THE SOUTHWEST'S LEADING ASSAYERS AND REPRESENTATIVES

Branch Representatives at Buyer's Plants:

Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

IDENTIFICATION	~~Gold ozs.~~	~~Silver ozs.~~	~~Lead %~~	~~Copper %~~	~~Zinc %~~	~~Mo %~~

ELEMENT:	Composite C:	Composite D:	ELEMENT:	Comp C:	Comp D
Silver *	< 0.0005%	< 0.0005%	Nickel	< 0.01%	< 0.01%
Aluminum	4.1	4.1	Phosphorus	< 0.1	< 0.1
Arsenic *	< 0.01	< 0.01	Lead	0.05	0.04
Boron	< 0.001	< 0.001	Rubidium *	< 0.1	< 0.1
Barium	0.48	0.30	Antimony *	< 0.01	< 0.01
Beryllium *	< 0.0001	< 0.0001	Silicon	28.00	26.00
Bismuth *	< 0.001	< 0.001	Tin *	< 0.001	< 0.001
Calcium	0.73	0.5	Strontium	< 0.01	< 0.01
Cadmium *	< 0.01	< 0.01	Tantalum *	< 0.1	< 0.1
Cerium *	< 0.01	< 0.01	Tellusium *	< 0.01	< 0.01
Cobalt	0.035	0.03	Thorium *	< 0.1	< 0.1
Chromium	0.07	0.03	Titanium	0.071	0.063
Cesium *	< 0.1	< 0.1	Thallium *	< 0.1	< 0.1
Copper	0.055	0.009	Uranium *	< 0.1	< 0.1
Iron	2.1	1.8	Vanadium	0.07	0.03
Gallium *	< 0.01	< 0.01	Tungsten *	< 0.1	< 0.1
Germanium *	< 0.001	< 0.001	Zinc *	< 0.01	< 0.01
Indium *	< 0.001	< 0.001	Zirconium	0.06	0.05
Potassium *	< 1.0	< 1.0	Au *	< 0.005	< 0.005
Lithium *	< 0.01	< 0.01	Molybdenum *	< 0.001	< 0.001
Magnesium	2.4	1.5			
Manganese	0.70	0.60			
Sodium	0.90	0.75	* Not detected		
Niobium *	< 0.03	< 0.03			

CC:
ADD:
CITY:
ADD:
CITY:

REMARKS:

Research Spectrograph
Page 6

Analysis Cert. By

Preparation $

Analysis $

ACC: American Smelting & Refining Co.	Date Spl. Received 3/18/69	Date Compl. 4/2/69	TUC 342539-A	$

HAWLEY & HAWLEY
Registered Assayers
HAWLEY & HAWLEY SINCE 1914

ASSAYERS AND CHEMISTS, INC.

1700 WEST GRANT ROAD - TELEPHONE 622-4836 - POST OFFICE BOX 5934

TUCSON, ARIZONA 85703

THE SOUTHWEST'S LEADING ASSAYERS AND REPRESENTATIVES

Branch Representatives at Buyer's Plants:
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IDENTIFICATION	~~Gold ozs.~~	~~Silver ozs.~~	~~Lead %~~	~~Copper %~~	~~Zinc %~~	~~Mo %~~

ELEMENTS:	Composite E:	Composite F:	ELEMENTS:	Comp E:	Comp F:
Silver *	< 0.0005%	< 0.0005%	Nickel	< 0.01	0.02
Aluminum	4.3	4.8	Phosphorus	< 0.1	< 0.1
Arsenic *	< 0.01	< 0.01	Lead	0.05	0.04
Boron	0.008	< 0.001	Rubidium *	< 0.1	< 0.1
Barium	0.78	0.81	Antimony *	< 0.01	< 0.01
Beryllium *	< 0.0001	< 0.0001	Silicon	29.00	31.00
Bismuth *	< 0.001	< 0.001	Tin *	< 0.001	< 0.001
Calcium	0.73	0.85	Strontium	< 0.01	< 0.01
Cadmium *	< 0.01	< 0.01	Tantalum *	< 0.1	< 0.1
Cerium *	< 0.01	< 0.01	Tellurium *	< 0.01	< 0.01
Cobalt	0.03	0.035	Thorium *	< 0.1	< 0.1
Chromium	0.04	0.08	Titanium	0.074	0.076
Cesium *	< 0.1	< 0.1	Thallium *	< 0.1	< 0.1
Copper	0.01	0.08	Uranium *	< 0.1	< 0.1
Iron	2.4	3.9	Vanadium	0.05	0.08
Gallium *	< 0.01	< 0.01	Tungsten	< 0.1*	< 0.1
Germanium *	< 0.001	< 0.001	Zinc	< 0.01*	< 0.01
Indium *	< 0.001	< 0.001	Zirconium	0.07	0.075
Potassium *	< 1.0	< 1.0	Gold *	< 0.005	< 0.005
Lithium *	< 0.01	< 0.01			
Magnesium	2.0	3.6	* Not detected		
Manganese	0.65	0.85			
Sodium	1.2	3.2			
Niobium *	< 0.03	< 0.03			
Molybdenum	< 0.001	< 0.001*			

CC:
ADD:
CITY:
ADD:
CITY:

REMARKS:

Research Spectrograph
Page 7

Analysis Cert. By

Preparation $
Analysis $
$

ACC: AMERICAN SMELTING & REFINING COMPANY

Date Spl. Received 3/18/69

Date Compl. 4/2/69

TUC 342539-A

HAWLEY & HAWLEY

HAWLEY & HAWLEY — SINCE 1914 — Registered Assayers

ASSAYERS AND CHEMISTS, INC.

1700 WEST GRANT ROAD - TELEPHONE 622-4836 - POST OFFICE BOX 5934

TUCSON, ARIZONA 85703

THE SOUTHWEST'S LEADING ASSAYERS AND REPRESENTATIVES

Branch Representatives at Buyer's Plants:
Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

IDENTIFICATION	~~Gold ozs.~~	~~Silver ozs.~~	~~Lead %~~	~~Copper %~~	~~Zinc %~~	~~Mo %~~

ELEMENTS:	Composite G:	ELEMENTS:	Composite G:
Silver*	< 0.0005	Nickel *	< 0.01
Aluminum	4.2	Phosphorus	< 0.1
Arsenic *	< 0.01	Lead	0.015
Boron	0.001	Rubidium *	< 0.1
Barium	0.55	Antimony *	< 0.01
Beryllium *	< 0.0001	Silicon	29.00
Bismuth *	< 0.001	Tin *	< 0.001
Calcium	0.80	Strontium	< 0.01
Cadmium *	< 0.01	Tantalum *	< 0.1
Cerium *	< 0.01	Tellurium *	< 0.01
Cobalt	0.030	Thorium *	< 0.1
Chromium	0.06	Titanium	0.069
Cesium *	< 0.1	Thallium *	< 0.1
Copper	0.23	Uranium *	< 0.1
Iron	2.8	Vanadium	0.04
Gallium *	< 0.01	Tungsten *	< 0.1
Germanium *	< 0.001	Zinc	< 0.01
Indium *	< 0.001	Zirconium	0.075
Potassium	1.0	Gold*	< 0.005
Lithium *	< 0.01		
Magnesium	2.4		
Manganese	0.70	* Not detected	
Sodium	2.4		
Niobium *	< 0.03		
Molybdenum *	< 0.001		

7 Research Spectrographs @ $20.00, $140.00 less 15% disc

CC: American Smelting & Refining Company
ADD: P. O. Box 5795
CITY: Tucson, Arizona 85703
ADD: Attn: Mr. John E. Kinnison
CITY:

REMARKS:

Research Spectrograph
Page 8

Analysis Cert. By

REGISTERED ASSAYER
CERTIFICATE
H. E.
RICH...D
Date Signed
Arizona U. S. A.

Spectrographs 119.00
Preparation $
Analysis $

ACC.	Date Spl. Received	Date Compl.		$
AMERICAN SMELTING & REFINING CO.	3/18/69	4/2/69	TUC 342539-A	119.00

HAWLEY & HAWLEY
ASSAYERS AND CHEMISTS, INC.

J. E. K.

APR 04 1969

1700 WEST GRANT ROAD - TELEPHONE 622-4836 - POST OFFICE BOX 5934
TUCSON, ARIZONA 85703

Registered Assayers

THE SOUTHWEST'S LEADING ASSAYERS AND REPRESENTATIVES
Branch Representatives at Buyer's Plants:
Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %	Hg
			ppm	ppm	ppm	ppm	ppm
Composite A PC-DC: 1, 2, 3, 4, 5, 6, 7, 8, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61 PC-RC: 65 - 50	None	None	60	54	72	< 5	< 1
Composite B PC-RC: 1, 2, 3, 4, 5, 10, 16, 17, 18, 82, 83 PC-RC: 77 - 29	None	None	66	74	62	< 5	< 1
Composite C PC-RC: 6, 7, 8, 9, 11, 13, 15 PC-RC: 77 - 29 77 - 32 PC-JC: 77 - 35 77 - 38 PC-RC: 74 - 29 PC-JC: 74 - 38 PC-RC: 71 - 29	None	None	96	202	118	< 5	< 1

CC: American Smelting & Refining Company
ADD: P. O. Box 5795
CITY: Tucson, Arizona 85703
ADD: Attn: Mr. John E. Kinnison
CITY:

REMARKS:
Verified
~~XXXXXX~~ - Au & Ag
Geochem - Pb, Cu, Zn, Mo & Hg
Page 1

Analysis Cert. By

Preparation $
Analysis $
$

ACC: AMERICAN SMELTING & REFINING CO

Date Spl. Received 3/18/69

Date Compl. 4/3/69

TUC 342539

HAWLEY & HAWLEY
Registered Assayers
ASSAYERS AND CHEMISTS, INC.
1700 WEST GRANT ROAD - TELEPHONE 622-4836 - POST OFFICE BOX 5934
TUCSON, ARIZONA 85703

THE SOUTHWEST'S LEADING ASSAYERS AND REPRESENTATIVES
Branch Representatives at Buyer's Plants:
Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %	Hg
			ppm	ppm	ppm	ppm	ppm
Composite D	None	None	112	76	78	< 5	< 1
PC-DC: 51							
PC-DC: 1							
PC-DC: 50							
38							
PC-RC: 47 - 47							
47 - 44							
47 - 41							
PC-JC: 50 - 50							
50 - 44							
PC-JC: 50 - 47							
50 - 41							
50 - 38							
PC-RC: 53 - 50							
53 - 47							
53 - 44							
53 - 41							
PC-JC: 53 - 38							
PC-RC: 56 - 50							
56 - 47							
56 - 44							
56 - 41							
PC-JC: 56 - 38							
62 - 38							
PC-RC: 65 - 47							
65 - 44							
65 - 41							
PC-JC: 65 - 38							
68 - 38							
71 - 38							
Composite E	None	None	48	54	60	< 5	< 1
PC-JC: 2, 3, 4,							
PC-DC: 46, 47, 48, 49							
42, 43, 44, 45							
33, 34, 35, 36							

CC:
ADD:
CITY:
ADD:
CITY:

REMARKS:
Verified
XXXXXX- Au & Ag
Geochem - Pb, Cu, Zn, Mo & Hg -
Page 2

Analysis Cert. By

Preparation $
Analysis $
$

ACC: AMERICAN SMELTING & REFINING CO

Date Spl. Received 3/18/69

Date Compl. 4/3/69

TUC 342539

HAWLEY & HAWLEY

HAWLEY & HAWLEY SINCE 1914

Registered Assayers

ASSAYERS AND CHEMISTS, INC.

1700 WEST GRANT ROAD - TELEPHONE 622-4836 - POST OFFICE BOX 5934

TUCSON, ARIZONA 85703

THE SOUTHWEST'S LEADING ASSAYERS AND REPRESENTATIVES

Branch Representatives at Buyer's Plants:
Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %	Hg		
			ppm	ppm	ppm	ppm	ppm		
Composite F	< 0.005	None	122	488	202	5	< 1		
PC-RC: 9, 10, 11									
PC-JC: 50 - 23									
53 - 23									
56 - 23									
59 - 23									
62 - 23									
65 - 23									
65 - 26									
PC-RC: 68 - 29									
69 - 32									
71 - 32									
74 - 32									
PC-JC: 71 - 35									
74 - 35									
62 - 26									

CC:
ADD:
CITY:
ADD:
CITY:

REMARKS:
Verified
~~XXXXXX~~ - Au & Ag
Geochem - Pb, Cu, Zn, Mo & Hg

Page 3

Analysis Cert. By

Preparation $
Analysis $
$

ACC:	Date Spl. Received	Date Compl.		
AMERICAN SMELTING & REFINING CO	3/18/69	4/3/69	TUC 342539	$

Registered Assayers

HAWLEY & HAWLEY

ASSAYERS AND CHEMISTS, INC.

1700 WEST GRANT ROAD - TELEPHONE 622-4836 - POST OFFICE BOX 5934

TUCSON, ARIZONA 85703

THE SOUTHWEST'S LEADING ASSAYERS AND REPRESENTATIVES

Branch Representatives at Buyer's Plants:
Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %	Hg
			ppm	ppm	ppm	ppm	ppm
Composite G	None	None	118	> 1000	154	5	< 1
PC-JC: 50 - 26							
53 - 26							
56 - 26							
59 - 26							
59 - 26 BZ							
50 - 29							
PC-RC: 53 - 29							
56 - 29							
59 - 29							
62 - 29							
65 - 29							
PC-JC: 50 - 32							
PC-RC: 53 - 32							
56 - 32							
59 - 32							
60 - 32							
62 - 32							
65 - 32							
PC-JC: 50 - 35							
53 - 35							
59 - 35							
62 - 35							
65 - 35							
68 - 35							
53 - 24							

142 samples composited @ $0.20 each	$ 28.40
7 verified Au - Ag @ $6.50	45.50
7 geochem Cu, Pb, Zn @ $2.50	17.50
7 geochem Mo @ $1.50	10.50
7 geochem Hg @ $1.50	10.50
	$112.40

CC: American Smelting & Refining Company
ADD: P. O. Box 5795
CITY: Tucson, Arizona 85703
ADD: Attn: Mr. John E. Kennison
CITY:

REMARKS:
Verified ~~XXXXXX~~- Au & Ag
Geochem - Pb, Cu, Zn, Mo & Hg
Page 4

Analysis Cert. By

REGISTERED ASSAYER CERTIFICATE NO. 6784 H. E. ... State Signed ... Arizona U. S. A.

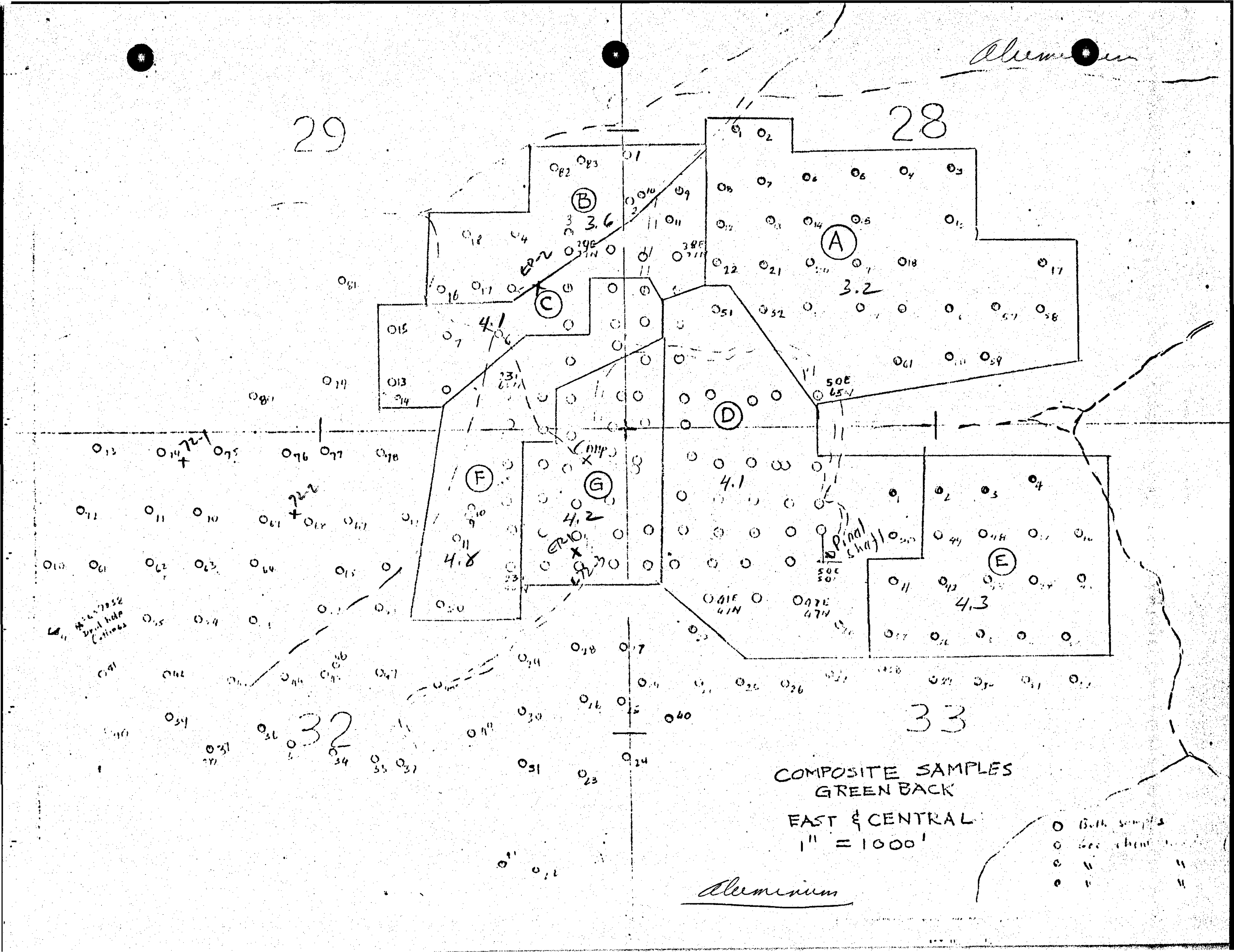
Compositing $ 28.4
Preparation $
Analysis $ 84.0
$ 112.4

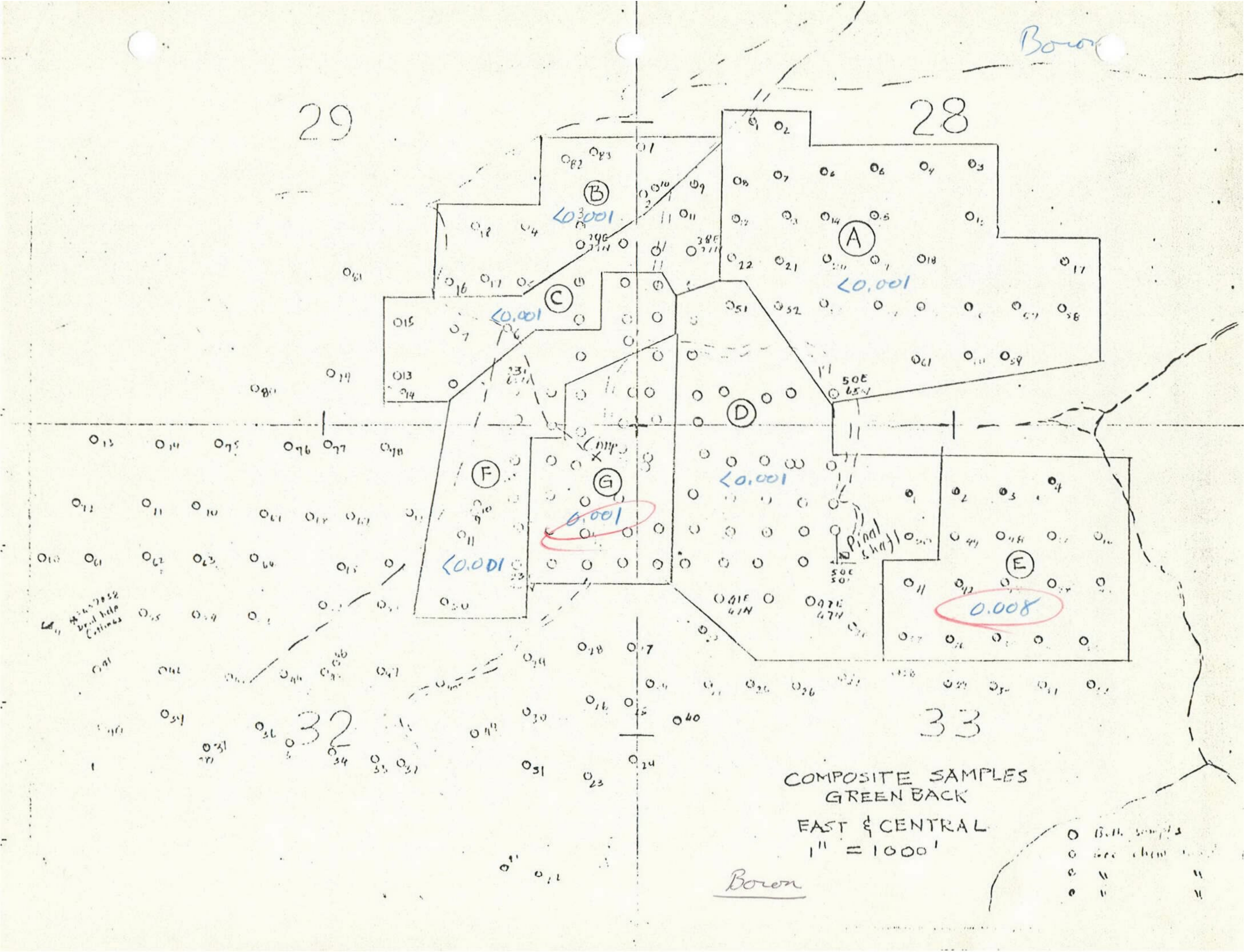
ACC: AMERICAN SMELTING & REFINING CO

Date Spl. Received 3/18/69

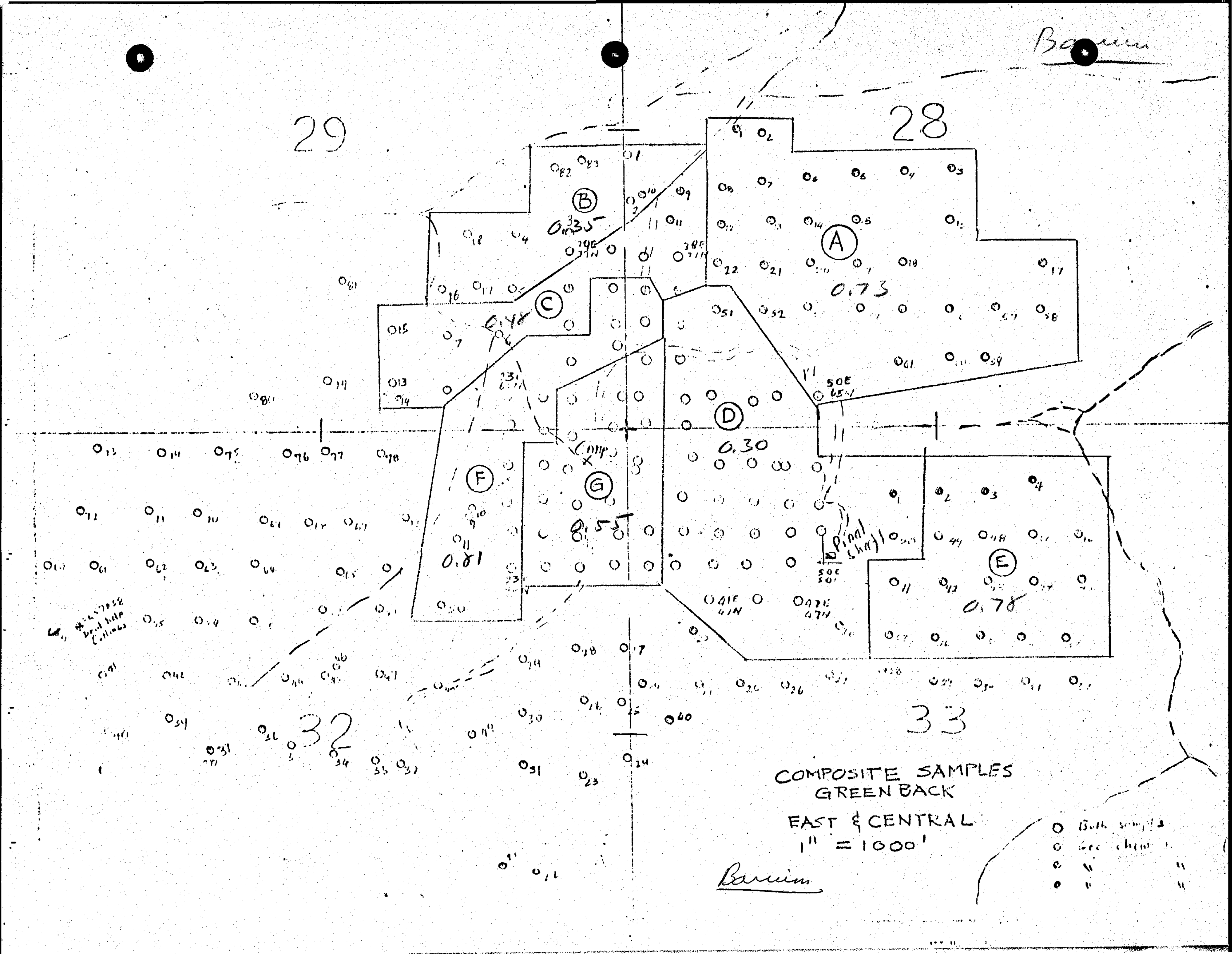
Date Compl. 4/3/69

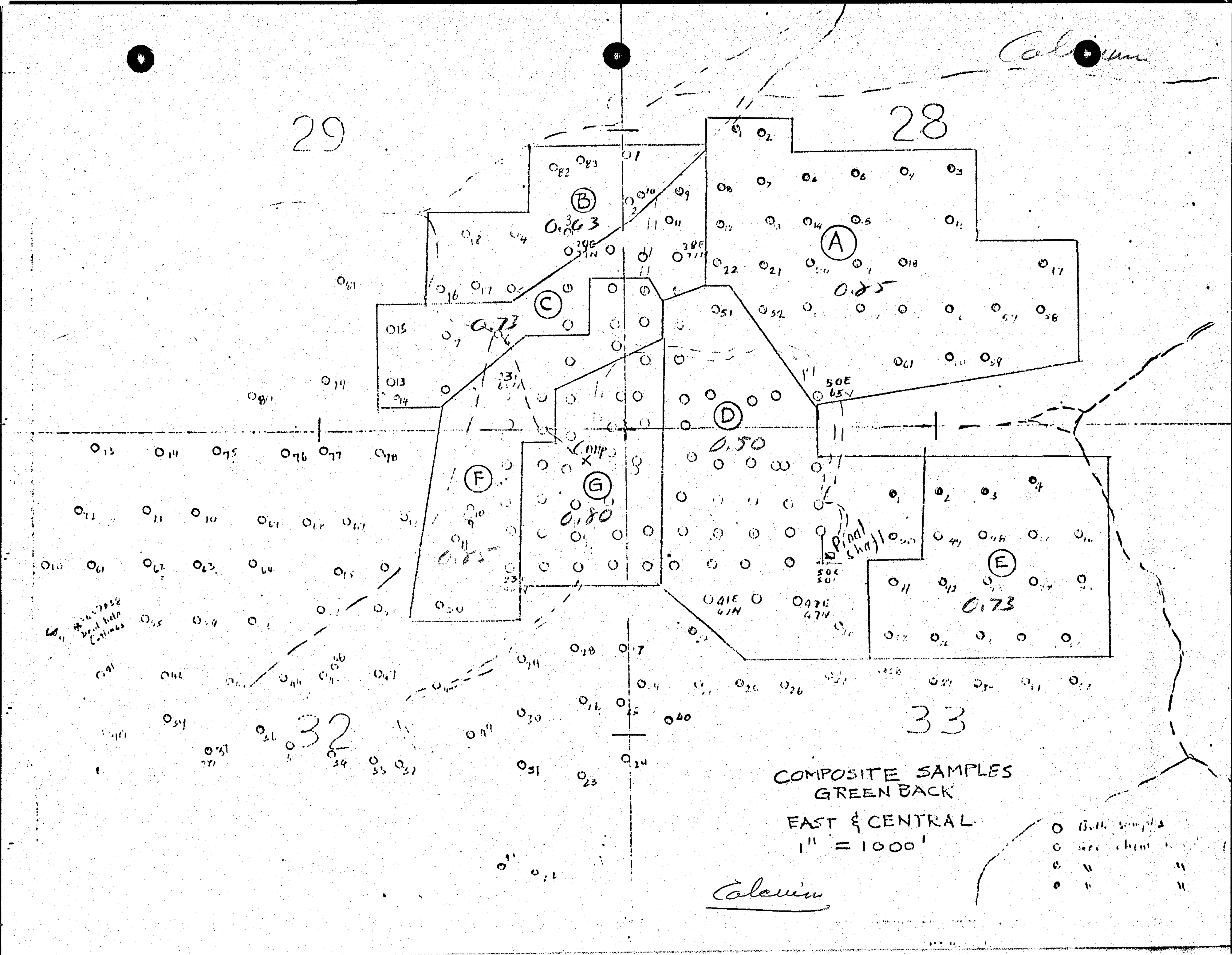
TUC 342539


Aluminum
29
28
32
33
A
B
C
D
E
F
G
3.2
3.6
4.1
4.1
4.2
4.8
4.3
Pinal shaft
COMPOSITE SAMPLES
GREEN BACK
EAST & CENTRAL
1" = 1000'
Aluminum

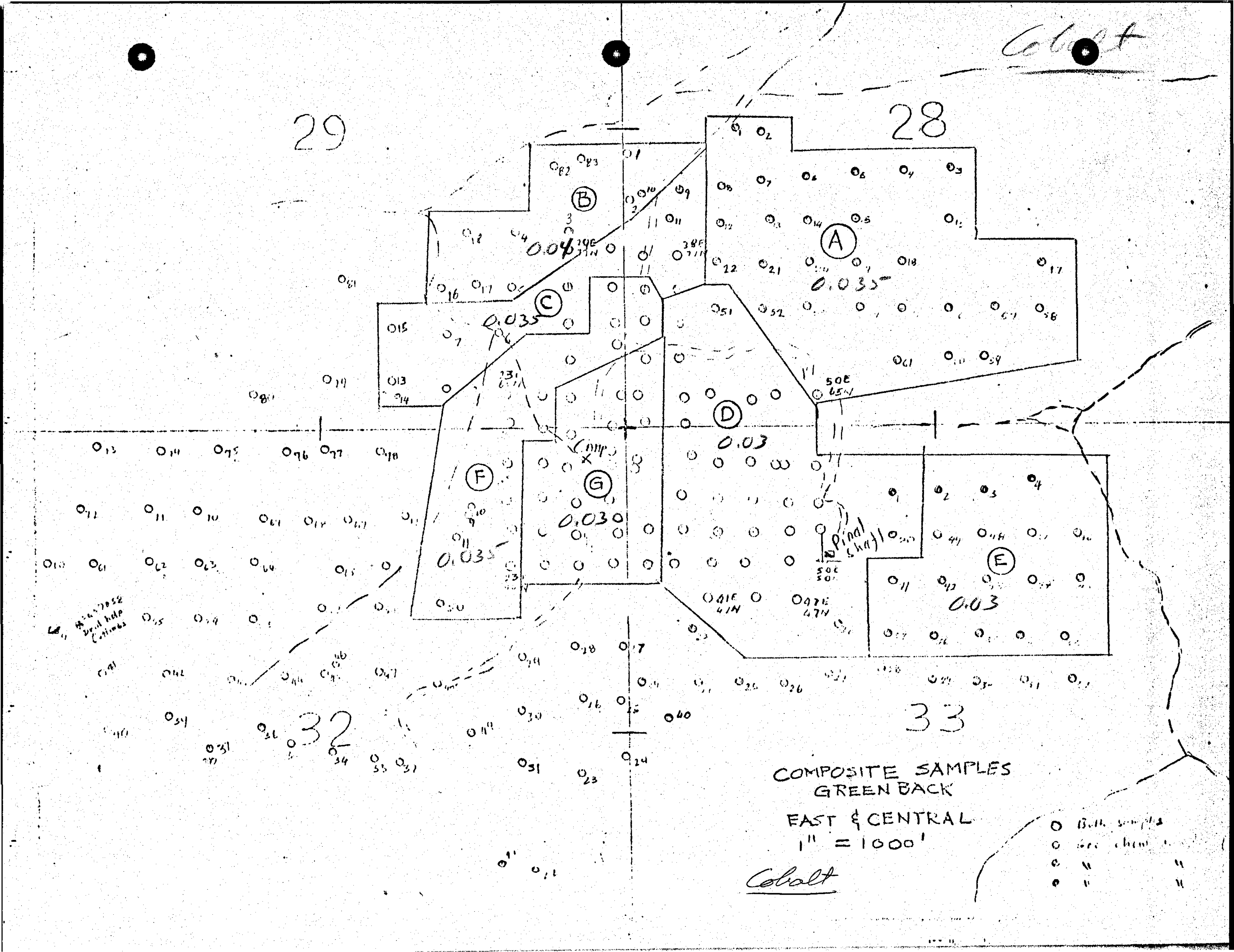


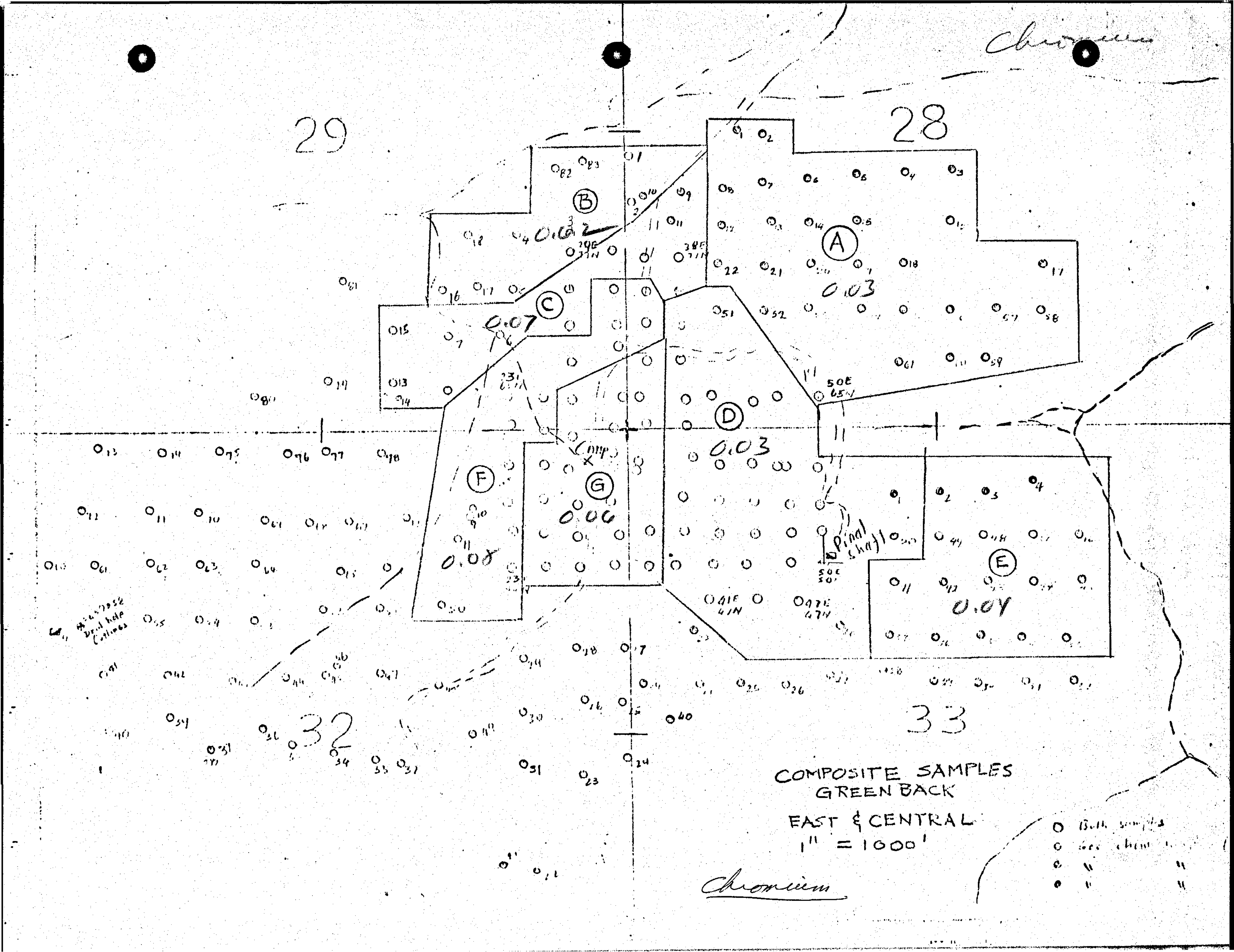
Boron
29
28
32
33
A
<0.001
B
<0.001
C
<0.001
D
<0.001
E
0.008
F
<0.001
G
0.001
Comp
Pinal shaft
COMPOSITE SAMPLES
GREEN BACK
EAST & CENTRAL
1" = 1000'
Boron


Barium
29
28
32
33
A
0.73
B
0.335
C
0.48
D
0.30
E
0.78
F
0.81
G
0.55
Comp.
Pinal shaft
COMPOSITE SAMPLES
GREEN BACK
EAST & CENTRAL
1" = 1000'
Barium

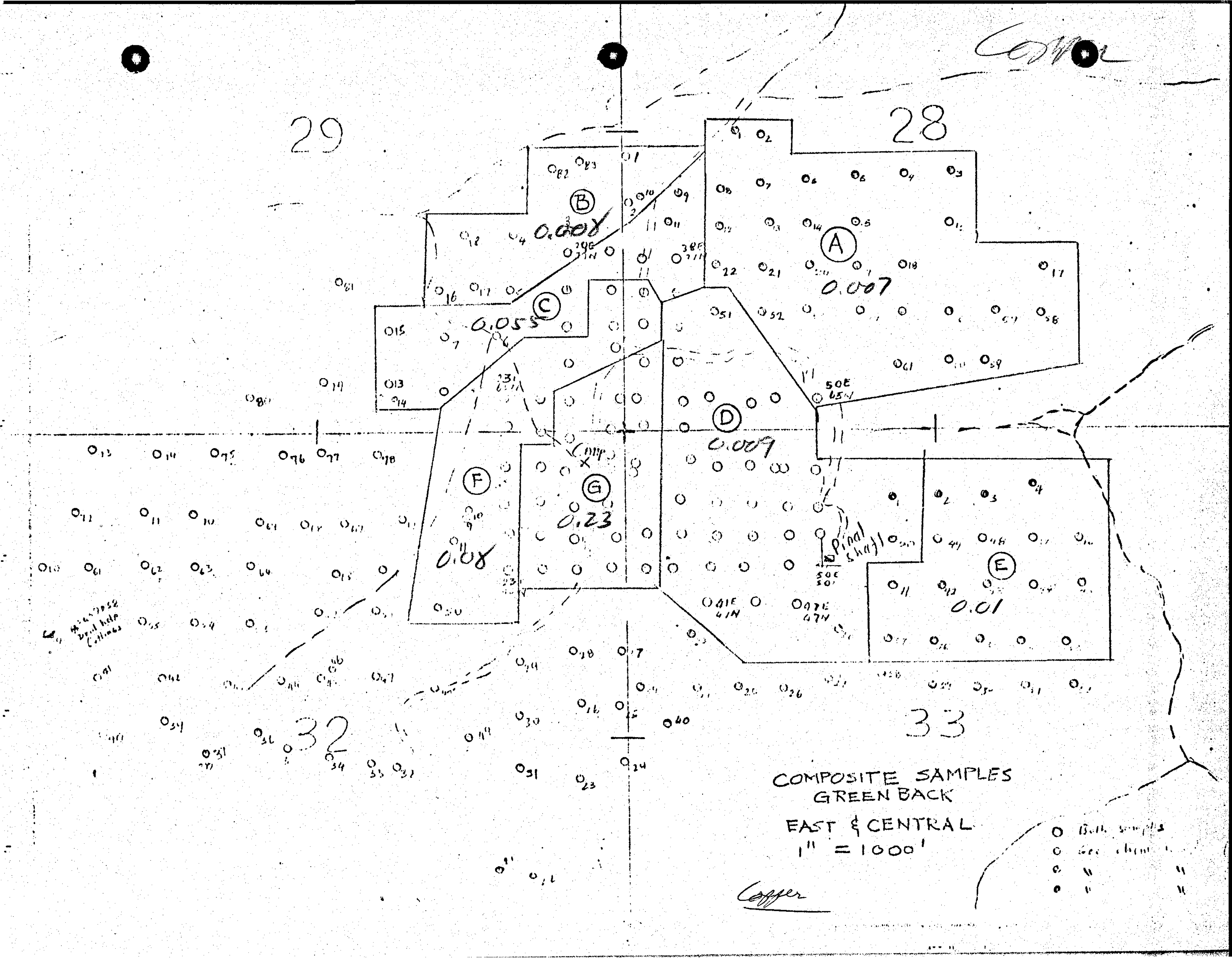


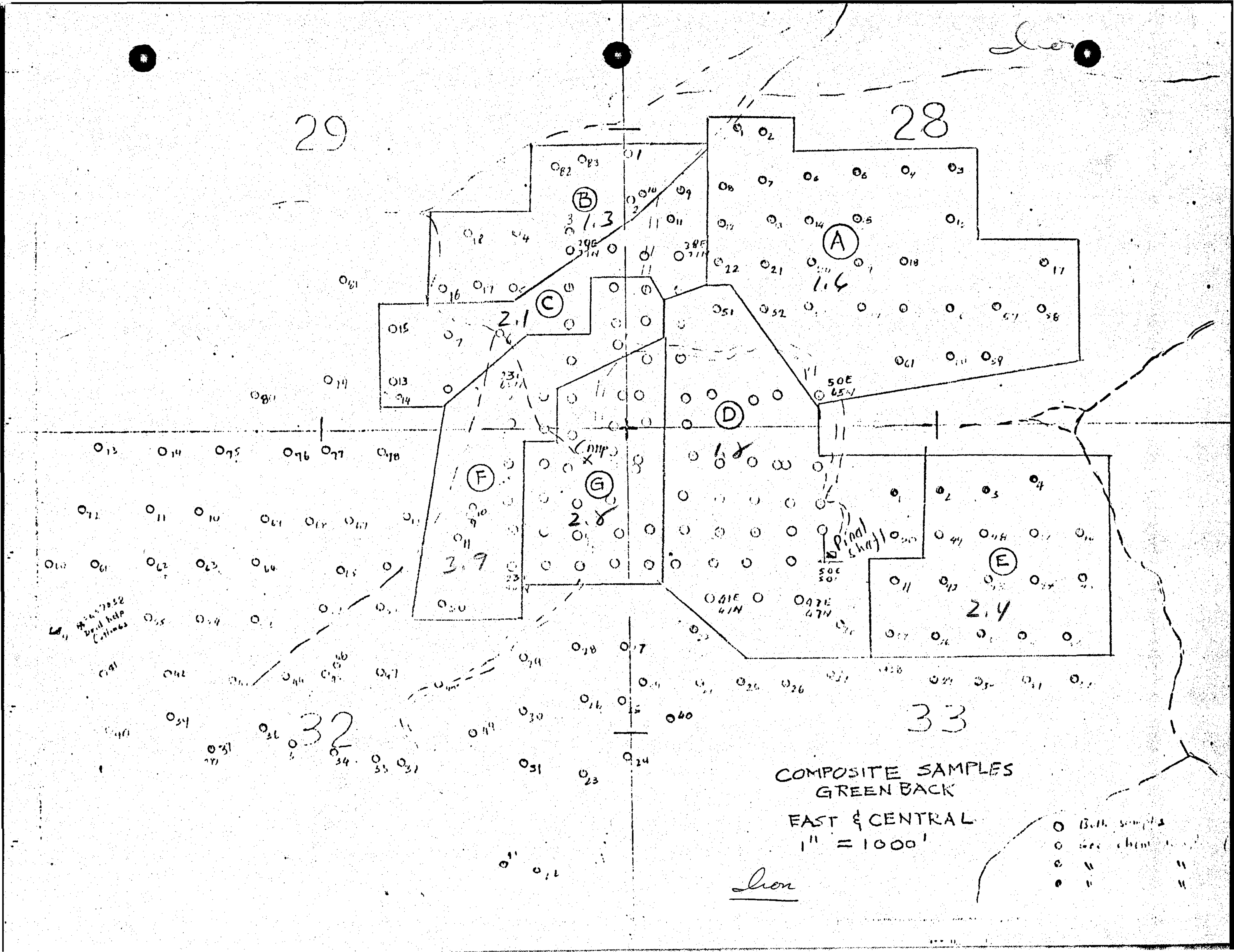
Calavim
29
28
32
33
A
0.85
B
0.63
C
0.73
D
0.50
E
0.73
F
0.85
G
0.80
Camp
Pinal shaft
COMPOSITE SAMPLES
GREEN BACK
EAST & CENTRAL
1" = 1000'
Calavim

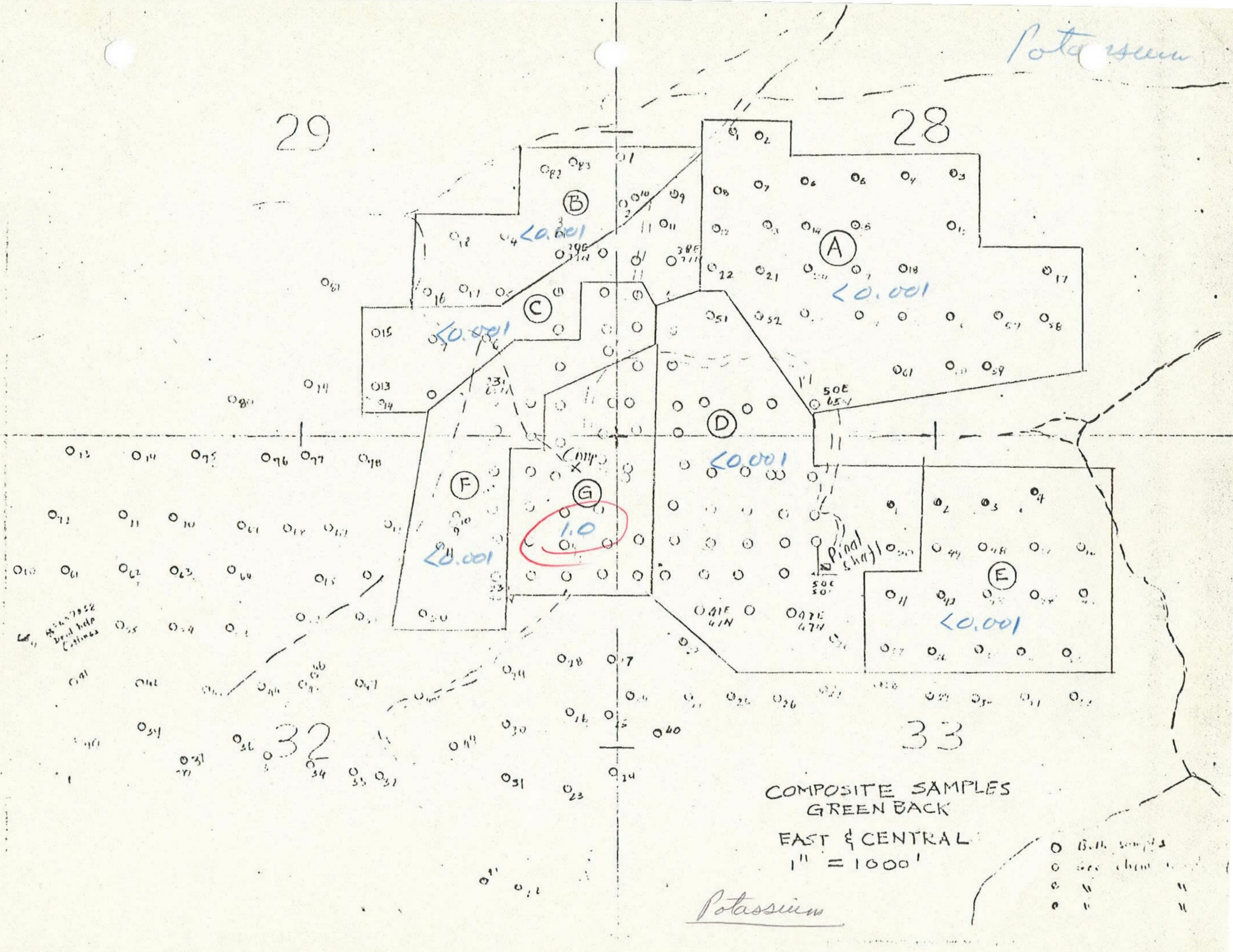

Cobalt
29
28
32
33
A
0.035
B
0.04
C
0.035
D
0.03
E
0.03
F
0.035
G
0.030
Comp
Pinal shaft
COMPOSITE SAMPLES
GREEN BACK
EAST & CENTRAL
1" = 1000'
Cobalt

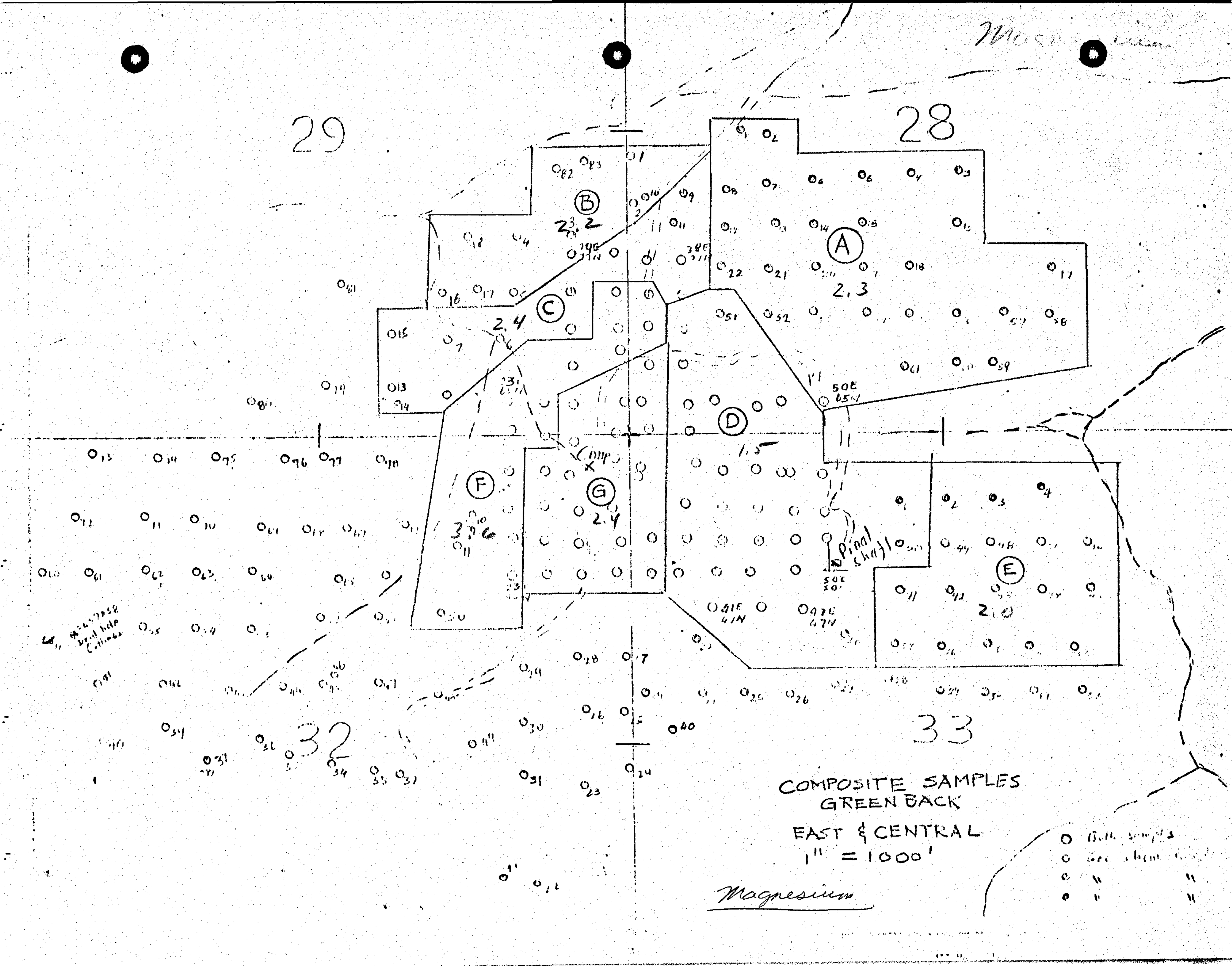


Chromium
29
28
32
33
A
0.03
B
0.02
C
0.07
D
0.03
E
0.04
F
0.08
G
0.06
Comp
Pinal shaft
COMPOSITE SAMPLES
GREEN BACK
EAST & CENTRAL
1" = 1000'
Chromium

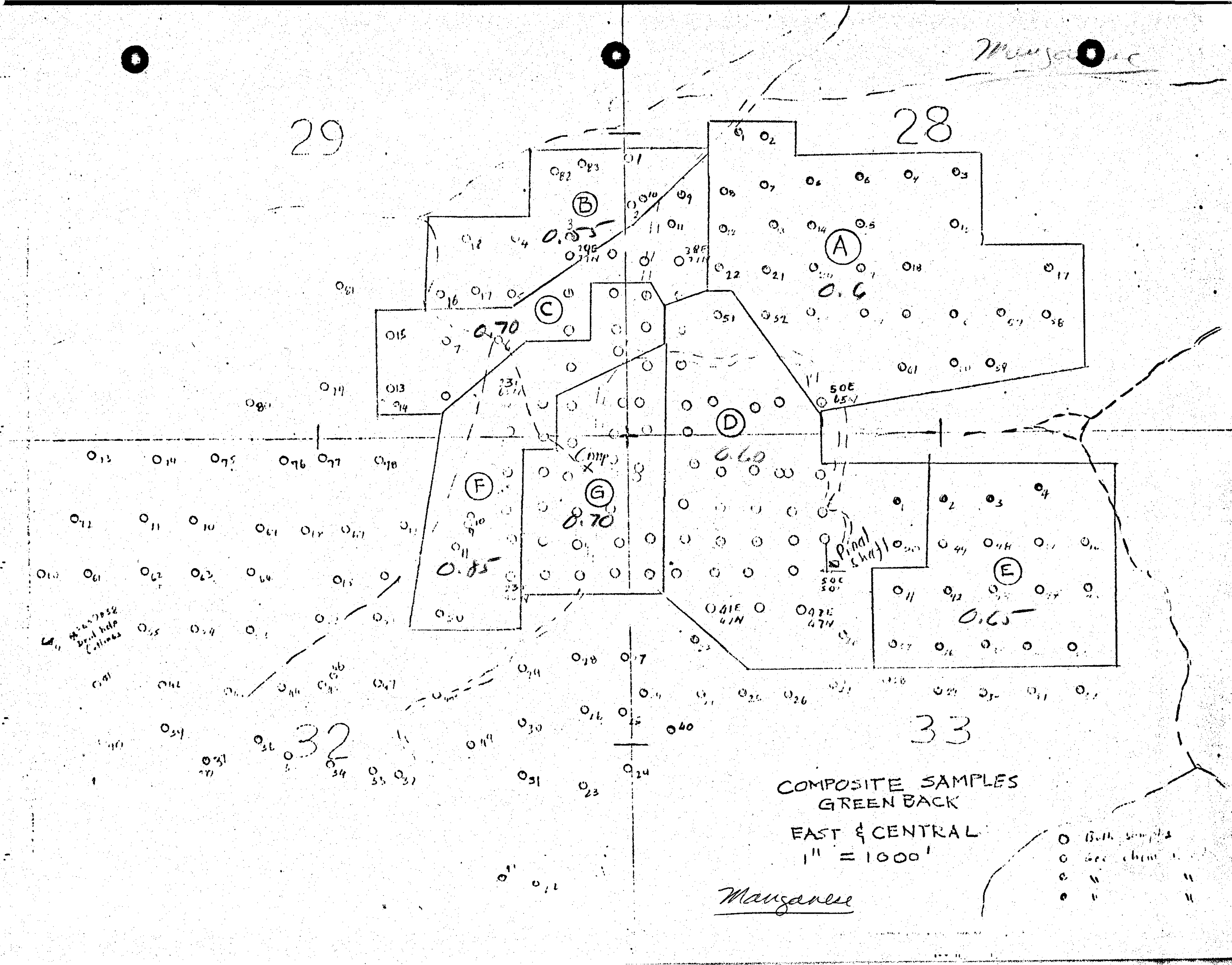

Copper
29
28
32
33
A
0.007
B
0.008
C
0.055
D
0.009
E
0.01
F
0.08
G
0.23
Comp.
Pinal shaft
COMPOSITE SAMPLES
GREEN BACK
EAST & CENTRAL
1" = 1000'
Copper

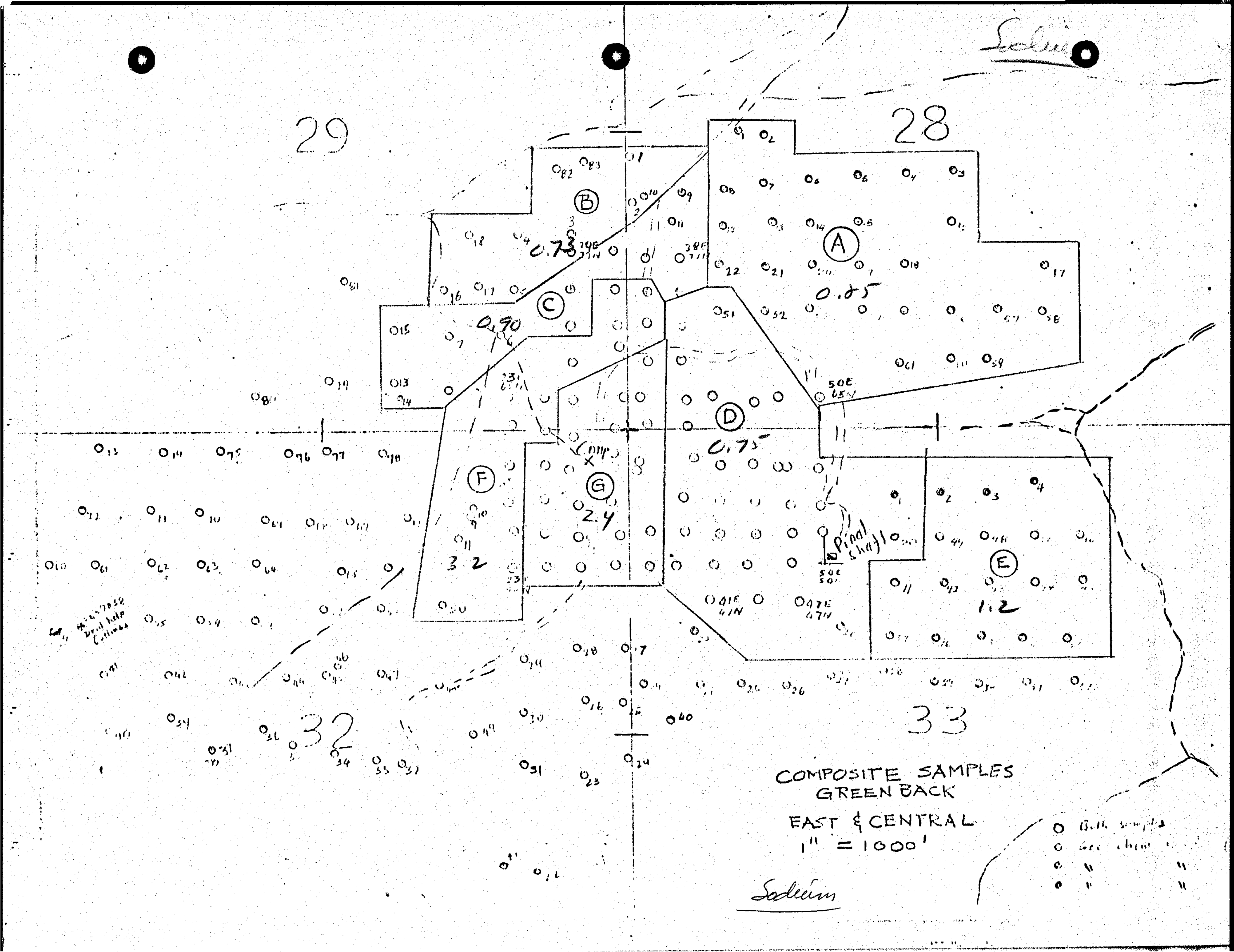

29
28
32
33
A
1.6
B
1.3
C
2.1
D
1.8
E
2.4
F
3.9
G
2.8
Comp
Pinal shaft
COMPOSITE SAMPLES
GREEN BACK
EAST & CENTRAL
1" = 1000'
Lion

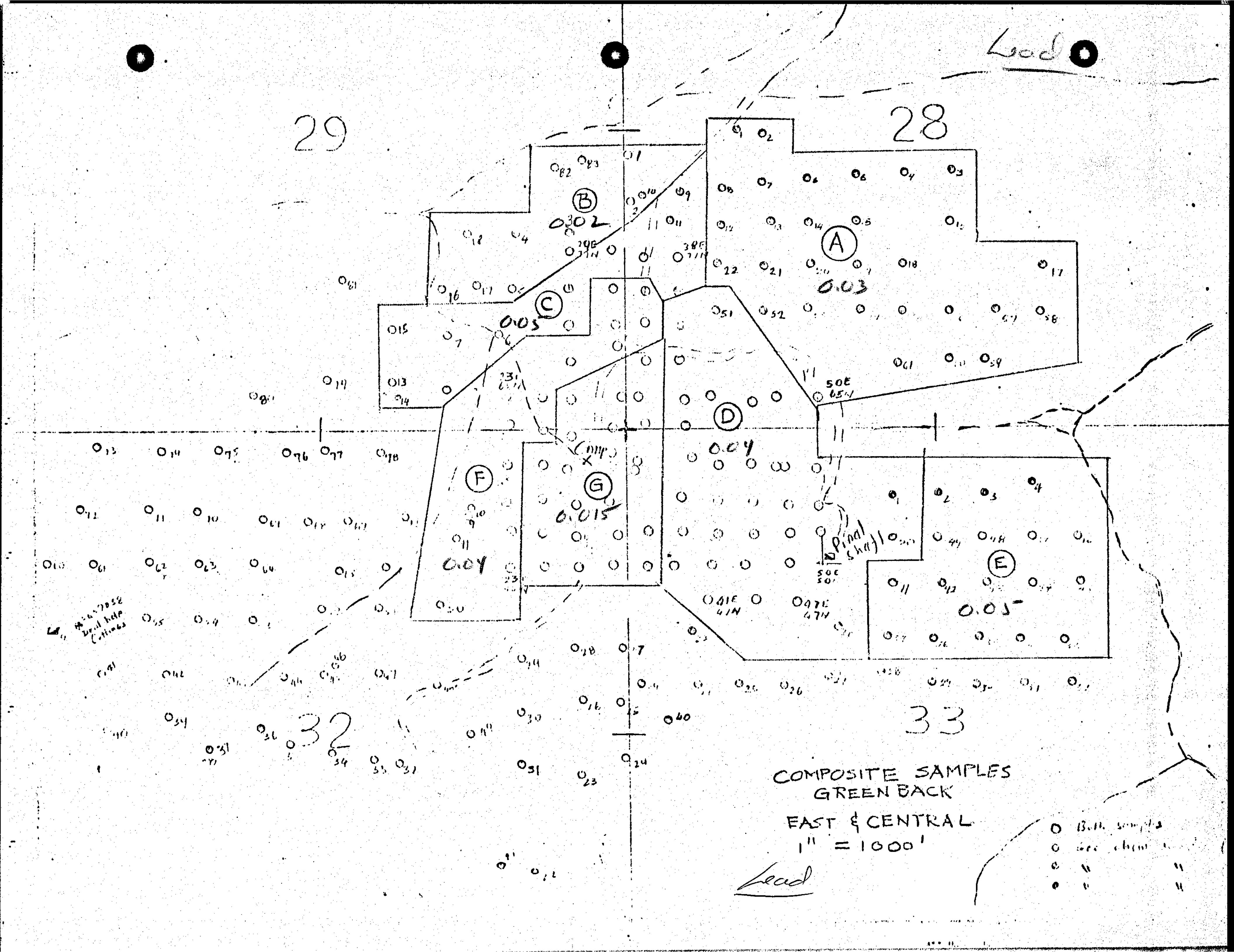

Potassium
29
28
32
33
A
B
C
D
E
F
G
<0.001
<0.001
<0.001
<0.001
<0.001
<0.001
1.0
Comp
Pinal Shaft
COMPOSITE SAMPLES
GREEN BACK
EAST & CENTRAL
1" = 1000'
Potassium

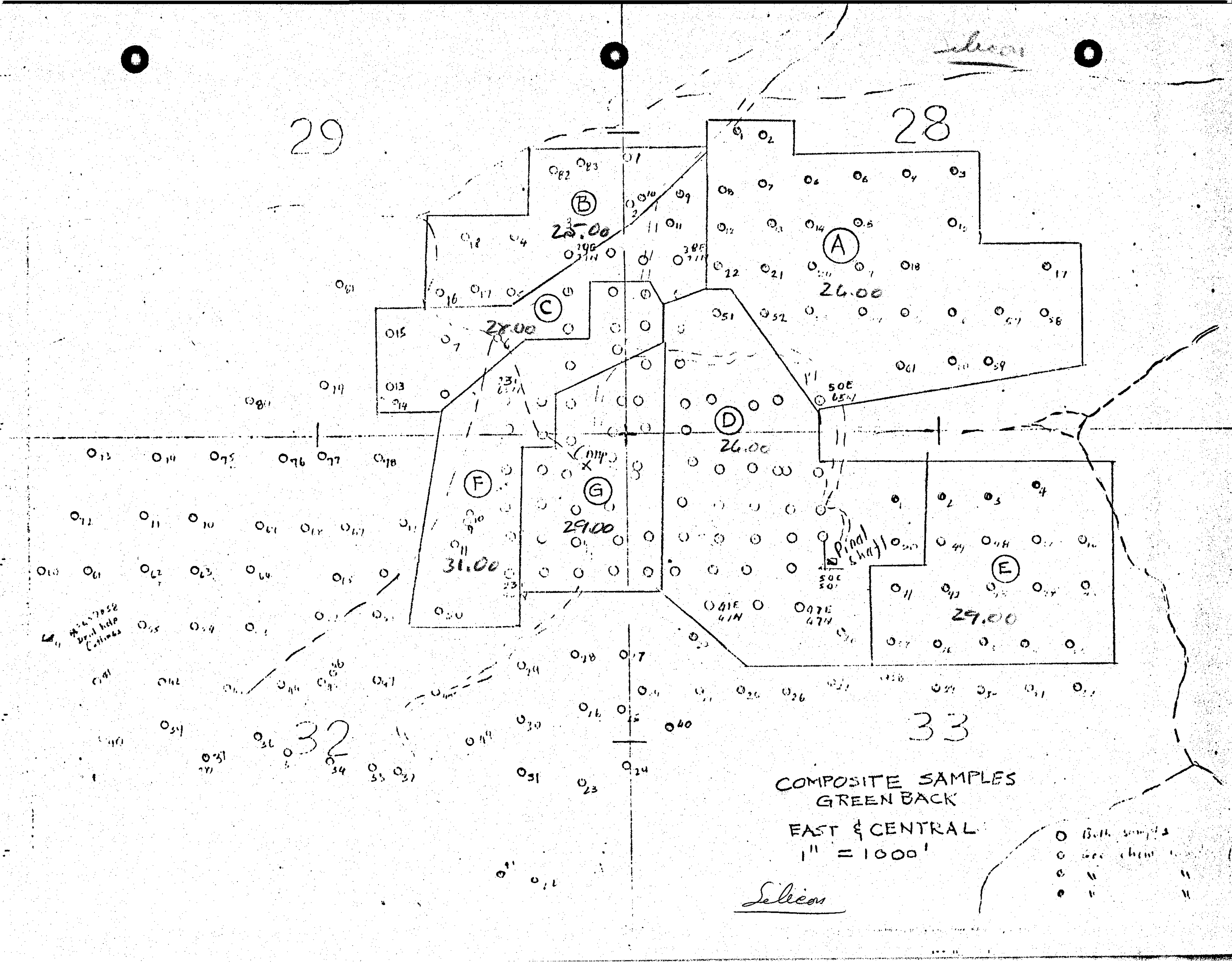


29
28
32
33
A
2.3
B
2.2
C
2.4
D
1.5
E
2.0
F
3.6
G
2.4
Comp
Pinal shaft
COMPOSITE SAMPLES
GREEN BACK
EAST & CENTRAL
1" = 1000'
Magnesium

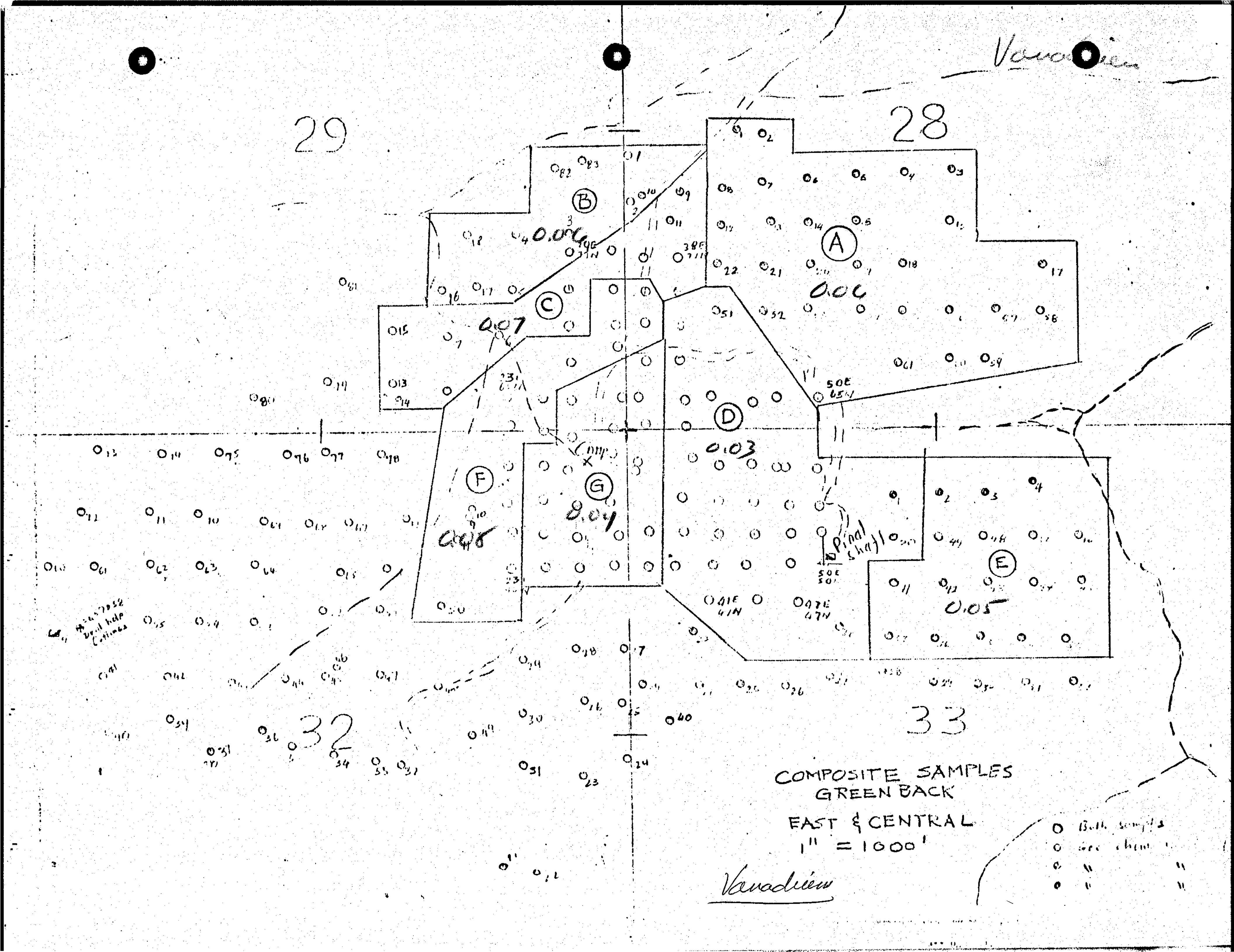

29
28
32
33
A
0.6
B
C
0.70
D
0.60
E
0.65
F
0.85
G
0.70
Camp
Pinal shaft
COMPOSITE SAMPLES
GREEN BACK
EAST & CENTRAL
1" = 1000'
Manganese

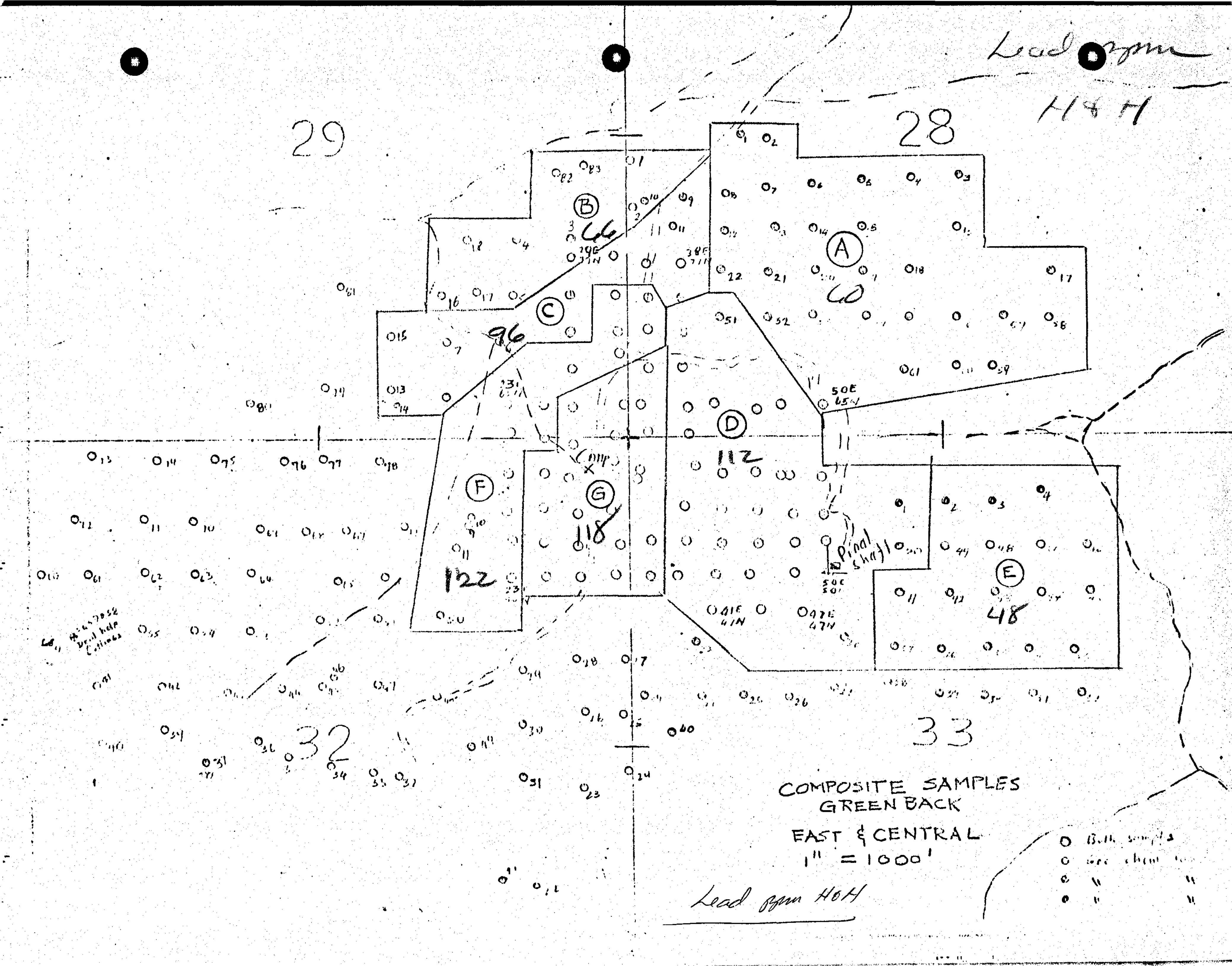

COMPOSITE SAMPLES
GREEN BACK
EAST & CENTRAL
1" = 1000'
29
28
32
33
A
B
C
D
E
F
G
0.85
0.73
0.90
0.75
1.2
2.4
3.2
Pinal shaft
Comp.
Bulk samples

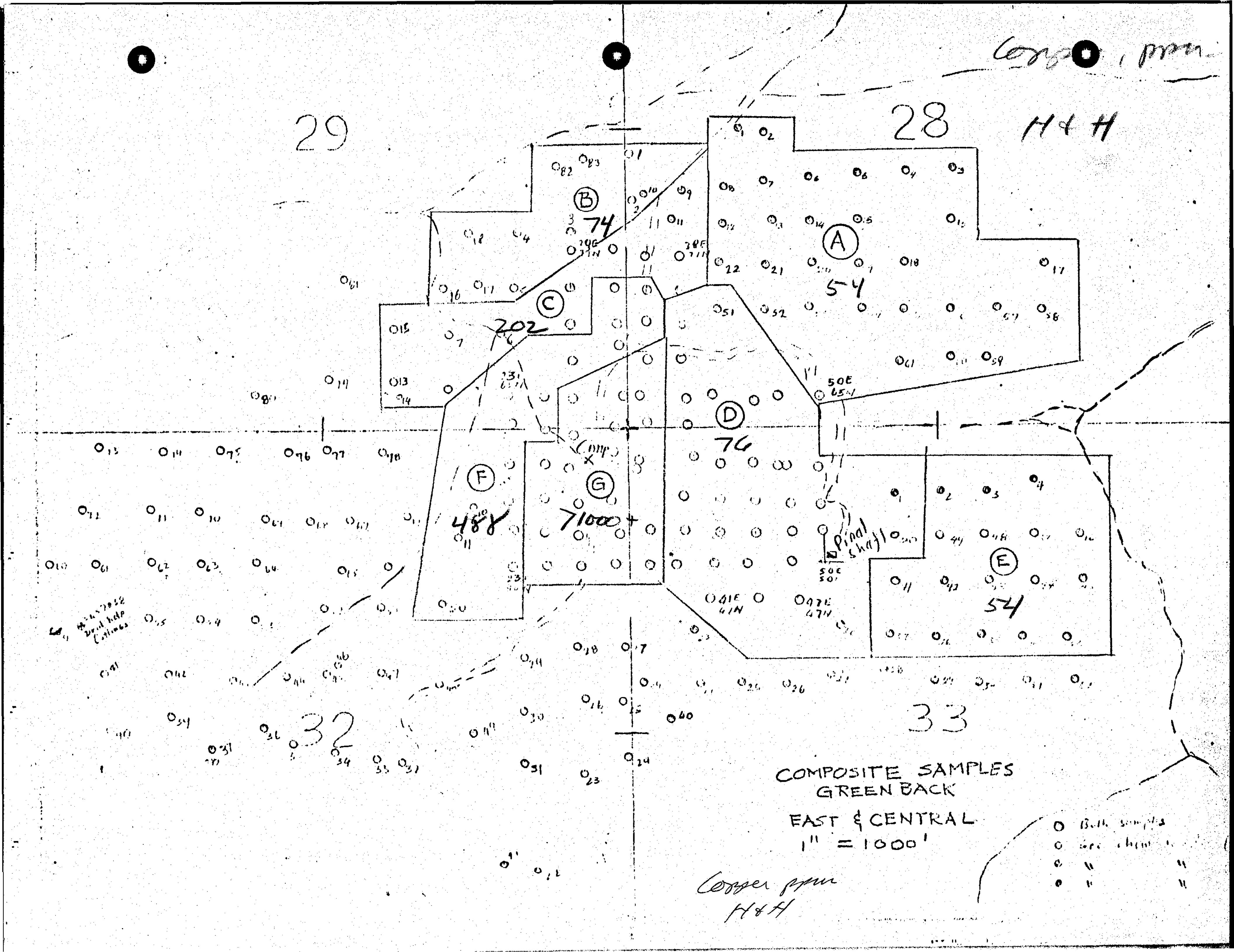

Lead
29
28
32
33
A
0.03
B
0.02
C
0.03
D
0.04
E
0.05
F
0.04
G
0.015
Comp
Pinal shaft
COMPOSITE SAMPLES
GREEN BACK
EAST & CENTRAL
1" = 1000'
Lead



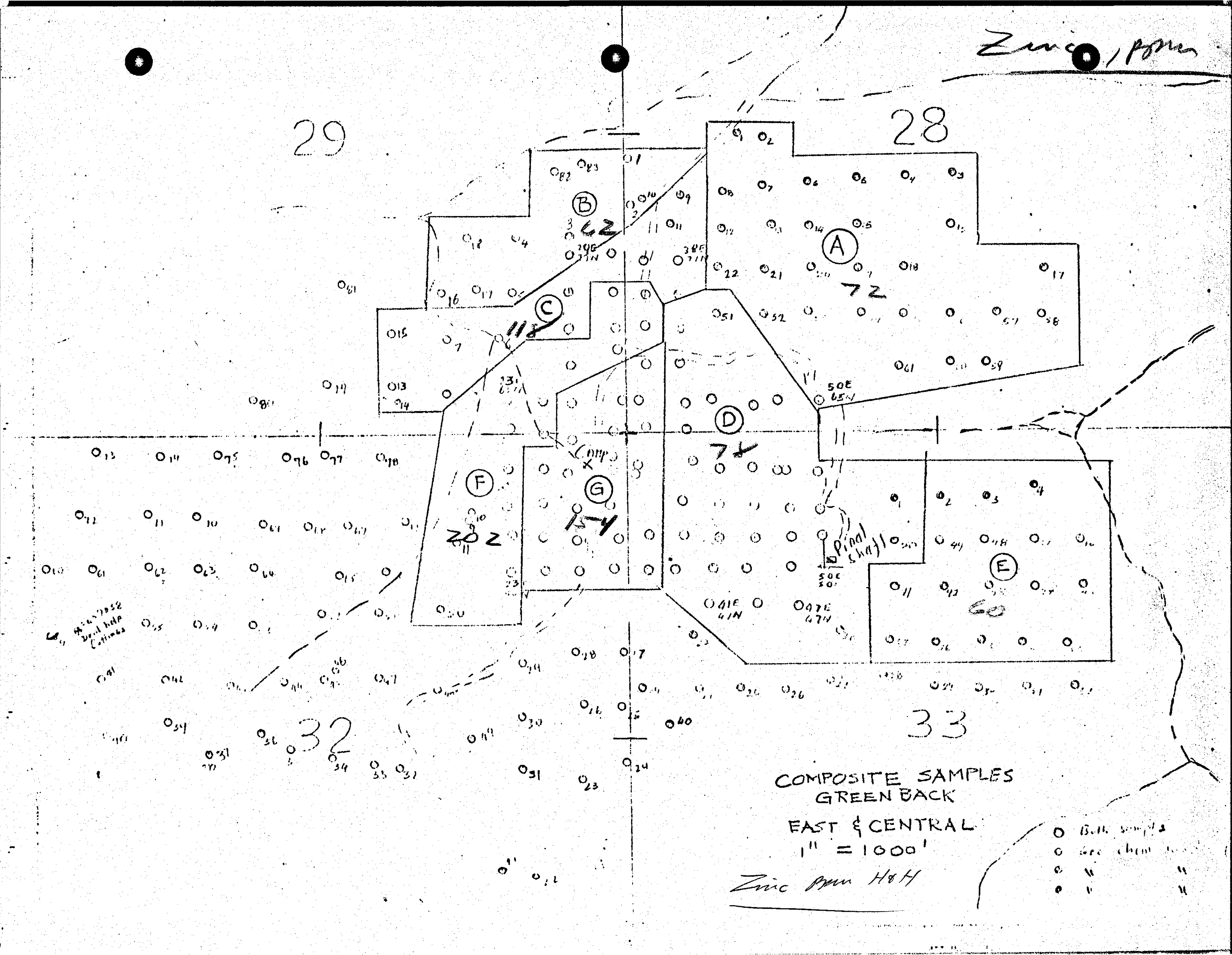
29
28
32
33
A
26.00
B
25.00
C
27.00
D
26.00
E
29.00
F
31.00
G
29.00
Comp
Pinal shaft
COMPOSITE SAMPLES
GREEN BACK
EAST & CENTRAL
1" = 1000'

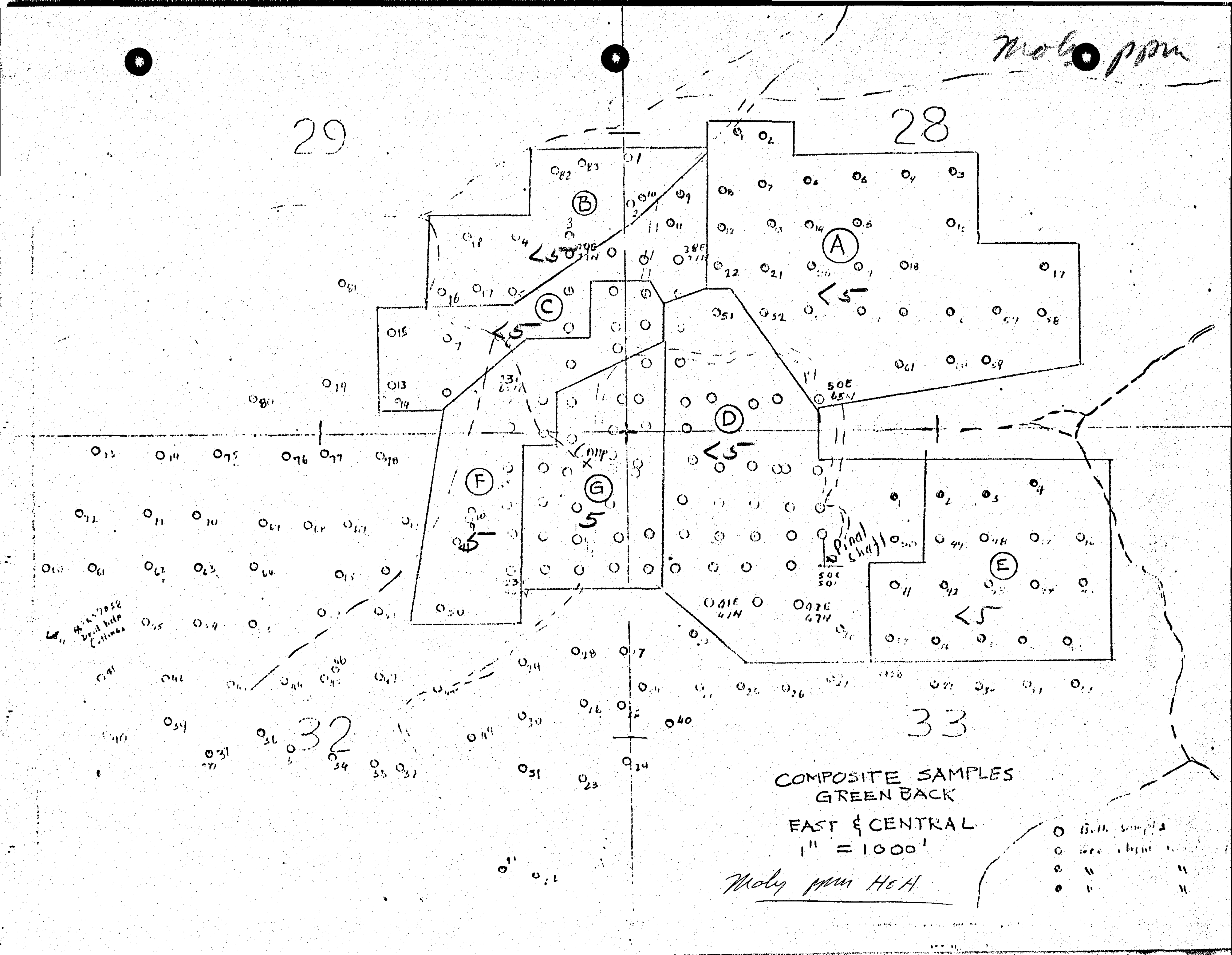

Vanadium
29
28
32
33
A
B
C
D
E
F
G
0.06
0.006
0.07
0.03
0.04
0.08
0.05
Comp
Pinal shaft
COMPOSITE SAMPLES
GREEN BACK
EAST & CENTRAL
1" = 1000'
Vanadium

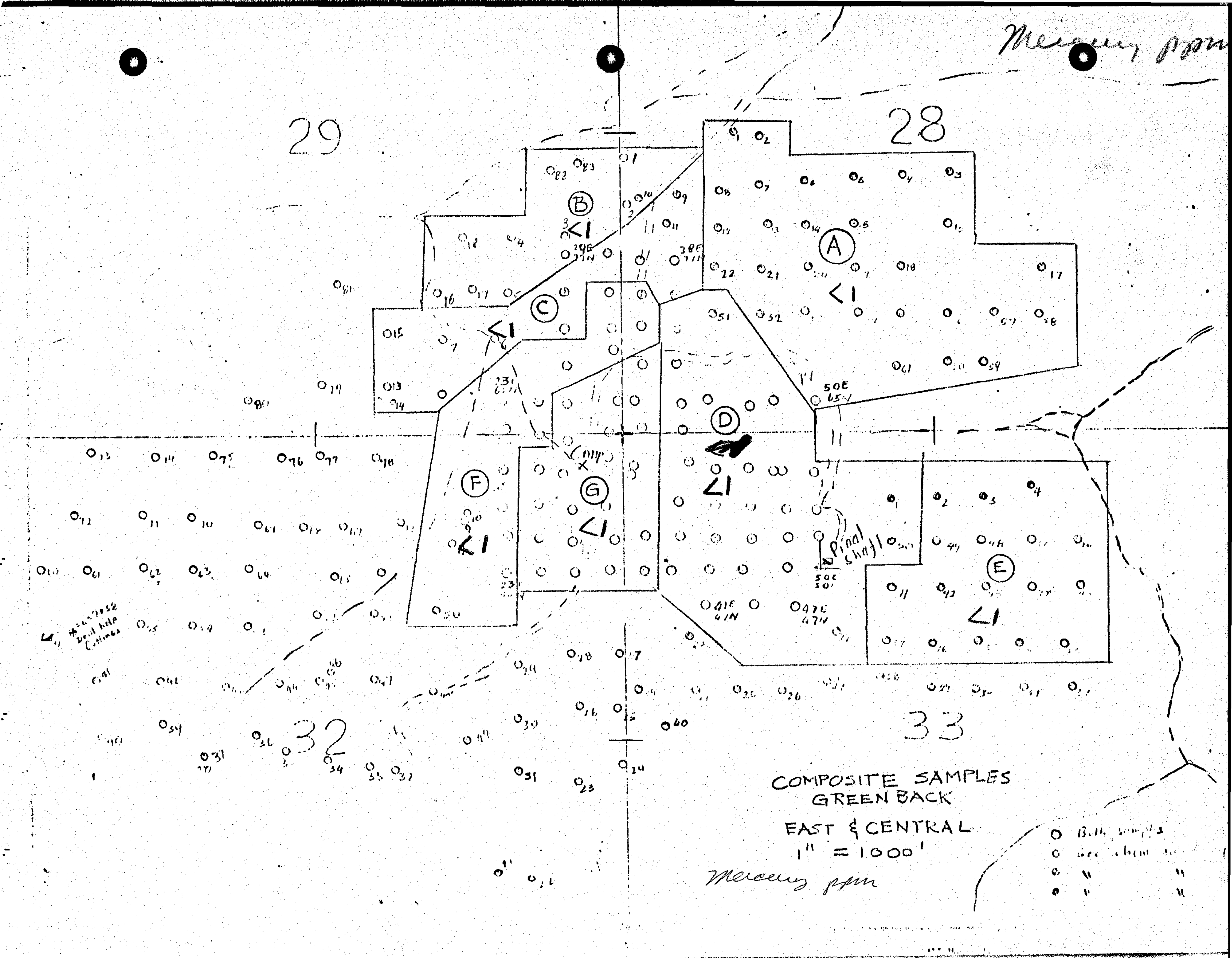

Lead ppm
H&H
29
28
32
33
A
60
B
66
C
96
D
112
E
48
F
122
G
118
Comp
Pinal shaft
COMPOSITE SAMPLES
GREEN BACK
EAST & CENTRAL
1" = 1000'
Lead ppm H&H



Copper, ppm
H & H
29
28
32
33
A
54
B
74
C
202
D
76
E
54
F
488
G
71000+
Comp.
Pinal shaft
COMPOSITE SAMPLES
GREEN BACK
EAST & CENTRAL
1" = 1000'
Copper ppm
H & H


Zinc, ppm
29
28
32
33
A
72
B
62
C
118
D
78
E
60
F
202
G
154
Comp
Pinal shaft
COMPOSITE SAMPLES
GREEN BACK
EAST & CENTRAL
1" = 1000'
Zinc ppm H&H


Moly ppm
29
28
32
33
A
B
C
D
E
F
G
<5
5
Comp
Pinal shaft
COMPOSITE SAMPLES
GREEN BACK
EAST & CENTRAL
1" = 1000'
Moly ppm HEH



Mercury ppm
29
28
32
33
A
B
C
D
E
F
G
<1
Comp
Pinal shaft
COMPOSITE SAMPLES
GREEN BACK
EAST & CENTRAL
1" = 1000'
Mercury ppm

SIERRA DIAMOND DRILLING CO.

Report on Drilling Results
for
Pinal Copper Corporation
on
Kick Back No. 2 and Kick Back No. 5 Claims

Feb.-Mar., 1970

INDEX

Page

Pinal Copper Corporation

Kick Back No. 2 and Kick Back No. 5 Claims

To date the Pinal Copper Corporation has had very limited knowledge of the potential of the Greenback group of eight claims which constitute part of their holdings.

In 1923 when the shafts were all accessible a very commendible report was written on these claims by Dr. G. Montague Butler of the University of Arizona in Tucson, and also Director of the Arizona Bureau of Mines.

In the "Summary" of his report Dr. Butler states: "I consider that the property of the Greenback Mining Company constitutes a very promising prospect. I believe further an extensive development to be abundently justified by the showing already made, and feel that there is a good chance that intelligent work will develop ore of such amount and grade as may be mined profitably."

In his "Conclusions" Dr. Butler further states: "The property of the Greenback mining Company is not a developed mine in which it is possible to compute the available ore or even to estimate closely the probable grade of such ore as may be developed. It is purely a prospect, but the size and character of the veins and the work already done, make it a very attractive prospect. In fact I do not remember ever to have examined a gold property in which the indications appear to be more favorable.

A meeting of the Directors of Pinal Copper Corporation was held the latter part of 1969 to discuss a procedure to be followed in regards to these claims. It was unanimously agreed by the Directors that some exploratory drilling should be done in order to evaluate the claims, and to verify Dr. Butler's report.

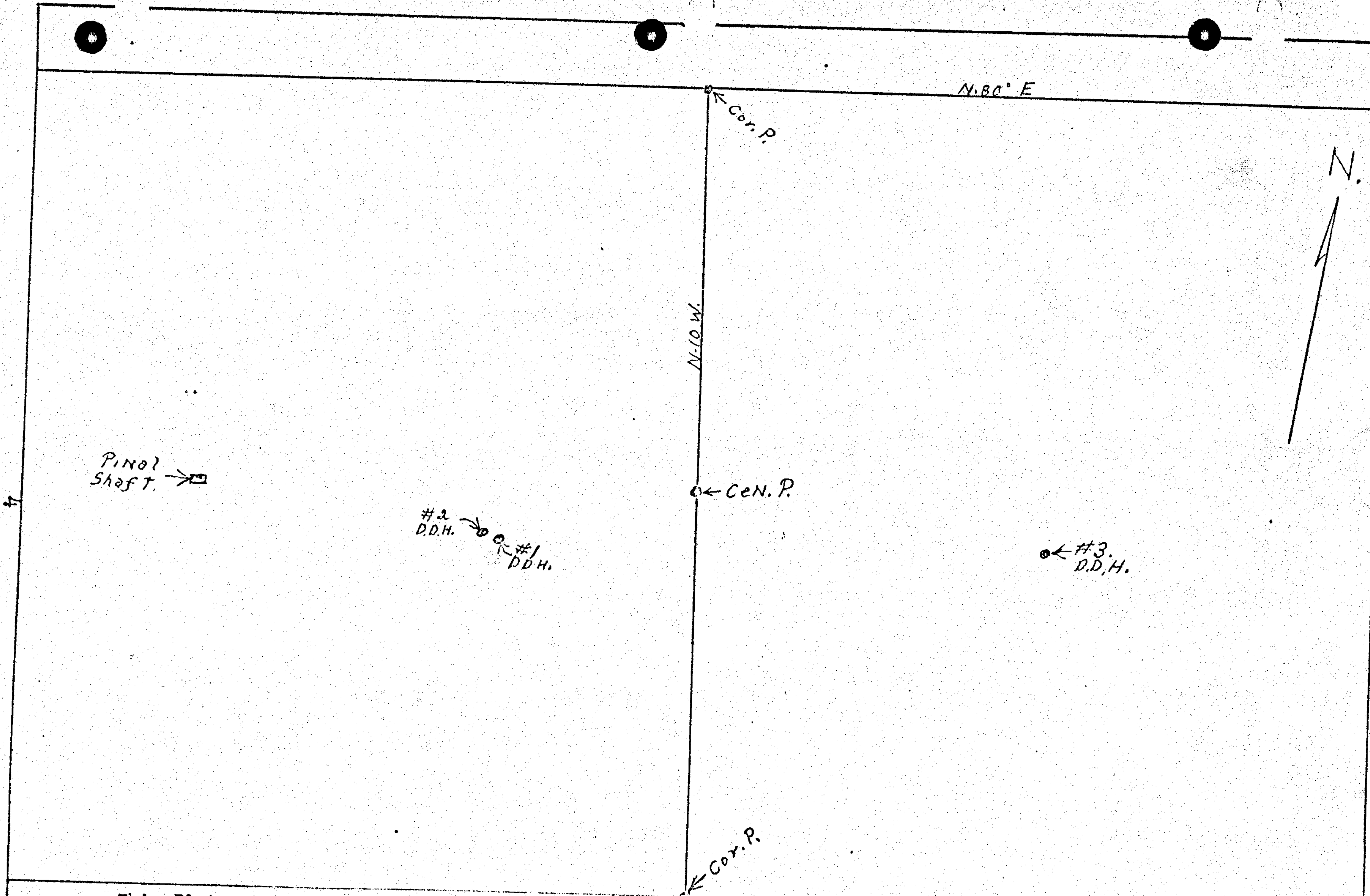
As a result the writer was retained to drill three shallow holes, and to determine the location of these holes.

Following is the result of this drilling:

Drill Hole No. 1

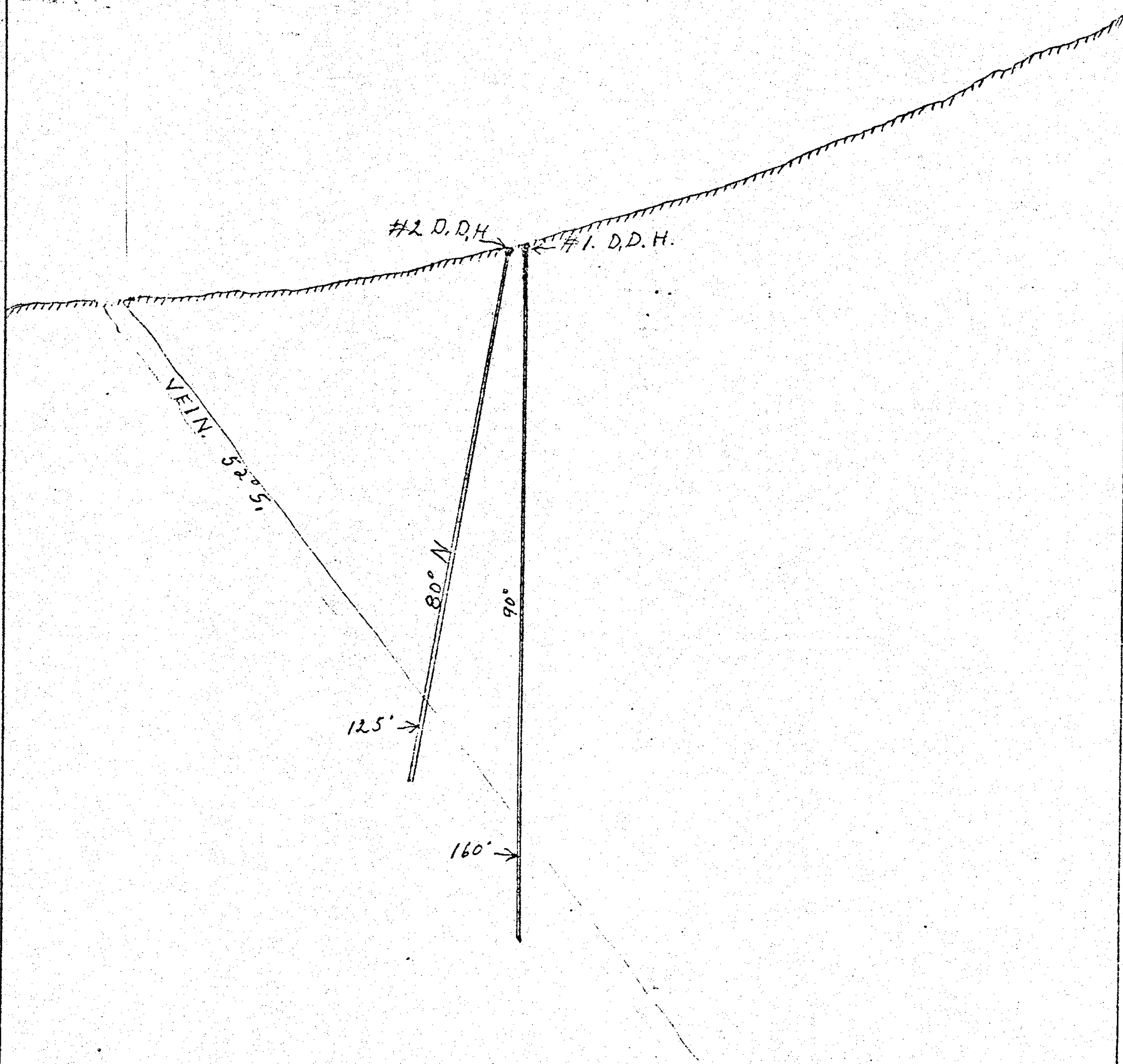
The first hole was drilled 214 feet east of the old Pinal Shaft along the general strike of the vein. This is illustrated on the accompanying Vertical Cross Section Map for No. 1 and No. 2 holes.

Attached is an assay of the vein structure of this drill hole showing results far beyond our expectations.



This Plat embraces the East 500' of Kick Back #2 claim, and the west 500' of Kick Back #5 claim, and illustrates the position of the three holes drilled on the above in February & March, 1970 by Sierra Diamond Drilling Co.

Vertical Cross Section
Illustrating Position Vein was cut
With No. 1 and No. 2 Diamond Drill Holes
On Kick Back No. 2 Claim



SIERRA DIAMOND DRILLING CO.

DIAMOND DRILL HOLE LOG

Property Pinal Copper

Hole No. 1

Date Drilled Feb. 20, 1970

Inclination Vertical

From	To	% Core		Remarks	Assay			
				No core kept above 50 ft.				
50	60	90		Andesite porphyry with Fe oxides				
				in soft zones and fractures				
60	70	98		Hard massive grey porphyry				
70	80	96		Hard massive grey porphyry				
80	90	98		Hard massive grey porphyry				
90	100	97		6 Ft. hard grey andesite, 4 ft. altered				
				soft andesite, Fe in fractures				
100	110	98		2 Ft. fine grained andesite, 4 Ft. coarse				
				grained andesite				
110	120	95		Fine grained hard silicified porphyry				
				with 2 inch quartz breccia seams showing				
				pyrite vugs				
120	130	90		Andesite breccia with quartz seams and Fe				
130	140	85		Fractured andesite with quartz seams				
				and Fe				
140	150	90		6 Ft. coarse grained grey andesite,				
				4 Ft. highly altered with quartz breccia				
				and Fe				
150	160	80		4 Ft. andesite breccia with some quartz				
				and Fe. 6 Ft. quartz and quartz breccia				
				assayed for gold	58.10			
160	170	94		Andesite with Fe in all fractures				
170	180	96		Andesite porphyry, Fe in fractures				

ARIZONA TESTING LABORATORIES

A DIVISION OF CLAUDE E. McLEAN & SON LABORATORIES, INC.
817 WEST MADISON ST. PHOENIX, ARIZONA 85007 PHONE 254-6181

For Sierra Diamond Drilling Co.
Mr. Harold Ferrin
Post Office Box 102
Mesa, Arizona

Date February 25, 1970

Sample of Core Chips

Received: 2-24-70

Submitted by: same

ASSAY CERTIFICATE

Gold figured at $ 35.00 per ounce

Silver figured at $ 2.00 per ounce

LAB. NO.	IDENTIFICATION	GOLD		SILVER		PERCENTAGES	
		OZ. PER TON	VALUE	OZ. PER TON	VALUE		
6775	Core Chips	1.66	$58.10	0.10	$0.20		

Respectfully submitted,

ARIZONA TESTING LABORATORIES

Claude E McLean Jr

Claude E. McLean, Jr.

Rocky Mountain Geochemical Corporation
2050 EAST 14TH STREET
TUCSON, ARIZONA 85719
Phone 622-5702
Area Code: 602

CERTIFICATE OF ANALYSES

Date April 28, 1970

Client Sierra Diamond Drilling Company
P.O. Box 102
Mesa, Arizona

ATTN: Mr. Harold Ferrin

Report on: 1 Core Sample

Submitted by: Mr. Ferrin

Date Received: April 15, 1970

Analysis: Gold

Remarks: Analysis determined by atomic absorption.

Job No. 70-3-20T

cc: Enclosed (2)
RMGC--Salt Lake
file

MH:ab

By Martin Hibbetts

Martin Hibbetts

Sample No.	ppm Gold
#1 Hole	51.5 (=1.5 oz/ton)

This assay was made in order to verify the results of the assay made by Arizona Testing Laboratories. H. Ferrin

ND = Non Detected 1 ppm = 0.0001% 1 Troy oz./ton = 34.28 ppm % Mo. x 1.6683 = %MoS_2

Drill Hole No. 2

The second hole was placed to encounter the vein approximately 30 feet from the No. 1 Hole in order to determine if we had hit a high grade spot, or if there was any real continuity to the mineralization. The strike of this drill hole is shown on the Vertical Cross Section Map for No. 1 and No. 2 holes.

The results of No. 2 Hole were equivalent to that of No. 1 Hole as is shown on the accompanying assay.

SIERRA DIAMOND DRILLING CO.

DIAMOND DRILL HOLE LOG

Property Pinal Copper

Hole No. 2

Date Drilled Mar. 5, 1970

Inclination 80° N

From	To	% Core		Remarks	Assay		
				No cores were kept above 50'			
50	60	98%		Andesite porphyry			
60	70	96%		Andesite porphyry			
70	80	95%		Quartz monzonite porphyry			
80	90	98%		Porphyry			
90	100	100%		Andesite porphyry			
100	110	95%		Brown porphyry with quartz seams			
110	118	96%		Porphyry			
118	125	70%		Quartz vein and porphyry breccia			
				highly mineralized. 5 ft. core split			
				assayed for gold	$59.15		
125	130	98%		Andesite porphyry			

ARIZONA TESTING LABORATORIES

A DIVISION OF CLAUDE E. McLEAN & SON LABORATORIES, INC.
817 WEST MADISON ST. PHOENIX, ARIZONA 85007 PHONE 254-6181

For Sierra Diamond Drilling Co.
Mr. Harold Ferrin
Post Office Box 102
Mesa, Arizona

Date March 9, 1970

Sample of ~~oxx~~ Core Chips

Received: 3-9-70

Submitted by: Same

ASSAY CERTIFICATE

Gold figured at $ 35.00 per ounce

Silver figured at $ 2.00 per ounce

LAB. NO.	IDENTIFICATION	GOLD		SILVER		PERCENTAGES	
		OZ. PER TON	VALUE	OZ. PER TON	VALUE		
6851	Hole #2, Core Chips	1.69	$59.15				

Respectfully submitted,

ARIZONA TESTING LABORATORIES

Claude E. McLean, Jr.

Drill Hole No. 3

Apparently from the results of number one and number two drill holes the mineralization seemed to be coming from the east. Therefore the third hole was placed approximately 640 feet east from the shaft where several veins parallel through the hill, and a small cross vein intersects the Pinal vein at this point. The position of this hole is shown on the attached Vertical Cross Section Map for No. 3 Drill Hole.

The accompanying assay shows the results of this No. 3 drill hole.

Conclusions

In view of the fine results of the three holes drilled, it is my opinion a more extensive drilling program should be undertaken to further determine the values and extent of the ore zones of the Pinal Copper Corporation holdings.

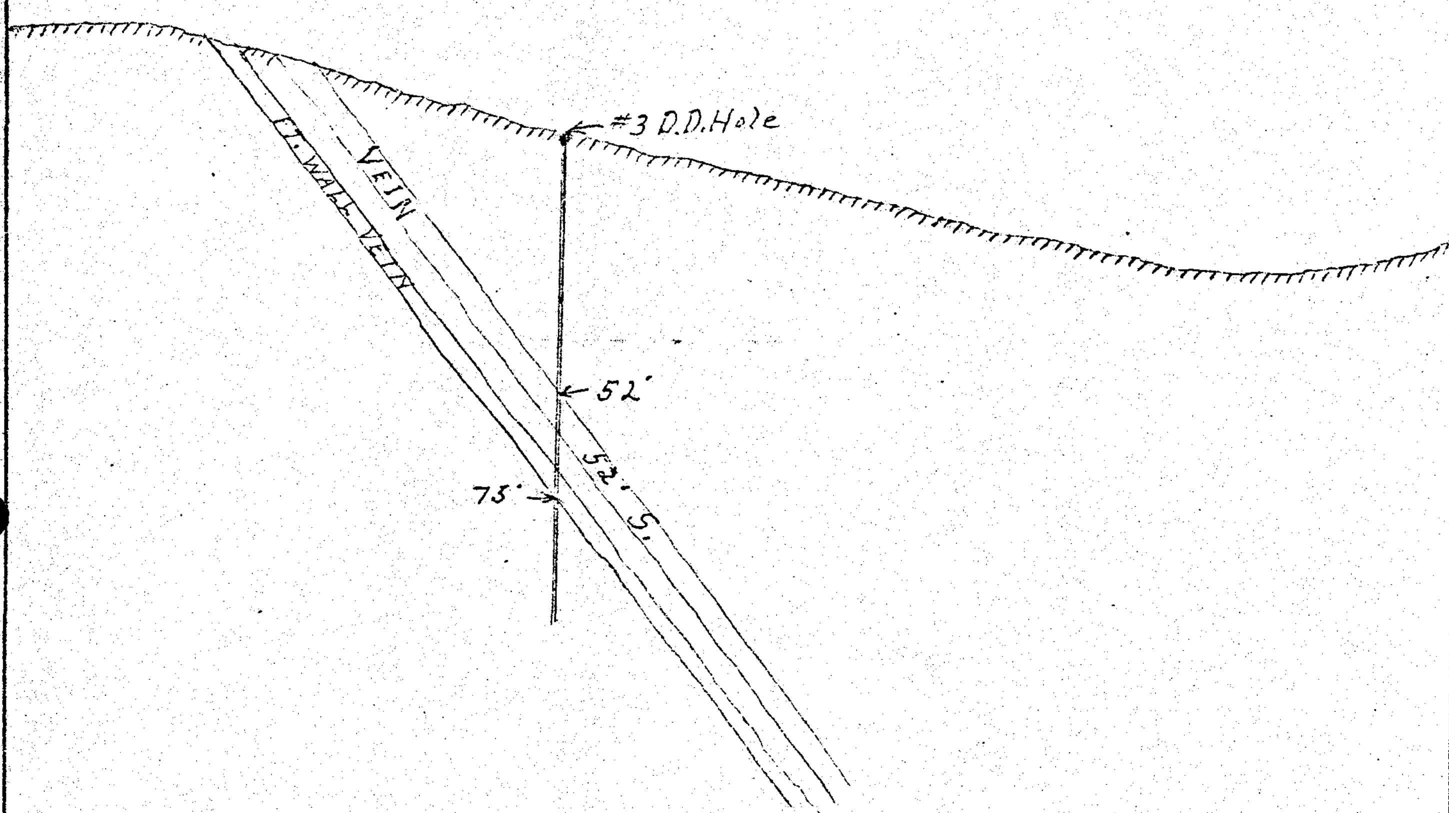
Respectfully submitted,

Harold Ferrin

Harold Ferrin

April 5, 1970

Vertical Cross Section
Illustrating Position Vein was Cut
With No. 3 Diamond Drill Hole
On Kick Back No. 5 Claim



SIERRA DIAMOND DRILLING CO.

DIAMOND DRILL HOLE LOG

Property Pinal Copper

Hole No. 3

Date Drilled Mar. 20, 1970

Inclination Vertical

From	To	% Core		Remarks	Assay	
				No core taken above 40 ft.		
40	50	80		Andesite porphyry		
50	52	90		Andesite porphyry, some Fe oxide		
52	55	75		Quartz, quartz porphyry and vein breccia Gold assay	$14.00	
55	60	70		Quartz, quartz porphyry and vein breccia Gold assay	$17.00	
60	70	80		Broken up gangue filling		
70	75	70		Quartz vein structure Gold assay	$42.00	
75	80	90		Altered andesite porphyry and Fe		
80	90	94		Quartz and andesite breccia, Fe in all joints		
90	100	96		Andesite porphyry		

ARIZONA TESTING LABORATORIES

A DIVISION OF CLAUDE E. McLEAN & SON LABORATORIES, INC.
817 WEST MADISON ST. PHOENIX, ARIZONA 85007 PHONE 254-6181

For Sierra Diamond Drilling Co.
Post Office Box 102
Mesa, Arizona 85201

Date April 3, 1970

Sample of Ore

Received: 4-2-70

Submitted by: Same

ASSAY CERTIFICATE

Gold figured at $ 35.00 per ounce

Silver figured at $ 2.00 per ounce

LAB. NO.	IDENTIFICATION	GOLD		SILVER		PERCENTAGES	
		OZ. PER TON	VALUE	OZ. PER TON	VALUE		
7049	3-Hole, 52'-55'	0.40	$14.00				
7050	3-Hole, 55'-60'	0.50	$17.50				
7051	3-Hole, 70'-75'	1.20	$42.00				

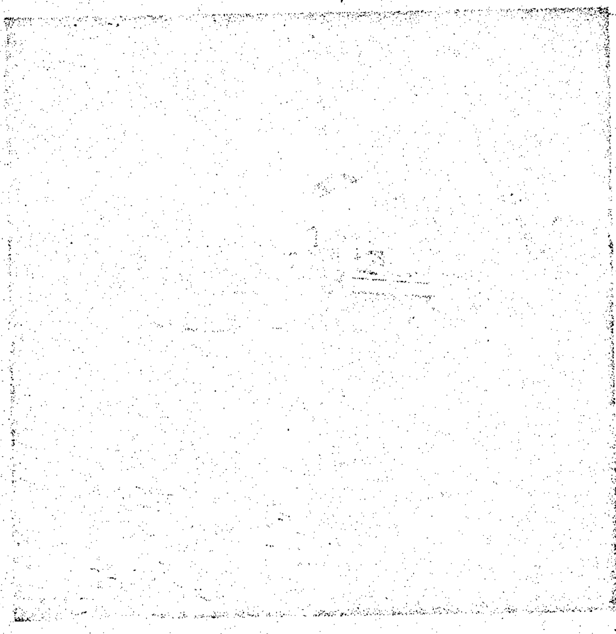
2 cc: Mr. Tom Hopkins
401 East Indian School Road
Room 107
Phoenix, Arizona

Respectfully submitted,

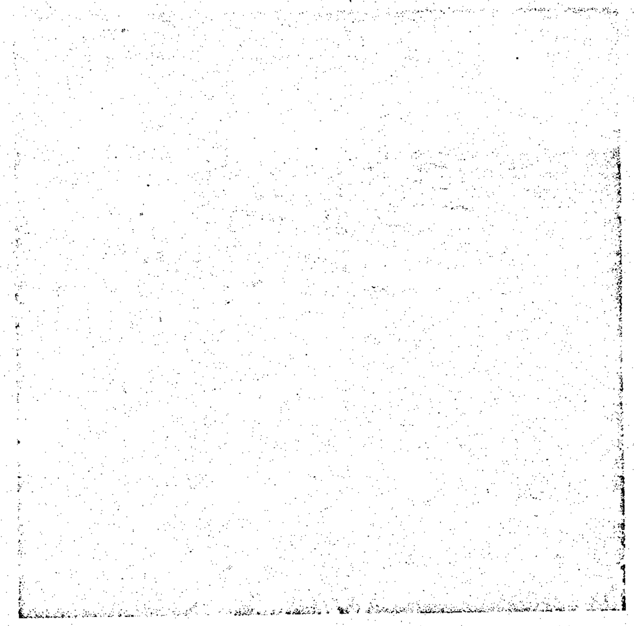
ARIZONA TESTING LABORATORIES

Claude E. McLean Jr.

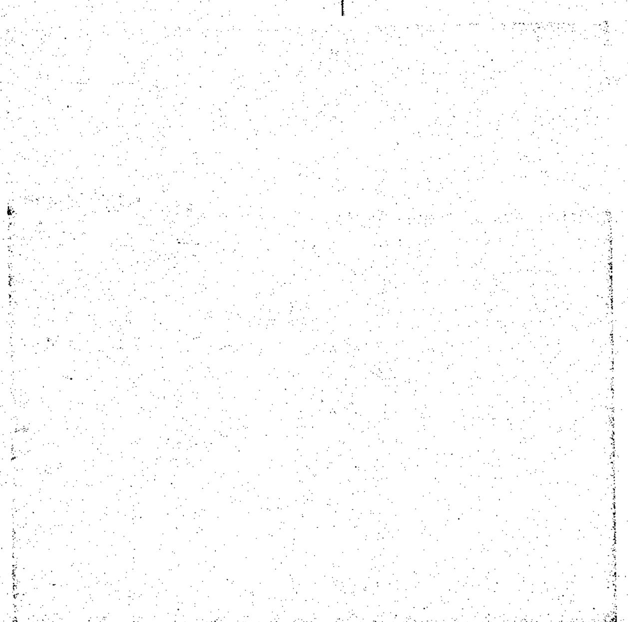
Claude E. McLean, Jr.



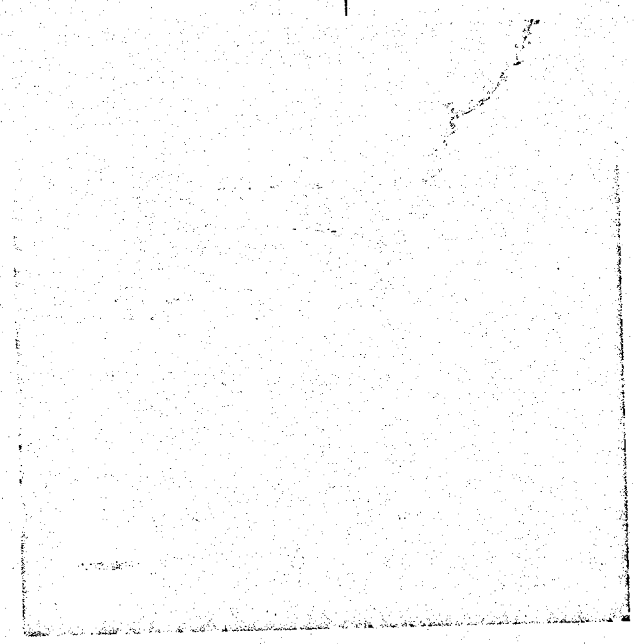
Drill Site of No. 3 Hole
on Kick Back No. 5 Claim



Taken from slope above
Pinal shaft



Taken looking East from Pinal
Shaft Dump
Red arros shows position of
No. 1 and No. 2 Holes



Looking NE from Pinal Shaft

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

May 10, 1972

FILE MEMORANDUM

Pinal Copper
(Greenback Mine)
Papago Indian Reservation
Pima County, Arizona

On May 9, 1972, John Balla and I visited the Pinal Copper area at the old Greenback Mine, in the Copperosity Hills, to collect an age-dating sample from the main unit.

New roads and an airstrip have been constructed into the area. On our way out a plane landed and we stopped to find out more. The pilot turned out to be a Mr. C. E. (Chuck) Cronenwelt (Tucson phone 623-1026), a consulting geologist. He is also on the Board of Directors of the Pinal Copper and Development Corporation, the major land holder of the Greenback Mine area.

We toured part of the area with Chuck and learned that Dr. Tom Mitcham is doing an alteration study to go with Mr. Cronenwelt's 1"=600 ft. geologic reconnaissance map. Chuck says the company has funds for drilling three or four holes aggregating 3000 ft. of drilling. He believes the drilling will start within 4-6 weeks, at which time the mapping and alteration reports will have been evaluated. He has said that we can secure the drill hole locations from him, but the drilling will be "tight holes".

With the ASARCO interest, the work will be followed.

James D. Sell

James D. Sell

JDS:lad

THOMAS W. MITCHAM
6644 N. Amahl Place
Tucson, Arizona 85704

ining geologist

phone: (602) 297-4070

December 12, 1972

Mr. Edward Hopkins, Jr., President
Pinal Copper Corporation
401 E. Indian School Road, Suite 107
Phoenix, Arizona 85012

Final Report, 1972 Exploration
Pinal Copper Property
T10S, R2E, Pinal County, Arizona

Dear Mr. Hopkins:

I shall attempt here to summarize the 1972 exploration program conducted on subject property, starting in March 1972 and terminating with preparation of this report.

Mapping.--Systematic mapping on a part-time basis was conducted during the course of the program. This involved location of old drill holes, shafts, pits, and additional roads as well as geologic mapping and surface sampling. Contours were taken from a topographic map prepared previously by Landis Aerial Surveys.

Three maps (A,B,C) were prepared on a common base at a scale of 1" = 400'. The base includes coordination, topography, roads, shafts, pits, and drill holes. Copies of the three principal maps are enclosed, i.e., Map A (Claim Map), Map B (Geologic Map), and Map C (Alteration and Mineralization Map). In addition, a copy of Map D (Oxide Deposit) on a scale of 1" = 40' is attached.

Drilling.--Three vertical diamond drill holes were drilled on the property during the course of the 1972 program. Locations of these holes are shown on all three principal maps (A,B,C), and the logs (total 30 pages) are enclosed. The three holes are tabulated below.

Hole	Depth	Bottom size	Casing left in hole
72-1	300'	NQ	Collar standpipe only
72-2	3500'	BQ	670' 3" pipe, 2500' BX casing
72-3	1372'	NQ	480' 3" pipe

All holes were left in good condition and with secure caps. All drilling was core drilling with the following exceptions: because Hole 72-3 was a reentry of old El Paso Hole #1, it was reamed to 532' before coring was started; because Hole 72-2, following an unsuccessful attempted reentry of old Miami hole #M-2, was a 22-ft. offset of this old hole, it was drilled by rotary rock bit to a depth of 670' before coring was started; 20' of Hole 72-1 was rotary rock bit drilling.

By classification, the project total (5172') consisted of 3950' of core drilling, 690' of rotary rock bit drilling, and 532' of old-hole reaming.

The drilling was done with one truck-mounted Longyear 44 drill by the Longyear Company, starting June 24, 1972, and terminating October 26, 1972. Drilling was well executed, and core recovery was excellent. The total of contract drilling charges was $59,046.22, which includes all water and casing costs. Drill site preparation and engineering (e.g., logging and assaying) costs were additional.

Drilling water was pumped from an old Miami churn drill hole, M-3, where the water table is at a depth of 400'. The original depth of this hole was 700', but it was blocked at 465'.

Regardless of visual core observations, pilot samples were split at intervals, generally 5' runs at 25' intervals, and sampling was continuous where mineralization was encouraging. Cores and sample pulps and rejects are on file, presently in Tucson. Rotary cuttings from the first 670' of Hole 72-2 were not sampled because results of the old Miami hole, which it offsets by 22', were known.

<u>Geologic notes</u>.--The original objective was to make a deep test for mineralization somewhere on the property. The approach to its accomplishment involved (1) the assembly and coalition of old data, insofar as possible, (2) the acquisition of new data by mapping, and (3) site selections from correlations among the combined data.

Much of the old data is fragmental; logs and identifications for most of the old drill holes shown on maps A, B, C could not be obtained. Adequate logs were obtained for holes drilled by El Paso (2), Miami (5), and American Metal (4), but locations of the American Metal holes could not be identified.

The general geologic setting (Map B) is Precambrian Pinal Schist (including tuffaceous quartzites) intruded by Precambrian dikes and irregular bodies of quartz monzonites (equigranular, aplitic, and pegmatitic) and minor diorite. These Precambrian rocks are intruded by dikes and large bodies of Tertiary (?) andesite and irregular bodies of breccia, composed of andesite and various Precambrian rocks (some of the andesite on the property may be extrusive). Finally, all of these rocks are intruded by dikes and irregular bodies of quartz latite. Paleozoic and Mesozoic rocks were not encountered and must be interpreted as missing in most (if not all) of the property.

All of the above described rocks are variously mineralized (MapC) over a large portion of the property. Mineralization consists of intensely silicified shear zones (with small gold shoots in the vicinities of the Pinal and Greenback shafts), large volumes of disseminated pyrite, and some areas of disseminated chalcopyrite and pyrite. The Oxide deposit (Map D) is a supergene enriched area which was subsequently oxidized. The best primary copper mineralization encountered was in Hole 72-2 where values generally exceed 0.15% Cu for runs of 150' and 208' (1770-1920' and 2400-2608' respectively).

No pa_ticular preference of copper mineralization for rock type was noted, but a general spatial association of copper and quartz latite is indicated.

Propylitic alteration is widespread, but sericitic alteration and silicification are intense locally. Secondary biotite and anhydrite were observed in some of the cores. Flooding by primary hematite is common on contacts between Precambrian and Tertiary rocks. Magnetite in various quantities is common in Precambrian rocks, but it does not appear to be an alteration mineral.

Fairly complete oxidization extends to various depths, averaging about 190'. Specifically, the elevation range appears to be about 1820' to 2070'.

The present water table is about 400' below the surface, specifically ranging in elevation from about 1713' to 1720'.

Acknowledgements--Under my supervision, a surface sampling was done by Douglas M. Martin, and core logging and sampling by Mr. Martin and Charles E. Cronenwett. Also, geologic mapping was facilitated by reference to some previous mapping by Mr. Cronenwett. Petrographic studies were made by James A. Fouts. Don Melhado did the basic drafting on the maps.

Surface samples were chemically analyzed by the Rocky Mountain Geochemical Corporation and drill core samples by Hawley & Hawley Assayers & Chemists, Inc.

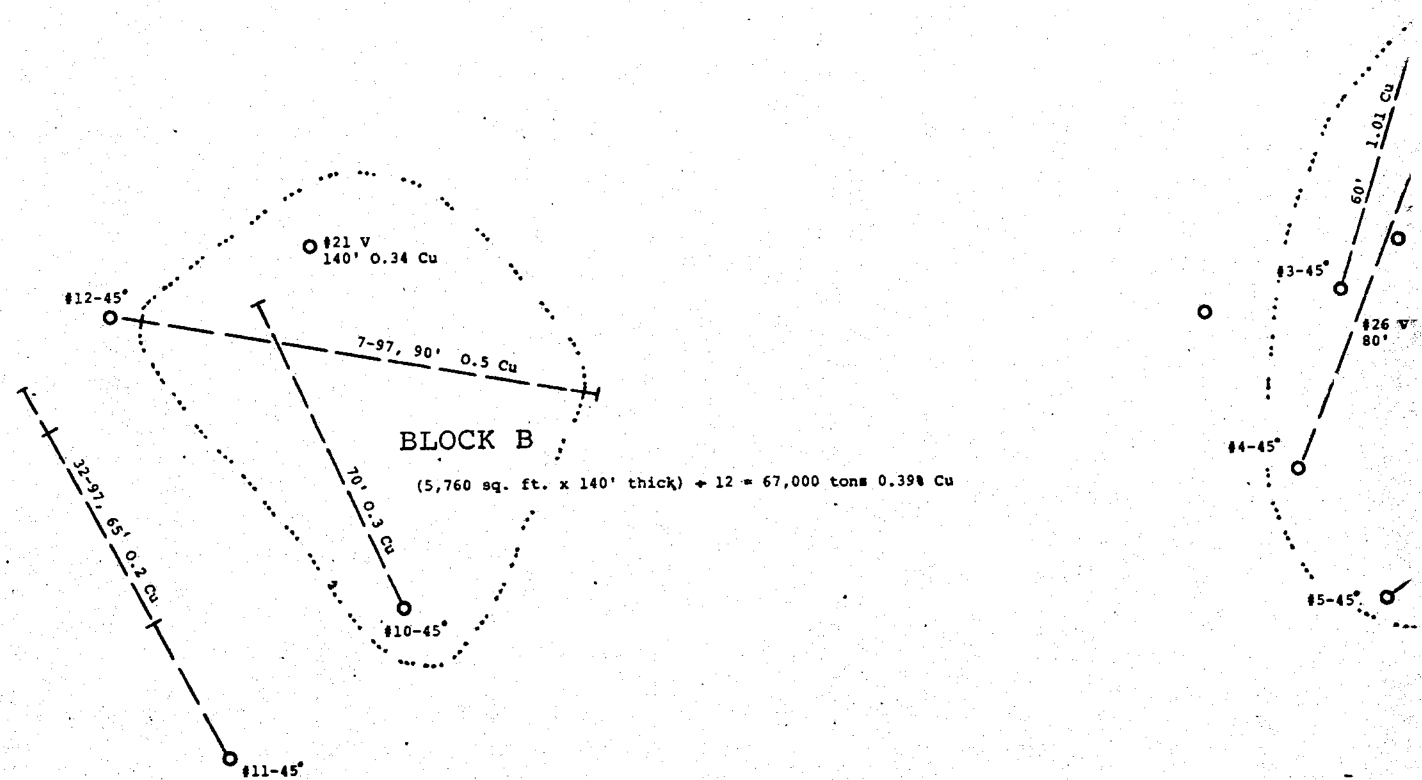
As previously noted, drilling was done by the Longyear Company and topographic mapping by Landis Aerial Surveys.

Very truly yours,

Thomas W. Mitcham

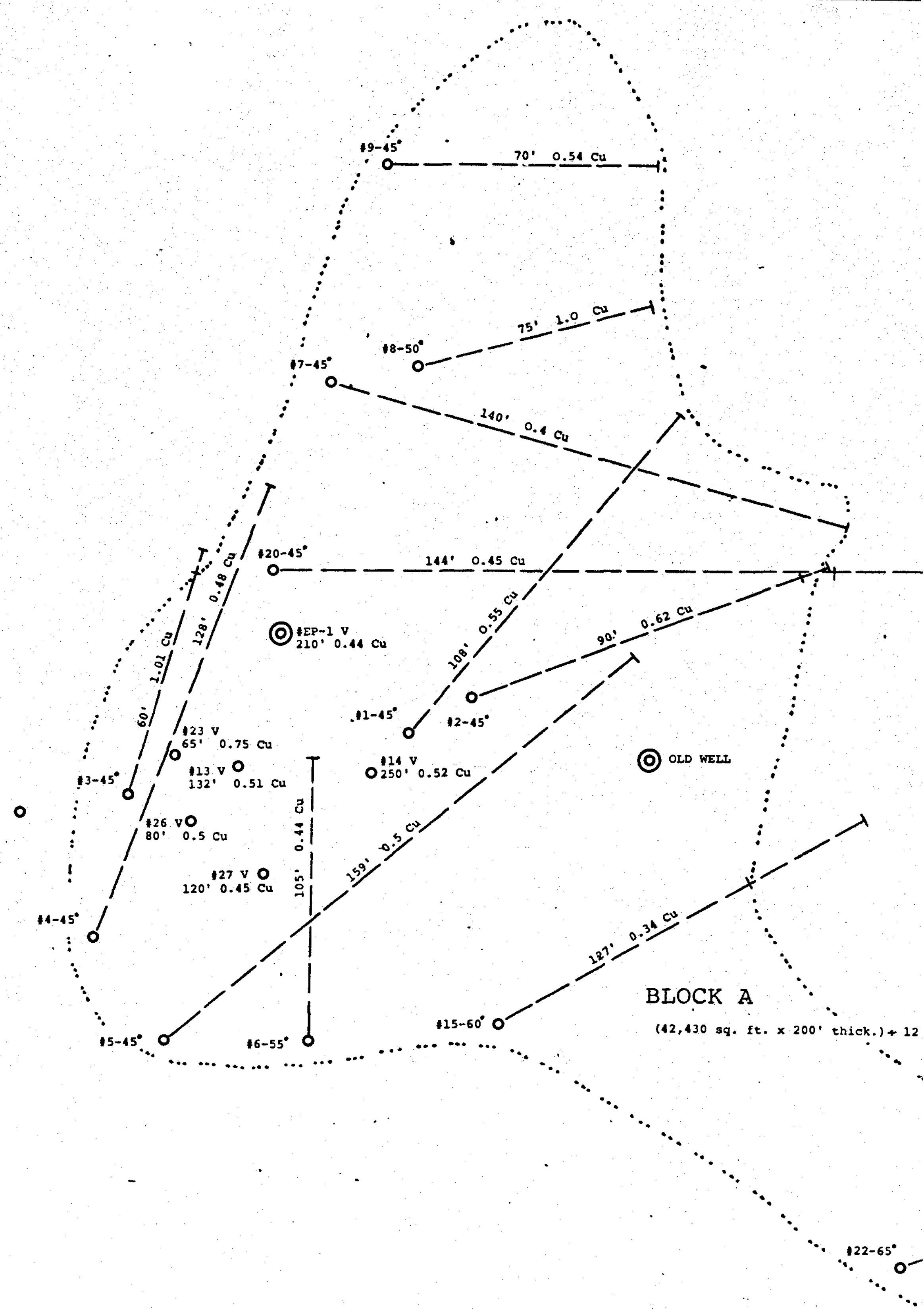
TWM/cm

Enclosures:	Drill hole logs (30 Pages)	
	Map A	claims
	Map B	geology
	Map C	mineralization
Attachment:	Map D	Oxide deposit



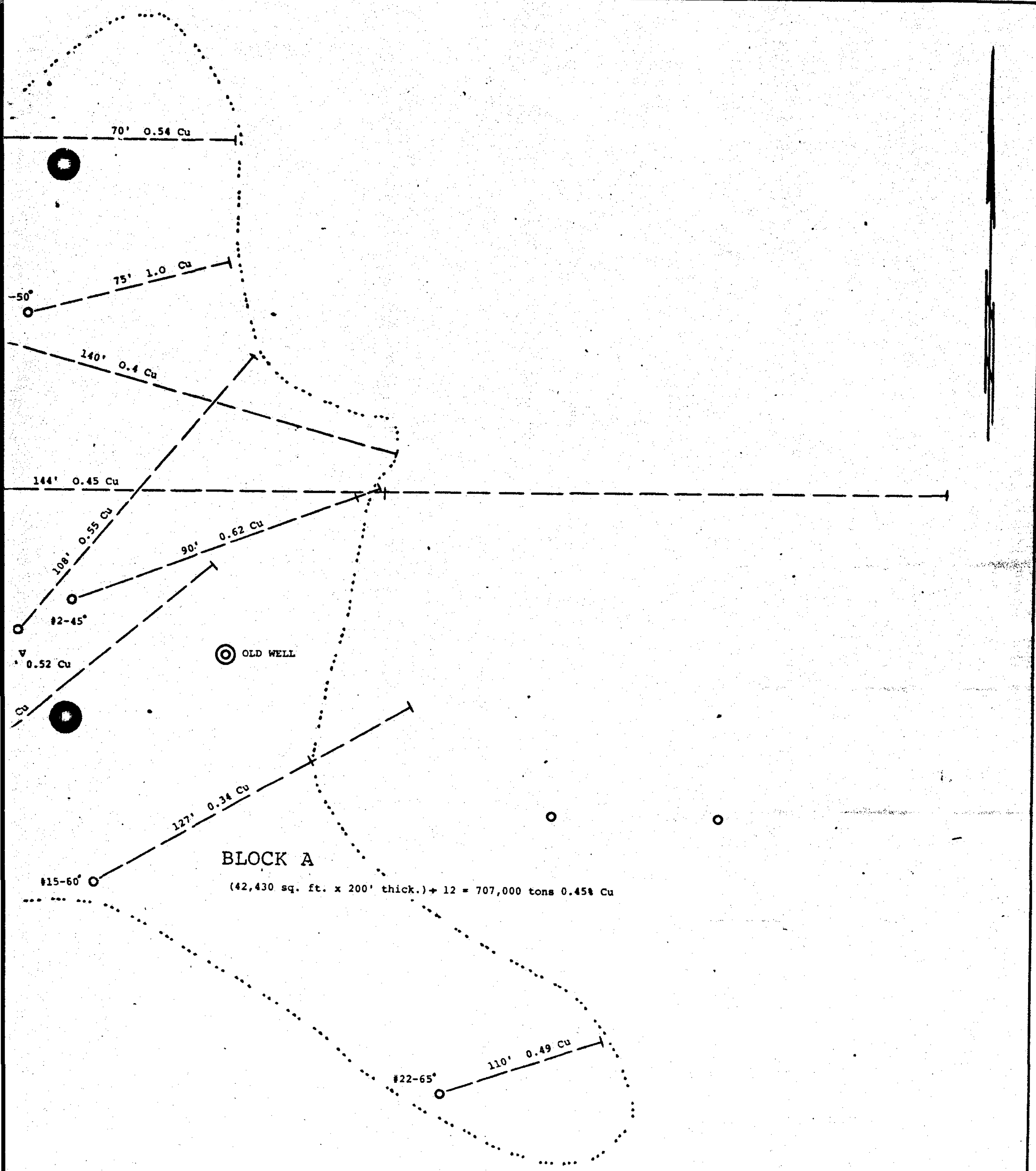
TOTAL INDICATED OXIDE ORE: 77

Thicknesses shown on inclined holes are vertical components of inclined intercepts. Cut-off 0.30% Cu except for short internal runs.



= 67,000 tons 0.39% Cu

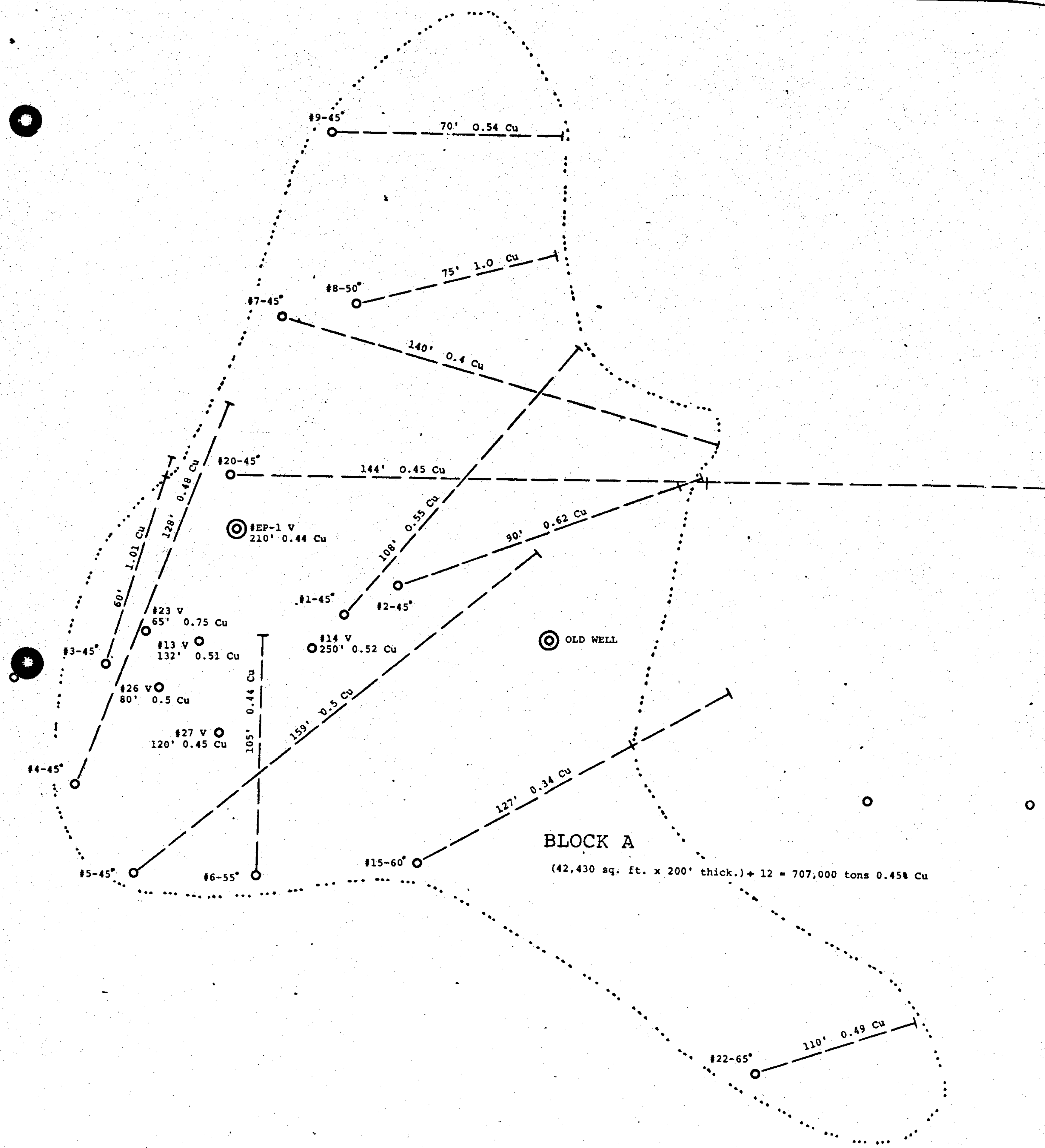
TOTAL INDICATED OXIDE ORE: 774,000 tons 0.44% Cu



OXIDE DEPOSIT
Pinal Copper Property
Pinal County, Arizona
1" = 40'

Platted from old drilling data which are fragmental and, in part, difficult to interpret. TWM, Nov. 1972

Map D



AL IND D OXIDE ORE: 774,000 tons 0.44% Cu

OX

Pinal

Platted f

and, in part,

GREENBACK Jan 24, 1973

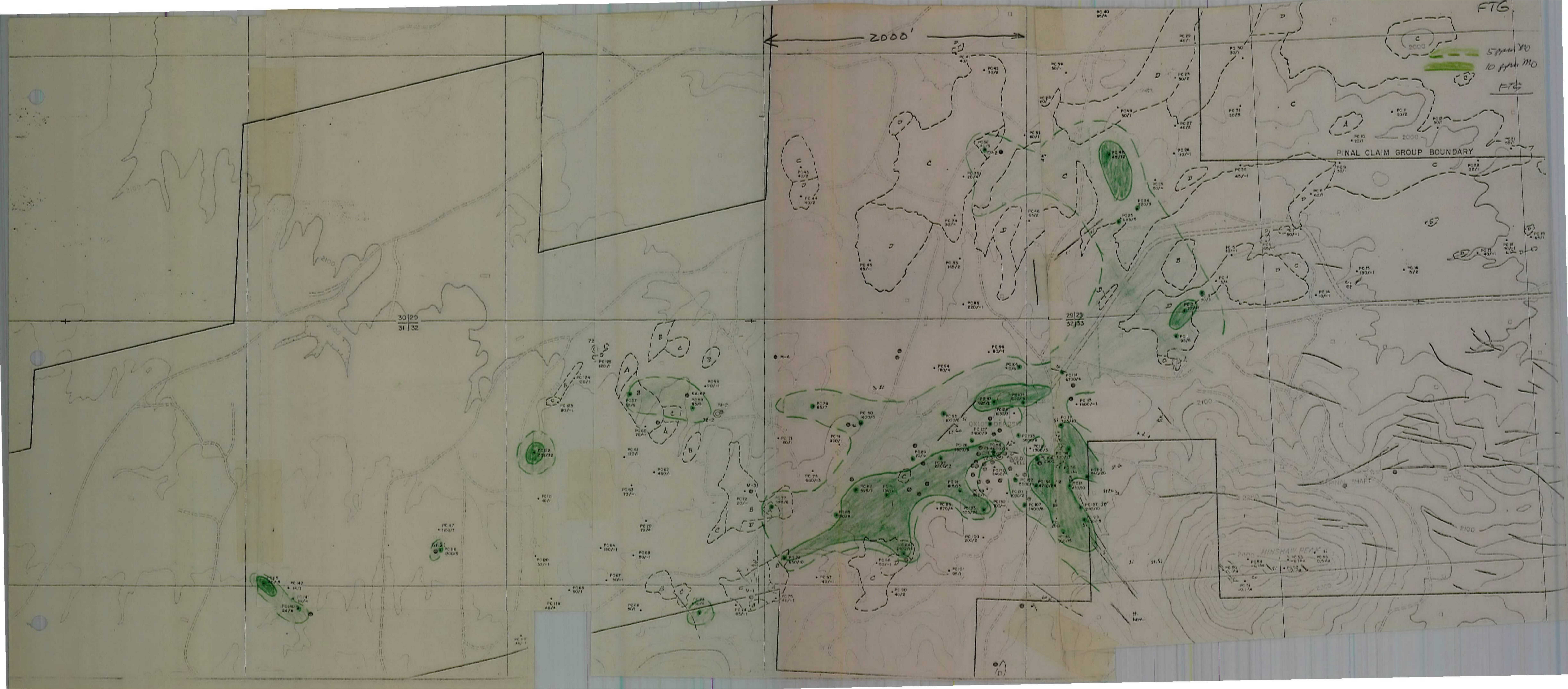
Jim:

1.) hole 72-2 (3500 ft.) was apparently drilled in best surface alteration. Mo geochem in core is irreg. high but falls to low levels w. depth

2.) hole 72-3 (1372 ft) was drilled on CuOx show(?) in unaltered (?) rock. However (see sketch) this is the best surface Mo anomaly. Was this hole drilled on Mo or CuOx? Mo in core is low but it might be an interesting hole to log also.

Fred.

(Report now with Kurtz)


FTG.
2000'
5 ppm MO
10 ppm MO
FTG
PINAL CLAIM GROUP BOUNDARY
30|29
31|32
29|28
32|33
PINAL SHAFT
HINSHAW PEAK

Revised – Nov. 1972 by J.D. Sell
Showing El Paso & Pinal Copper Drill Holes

EXPLANATION

- Contact
- Possible Contact
- Limit of Outcrop
- Limit of Alteration–Mineralization
- CDH Churn Drill Hole
- DDH Diamond Drill Hole

ROCK TYPES

- Vu — Volcanics, Undifferentiated

POST MINERAL
PRE MINERAL

- Ap — Andesite and Andesite Porphyry
- LMp — Latite and Monzonite Porphyry Complex
- Ps — Pinal Schist
- Gr — Granite, Pre-Cambrian

- Silicified Zone – Massive Quartz
- Breccia Zone

ALTERATION – MINERALIZATION

- Strong Alteration – Silicification, Pervasive CuOx Staining
- Moderate Alteration – Mineralization
- Weak Alteration – Mineralization
- Barren Alteration – Mineralization
- 2-4% FeOx After Sulfides
- Limonite Closely Resembles Live Limonite

GEOLOGY AND ALTERATION–MINERALIZATION

PAPAGO CENTRAL PROJECT
GREENBACK AREA

PINAL CO., ARIZONA

SCALE: 1" = 1000'

June 1969 SRD, JEK

21588

American Engineering Co.
CONSULTING ENGINEERS
3013 W. FAIRMOUNT
PHOENIX, ARIZONA 85017

MARVIN E. LARSON
PRESIDENT

279-9369

PINAL COPPER CORPORATION

401 EAST INDIAN SCHOOL ROAD, SUITE 107
PHOENIX, ARIZONA 85012

EDWARD HOPKINS, JR.
PRESIDENT

(602) 279-6402

A REPORT ON THE GEOLOGIC EXAMINATION OF MINING CLAIMS HELD BY THE PINAL COPPER CORPORATION IN SOUTHWESTERN PINAL COUNTY, ARIZONA

by

Charles E. Cronenwett
Consulting Geologist

Charles Emanuel Cronenwett

3356
CHARLES EMANUEL
CRONENWETT
Date Signed 1-31-73
ARIZONA, U.S.A.

TABLE OF CONTENTS

APPENDICES

TABLE OF CONTENTS--Continued

OTE: Appendix III is included with original report on file at Pinal Copper Corporation offices, 401 East Indian School Road, Suite 107, Phoenix, Arizona 85012

CHARLES E. CRONENWETT

Consulting Geologist

Telephone 801-355-7642

Mining and Mineral Property Valuation
Mineral Exploration

614 13th Avenue
Salt Lake City, Utah 84103

A REPORT ON THE GEOLOGIC EXAMINATION OF MINING CLAIMS HELD BY THE PINAL COPPER CORPORATION IN SOUTHWESTERN PINAL COUNTY, ARIZONA

LOCATION

The subject property consists of 64 unpatented lode mining claims situated on the Papago Indian Reservation and located on portions of Sections 28, 29, 30, 31, 32, 33, Township 10 South, Range 2 East G. and S.R.B. and M., Pinal County, Arizona. The claims lie within the Vekol Mining District.

The area lies about 40 miles southwest of Casa Grande, a town on the Southern Pacific railroad, 85 miles northwest of Tucson. The closest significant copper porphyry deposit is the Hecla Mining Company's Lakeshore facility 15 miles east. Its reserves have been published at 470 million tons of sulfides and oxides, averaging 0.75 percent copper. Of interest is Newmont Mining Company's prospect 9 miles northeast with a reported 800 million tons averaging 0.8 percent copper.

TITLE AND HISTORY

Portions of the claimed area have been of record since 1916. Although the property was once substantially larger elimination and consolidation of various claim groups has resulted in the present body of 64 contiguous claims which cover approximately 1200 acres and are of record at Florence, the County Seat. The Pinal Copper Corporation[1] was formed on the basis of these claims in 1954.

Various mining companies have examined and drilled this area over a period extending back into the 1920's. Much of the resulting information is inaccessible in company

1. 401 East Indian School Road, Suite 107, Phoenix, Arizona.

files or has been lost. The writer was retained by the present owners to collect as much of this data as possible (see Appendix III) and to construct a geologic map of the area preparatory to initiating an exploration drilling program to be funded by Pinal Copper.

As a first step a surveying program was carried out to locate claim and section markers and establish critical elevation control. Aerial photographs of the property were then taken by Landis Aerial Surveys[2] who combined the survey net with photo analytic techniques to produce a topographic map of the property at a scale of 1" = 400' with a contour interval of 5 feet. Finally a detailed geologic map was prepared on this base to assist in location of appropriate drill sites. Drilling was accomplished in 1972 under the direction of Dr. T. W. Mitcham[3]. The writer assisted in this drilling program and information derived from core studies was in turn incorporated in this report.

SUMMARY

The property lies in the extreme southwest corner of Pinal County. A continuous tract of 64 claims is oriented in an east-west direction at the north end of the Cimarron Mountains.

The topography varies from gently rolling to precipitous at an average elevation of 2100 feet and with a maximum relief of about 500 feet. Approximately half of the area is mantled under Quaternary alluvium.

On the eastern 1/3 of the property exposures consist of Pinal Schist and quartz monzonite of Precambrian age, and Mesozoic (?) and/or Tertiary andesite dikes and flows. The schists exhibit nearly vertical bedding with an average strike of N 75° W. The dikes which appear to intrude the schist also strike westerly but have southerly dips averaging 55°. A system of massive gold-bearing quartz veins have intruded the eastern claims. These commonly parallel the strike and dip of the andesite dikes.

On the western 2/3 of the property irregular latite bodies of as yet undefined geometry appear to be encircled by andesite flows. Exposures of schist and monzonite are restricted to the southwestern corner of this area. The

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2. 410 North Central Avenue, Phoenix, Arizona.
3. 6644 North Amahl Place, Tucson, Arizona.

latite exhibits a weak leached capping. The introduced sulfide content prior to conversion into iron and copper oxides and silicates is estimated as 1%-1.5%. A portion of the latite noted on Map A as oxide deposit is a supergene enriched area that averages approximately 0.5% copper at the surface.

RECOMMENDATIONS

1. It is recommended in any subsequent core drilling exploration programs of the gold-bearing quartz veins funded by Pinal Copper Corporation that:

a) drill sites be located according to a regular pattern.
b) individual veins be methodically tested.
c) initial drilling be limited to tests of the first 50 feet down dip from the outcrop.

2. It is recommended on the basis of surface geology that additional subsurface exploration of the mineralized latite bodies include:

a) north ½ of the Pinal Copper Extension No. 7 claim.
b) north ½ of the Copper Bell No. 8 claim.
c) deepening the El Paso No. 2 hole.

It is suggested that establishing geometric, stratigraphic and mineralization boundaries should be the foremost objectives of any further drilling programs funded by this company.

GEOLOGY

The strata within the claim boundaries are exposed along the westerly trending ridges and low hills which form the northern limit of the Cimarron Mountains. Additional exposures are visible in northerly trending washes which have downcut through the Quaternary alluvium and Recent caliche cemented conglomerate mantle.

All of the non-igneous exposures appear to belong to the Precambrian Pinal Schist Group. This is in marked contrast to the Vekol Mountains 3 miles to the north where 1700 feet of Paleozoic strata overlie the Pinal schist.

Precambrian plutonic or coarsely crystalline equigranular rock is represented in the area by one or more stock-like bodies of quartz monzonite. Age assignment was on the basis of weathering and morphological similarity with strata in other areas. In most exposures the pluton-Pinal schist contact was concordant with minor or no disruption attendant upon intrusion. Ubiquitous, narrow, vertical alaskite dikes and occasional exposures of pink aplites were provisionally included with the quartz monzonite on Map A. Their age together with some of the fresher appearing monzonites may prove to be much later in age.

Mesozoic(?) and or Tertiary age rocks include andesite, latite and diorite. Most andesites appear in the form of dikes which exhibit variable strike and dip. Breccia-bearing andesites were interpreted as flows. Within or at the contact of various andesites repetitive introduction of silica in some areas produced sill like quartz veins more than 8 feet thick. Some of these veins can be traced for several thousand feet. The latites occur as irregular stock-like bodies. The diorite is found in both dike and stock-like form.

Several fault systems appear to divide the area into separate blocks. The following strike directions of faults are prominent: N 75° W, N 15°-40° W, N, and N 15°-40° E.

Alteration of the strata varies from propylitic to sericitic and all rocks have been silicified to varying degrees. Intense alteration of the monzonite locally produces a gneissic texture. The effects of alteration also blur the andesite/latite contacts. In the latites the alteration presumably accompanied the introduction of copper and iron bgearing solutions. Subsequent weathering has developed a leached capping attendant upon the formation of secondary iron and copper oxides, silicates and carbonates.

Stratigraphy

Metamorphic Rocks

<u>Pinal Schist Group</u>. This name is applied to the sequence of metamorphic rocks predominently of clastic sedimentary origin. They are characteristically well bedded and vary from schist to quartzite. Within the property three units appear to provide mapable horizons. Their contacts may be transitional over a vertical range of several tens of feet but beyond this zone the individual units are generally distinctive.

Laminar bedding is well displayed and varies from knife edge to ¼ inch in thickness. Foliation which is very prominent in some outcrops seems to closely parallel the bedding. Both have been inclined to within 15° to 20° of the vertical. In some areas bedding may be overturned.

UD*: Ps - Pinal Schist
SD*: -
TL*: 500 feet S 70° E from NW claim corner Kickback No. 4

Light to dark gray with greenish cast (chlorite dependent); specimens exhibit conspicuous satin-like sheen typical of schist; bedding subordinate to foliation.

UD: Psa - Pinal Schist argillite
SD: -; 421* rhyolite(?)
TL: 500 feet S 40° W from NE claim corner Kickback No. 4

Alternating dark and light gray bands of silica; gradational contact with Ps, sheen much reduced, with foliation subordinate to bedding which ranges 1/4-1/8 inch in thickness; increasing percentage of quartz fraction; linear pods and lenses of quartzite to 1/2 inch thick exhibiting boudinage structure. Includes a lentil of rhyolite(?) affinity.

UD: Psq - Pinal Schist quartzite
SD: 217
TL: NE claim corner Big Ike No. 1

Light pink to purple; massive; finely laminated with grain size averaging less than 0.5 millimeters; gradational to interbedded contact with Psa.

Igneous Rocks

Rock types in order of surface abundance are andesite, quartz monzonite, latite, alaskite and diorite. The form of the exposed igneous rocks include stocks, dikes and possibly flows. The similarity in texture of intrusive and extrusive andesites suggests that they may better be classified as hypabyssal.[4] All of the hypabyssal specimens submitted by the writer for microscopic identification were

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*UD - Unit designator
*SD - Specimen description Appendix I
*TL - Type Locality
4. Hypabyssal - inclusive of dikes and flows with some exposures exhibiting transitional features.

determined to be andesites, although surface specimens collected by Dr. T. W. Mitcham as well as many intervals encountered during coring were identified as latite. This distinction may be of importance because of the common association of latites as host material for porphyry copper deposits. Differentiation is often difficult, however, due to alteration of the feldspars and map boundaries for the latite therefore are tentative.

Division of the andesites into mapable units was also difficult. Megascopically many outcrops appear distinctive on the basis of mineralogy, texture, coloring or weathering. Under microscopic examination, however, there commonly was a greater variation of these criteria within a specimen than there was between specimens. The effects of alteration on the mineral suites made recognition and correlation of the units uncertain. In the area extending from the Greenback shaft to Hopkins Wash some of the andesites are unquestionably in the form of dikes, possibly up to 50 feet thick. The few that could be so mapped appeared to maintain westerly strikes and 50°-55° southerly dips. Other andesites are vesicular, present a clinkery surface or carry entrained fragments of underlying rock types, and may be surface flows.

Mapping of the monzonite(s) was beset with difficulties similar to those encountered with the andesites. Frequently it was impossible to determine if the variability noted among outcrops reflected changes produced by alteration or represented separate intrusions.

Mindful of these limitations and uncertainties the units on the accompanying maps are presented as a tentative guide to assist in subsequent fieldwork.

<u>Extrusive</u>. The andesite/latite sequence share a composition of cloudy feldspar phenocrysts, quartz, sericite, biotite, chlorite, hornblende, with minor amounts of magnitite, hydrous iron oxides, and accessory minerals embedded in a cryptocrystalline to felty groundmass of feldspar and alteration mineral debris.

This basic mineralogy has been complicated to varying degrees from the effects of deuteric and hydrothermal alteration.

The fabric of these rocks seldom exhibits orientation of minerals even though feldspar phenocrysts locally are sufficiently abundant to constitute a porphyritic texture.

UD: A-1 - Andesite
SD: 221
TL: 600 feet N 45° W from SE claim corner Pinal Copper Extension No. 1

Dark gray to dark green, finely crystalline with rare 4 millimeter plagioclase (pf) phenocrysts; propylitized and sericitized pyroxenes embedded in a microcrystalline quartz-sericite matrix, minor biotite.

UD: A-2 - Andesite porphyry
SD: 215*
TL: SW claim corner Pinal Copper Extension No. 1

Medium gray, porphyritic with aligned gray translucent pf phenocrysts to 1.5 millimeters, averaging 1 millimeter sericitized pyroxenes(?) to 5 millimeters (possibly diorite fragments) in slightly pinkish matrix slightly vesicular.

UD: A-3 - Andesite
SD: 412*
TL: 200 feet N 65° W from SE claim corner Pinal Copper Extension No. 1

Grayish with flesh pink cast, porphyritic; gray translucent and cream opaque fragmented feldspar phenocrysts to 1 millimeter, averaging 0.5 millimeters, hornblende to 2 millimeters fringed with sericite and magnetite and/or altered to chlorite, occasional pyroxene, minor biotite.

UD: A-4 - Andesite porphyry
SD: 222*
TL: 100 feet N 10° W Greenback shaft

Pinkish brown, conspicuously porphyritic with phenocrysts of sericitic centered-kaolinite rimmed pf to 4 millimeters and completely altered pyroxenes to 2 millimeters. 1 millimeter euhedral biotite flakes in cryptocrystalline groundmass. This unit overlies A-3 with 45° southerly dip in this vicinity.

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*Indicates thin section preparation. See Appendix I.

UD: A-5 - Andesite
SD: 269*
TL: 400 feet south of Greenback shaft

Conspicuously lighter gray, fine crystalline with occasional 1-2 millimeter pf and 1 millimeter augite phenocrysts and abundant .2-.5 millimeter biotite flakes in an equigranular matrix of interstitial quartz and orthoclase.

UD: A-6 - Andesite
SD: 216; 218; 219*; 235*; 227*; 276*; 209*; 264*; 265*; 266*
TL: 50 feet south of Pinal shaft

Pinkish gray porphyritic to porphyry, with opaque, glassy and normally zoned bimodal (±4 millimeters, ±1 millimeter) nonoriented pf (andesine); biotite flakes to 1 millimeter; pyroxenes to 2 millimeters; chloritized hornblende to 5 millimeters; in a brown to tan, fine crystalline, felty groundmass composed of pf shreds, sericite, chlorite, quartz, iron oxides and other alteration products.

Alteration products frequently comprise 10 percent of the specimen and appear as dark patches to 2 millimeters. Some specimens carried an estimated 1 percent sulfides and, depending on the degree of oxidation, present colors ranging from gray to green to orange-yellow. The major iron phase is now goethite.

This unit probably includes material originating from dikes and flows. Other workers (T. W. Mitcham, personal communications) have noted the presence of latites in proximity to the locations of the specimens taken by the writer.

A more complete breakdown of this unit has been hindered by compositional uniformity, intensity of alteration and discontinuous exposures.

UD: A-7 - Felsite
SD: 230
TL: Patio Greenback shaft

Maroon to dark gray; felsite, to very finely crystalline with occasional very altered pf and pyroxene (?) fragments. This unit appears to be associated with massive quartz veins. It was noted above and beneath them but seldom exceeds a few feet in thickness. Post consolidation movement of the quartz veins frequently has brecciated this unit thus giving the impression that it predates the quartz. Due to their association and the absence of the felsite elsewhere, the writer suggests that the felsite may have somewhat predated deposition of the quartz veins; the siliceous solutions later utilizing and enlarging fracture zones developed by the emplacement of these dikes.

UD: A-8 - Andesite breccia
SD: -
TL: 600 feet S 80° E from NW claim corner South Copper No. 3

Mottled maroon to pinkish gray; feldspars, frequently white, fragmented occasionally to 2.5 millimeters generally less than 1 millimeter; ferromagnesian minerals less than 1 millimeter altered to chlorite and hematite in cryptocrystalline matrix; locally exhibits pseudo platy bedding. Characterized by inclusions of maroon andesite and occasional monzonite fragments to 6 inches, average: 2 inches. Possibly a surface flow or basal portion of one of the previously described. Overlies latite(?)

UD: A-9 - Andesite breccia
SD: -
TL: 700 feet N 80° W from SE claim corner Good Gold

Similar to unit A-8 but contains numerous rounded quartz monzonite cobbles to 6 inches in addition to andesite breccia. Overlies latite(?)

UD: A-10 - Andesite porphyry
SD: 213*
TL: 500 feet W SE claim corner South Side No. 2

Purple to maroon to pinkish gray fine grained matrix containing euhedral zoned pf phenocrysts to 50 millimeters, 8 millimeters common; less abundant fresh hornblende phenocrysts to 15 millimeters with chloritic biotite books to 2 millimeters. Magnetite and hematite occur in biotite sites.

This unit commonly occurs as steeply dipping dikes. The linear continuity for some dikes exceeds 3000 feet.

UD: L-1 - Quartz-latite
SD: L-3 of Mitcham report
TL: Oxide deposit

Hand Sample: Porphyritic, fine to medium grained, pinkish

Thin Section Texture: Porphyritic, fine grained groundmass, medium grained phenocrysts.

Plagioclase - subhedral phenocrysts, 1 to 5 millimeters in length. Strongly argillized near margins: centers of grains are fresh or contain a few flakes of sericite. Also argillized along fractures. Biotite - brown phenocrysts 0.5 to 1 millimeter in diameter. Mostly very fresh. Locally stained with iron oxide. A few grains are slightly bleached. Orthoclase - fine grained in groundmass. Quartz - fine grained in groundmass. Opaques - mostly magnetite. Some hematite locally.

Difficult to estimate mineral percentage. Phenocrysts make up roughly one-half of the rock. These are plagioclase and biotite with plagioclase being more abundant. The groundmass is almost all quartz and orthoclase, the two being about equal in amounts. (Description by James A. Fouts)

Intrusive. Except for diorite outcrops in the extreme southwestern portion of the area all the plutonic representatives belong to the monzonite clan. The various units share a simple mineralogy of cloudy feldspars, quartz and muscovite mica with minor amounts of chlorite, epidote and iron oxides as accessory or alteration products. Leucoxene, possibly a result of thermal metamorphism, was tentatively identified in one specimen.

The feldspars and quartz crystals present a general granoblastic (randomly oriented) texture exhibiting sutured grain boundaries. Micas, however, are sometimes sufficiently oriented to give some outcrops a gneissic appearance.

In the upper reaches of Arms Wash outcrops of diorite were identified. The form of these reddish-brown coarsely crystalline rocks is uncertain as they appear both in dike-like and irregular bodies.

UD: qm_1 - quartz monzonite
SD: 210*; 262*
TL: 150 feet N 20° E from SW corner Pinal Copper Extension No. 3

Light colored, coarsely crystalline, generally equigranular[5], 55-70 percent feldspar; 25-30 percent quartz; average grain size 2 millimeters but locally feldspar phenocrysts may reach 20 millimeters[6]. The feldspar is more or less sericitized and surrounded by sutured, embayed and interlocking quartz grains. Recrystalization is generally present with fresh microcline replacing orthoclase and

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5. In some specimens light gray resistant quartz grains up to 4 millimeters stand up as oval islands or "eyes" above the cream colored feldspar groundmass. Rock with such texture is sometimes referred to as "quartz-eye" porphyries.

6. Such specimens resemble the Oracle granite of Precambrian age. It is also quite similar in appearance to the Precambrian granite present at the southeastern tip of the Vekol Mountains.

plagioclase. Plagioclase crystals are commonly cloudy and in some specimens show replacement by secondary orthoclase and plagioclase. Biotite is present and in some specimens has been altered to chlorite and iron oxides. Occasional inclusions of diorite-like rock were noted.

Stratigraphic relations indicate that this unit is the earliest post Pinal plutonic intrusive. It commonly is exposed only in washes having been uncovered by relatively recent erosion. It is believed to be of Precambrian age.

UD: qm_2 - quartz monzonite (including alaskite)
SD: 267*; 231*; 263*; 212*; 273*
TL: 350 feet S 20° E from SW corner of Kickback
No. 3

Conspicously light colored, coarsely crystalline, granular, anhedral (devoid of crystal faces); 65 percent quartz and orthoclase (Kf); 25 percent, plagioclase (pf); 5 percent mafic minerals; grain size average 1 millimeter. Muscovite defines a weak foliation which assumes a gneissic texture typified in outcrops 800 feet NW of the Pinal shaft. The unit has been strongly recrystalized with the presence of cordierite suggesting thermal metamorphism.

Also correlated with this unit is a flesh pink aplitic (sugary textured) monzonite(?) 400 feet north of the Pinal shaft. In view of the mineralogic similarity it is possible that qm_2 is a local alteration variety of qm_1 with the aplite possibly representing a chilled border phase.

Also included as a subunit of qm_2 are the numerous, generally less than 1 foot wide veins of No. 263* (designated + — + on the map). Mineralogically this unit is characterized by crystals of Kf (50 percent); highly sericitized pf (25 percent); and mica plates up to 20 millimeters across. These are enclosed in gray quartz. The coarse texture, similar bulk composition and cross cutting relation to all other monzonites and schists suggest that these veins represent a late differentiate or pegmatite stage of the monzonite intrusive event. This unit is classified as an alaskite.

Also mapped as qm_2 is a medium grained monzonite(?) No. 273* whose feldspars exhibit a possible protoclastic (broken during flow) texture which are set in a matrix of light brown clear to semi-transparent quartz. It commonly occurs in the Psq unit as concordant narrow bands and stringers as well as occurring in separate outcrops. Due to severe recrystalization a sedimentary origin for this unit cannot be discounted.

UD: di - diorite
SD: 420*
TL: 400 feet N 80° W southeast corner Copper Flat (in Arms Wash)

Red-brown, coarsely crystalline; 45 percent hornblende (hb); 45 percent plagioclase (pf); 8 percent quartz; 2 percent orthoclase (Kf); hb and pf crystals reach 5 millimeters; pf altered to sericite and epidote, reddish mottle and platy alteration of hb are distinguishing features. The locally tabular outcrop of the type locality suggests a dike-like intrusion, however, areas to the southwest in Arms Wash appear to lack a definitive geometrical shape and possibly indicate an intrusive body.

A fine grained variety of this rock occurs in small isolated outcrops in the central part of the claims.

The age of this unit is unknown. It appears to postdate the monzonite intrusions.

STRUCTURE

Much of the structural history of the claimed area is unknown due to the absence of strata representing the intervals of Paleozoic to mid-Mesozoic (?) or Tertiary. The present near-vertical condition of the Pinal Schist Group shows the area to have been strongly folded but regional studies indicate that much of this folding was possibly accomplished prior to Paleozoic time. The strong similarity of the quartz monzonite (unit qm_1) to other Precambrian granites suggests that any deformation or doming accompanying this intrusion was accomplished early in the history of the area. The intrusion of the andesite and latites may have been facilitated by the early doming or low folding in the area. Subsequent erosion has removed the roof of schist over most of the claimed area and has exposed the andesites as a series of north facing escarpments on what remains of the south dipping limb of the uplift (see Section 1). A portion of the schist roof appears to have been preserved as a down-dropped block which forms the eastern half of Hinshaw Peak. The structure may have been down-faulted along the Hopkins Wash and Pinal faults (see Section 2) or otherwise altered in form by the presumably more vertical movement associated with emplacement of the latite and coeval qm_2 stocks.

In the Pinal and Greenback shafts numerous steep, predominently east dipping faults have formed small graben or half-graben structures. Two systems N 15°-40° E and N 15°-40° W can be discerned on Maps B and C. The apparent displacement noted on the main quartz vein was 20 feet or less. Locally the relative movement can be interpreted as right lateral or as reverse with the upthrown blocks to the west. Reverse faulting could be visualized as a response to vertical uplift accompanying the emplacement of the latite intrusions which lie to the west.

Surface evidence for faulting is found in the northerly cross grain trend of many washes. These are in part the result of run-off exploiting fault breccia zones. Abrupt changes in strike were frequently noted adjacent to and within many streambeds. In some areas, however, silica cemented fault breccias are more resistant than the surrounding bedding and fault zones are identified as low linear ridges.

The relation of fault zones to mineral emplacement is not clear. In the underground workings mineralization was sometimes associated with NE and NW faults. On the surface considerable iron staining was noted on northwesterly faults. The Hopkins Wash fault which transects the east boundary of the Kickback No. 2 claim is a case in point. This fault coincides with the western end of Hinshaw Peak and parallels the eastern edge of the oxide deposit. Numerous prospect pits have been dug along its trace but there is no record of assays or production. Its genetic relationship to the topographic discontinuity or to the emplacement of copper mineralization is problematical.

The Pinal fault, mentioned earlier, approximately parallels the southern claim boundary. It is traceable from coordinates 14,000 E to 18,000 E (see Map A) with its strongest expression from 16,000 E to 18,000 E. It is well exposed in Arms Wash and in the vicinity of the Miami No. 1 hole. Considerable brecciation along the fault coincides with the apparent northern surface limit of the Pinal Schist Group (see Section 2). Although in the P.C.C. No. 72-2, 1500 feet to the north, the Pinal Group was not encountered until a depth of 975 feet, this does not reflect the true displacement along the fault since an undetermined thickness of Pinal to the south has apparently been removed subsequent to movement and the slope of the pre-fault topography is unknown.

<u>Mineralization and Alteration</u>

In a discussion of mineralization it is convenient to separate the claims which lie east of Hopkins Wash from those that lie to the west.

Mineralization East of Hopkins Wash. Visible mineralization in this area appears to be restricted to the N 65° W trending veins of massive quartz. These veins (sills) and the andesite dikes which enclose them maintain a rather uniform southerly dip that averages 55°. The larger veins may exceed 8 feet in width but even those of lesser thickness can often be traced on the surface for more than 3000 feet.

The quartz is opaque and milky white in color, however, bands of amethyst were noted in the subsurface. It exhibits both finely banded colloform and cockade textures and was doubtless precipitated (in open fractures) from solutions of colloidal silica, probably at low temperatures. Vein thickness is augmented by zones of breccia that extend for several feet above and below the quartz. The breccia fragments are andesite, banded quartz and second generation cemented fragments of andesite and quartz which evidence movement and the episodic nature of vein emplacement.

The trace of the larger veins is dimpled with numerous prospect pits, few of which exceed 10 feet in depth. Numerous pits sampled by the United States Department of the Interior, Bureau of Land Management valuation engineer in 1958 showed the following averages: Au .03; Ag 0.1; Cu 0.15.

Most of the early mining activity was centered in and around the Pinal shaft begun in 1920 and the Greenback shaft begun in 1922. Exploration down dip was carried to a depth of 150 feet in the Greenback shaft and to 688 feet in the Pinal shaft. Sublevels in each working follow the veins for varying distances along strike. Occasional winzes and raises suggest that local ore pockets were encountered. Mr. Paul Hinshaw stated to the writer that continuous mining activity in the area was suspended in 1929 upon completion of assessment work performed in the 500 level winze located at the terminus of the east drift of the Pinal shaft.

Significant gold values were originally found on the surface at the site of the Pinal shaft but surface gold was absent at the Greenback discovery.

a) Greenback Mine: unverified records of assays show that occasional samples running to 25 ounces of Au per ton were recovered (see Appendix III). The average value mined would appear to be less than 0.5 ounces Au and these values apparently restricted to within 100 feet or less of the surface. Samples taken by the writer averaged about .002. ounces Au per ton (see Map B).

b) Pinal Mine: values of 10 ounces per ton were reported in occasional near surface samples in the Pinal shaft. The operator Mr. Paul Hinshaw, now deceased, reported dollar values (at $20.67 per ounce) which have been converted to the following ounces per ton: 0 feet-24 feet, 0.97 ounces Au; 24 feet-50 feet, 0.2-0.02 ounces Au. Values in the 500 foot level averaged less than 0.2 ounces Au in samples taken by the writer (see Map C).

Three core holes put down in 1970 in the vicinity of the Pinal shaft (see H. Ferrin report, Appendix III) showed values ranging from 0.4 to 1.69 ounces Au per ton at depths ranging from 75 to 195 feet as measured down the dip of the veining.

The Pinal and Greenback underground workings were mapped and selectively sampled by the writer as a check on previous work. (See Maps B and C, and Assay returns 1 and 2, pp. A-II:1-2.) For comparison with a more extensive sampling examination the reader is referred to Leonard's 1932 report (Appendix III).

In specimens examined by the writer the ore was in the form of grains and flakes of free gold, sometimes in association with chalcopyrite, covelite, and pyrite. The copper sulfides appeared to be concentrated in a single, discrete quartz band located near the surface of quartz and andesite fragments. Gold is also present in the late stage, non-banded, intrafragmental siliceous cement. This seems to indicate that the copper mineralization may have been restricted to an early phase of mineral emplacement. Although this situation may not be typical for all the quartz veins, it would suggest that the eastern claims may lie in a direction away from the principle locus of copper mineralization. The relationship of the quartz veins to the enclosing andesite is not clear. In some areas they appear to maintain a general parallelism of strike and dip. In other areas the veins diverge into other rock types. It seems likely, however, that even if the silica solutions have no genetic relation to the andesite, emplacement of the andesite played at least a locally important role in ground preparation and/or provided pathways for the ascending solutions.

Other visible mineralization in this area occurs as extremely spotty copper oxide staining in quartz monzonite.

<u>Mineralization West of Hopkins Wash</u>. The area west of Hopkins Wash differs in the following respects from the eastern portion of the property.

1. The area west of Hinshaw Peak has a much lower average relief.

2. There are notably fewer exposures of plutonic rocks.

3. The south dipping andesite dikes are replaced by andesite flows which appear to overlap geometrically undefined latite bodies. Farther west, northeasterly striking andesite dikes with steep to 45° dips crosscut both the flows and latite bodies.

4. Massive quartz veins are generally absent. Vertical veinlets of clear quartz are associated with the latite bodies, however.

5. A weak leached capping representing a former sulfide content estimated at 1-1½ percent is developed on the latite.

Perhaps the most conspicuous feature of these claims is the area of copper oxide staining (see Map A). A minor area of staining also is present in the northwest corner of the South Side No. 2 claim. The mineralization appears to be related to the silicified latite bodies which stand out as low iron stained hills above the less resistant andesite (flows?).

Discoloration is also present in the vicinity of the footwalls of some andesite dikes. A geochemical map illustrating the copper anomalies in this area was prepared prior to the 1972 drilling program and is included in the Mitcham (December, 1972) report.

MINERAL POTENTIAL OF THE PINAL PROPERTY

As was pointed out in the summaries above this property presents a varying mineral aspect along a median east-, west line.

To the east, exploration of the gold-quartz veins to date indicates a narrow vertical range of mineralization. At least 4 prominent vein systems are present and they would be readily accessible to core drilling along their outcrops. In view of their apparently constant inclination any hole drilled 50 feet south of the outcrop should penetrate the most favorable zone with a 50 foot test. Due to the type of mineralization economies can be affected by utilizing conventional drilling to the breccia zone overlying the quartz; and reserve coring for the zone of potential mineralization.

Subsequent drilling should be developed on a regular pattern with surveyed drill site locations and methodical exploration of individual vein systems.

To the west copper bearing latites and andesites are present west of Hopkins Wash. Drilling programs to date have not yet succeeded in defining a sulfide orebody although 1.5 million tons of 0.3 percent copper is estimated to be present in the oxide deposit.

The mineral potential of this area as derived from subsurface data has been adequately presented in a recent companion report by T. W. Mitcham. The following evaluation is derived from surface geological studies.

Strata which have provided suitable host rock in other mining areas are present; viz. latite, andesite, schist, quartz monzonite and diorite. Of these only isolated latite bodies and their immediately adjacent andesite cover contain copper mineralization approaching economic amounts. Mesozoic or Tertiary intrusions of the monzonite clan, the age and rock type perhaps most favorable to porphyry deposits, are either concealed or are not present on the surface. The monzonite mapped as qm_1 is believed to be Precambrian in age and shows only very scattered copper staining. The monzonite mapped as qm_2 may be either a separate intrusion or the result of intense local alteration of qm_1. This unit also shows no evidence of sulfide deposition. It is to be noted, however, that the linear arrangement of the mineralized latite bodies appear to be approximately on strike with the qm outcrops to the east. It is not clear what part, if any, the qm_2 unit (or the alteration event responsible for it) has had in the copper enrichment of the latites to the west.

On the south end of the Oxide Area the strongest metalization coincides with a linear, 15 to 20 foot wide east-west zone of translucent quartz veinlets. These are predominently vertical but 50° south dipping veins are also present. They diminish to an average of 1 per foot within 15 feet of the center of the zone. The intensity of mineralization simultaneously decreases from more than 1½ percent Cu to an average of 0.5 percent.

Surface mapping indicates that the latite bodies are the principle copper host. The outcrop pattern and geochemical sampling (T. W. Mitcham, personal communication) suggest that the main mass of these intrusive (?) bodies lies north of the southern claim boundary between the 15,500 E and 21,000 E coordinates (Map A). The southern boundary appears to coincide with the east-west Pinal fault zone while the northern limit is concealed beneath andesite flows and Recent cover. The presence of a weak leached capping extending along the west side of Hopkins Wash suggests that the latite intrusion(s) are somewhat elongated in a north-easterly direction. On the basis of surface mapping it is recommended that additional exploration should center in the area bounded by coordinates 18,000 E-24,000 E; 10,000 N-12,000 N.

Favorable target areas include:

1) north $\frac{1}{2}$ of Pinal Copper Extension No. 7
2) north $\frac{1}{2}$ Copper Bell No. 8
3) deepening the El Paso No. 2 hole

In the writer's opinion subsurface exploration funded by the Corporation should be directed toward the systematic development of a geometric, petrographic and mineralogic data base. Tests limited to a maximum depth of 2500 feet or less should be sufficient to develop the parameters necessary to attract venture capital.

Respectfully submitted,

Charles E. Cronenwett
Consulting Geologist

Tucson, Arizona

Charles Emanuel Cronenwett

CHARLES EMANUEL
CRONENWETT
1-31-78

SEAL

Samples 209, 215, 219, 222, 227, and 235 are apparently all andesites. They are similar in that they all have an abundance of plagioclase phenocrysts, a cryptocrystalline, felty groundmass, and alteration minerals associated together in patchy areas. In 222 and 235 these patches have shapes reflecting the euhedral outlines of small pyroxene phenocrysts; in the other slides the patches have irregular shapes.

Plagioclase compositions were determined for slides 215, 222, and 227, the only ones in which this was possible, by measuring extinction angles in albite twins. Their compositions are approximately similar and in the range An_{35-42}.

The apparently simple mineralogy of these samples has been complicated by severe alteration, which is slightly different from slide to slide. For example, epidote is present in 227 and 235 but absent elsewhere; calcite is present in 222, 215, and 219. Similarily, muscovite (not sericite, which is universally present) has been noted in 227 and 219 but not in 209, 215, 222, or 235. Iron oxides are present in all slides in varying amounts.

Sample 221 differs from the above in that it is non-porphyritic, has a high percentage of iron oxides, and is richer in alkali components.

Samples 210, 212, and 231 share a simple mineralogy of cloudy feldspar, quartz, and muscovite. They have undergone nearly complete recrystallization; and their cloudy feldspars are the only clue to their probable igneous origin.

The specific answers to your queries are as follows:

1. 209 vs. 219. Both samples are andesites, differing only in that 219 contains muscovite and has slightly more chlorite and calcite.

2. 215 vs. 222. These samples are also similar, although they differ in detail:

(a) The most calcic plagioclase composition of 215 is $An_{42\pm5}$, whereas that of 222 is $An_{35\pm5}$. Note the large error in the determinative method, however.

(b) 215 is richer in magnetite and has less biotite and calcite. Note, however, that there is more hetrogeniety exhibited in handspecimen between pieces of the same sample than between each sample.

It is believed that the above differences are not a reasonable basis for distinguishing these rocks.

3. 220 vs. 219. These are both porphyritic andesites, but they differ in several important respects:

(a) Phenocrysts in 220 include plagioclase and hornblende. The latter was probably never present in 219.

(b) The groundmass of 220 is distinctly trachytic and slightly coarser than the felty groundmass of 219.

(c) Alteration products of 220 are mainly biotite, magnetite, and epidote. In 219 they are muscovite, chlorite, and calcite.

It is believed that the presence of abundant hornblende phenocrysts in 220 is an important basis for distinguishing it from 219.

4. 222 vs. 221. These are similar in that

(a) plagioclase is abundant in both;

(b) the alteration is particularly intense in both;

(c) each has an intermediate composition.

They differ in that

(a) 222 is porphyritic whereas 221 is more equigranular;

(b) 221 has undergone severe low temperature alteration (magnetite to hematite);

(c) 221 is much richer in iron and probably alkalis.

5. 222 vs. 227. These samples are closely similar, having numerous plagioclase phenocrysts, a felty groundmass, and similar alteration characteristics. Only minor differences exist:

(a) Calcite is absent in 227 but abundant in 222;

(b) muscovite is absent in 222 but present in 227;

(c) there is no clear evidence of the former presence of pyroxene in 227, as there is in 222;

(d) plagioclase phenocrysts are more abundant but smaller in 227.

Thus, these rocks may well be varieties of each other.

6. 231 vs. 222. There is no petrographic basis for relating these samples; their textures, mineralogy, and bulk compositions are different. For example, 222 contains more iron and is less siliceous.

7. 235. Sample 235 bears close resemblance to 227, 222, 215, 219, and 209. It appears most similar to 222 since both exhibit definite evidence of the former presence of pyroxene phenocrysts.

12/21/71

E.A. Mathez
Dept. of Geosciences
University of Arizona
Tucson, Arizona 85721

Received for these services from Chuck Cromwell $105.00

E A Mathez
1/7/72

8. 217. The rock is composed of close packed, equigranular quartz grains (av. diameter .1 mm) and interstitial cloudy feldspathic material. The dark bands are probably composed of magnetite and goethite. Quartzite

TO: C. Cronenwett

FROM: E.A. Mathez
Rm. 318 H
Dept. of Geosciences
Univ. of Arizona
Tucson, Az. 85721

SUBJECT: REPORT OF PETROGRAPHIC ANALYSES

Specific Answers to Questions Posed

I. Samples 264, 265, 266, 269 (pp.4-8)

1. The gradation in color of these three slides represents a progressive increase in the abundance of goethite and decrease in total magnetite plus hematite in the sequence 264→265→266. Goethite is a hydrous iron oxide (FeO·OH) and the major constituent of limonite. It represents low temperature alteration, that is, it is likely a weathering phenomenon. These three samples are similar in all other respects, however; and it is also likely that their total Fe content is similar but simply held in different mineral proportions. Therefore, their gradation in color does not reflect fundamental differences in their hydrothermal alteration.

2. These rocks are similar to the andesites previously described (specifically, samples 209, 215, 219, 220, 221, 227, 230, and 235) in that they all contain abundant plagioclase phenocrysts in the composition range An_{35-42}. If a mafic phenocryst mineral existed in 264, 265, or 266, as it does in some of the other samples, it is now completely altered beyond recognition. In any case, the presence or absence of mafic phenocrysts may only be useful in distinguishing individual flows, which are likely issued from the same vent.

3. Sample 269 is distinguished from the above by its non-porphyritic and coarser texture and by its lack of alteration. Mineralogically, and probably chemically, it is similar, however.

4. Nomenclature and genetic character--According to Walstrom's classification, the alkali feldspar/plagioclase ratio of latites is in the range 5/3 and 3/5, whereas for andesites this ratio is less than 3/5. In view of the composition (andesine) and high abundance of plagioclase phenocrysts in these rocks, they are all clearly andesites.

Chemically, these rocks appear to have all the features common to the typical calcalkaline andesites so voluminous in island arc and other orogenic regions. These features include, namely, high aluminum and relatively low iron contents relative to the iron-rich middle stage differentiates of gabbroic bodies (the Skaergaard, etc.) and tholeiitic basalts.

II. Sample "X" (pp. 6-7)

1. From observation of the handspecimen, it is concluded that the andesite is post quartz-monzonite on the following bases:
   a. A compositional banding in the andesite is evident and parallels the contact. If the quartz monzonite postdated the the andesite, then it is a reasonable inference that the banding resulted from the forceful intrusive event. But in this case, parallel alignment of the numerous plagioclase phenocrysts of the andesite is required. Their random orientation eliminates this possibility.
   b. Plagioclase phenocrysts exhibit no thermal effects that are evident in handspecimen.
   c. The formation of vugs at the contact (unassociated with veins or fractures) should not occur in the relatively deep énvironment into which the quartz monzonite intruded.

2. The andesite of sample "X" most closely resembles samples 219, 235, 264, 265, and 266 since their phenocryst mineralogy is similar.

III. Sample 262 (pp. 9-11)

1. The matrix is a recrystallized quartz monzonite having a character similar to 263, 267, and 210 (see below).

2. Xenolith--The xenolith is interpreted as having been derived from an igneous body having dioritic to monzonitic affinities. It exhibits no relic textures, which would be the expected result if it were originally an andesite. (see pp. 10-11)

IV. Sample 268 (no description)

1. Examination in both thinsection and handspecimen reveal that the matrix is a recrystallized quartz monzonite having coarse grained feldspar and quartz with sutured edges and cloudy plagioclases. The xenoliths appear to be silicified and include:
   (a) Andesite similar in appearance to those previously described with numerous plagioclase phenocrysts, epidote, an altered and unidentifiable matrix, and showing evidence of slight recrystallization. Its texture is well preserved.
   (b) Siliceous, shistose rock, probably of sedimentary origin.
   (c) Eyes of pure quartz having straight, well defined boundries and exhibiting a vague foliation.

V. Samples $\overbrace{210, 262}^{qm_1}$, $\overbrace{263, 267}^{qm_2}$ (pp. 9-14)

1. All these rocks share a general granoblastic, xenomorphic texture and have quartz and feldspars exhibiting sutured grain boundries, indicative of recrystallization. They are mineralogically similar and termed recrystallized quartz monzonites on the basis of their major minerals, which include K-feldspar, plagioclase, and quartz.

The differences among these rocks are:
(a) The feldspars of 210 are extremely cloudy whereas they are progressively less so in 263 and 267.
(b) Epidote is present only in 262.
(c) Chlorite is present in 210 and 262 but not in 267 or 263.
(d) 263 is coarser than the others.
(e) 267 is distinguished from the others in that it has probably been subjected to thermal metamorphism. The evidence for this is the probable presence of cordierite, strained muscovites and quartz, the large grain size of the muscovites, and a distinct foliation. The X-ray diffraction data does not show cordierite, which must be present in only small quantities. (see pp. 13-14).

The following pages give the observational data for each sample examined.

EfMatz

4/27/72

Sample No. 213 (A-10)

Hand Sample: Porphyritic, abundant feldspar phenocrysts up to 1" in length; less abundant hornblende phenocrysts up to 3/4" in lenght. Biotite books with a diameter of 1mm or less are fairly abundant. The groundmass is fine-grained with vesicles. The rock is a red-brown color.

Thin Section Texture: Porphyritic with a fine-grained groundmass.

<u>Mineralogy</u>

plagioclase (andesine)
hornblende
biotite
magnetite
hematite
quartz
orthoclase
chlorite
sericite
kaolinite
apatite

Plagioclase is the most abundant mineral occuring as phenocrysts and in the groundmass. The phenocrysts are somewhat altered mostly to sericite in the central part of the crystals and to kaolinite near the margins. Iron oxide stains the margins. Dark green hornblende also occurs as phenocrysts. Much of the hornblende was plucked out during preparation of the thin section but that which remains shows little alteration. Biotite is fairly abundant but about 75% of the original biotite has been replaced by chlorite (penninite) and iron oxide. Minor magnetite occurs in the groundmass, some occurs in biotite sites with chlorite and fine-grained magnetite and hematite are concentrated along the margins of vesicles. Quartz is a very minor constituent and occurs only in the groundmass. Some of the feldspar in the groundmass appears to be orthoclase but because of the fine-grain size no accurate estimate of abundance can be made. Apatite is a common accessory mineral.

Rock Name: Andesite Porphyry

Sample No.: 412 (A-3)

Hand Sample: Fine to medium grained. Pinkish grey.

Thin Section Texture: Fine to medium grained porphyry. Abundant euhedral plagioclase phenocrysts.

Mineralogy	Estimated %
plagioclase	45-50
augite	< 5
biotite	15-20
chlorite	~ 5
epidote	trace
apatite	trace
magnetite hematite	2-3
quartz	< 5
sericite	trace
calcite	trace
orthoclase	5-10

Euhedral plagioclase phenocrysts make up about 50% of the rock. They have a maximum length of about 1.5mm. All crystals show some alteration to a fine grained sericite. Biotite is the next most abundant mineral occuring as plates similar in size to plagioclase. Most plates have irregular edges with abundant fine grained opaque minerals at the margins. Some grains are partially or completely altered to chlorite (pennite). Minor amounts of epidote are sometimes associated with the chlorite. Augite occurs as phenocrysts.

The groundmass is composed mostly of minerals with low birefringence. Some quartz is present but probably makes up less than 5% of the rock. Orthoclase is more abundant than quartz.

Magnetite is the most abundant opaque mineral with some hematite.

Rock Name: Andesite

Sample No. 420 (di)

Hand Sample: Red-brown, medium-grained rock.

Thin section texture: Medium-grained, granular.

Mineralogy	Estimated %
hornblende	40-45
plagioclase	40-45
quartz	5-8
orthoclase	1-2
opaques	
apatite	

Secondary Minerals

chlorite
epidote
sericite
calcite

Hornblende is present as prismatic crystals up to 5mm in length. Most crystals show some replacement by chlorite. Plagioclase crystals are irregular in shape and have a maximum diameter of about 5mm. All of the plagioclase crystals are altered to sericite and smaller amounts of epidote. Epidote is usually concentrated near the center of the crystal. Quartz is finer-grained than plagioclase and hornblende. No orthoclase was recognized in the thin section but staining the slabs indicated that minor amounts are present. A few fairly large opaque grains are present. These are white in reflected light indicating lexcoxene probably formed from ilmenite. Smaller opaque grains are black in reflected light indicating magnetite. Some are oxidized to hematite. A few patches of secondary calcite are present.

Although the rock is badly altered, its texture and mineralogy suggest an igneous rock, probably a diorite.

Sample No. 421 rhyolite

Hand Sample: Dark gray fine-grained rock cut by a 1" vein of light colored material.

Thin Section Texture: Fine-grained.

Mineralogy (dark part)	Estimated %
quartz	35-40
epidote	15-20
biotite	30-35
plagioclase	5 or less
magnetite	5
sericite	
apatite	
sphene	
chlorite	

Mineralogy (light part)

quartz
plagioclase
orthoclase
epidote
sericite
magnetite

The dark part of the rock is composed mostly of quartz, biotite, and epidote. Quartz and biotite are generally very fine-grained ($\ll$0.5mm). The quartz has numerous inclusions of fine-grained magnetite. Biotite is greenish-brown and shows no preferred orientation. A very small amount of chlorite is present forming from biotite. Epidote occurs as larger irregular grains that commonly include quartz. A few larger grains of plagioclase and orthoclase are present and the plagioclase is partially altered to sericite.

The light area is composed of coarser grained quartz, plagioclase, and orthoclase in roughly equal amounts. Epidote and sericite are forming from plagoclase.

The texture of both parts of the rock is distinctly metamorphic. The fine-grain size and mineralogy suggest that the dark rock's parent was a fine-grained rock rich in SiO_2 and relatively rich in FeO, MgO and somewhat rich in Al_2O_3, CaO, and K_2O. This could have been a shale or perhaps an intermediate volcanic rock. The abundance of very fine grained quartz might suggest the former but one can not be sure. The light colored part may represent a vein of igneous material that was metamorphosed with the other part of the rock or possibly could have formed by some kind of segregation process during metamorphism.

SOUTHWESTERN ASSAYERS & CHEMISTS, Inc.

A-II-1

REGISTERED ASSAYERS

FELIX K. DURAZO
WIL WRIGHT
ARIZONA REG. NO. 5875

P. O. BOX 7517
TUCSON, ARIZONA 85713

710 E. EVANS BLVD.
PHONE 602-294-5811

Mr. C. E. Cronenwett
1050 E. 8th Street
No. 107
Tucson, Arizona

(Pinal Copper Corp.)

JOB # 010770
RECEIVED 2-4-72
REPORTED 2-8-72

SAMPLE NUMBER	GOLD OZ.*	SILVER OZ.*	LEAD %	COPPER %	ZINC %	Oxide Cu. %	MOLYBDENUM %
226	.410			1.05		1.04	
238	Nil	.08		.02		.02	
239	.080	.14					
240	Nil	.04					
241	.017	.10		.04		.03	
242	Nil	.20					
243	Trace	.18		.09		.07	
244	.320	.22		.02		.01	
245	.039	.94		.24		.19	
246	.100	1.02		.35		.33	
248	.008	.16		.01		.01	
249	.003	.06		<.01		<.01	
250	.033	.16		.08		.04	
252	.026	.10					
253	.008	.04					
254	.070	.20		.02		.01	

REGISTERED ASSAYER
CERTIFICATE No.
5975
WILBUR D.
WRIGHT
Date Signed
Arizona U. S. A.

CHARGE $ 122.00

* Gold and Silver reported in troy oz. per 2,000 lb. ton.

INVOICE

SOUTHWESTERN ASSAYERS & CHEMISTS, Inc.

A-II-2

REGISTERED ASSAYERS

FELIX K. DURAZO
WIL WRIGHT
ARIZONA REG. NO. 5875

P.O. BOX 7517
TUCSON, ARIZONA 85725

710 E. EVANS BLVD.
PHONE 602-294-5811

Mr. C. E. Cronenwett
1050 E. 8th Street
No. 107
~~Tucson, Arizona~~ (Pinal Copper Corp.)

JOB # 012836
RECEIVED 12-22-72
REPORTED 1-4-73

SAMPLE NUMBER	GOLD OZ.*	SILVER OZ.*	LEAD %	COPPER %	ZINC %		MOLYBDENUM %
255	Trace	.22					
256	.002	.16					
257	.002	.10					
258	.003	.14					
259	.003	.12					
260	Trace	.10					
261	.006	.14					

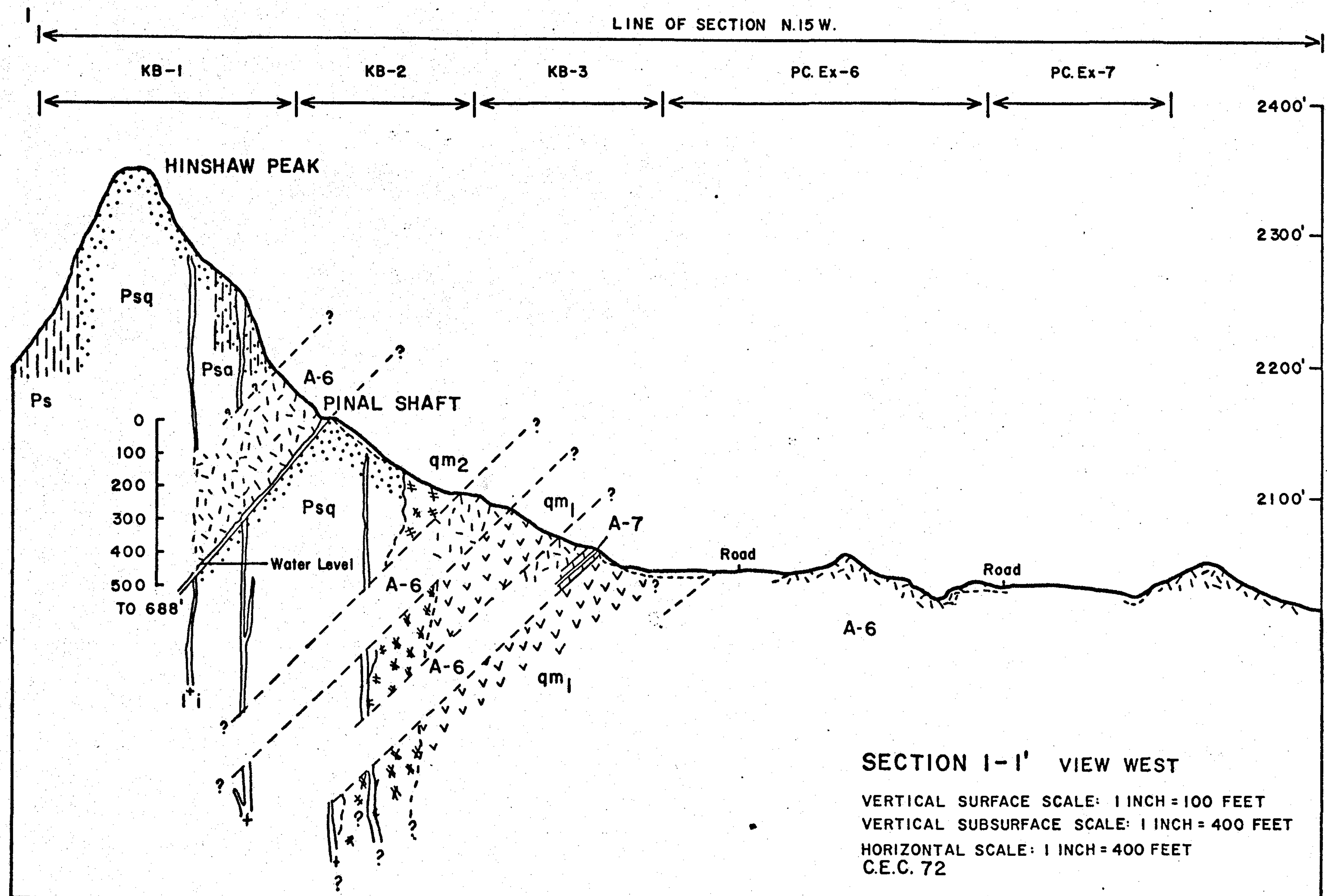
Assays Certified By

Richard C Aros
Richard Aros

CHARGE $ 35.00

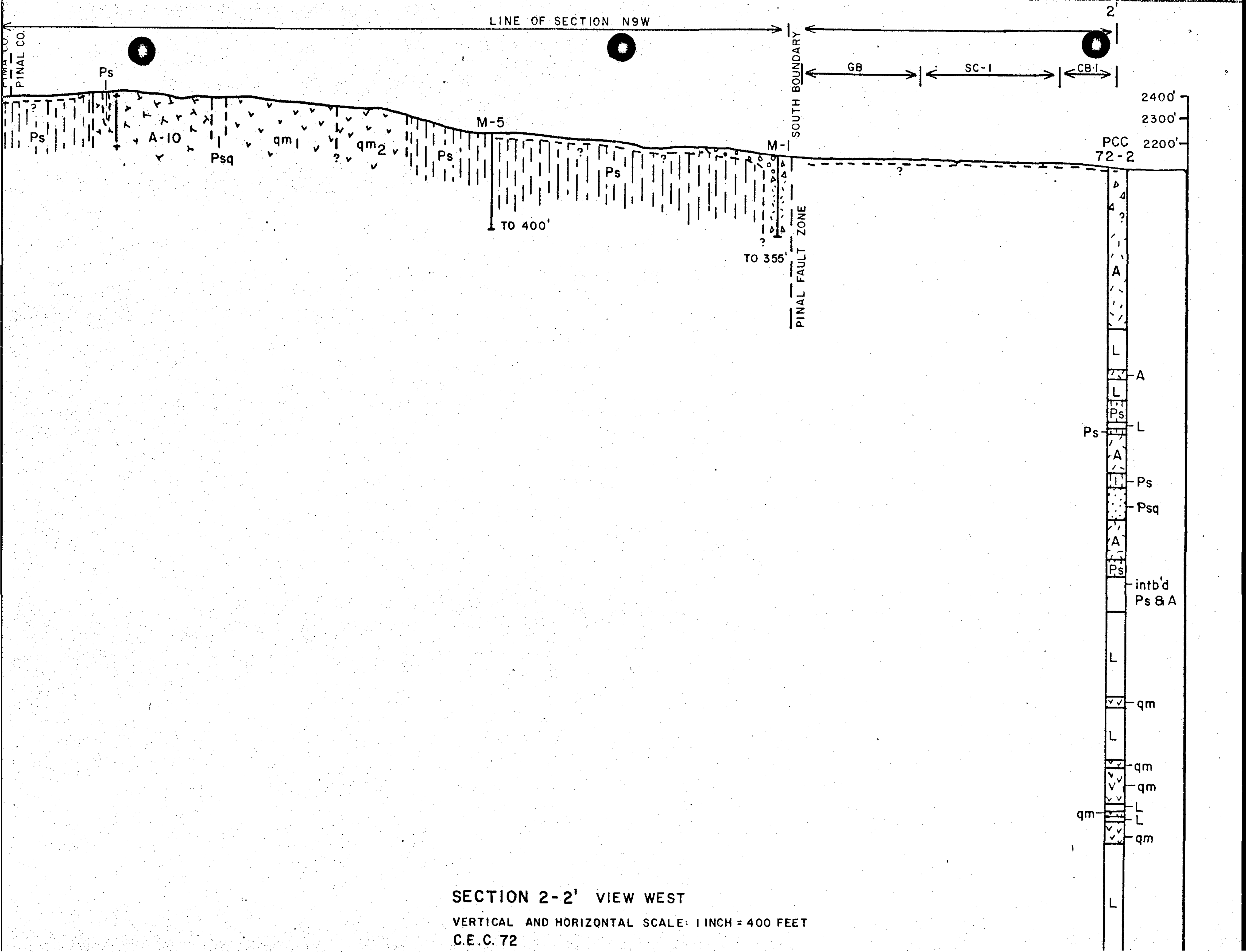
* Gold and Silver reported in troy oz. per 2,000 lb. ton.

INVOICE



SECTION I-I' VIEW WEST

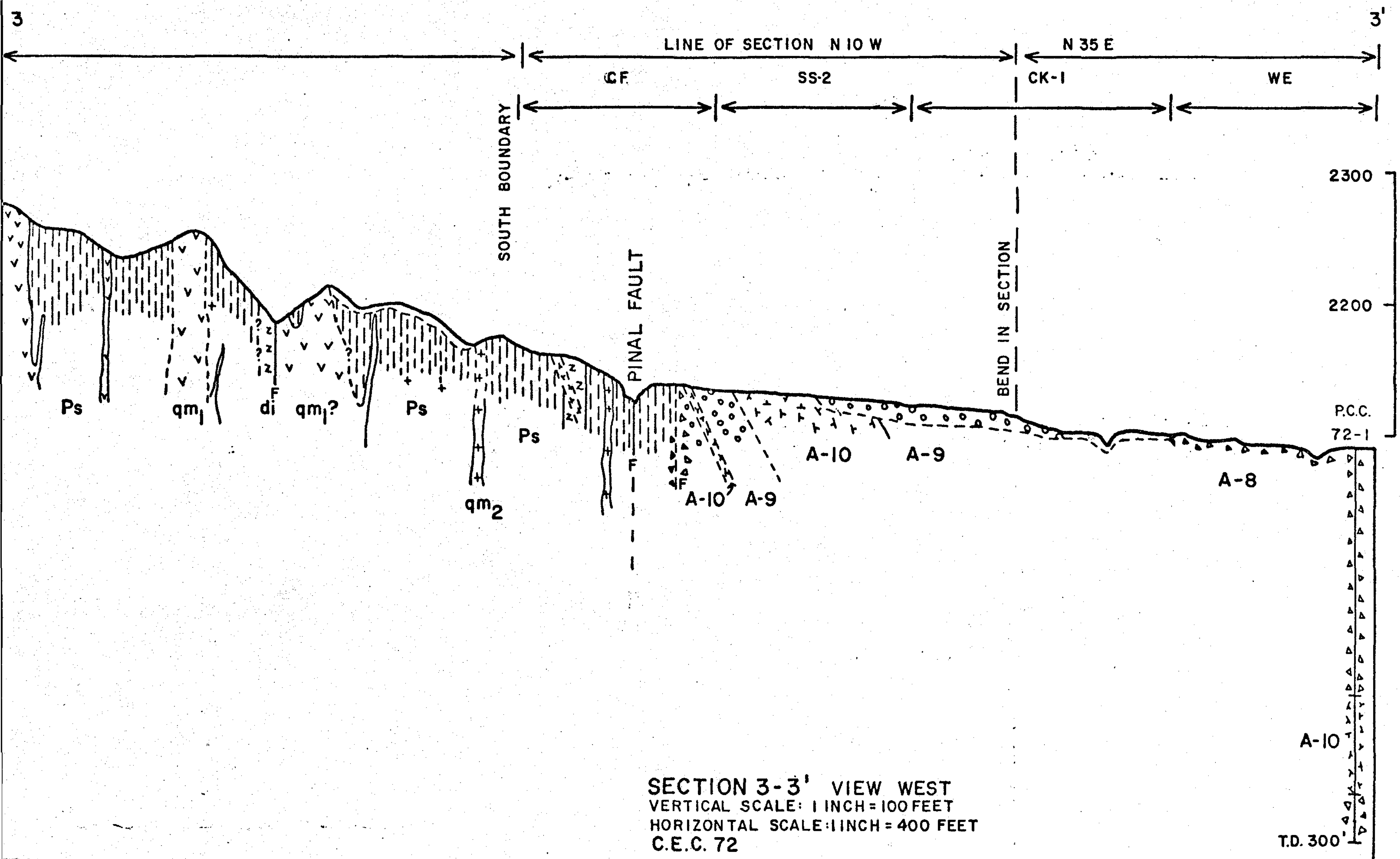
VERTICAL SURFACE SCALE: 1 INCH = 100 FEET
VERTICAL SUBSURFACE SCALE: 1 INCH = 400 FEET
HORIZONTAL SCALE: 1 INCH = 400 FEET
C.E.C. 72



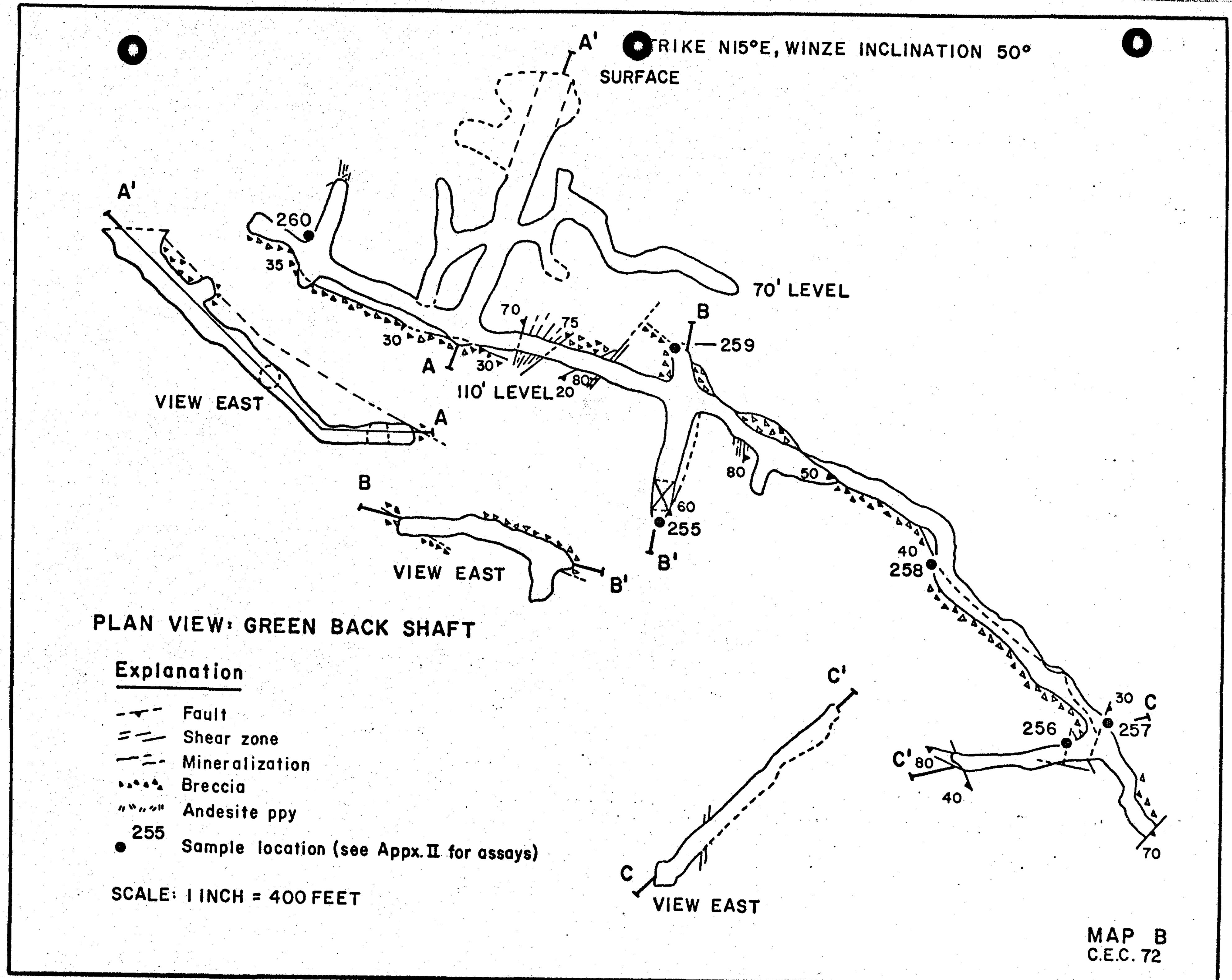
SECTION 2-2' VIEW WEST

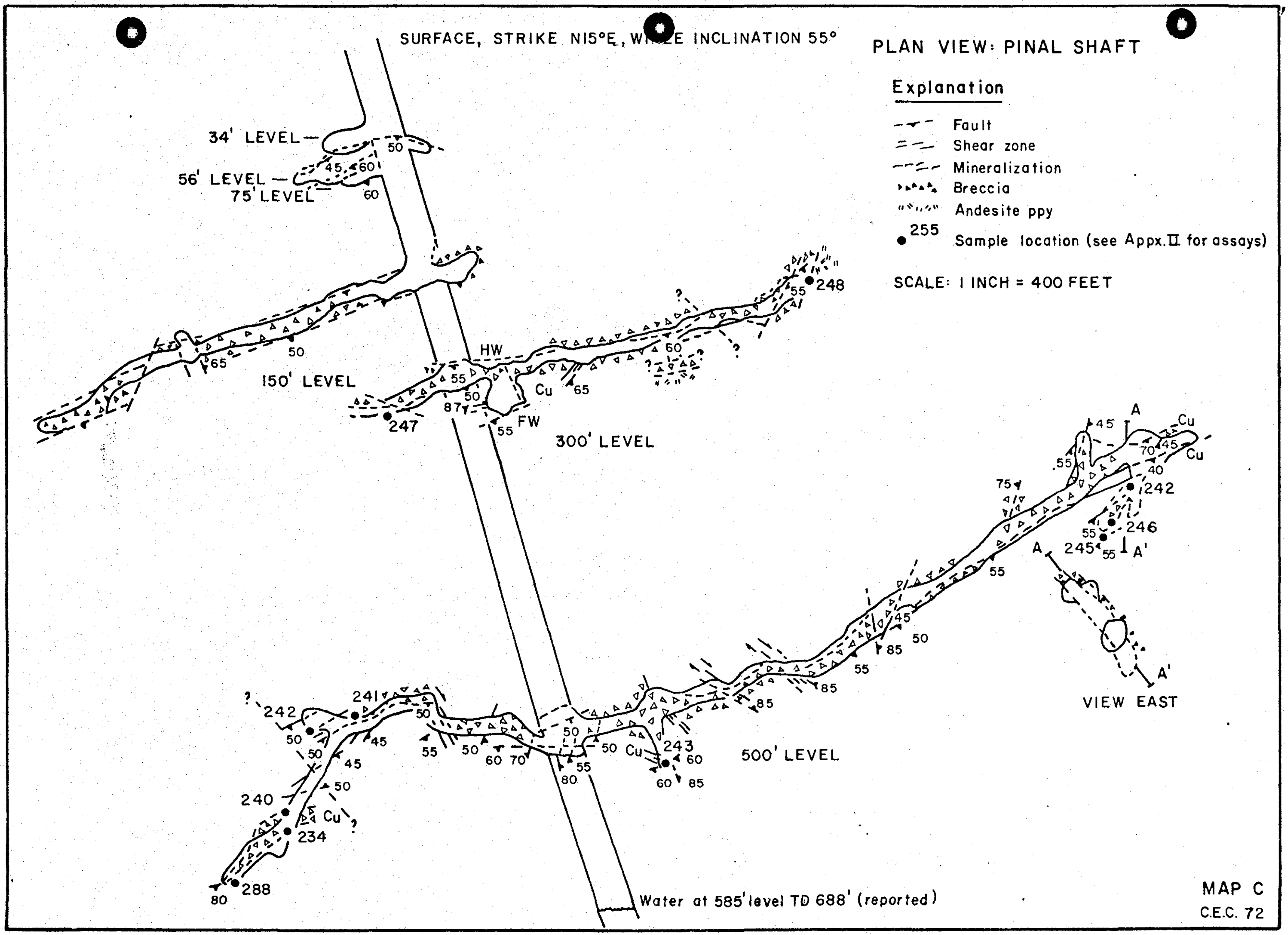
VERTICAL AND HORIZONTAL SCALE: 1 INCH = 400 FEET

C.E.C. 72



SECTION 3-3' VIEW WEST
VERTICAL SCALE: 1 INCH = 100 FEET
HORIZONTAL SCALE: 1 INCH = 400 FEET
C.E.C. 72


STRIKE N15°E, WINZE INCLINATION 50°
SURFACE
A'
A
70' LEVEL
110' LEVEL
VIEW EAST
B
B'
VIEW EAST
C
C'
VIEW EAST
260
259
255
258
256
257
PLAN VIEW: GREEN BACK SHAFT
Explanation
Fault
Shear zone
Mineralization
Breccia
Andesite ppy
255
Sample location (see Appx. II for assays)
SCALE: 1 INCH = 400 FEET
MAP B
C.E.C. 72


SURFACE, STRIKE N15°E,
INCLINATION 55°
PLAN VIEW: PINAL SHAFT
Explanation
Fault
Shear zone
Mineralization
Breccia
Andesite ppy
255
Sample location (see Appx.II for assays)
SCALE: 1 INCH = 400 FEET
34' LEVEL
56' LEVEL
75' LEVEL
150' LEVEL
300' LEVEL
500' LEVEL
HW
FW
Cu
248
247
242
246
245
243
241
240
234
288
A
A'
VIEW EAST
Water at 585' level TD 688' (reported)
MAP C
C.E.C. 72

Mr. Robert Crist

March 1973

AN EXPLORATION DRILLING PROGRAM PROPOSED TO EVALUATE GOLD BEARING QUARTZ VEINS ON CLAIMS HELD BY THE PINAL COPPER CORPORATION IN SOUTHWESTERN PINAL COUNTY, ARIZONA

by

Charles E. Cronenwett
Consulting Geologist

CHARLES E. CRONENWETT

Consulting Geologist

TEL. (602) 623-1026

e and Mineral Property Valuation
Mineral Exploration

AZ. REG. #8356
CALIF. REG. #2312

350 N. SILVERBELL RD. #96
TUCSON, AZ. 85705

AN EXPLORATION DRILLING PROGRAM PROPOSED TO EVALUATE GOLD BEARING QUARTZ VEINS ON CLAIMS HELD BY THE PINAL COPPER CORPORATION IN SOUTHWESTERN PINAL COUNTY, ARIZONA

HISTORY AND DEVELOPMENT

According to an undated report by Leonard[1] the series of branching quartz veins shown on Map A were first staked in 1918 as the Greenback Group of 20 claims. In 1920 gold was discovered on the surface at the site of the present Pinal mine shaft and in 1922 additional gold bearing quartz was discovered by random assessment work a few feet beneath the surface in the vicinity of the present Greenback shaft.

By December, 1926 when continuous mining ceased, the Pinal and Greenback shafts had been carried to their present respective depths of 688 and 112 feet as measured on the incline. During this period numerous prospect pits and several shallow shafts from 30 to 50 feet deep had also tested the vein system at various locations. Since about 1930 there has been no systematic exploration of the quartz veins although about 30 tons of ore were taken from the Greenback dump and the 50 foot level in the Pinal shaft during the years 1939-42.[2]

GEOLOGY AND MINERALIZATION

In 1971-72 the writer mapped and sampled the underground workings and surface exposures of the gold bearing quartz veins as part of a general examination. Map A, excerpted from this report, illustrates the intersecting and

---

1. F. M. Leonard, ca. 1932, Greenback Mine Report, Pinal Copper Corporation files.
2. F. Andrade, 1973, personal communication.

branching nature of these veins. The veins were delineated on the basis of their topographic prominence and/or continuity of exposure. For this proposal roman numerals have been appended to those veins which appear to have the most conspicuous continuity. Prospect pits and shafts are designated by an open box symbol. The resulting observations and conclusions plus data from prior reports follow in summary form.

(a) The system of quartz veins appears to maintain a general southerly dip ranging between 40° and 60° with a west-northwesterly surface trend in excess of 3000 feet.

(b) The thickness of the Pinal (V-A) and Greenback (VIII) veins is variable from 6 to 9 feet. An average thickness for all veins is difficult to estimate since there may be considerable enlargement at intersections. The vein thickness is augmented by several feet of flanking breccia which may also be mineralized. The veins delineated on the map range from 2 to 9 feet excluding intersections.

(c) Although several sets of faults intersect the veins, in the underground workings the maximum vein displacement measured was about 20 feet. In general, the stratigraphic displacements noted were less than 5 feet. Where possible the location of drill sites should be biased in favor of these fault/vein intersections to determine if a systematic relationship exists between fault sets and mineralization.

(d) Observation of the zones of high gold values underground suggest that the ore grade mineralization may favor shoots which rake (pitch) southwesterly within the plane of the quartz veins. It follows that the south dipping Greenback and Pinal shafts begun in such shoots would necessarily pass out of the axis of the ore with depth. As the boundary of the ore is fairly abrupt it appears that the ore has been "cut off" in these shafts. Drilling objectives in the vicinity of these shafts should include the ground south and west of the shaft collars to explore for extension of the original ore shoots.

(e) These veins with gold values contained in shoots resemble many other gold-quartz veins associated with Tertiary volcanics described in the geologic literature. Typically such shoots are irregular, of limited vertical extent with values concentrated at vein intersections. The ore is primarily free gold, low in pyrite and tellurides with silver in ratios of 3 or 4:1. In addition some ore shoots may not be exposed at the surface as was the case at the Greenback discovery.

(f) Although the veins may be related to the period of igneous activity which produced the volcanic or hypabyssal andesite-latite sequence, the veins cross-cut a variety of as yet untested host rock types. In addition to the presence of gold in the quartz vein system this potential of an associated low grade gold deposit amenable to open pit mining, should not be overlooked during the exploration drilling program.

(g) The absence of manganese minerals coupled with the dense character of the quartz vein makes it unlikely that a zone of secondary enrichment will be encountered at depth.

(h) Table 1 is a summary of assays averaged by the writer from prior reports or personal communication. A realistic evaluation of this raw data should take into account the following variables:

(1) mine averages are unweighted and include assays of unknown quantities of material taken from a variety of depths and locations within a given vein.
(2) assayers and assay techniques are of unknown reliability.
(3) surface averages are from an unknown number of veins.

PROPOSAL

Objective

Of the more than 15,000 linear feet of quartz veins shown on Map A, less than 100 feet have been examined in ore shoots of the Pinal and Greenback mines. The proposed core drilling will provide an exploratory examination of the gold bearing potential in the remainder of the vein system present in the eastern 1/3 of the property. This program if funded according to the proposal will core and test individual veins and their associated breccia zones at approximately 50 sites along the length of their surface trace at a depth of 50 feet.

Locations

Forty-five tentative proposed locations are plotted on the accompanying Map A spaced on 200 foot centers. The final locations will be staked after a field check of the

TABLE 1. Summary of Assay Averages

Source	Pinal Av.	Pinal Max.*	Greenback Av.	Greenback Max.*	Surface	Remarks
		GOLD (oz.)				
Hinshaw, P., 1920	(0.02-0.97)					
Defty, W. E., 1921	0.30	0.80				
Cole, F. L. and Linton, R., 1922	0.43	1.38	1.17	1.34	0.10	
Cole, F. L. and Linton, R., 1922	0.14	0.50				500 ft. level winze
Cole, F. L. and Linton, R., 1922				2.22		dump
Cole, F. L. and Linton, R., 1922				50.0		company assays
Butler, G. M., 1923	0.15					
Leonard, F. M., ca. 1932	0.50	0.73			0.87	
Andrade, F., 1939-42	0.77					
U.S.B.L.M., 1958					0.03	
Ferrin, H., 1970	(0.4-1.69)					cores
Cronenwett, C. E., 1972	0.06	0.32	.002		0.41	
		SILVER (oz.)				
Defty, W. E., 1921	0.52	0.7				
Cole, F. L. and Linton, R., 1922	0.58	1.14	1.3		0.18	
Cole, F. L. and Linton, R., 1922	4.4	28.9				500 ft. level winze
Cole, F. L. and Linton, R., 1922		66.8(not included in average)				500 ft. level winze
Butler, G. M., 1923	0.37	0.85				
Leonard, F. M., ca. 1932	2.56	4.5				
U.S.B.L.M., 1958					0.1	
Cronenwett, C. E., 1972	0.24	1.02	0.14	0.22		

*Max. - the highest assay recorded

drill sites has been made to evaluate faults, fracturing or other potential mineral controls and terrain conditions. Drill sites will be positioned relative to the south dipping veins so that holes to a 50 foot depth will have penetrated the host rock at the base of the vein.

In the vicinity of the Greenback and Pinal shafts additional locations may be chosen to test for a possible extension of the original ore shoots in the direction of their apparent southwesterly rake.

Recovery of significant assays may suggest subsequent offset locations at less than 200 foot spacings for confirmatory tests.

Target

The proposed minimum core footage per hole is 15 feet. This interval should include the vein proper, its associated breccia zones and several feet of potentially mineralized host rocks adjacent to the vein. It is proposed that cores of entire test holes be taken periodically to verify lithology and host rock sludge assays. In this respect it would be desirable to consider drilling bids with the lowest price per cored foot.

Sampling

The proposed sample intervals are:

(a) sludge from drilling - 10 ft.
(b) core from host - 5 ft.
(c) quartz vein and breccia - 2.5 ft.

The more frequent sampling of the quartz vein may assist in arriving at reliable averages from material that is notable for erratic distribution of gold values. Sludge sampling in host rocks may be reduced to spot checks if the absence of values appears firmly established. Original assays will specify gold and silver with retention of pulps for subsequent analysis.

Results

The estimated drilling time for this project is 60 days. Geological supervision will be kept to the minimum necessary to assure prompt completion of the project. It will also include: drill site selection, core logging and transportation to assayer and storage, accounting and final report. The geologist will advise the company on a continuing basis of all costs and data derived from drilling in order that the program will be subject to continuing review.

Cost

A pro forma cost of anticipated direct and indirect expenses is included in the comparative cost summary, Table 2. Total estimated cost on the basis of submitted bids is also summarized below. It is to be noted that bid #3 is based on coring the entire footage. This would, of course, result in a considerable increase in substantive information; all other considerations being equal this would be the bid of choice from a geological standpoint.

Cost Summary

	#1 Longyear	#2 Metler	#3 Loveall
Direct	$21,740.00	$16,978.00	$17,040.00
Indirect	6,825.00	6,825.00	6,825.00
	$28,565.00	$23,803.00	$23,865.00

Respectfully submitted,

Charles E. Cronenwett

Charles E. Cronenwett
Consulting Geologist

Tucson, Arizona
March, 1973

REGISTERED GEOLOGIST
CERTIFICATE
8328
CHARLES EMANUEL
CRONENWETT
Date Signed 3/29/73
ARIZONA, U.S.A.

SEAL

701 West Drexel
Tucson, Arizona 85706
March 26, 1973

Pinal Copper Company

Re: Drilling Program planned
South of Casa Grande

Concerning drill program you presently plan near Casa Grande, Arizona, I, Willaim Loveall, Drill Contractor, agree to core drill at the sites designated and prepared by the Company, and to provide the following:

1. All personnel.
2. Drilling equipment.
3. Supplies necessary to perform requested drilling, including water, drilling mud, cement, etc., except where qualified below.
4. Core boxes, properly preserved and marked.

Drill size will be B.X.W.L. Company will not be responsible for the cost of any supplies used, lost, damaged or stolen during the project, but will reimburse contractor at cost for any casing left in the hole at Company's request.

Pinal Copper Company will compensate me for the drilling, based on the following schedule:

1. $6.00 per foot from 0 - 500 ft.
   $7.00 per foot from 500 - 1000 ft.
2. Company will reimburse contractor at cost +5% for drilling mud, core boxes and cement.
3. Company agrees to pay 1/2 of bit cost, should bit cost exceed $2.00 per foot.
4. Pinal Copper Company will install pump and pipe for water, or contractor will install at cost +10%. Should difficulty arise with water circulation, Company agrees to reimburse contractor the cost of supplying water.
5. Company will pay a fee of $1.00 per mile for mobilization and demobilization.
6. Contractor will present a statement at the end of each two-week period for drilling completed.
7. Down-time will be paid by Company at $25.00 per hour.
8. Any required Cat work will be at Company expense.

William Loveall,
Drill Contractor

William Loveall
Contractor

Company

Longyear

LONGYEAR COMPANY
308 EAST PIMA STREET
PHOENIX, ARIZONA 85004
PHONE 258-6543
GEN. OFFICE - MINNEAPOLIS, MINN.

March 20, 1973

Mr. C. E. Cronenwett
350 North Silver Bell Road
Apt. 96
Tucson, Arizona 85705

Attention: Mr. C. E. Cronenwett

SUBJECT: PROPOSAL WHICH WILL COVER YOUR PLANNED DRILLING PROGRAM LOCATED APPROXIMATELY 45 MILES SOUTHWEST OF CASA GRANDE, ARIZONA

Gentlemen:

1. In response to your telephone call outlining your program, we are pleased to submit our proposal as outlined below.

2. It is our understanding that your minimum program will consist of approximately 2,000 feet of drilling to be carried out in 50 holes. No hole is expected to go beyond the depth of 75 feet.

It is understood that you will prepare and maintain the necessary access roads and construct the required drill sites including mud pits if necessary.

3. For the work as outlined above, we propose to furnish one truck-mounted Longyear drilling machine together with all the required accessory equipment including water and service trucks.

We will expect to carry out the program working on a one shift per day, six day per week basis.

4. We will carry Comprehensive General Liability and Automobile Insurance covering personal injury and property damage and also statutory Workmen's Compensation Insurance. Certificates showing these coverages will be furnished upon request.

5. Based upon conditions which we expect to prevail on this work, we are pleased to quote as follows:

a) <u>Mobilization and demobilization</u> of personnel and drilling equipment......$465.00 lump sum/rig

b) Overburden drilling through alluvial material -

	4-1/2" or 3-7/8" size
0 to 50 feet in depth....................	$6.30 per foot

c) Diamond core drilling -

	NXL	BXL
0 to 100 feet in depth..............	$10.00/ft.	$9.80/ft.

d) Reaming, if required and where applicable, will be carried out at 55% of the above outlined prices.

NOTE: In computing the price schedule in the core drilling and reaming section, we provided for $1.50 per foot drilled or reamed to cover the anticipated diamond and setting charge expense. In the event the actual diamond bit expense should exceed the $1.50 per foot allowance, it is understood that 50% of such excess expense will be invoiced to you.

Diamond bit expense will be computed by using $12.50 per carat price for diamonds consumed plus applicable setting charges for the size and type of diamond set items used, divided by the footage drilled.

e) Rig time - Time spent by crews performing cementing activity, installing or pulling casing or performing hole stabilizing or hole plugging activity will be invoiced at the rate of..................$25.85 per hour for each 2-man drill crew.

f) Standby time or delays for your convenience or for which you are responsible, cement setting time, time spent moving from hole to hole and rigging, all time spent rigging well equipment over old drill holes as well as rigging down the well equipment will be invoiced at the rate of..................$19.50 per hour for each 2-man drill crew.

g) Cement, drill mud, additives or other hole stabilizing or hole plugging materials consumed in the program will be invoiced at our jobsite cost plus a 10% handling charge.

h) Casing lost or left in holes at your request will be invoiced at our replacement cost, jobsite basis.

i) Water truck service -

1) Truck rental charge..................$300.00 per month plus 20 cents per mile

2) Charges for water at its source will be invoiced to you at our cost.

3) A separate fulltime water truck driver, if required, will be furnished for..................$6.50 per hour

4) Pumping equipment as well as casing and all related pumping supplies will be furnished for......$150.00 per month

j) Core boxes, cardboard type, capacity ten feet of core in either NXL or BXL size will be invoiced at...........................$1.25 each

6. Cores obtained in the drilling program will be turned over to your representative at the drill sites in containers furnished by you or by the Longyear Company as outlined above.

7. Invoices covering the work performed will be prepared as promptly as possible after the fifteenth and last day of each month and payment shall be due within twenty days from your receipt of invoice.

8. This proposal will serve as the Agreement for the performance of the services and the furnishing of the equipment as described above if accepted by you and returned to the Longyear Company at its Phoenix, Arizona office within thirty days from date hereof.

Sincerely,

LONGYEAR COMPANY

Roy P. Muncy

Manager, Southwestern Zone
Contract Drilling Division

R.R.Muncy:smb

ACCEPTED:
Company________________________

By________________________

Title________________________

Date________________________

R. E. Metler Co.
6171 E. Bellevue St. #14
Tucson, Ariz. 85712

Mr. C. E. Cronenwett
Pinal Copper Corp.
350 No. Silverbell Rd #96
Tucson, Ariz. 85705

Dear Mr. Cronenwett,

In response to your inquiry I wish to submit tenative prices for your drilling near Casa Grande, Ariz.

(1) Mobe and de-mobe $1.00 per mile from our Tucson, Ariz. yard and return.
(2) Rotary drilling to 100 ft. $4.50 per ft.
(3) Diamond spot coring NX--$10.00 per ft. BX--$9.75 per ft.
(4) Diamond cost over $2.50 per ft. will be invoiced.
(5) Access roads and drill sites to be prepared in advance by your copany.
(6) Drilling water source to be arrainged by your company. We will supply a pump, if necessary and install for time and materials.

Thank you for the opportunity to quote on this project.

Yours Truly,
R. E. Metler
R. E. Metler

Accepted--________________

TABLE 2

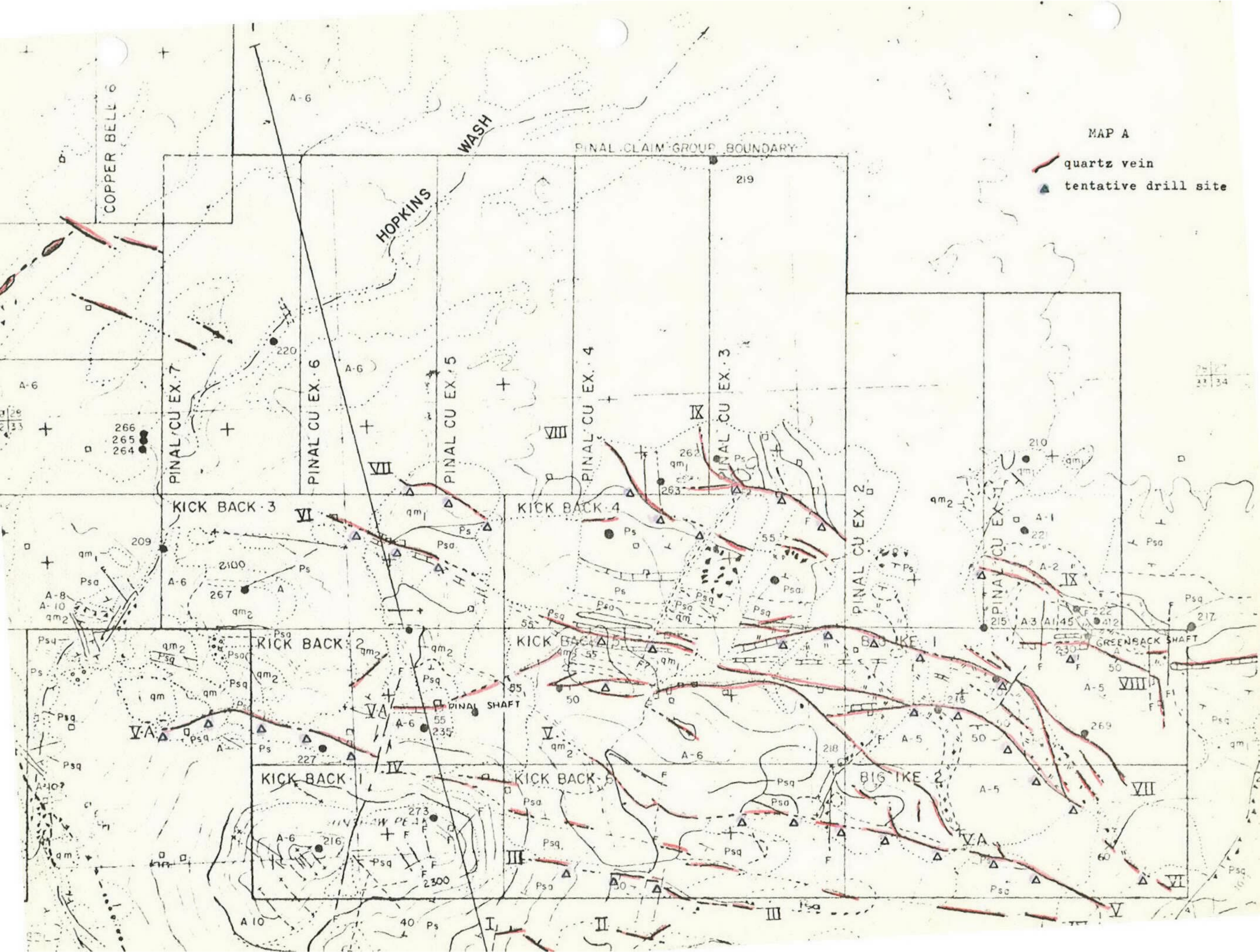
Comparative Pro Forma Cost Estimate

Direct Costs	Rate $	×	mileage (1) footage (2)		$	×	50 holes (3) 60 days (4)	days (5)	$
Drilling									
#1 Longyear, Phoenix, Az									
a) Mobilization	—								465.00
b) drilling	6.30		35	(2)	220.50		(3)		11,025.00
c) coring (BX)	9.80		15	(2)	147.00		(3)		7350.00
per hole					367.50				
d) water:									
Truck	300.00		30	(5)			(4)		600.00
pump	150.00		30	(5)			(4)		300.00
instal.	NC								—
e) bits:									—
50% in excess of	1.50								9
f) supplies									
cost + 10%	—								9
								sub total	19,740.00
g) contingency 10%									2000.00
									21,740.00
# Metler, Tucson, Az									
a) mobilization	1.00		240	(1)					240.00
b) drilling	4.50		35	(2)	157.50		(3)		7875.00
c) coring	9.75		15	(2)	146.25		(3)		7313.00
per hole					303.75				
d) water:									
Truck	NC								
pump	NC								
instal.	cost								9
e) bits:									
cost in excess of	2.50								9
f) supplies									
cost + 10%									9
								sub total	15428.00
g) contingency 10%									1550.00
									16,978.00

TABLE 2 - page 2

#3 Loveall, Tucson,							
a) mobilization	1.00	240	(1)				240.00
b) coring	6.00	50	(2)	300.00	(3)		15,000.00
c) water:							
truck	NC						
pump	} cost + 10%						
instal						(est)	300.00
d) bits:							
50% in excess of	2.00						f
e) supplies							
cost + 5%	—						f
						sub total	15,540.00
f) contingency 10%							1,500.00
							17,040.00
INDIRECT COSTS							
a) location prep.	250.00	3	(5)				750.00
b) assay	5.00	250					1250.00
c) core boxes	1.25	100					125.00
d) geological	100.00	30	(5)				3000.00
e) travel & core							—
transport.	10¢	240	(1)		(4)		600.00
f) final rept.							500.00
							6225.00
							600.00
							6825.00

	Longyear	Metler	Loveall
DIRECT	$ 21,790.00	$ 16,918.00	$ 17,040.00
INDIRECT	6825.00	6825.00	6825.00
	$ 28,915.00	$ 24153.00	$ 24215.00


MAP A
quartz vein
tentative drill site
PINAL CLAIM GROUP BOUNDARY
HOPKINS WASH
COPPER BELL 6
PINAL CU EX. 7
PINAL CU EX. 6
PINAL CU EX. 5
PINAL CU EX. 4
PINAL CU EX. 3
PINAL CU EX. 2
PINAL CU EX.
KICK BACK 3
KICK BACK 4
KICK BACK 2
KICK BACK 5
KICK BACK 1
KICK BACK 6
BIG IKE 1
BIG IKE 2
PINAL SHAFT
GREENBACK SHAFT
A-6
A-5
A-1
A-2
A-8
A-10
Psq
Ps
qm
qm_1
qm_2
219
220
209
266
265
264
267
227
235
273
216
218
210
221
222
215
217
230
269
2100
2300

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

July 19, 1973

TO: W. L. Kurtz

FROM: J. D. Sell

Greenback Prospect
Pinal Copper Company
Pinal County, Arizona

SUMMARY

Approximately 4,800 feet of core from four wide-spaced drill holes on the Greenback prospect were examined by ASARCO personnel. A mid-Tertiary andesite-latite-monzonite porphyry intrudes the Precambrian Pinal complex and is variably pyritized and altered throughout. Copper mineralization is limited to a near surface, sub-economic oxide zone and two restricted sulfide intercepts of less than 0.3%.

Favorable alteration zoning diminishes below 1900 feet in the deep test and does not imply a better target at depth. The possibility of lateral increase in alteration and mineralization still remains, but is not supported by the surface mapping.

The presence, however, of this type of alteration-mineralization in a late, mid-Tertiary intrusive is considered anomalous and may be justification for further regional reconnaissance. A program aimed at locating covered Laramide intrusives with greater associated mineral potential in the surrounding area would appear justified.

TEXT

Steve Davis and I logged (Nov. 13-16, 1972) the available core of the drilling at the Greenback Prospect held by the Pinal Copper Corporation (401 E. Indian School Road, Suite 107, Phoenix, Arizona 85012, phone: 279-6402. Edward Hopkins, Jr., President). Dr. Tom Mitcham, consulting geologist, made the core available after being contacted by the principals through Bob Crist.

Mitcham submitted a preliminary map showing topography, claim outline, old drill holes, and current (1972) drill holes. This map is bound with the file copy. ASARCO is also scheduled to receive a copy of Mitcham's final report. Attached to this report is the ASARCO Papago Central Project map of the Greenback area with the new drilling added.

Five holes were logged. El Paso had previously drilled EP-1 and EP-2, while Pinal Copper recently completed 72-1, 72-2, and 72-3. The hole data follows:

El Paso drilling

EP-1, terminated at 530 feet.
EP-2, terminated at 320 feet.

Pinal Copper drilling

72-1, terminated at 300 feet.
72-2, terminated at 3500 feet.
72-3, deepened EP-1 from 530 to 1372 feet.

The drill logs have been placed with the file copy with summary logs submitted as an Appendix to this report.

Based on accumulated data, the following features are revealed at Greenback.

The Greenback area is a mid-Tertiary intrusive complex. K-Ar age date from the latite monzonite near EP-1 has an isotopic age of 23.5 $\pm$ 0.9 m.y. based on biotite (Balla). The area is an andesite porphyry with a core zone of latite to monzonite porphyry with numerous zones of incorporated Pinal Schist and all cut by various breccia dikes and masses.

As shown by ASARCO mapping (Davis & Kinnison), the area is zonally altered from argillic in the central to various degrees of propylitic on the edges, with some minor quartz-sericite development and superimposed by varying amounts of silica flooding. The surface rocks have undergone heavy supergene destruction with resultant argillic alteration type. The primary alteration intensity varies from strong in the area of EP-1 to weak outward to 72-1 on the west and EP-2 on the north. Pyrite content also varies from 1% (or less) in the central zone to plus 5% on the fringes. Minor copper mineralization is controlled by the intensity of quartz-sericite alteration and in part by the intensity and type of silica veining and flooding.

Drill hole 72-2 contained the apparent better values (less than 0.1% overall), but the surface copper oxide staining is in the lower pyrite area to the east in the central zone. However, the drill hole EP-1 in the copper stain shows a rapid decrease and ending of the copper values shortly below the surface (± 100 feet). The two deep holes (1372 and 3500 feet) show increasing amounts of latite-monzonite porphyry and quartz latite-monzonite porphyry at depth. In drill hole 72-2, the alteration-mineralization increased from incipient argillic-chloritic alteration, with less than 1% pyrite, early in the hole to increased silica and weak but widespread argillic-chloritic alteration and increased pyrite down to 1900, where quartz-sericite-kaolinite is found in quartz-rich monzonite; after which it rapidly decreased to the bottom of the hole at 3500 feet. Gypsum veining does increase in drill hole 72-2 near the bottom and suggests the deeper monzonitic core zone.

Previous (Kinnison) bulk sample geochemistry and composite spectrochemical analysis results suggest, within the area of stronger alteration, a gain in copper, potassium, sodium, magnesium, and probably aluminum, iron, and manganese. The central zone is depleted in lead and probably vanadium.

Overall, this mid-Tertiary complex shows more alteration and mineralization than most other complexes of this age. Others of this class may be Rock House north of Superior and portions of the Turkey Creek complex in the Chiricahua Mountains. Perhaps this suggests that the later intrusive complexes will contain abnormal amounts of alteration-mineralization if they are within the primary lineament (conduit) zones along which the productive porphyries were produced. If so, continued search in the Table Top-Vekol area might turn up one of the earlier productive porphyries.

The core, especially in the intrusive breccias, was searched for clasts of an older copper-bearing material, but none was found and it is concluded that the Greenback complex was not emplaced through an earlier productive complex.

James D. Sell

James D. Sell

JDS:lb
Attachs.

cc: SRDavis

(NOTE: F. T. Graybeal brought to our attention the reference by Mac Namara. The formation of biotite pseudomorphing hornblende is found at Greenback and may offer more guidance than what was gleaned by Davis and myself in our logging.)

REFERENCES

Balla, J.C., 1972, K-Ar Age, Greenback Copper Prospect, Pinal County, Arizona: Letter to W. L. Kurtz from Spokane, Washington dated July 18, 1972, with attached analytical data sheet.

Davis, S.R., & Kinnison, J.E., 1969, Papago Central Project, Geology, Greenback Area, Pinal County, Arizona: ASARCO Report, 3 pages and 3 attachments, June 9, 1969.

Kinnison, J.E., 1969, Papago Central Project, Geochemical, Copperosity, Greenback Mine, Pinal County, Arizona: ASARCO report, 1 page and 9 attachments, April 4, 1969.

MacNamara, P.M., 1968, Rock types and mineralization at Panguna porphyry copper prospect, Upper Kaverong Valley, Bougainville Island: Proc. Aust. Inst. Min. Met., No. 228, December, p. 71-79.

APPENDIX: SUMMARY OF THE LOGS

El Paso - 1

0-370 Andesite porphyry, minor argillic alteration with silicification. Oxidized with minor copper stain. Some Precambrian gneiss-granite complex (Pinal Schist).

370-530 Andesite porphyry with incipient chlorite alteration. First pyrite, but oxidation continues to 485 along shears and veinlets. Weak quartz veining with some quartz-sericite, minor pyrite (0.5%). Also some Precambrian complex, basalt dikes, and breccia development.

Pinal Copper 72-3 (Continuation of EP-1)

530-689 Andesite porphyry and Precambrian complex in about equal amounts. Units have chlorite-clay alteration with fine-grained pyrite (0.5-1%) throughout and some magnetite in Precambrian complex.

689-702 Intrusive breccia (4') containing subangular fragments of gneiss complex, quartzite (?), fine-grained and coarse-grained andesite porphyry set in matrix of coarse-grained andesite porphyry. Weak argillic-chlorite alteration with pyrite in ferromag sites. Quartz latite-monzonite (9') with argillic-chloritic alteration and silica flooding. Cut by quartz and quartz-pyrite veinlets and with disseminated pyrite (2% total sulfides). Intrudes unit below.

702-1116 Precambrian complex, mainly of argillaceous and siliceous banded gneiss units. All cut by minor quartz veining and minor pyrite (less than 0.5%) in weak argillic-chloritic alteration cut by numerous shears and fractures as well as by dikelets of andesite porphyry, breccia, and latite-monzonite. Strong fault-gouge zones at 806-814 and 1099-1107.

1116-1339 Latite-monzonite porphyry with andesite porphyry core zone. Weak argillic alteration, slight chloritization of ferromags, and weak silica flooding increasing with depth. 0.5% pyrite.

1339-1361 Intrusive breccia of Precambrian complex and monzonite porphyry set in medium-grained monzonitic matrix.

1361-1372 Precambrian complex with weak quartz and pyrite veining in silica flooding.

End of hole -- capped for reentry.

El Paso - 2

0-148	Latite-monzonite porphyry. Weak argillic alteration with silica flooding. All oxidized with 1-3% former sulfides. Cut by numerous shears and gouge zones.
148-220	Latite porphyry. First pyrite (1-1/2%) with increasing argillic-chloritic alteration and silica overflooding. Numerous gouge and shear zones. Pyrite increasing to 5% predominantly in ferromag sites.
220-320	Latite porphyry. Moderate to strong argillic alteration with increasing chlorite (to 248') and silica overflooding. Decrease in quartz veining. Pyrite at 2-3%. Strong gouge and fracture zones throughout.
	End of hole.

Pinal Copper 72-1

0-131	Latite-monzonite porphyry. Strong hematite flooding, totally oxidized, probably 4-8% total former sulfides. No copper oxides. Somewhat chloritized with weak argillic alteration. Numerous shears and fractures.
131-187	Latite-monzonite porphyry. First pyrite, 2%, as disseminations and replaced ferromag sites. Moderate argillic alteration with weak-moderate silica overflooding. Highly broken by fractures.
187-256	Latite porphyry (dike?). Very dark matrix with large feldspars, sparse epidote, moderate chlorite with very sparse pyrite. Some shearing.
256-300	Latite-monzonite porphyry. Weak argillic alteration, some increase in chlorite, and moderate silica overflooding. 2% pyrite. Decreasing amounts of pyrite and argillic alteration below 285 feet, but increasing chlorite.
	End of hole.

Pinal Copper 72-2

0-670	Rotary? No core available.
670-843	Latite porphyry. Moderate argillic-chloritic alteration with 2% pyrite as quartz-pyrite replacement of feldspar and ferromag sites. Some hematite flooding to 720. Silica flooded zones with increased pyrite. Cut by few gypsum veinlets and intrusive breccia dikelets.

843-868 Basaltic andesite dike with intrusive contacts on both sides.

868-1012 Latite-monzonite. Incipient argillic-chloritic alteration, quartz flooding and 2% pyrite. Cut by crushed zones with mixed breccia texture. All has bleached appearance and cut by gypsum, quartz, pyrite, and pink alunite(?) veinlets.

1012-1061 Precambrian gneissic complex cut by dikes of above material. Incipient bleaching and clay-chlorite-pyrite development. Numerous small shears.

1061-1112 Intrusive breccia of latite porphyry with Precambrian complex clasts. Alteration-mineralization as above with lower (less than 1%) pyrite. Steep shearing and breccia-gouge zones.

1112-1213 Latite-monzonite porphyry with incipient argillic-chlorite alteration and minor quartz flooding with pyrite (less than 1% total). Some shearing and breccia zones.

1213-1275 Latite-monzonite porphyry completely replaced by sugary silica groundmass with visible argillized feldspars. Some brecciation and few silica-pyrite veinlets. Grades downward into intrusive breccia of medium-grained latite-monzonite with weak argillic alteration, silica flooding and sparse pyrite.

1275-1464 Precambrian complex with quartz-clay-chlorite development along schistosity. Silica overflooding with some pyrite, quartz-pyrite and specularite-chalcopyrite and bornite(?) in first 55 feet. Minor zone of quartz-breccia. Pyrite (2%) and quartz increasing along with chlorite latite-monzonite porphyry and andesite porphyry dikelets down to 1390. Alteration and mineralization then decreasing with exception of silica flooding.

1464-1764 Latite-monzonite porphyry with high quartz content as silica replacement of groundmass. Disseminated pyrite and quartz-pyrite stockwork veinlets, grading downward into decreasing silica flooded porphyry and into silica breccia with abundant Precambrian complex units containing weak clay-chlorite development (1631-1701). Quartz latite-monzonite with high silica matrix content below with decreasing amounts of quartz and pyrite veining, some disseminated pyrite (1% total).

1764-1845 Precambrian complex with porphyry zones. All with weak quartz-argillic-chloritic alteration, and disseminated pyrite (+1%). Some specularite-pyrite (up to 10%) in porphyry areas.

1845-2225 Quartz latite-monzonite porphyry. First 20 feet strongly altered with quartz-sericite-kaolinite in feldspars and complete chloritization of biotites. Quartz and quartz-pyrite veining and disseminated pyrite (+5% total sulfide). Amount and strength of alteration-mineralization decreases continually with less than 1% total sulfides by 1937 feet and by 2000 feet becomes very fresh looking, low pyrite (less than 0.5%), and minor bleached envelopes, some pyrite in ferromag sites. Some crushed and sheared zones.

2225-2472 Quartz latite-monzonite porphyry. Weakly argillized feldspars and weakly chloritized ferromags (mainly biotite). Few quartz and quartz-pyrite veinlets with alteration envelopes. Minor zones of quartz monzonite dikelets, basic inclusions, basaltic dikes and crushed zones.

2472-2652 Quartz latite-monzonite porphyry with weak argillic-chloritic alteration, but increasing quartz flooding and quartz-pyrite veinlets (1% pyrite) with some magnetite, and chalcopyrite in smoky silica zones.

2652-2720 Latite porphyry. Dark subvolcanic matrix with weak alteration. Cut by more silicic zones showing bleached envelopes. Ends in shear zone.

2720-3000 Quartz latite-monzonite porphyry. Weak argillic-chloritic alteration with heavy quartz flooding and numerous quartz and quartz-pyrite (1% total pyrite) veinlets. Some magnetite. One veinlet of moly at 2804 feet. Shear zones present. Rock unit texture is variable depending upon amount of silica and alteration veining.

3000-3411 Quartz latite-monzonite porphyry. Weakly altered with some epidote spotting. Scattered but increasing gypsum veinlets with some pyrite, chalcopyrite and galena, reaching maximum of 2% gypsum at 3100 feet. Continued shearing, latite dike features, and low (less than 0.5%) pyrite. Gypsum diminishing below 3360 feet until contact below.

3411-3500 Quartz latite-monzonite porphyry. Moderate quartz-argillic-chloritic alteration in mixed latite and monzonite units with increased shearing and mixing of alteration features. Some quartz and pyrite veining (less than 0.5% total sulfides).

End of hole.

EXPLANATION

Contact

Possible Contact

Limit of Outcrop

Limit of Alteration–Mineralization

CDH Churn Drill Hole

DDH Diamond Drill Hole

ROCK TYPES

Vu — Volcanics, Undifferentiated

POST MINERAL / PRE MINERAL

Ap — Andesite and Andesite Porphyry

LMp — Latite and Monzonite Porphyry Complex

Ps — Pinal Schist

Gr — Granite, Pre-Cambrian

Silicified Zone — Massive Quartz

Breccia Zone

ALTERATION — MINERALIZATION

Strong Alteration—Silicification, Pervasive CuOx Staining

Moderate Alteration—Mineralization

Weak Alteration—Mineralization

Barren Alteration—Mineralization

2-4% FeOx After Sulfides

Limonite Closely Resembles Live Limonite

GEOLOGY AND ALTERATION—MINERALIZATION

PAPAGO CENTRAL PROJECT
GREENBACK AREA

PINAL CO., ARIZONA

SCALE: 1" = 1000'

June 1969 SRD, JEK

Revised – Nov. 1972 by J.D. Sell
Showing El Paso & Pinal Copper Drill Holes

EXPLANATION

Contact
Possible Contact
Limit of Outcrop
Limit of Alteration–Mineralization
CDH Churn Drill Hole
DDH Diamond Drill Hole

ROCK TYPES

Vu Volcanics, Undifferentiated

POST MINERAL
PRE MINERAL

Ap Andesite and Andesite Porphyry
LMp Latite and Monzonite Porphyry Complex
Ps Pinal Schist
Gr Granite, Pre–Cambrian

Silicified Zone–Massive Quartz
Breccia Zone

ALTERATION – MINERALIZATION

Strong Alteration–Silicification, Pervasive CuOx Staining
Moderate Alteration–Mineralization
Weak Alteration–Mineralization
Barren Alteration–Mineralization
2–4% FeOx After Sulfides
Limonite Closely Resembles Live Limonite

GEOLOGY AND ALTERATION–MINERALIZATION

PAPAGO CENTRAL PROJECT
GREENBACK AREA

PINAL CO., ARIZONA

SCALE: 1" = 1000'

June 1969 SRD, JEK

2158B

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

July 19, 1973

FILE MEMORANDUM

Greenback Prospect
Pinal Copper Company
Pinal County, Arizona

Several reports have been added to the file, but not otherwise distributed:

1. Xerox of paper: Rock Types and Mineralization at Panguna Porphyry Copper Prospect, Upper Kaverong Valley, Bougainville Island, by P. M. Mac Namara: Proc. Aust. Inst. Min. Met., No. 228, December 1968.

2. Pencil log sheets by JDS and SRD of drill holes.

3. Packet of information from E. Hopkins, Jr., President of Pinal Copper Co. Includes Dr. T. W. Mitcham's final report with maps and drill logs (Dec. 12, 1972). Miscellaneous older reports.

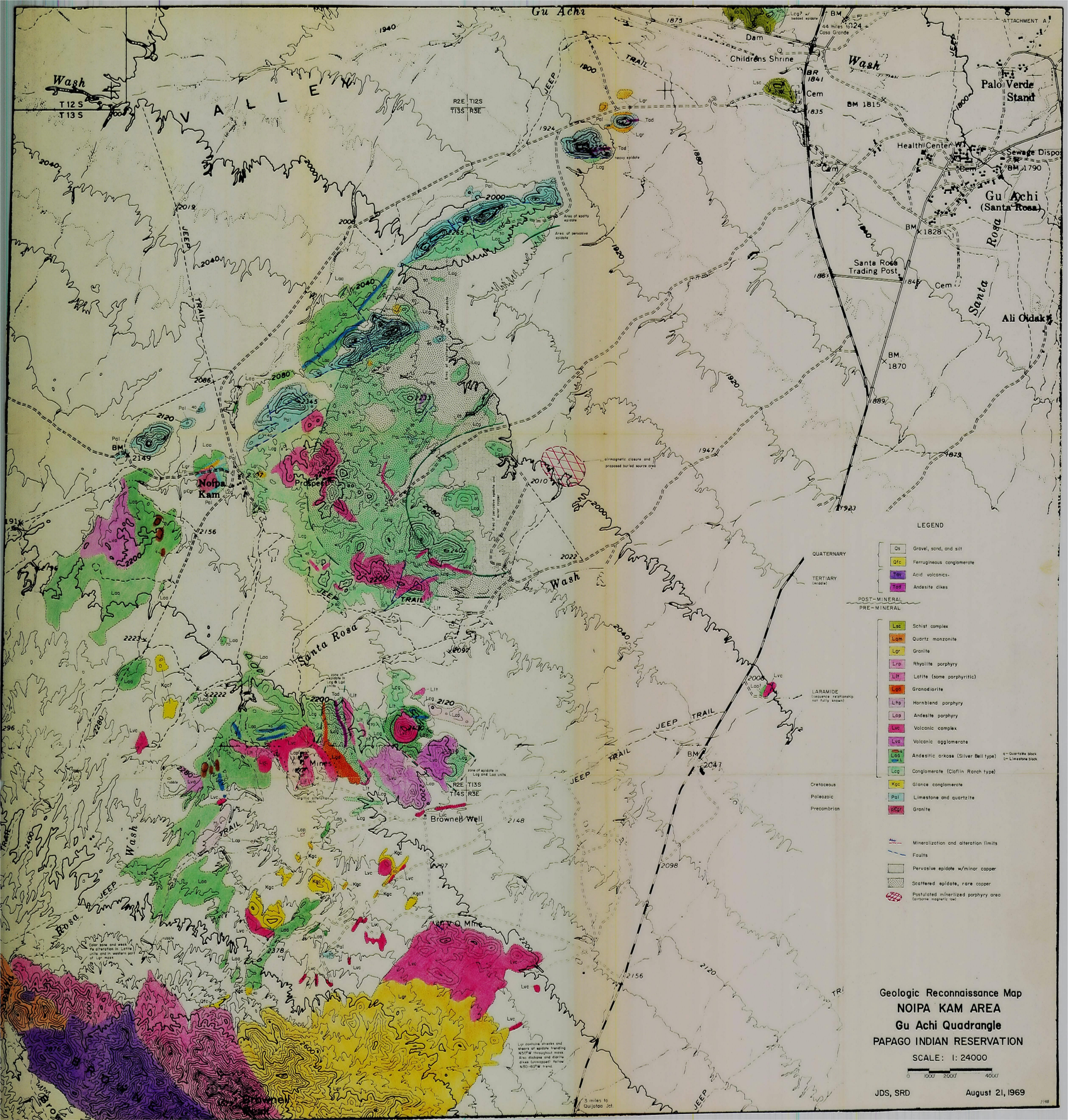
4. Report on the Geologic Examination of Mining Claims, by C. E. Cronenwett (1-31-73).

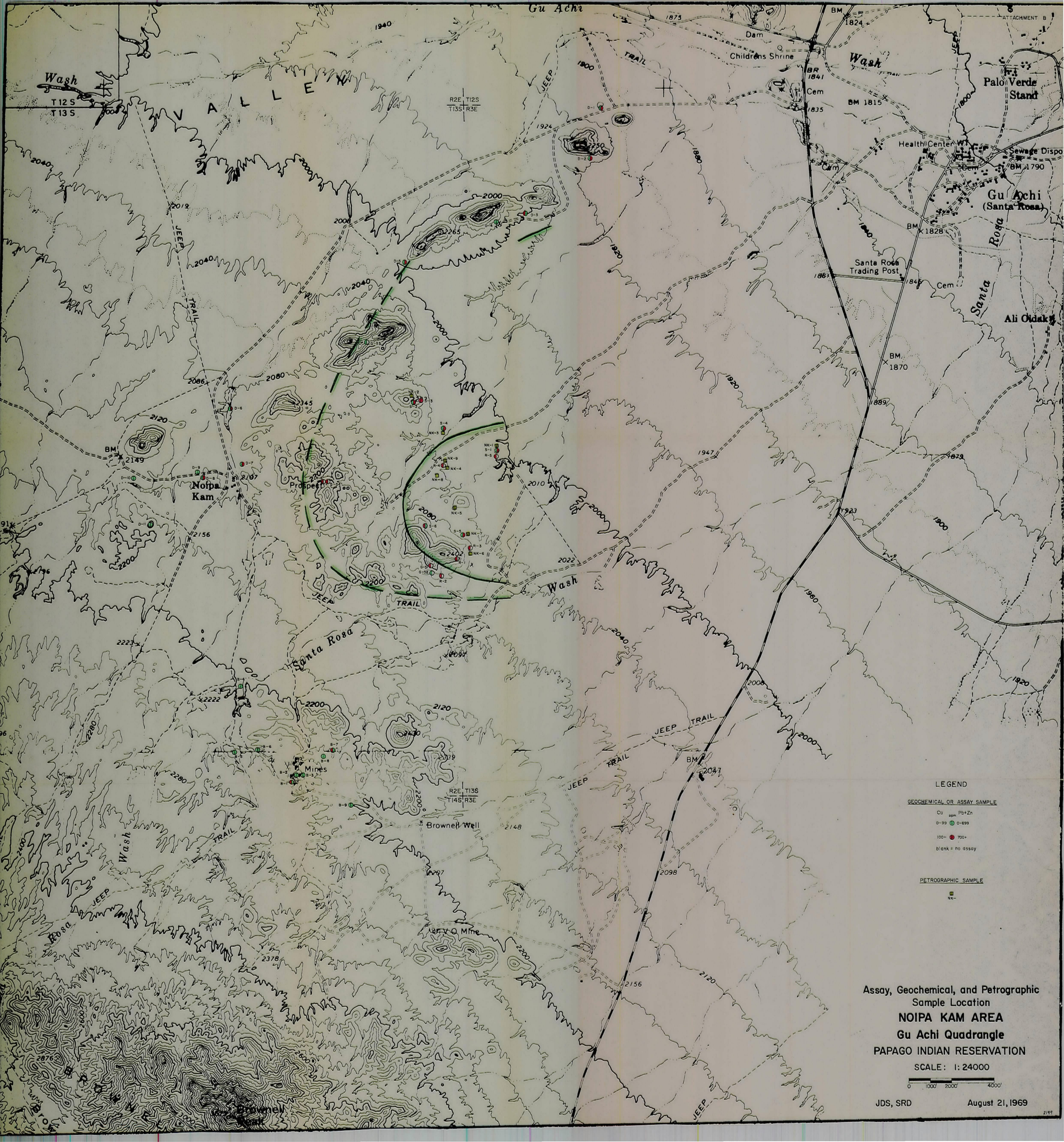
5. Xerox copy of report on an Exploration Drilling Program to Evaluate Gold Bearing Quartz VEins, by C. E. Cronanwett (March 29, 1973).

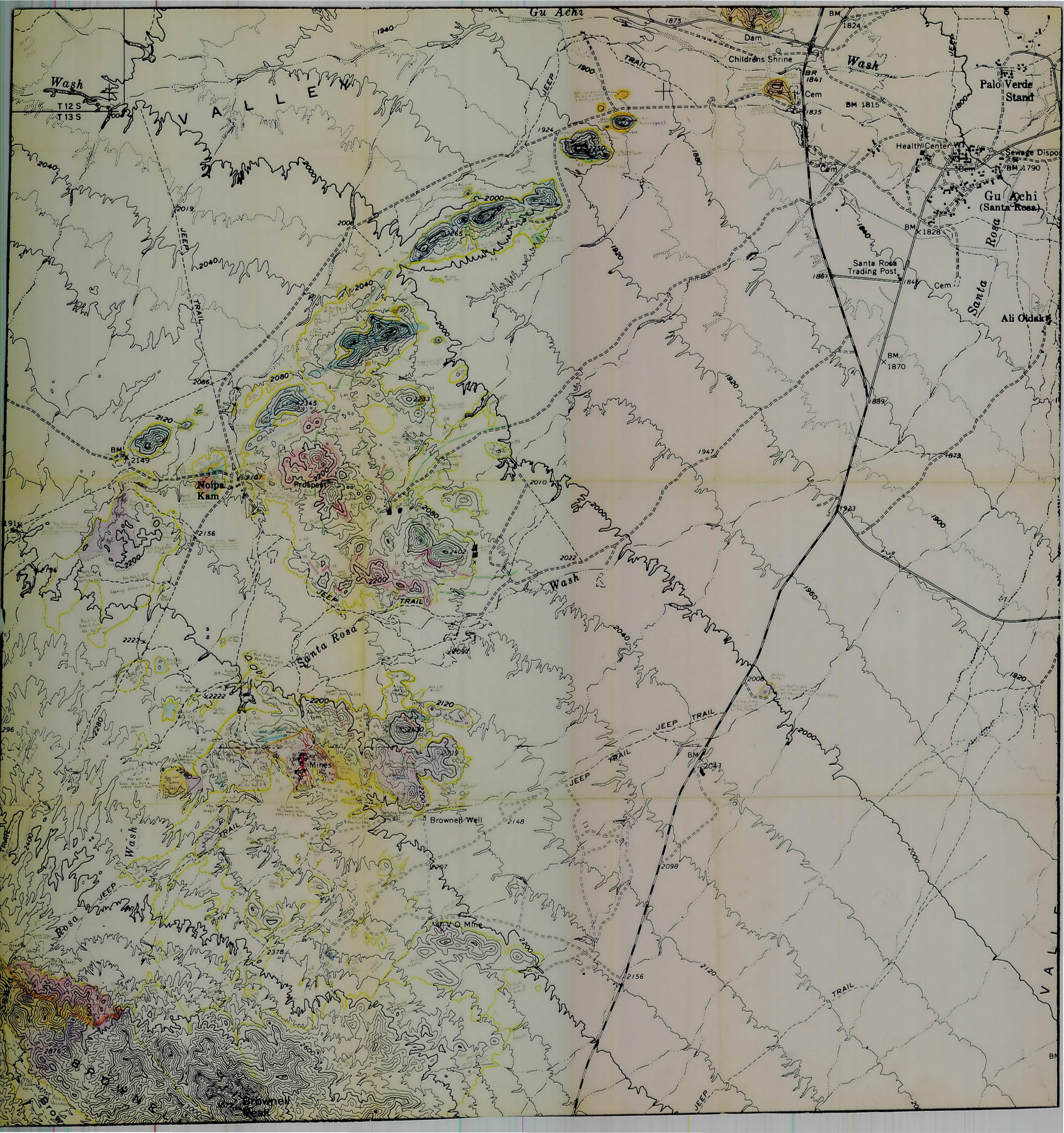
James D. Sell

James D. Sell

JDS:lb


Gu Achi
ATTACHMENT A
VALLEY
Wash
T12S
T13S
R2E T12S
T13S R3E
Dam
Childrens Shrine
44 miles to Casa Grande
BM
Palo Verde Stand
Cem
BM 1815
Health Center
Sewage Disp
BM 1790
Gu Achi (Santa Rosa)
BM 1828
Santa Rosa Trading Post
Santa Rosa
Ali Oidak
BM 1870
JEEP TRAIL
Noipa Kam
Prospect
Wash
Santa Rosa
Mines
R2E T13S
T14S R3E
Brownell Well
V V Q Mine
Rosa Wash
Brownell
3 miles to Quijotoa Jct.
LEGEND
QUATERNARY
Qs Gravel, sand, and silt
Qfc Ferrugineous conglomerate
TERTIARY (middle)
Tav Acid volcanics.
Tad Andesite dikes
POST-MINERAL
PRE-MINERAL
LARAMIDE (sequence relationship not fully known)
Lsc Schist complex
Lqm Quartz monzonite
Lgr Granite
Lrp Rhyolite porphyry
Llt Latite (some porphyritic)
Lgd Granodiorite
Lhp Hornblend porphyry
Lap Andesite porphyry
Lvc Volcanic complex
Lva Volcanic agglomerate
Laa Andesitic arkose (Silver Bell type)
q— Quartzite block
L— Limestone block
Lcg Conglomerate (Claflin Ranch type)
Cretaceous
Kgc Glance conglomerate
Paleozoic
Pal Limestone and quartzite
Precambrian
pЄgr Granite
Mineralization and alteration limits
Faults
Pervasive epidote w/minor copper
Scattered epidote, rare copper
Postulated minerlized porphyry area (airborne magnetic low)
Geologic Reconnaissance Map
NOIPA KAM AREA
Gu Achi Quadrangle
PAPAGO INDIAN RESERVATION
SCALE: 1: 24000
0 1000 2000 4000
JDS, SRD
August 21, 1969


ATTACHMENT B
Gu Achi
Dam
Childrens Shrine
Wash
Palo Verde Stand
Cem
BM 1815
BM 1824
Health Center
Sewage Dispo
BM 1790
Gu Achi
(Santa Rosa)
BM 1828
Santa Rosa Trading Post
Cem
Santa Rosa
Ali Oidak
BM 1870
VALLEY
Wash
T12S
T13S
R2E T12S
T13S R3E
JEEP TRAIL
Noipa Kam
Prospect
BM 2149
Wash
Santa Rosa
JEEP TRAIL
Mines
Brownell Well
V O Mine
Rosa
Wash
R2E T13S
T14S R3E
BM 2047
LEGEND
GEOCHEMICAL OR ASSAY SAMPLE
Cu ppm Pb+Zn
0-99 0-699
100+ 700+
blank = no assay
PETROGRAPHIC SAMPLE
NK-
Assay, Geochemical, and Petrographic
Sample Location
NOIPA KAM AREA
Gu Achi Quadrangle
PAPAGO INDIAN RESERVATION
SCALE: 1:24000
0 1000' 2000' 4000'
JDS, SRD
August 21, 1969



Gu Achi
Wash
T12S
T13S
VALLEY
Dam
Childrens Shrine
Wash
Cem
BM 1815
Palo Verde Stand
Health Center
Sewage Dispo
Gu Achi
(Santa Rosa)
Santa Rosa Trading Post
Cem
Santa Rosa
Ali Oidak
JEEP TRAIL
Noipa Kam
Prospect
Wash
Santa Rosa
Mines
Brownell Well
Wash
Rosa
V O Mine
TRAIL
Brownell Peak
VALLEY

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

July 16, 1969

TO: J.H. Courtright

FROM: W.G. Farley

GEOPHYSICAL SURVEYS
GU ACHI (SANTA ROSA)
PIMA COUNTY, ARIZONA

On May 9, 1969 an I.P. resistivity survey was initiated west of the Indian town of Gu Achi (Santa Rosa) to test an area of weak alteration and mineralization discovered during the 1966 helicopter, geological, reconnaissance program. A total of 44 line miles of I.P.- resistivity survey was run in this area using the Hunter-Scintrex 7.5 kilowatt I.P. unit. The electrode configurations used were a wenner 1000 foot and 2000 foot "a" and a three electrode 1000 foot "a". The traverse lines were spaced approximately one half mile apart with readings taken at 1000 foot intervals. Figure 1 shows the location of I.P.-Resistivity lines with the I.P. and resistivity values that were obtained at each station with the wenner 2000 foot "a". The I.P. background in this area ranged from 2 to 3 m.v./v. I.P. values above 3 m.v./v. were considered anomalous and were contoured on 1 m.v./v. intervals. Resistivity values were contoured on intervals of 100 ohm feet from 0 to 500 and on intervals of 500 ohm feet above 500.

An anomalous I.P. area with a maximum response of 6.3 m.v./v. was detected about one mile southwest of the village of Gu Achi in an area of deep bedrock as suggested by low resistivity values. This anomalous I.P. area is open to the northeast towards the deep Santa Rosa Valley. The source of the I.P. anomaly is believed to be interconstitual clay in the valley conglomerate. South of the above mentioned I.P. anomaly are several small, weak anomalous I.P. zones (3.0 to 3.7 m.v./v.) that follow a resistivity low zone. The resistivity low zone is believed to be caused by a deep bedrock channel and the weak anomalous I.P. zones are believed to be coming from interconstitual clay in the valley conglomerate. On line 4, a single station weak anomalous I.P. response of 3.1 m.v./v. was obtained near the Brownell Mine in an area of high resistivity (2200 ohm feet). This anomalous I.P. response was most likely coming from a narrow sulfide zone in the area. Abundant outcrops in the Brownwell Mine area show the mineralization in that area to be limited in extent.

Near the center of the geophysically surveyed area, detailed geological mapping by Asarco geologist J.D.Sell partially outlined an area of weak alteration and weak copper and epidote mineralization at the edge of alluvial cover. (See Figure 1) The I.P. survey over this area did not detect any anomalous I.P. response. One half mile northeast of the pervasive epidote and weak copper sulfides mapped by Mr. Sell, a recent Asarco aeromagnetic survey (Figure 2) detected a weak magnetic low in an alluvial cover area. The location of this low has been outlined on the I.P.-Resistivity map. (Figure 1) This weak magnetic low probably indicates the center of the alteration zone partially outlined by Mr. Sell. An I.P.-Resistivity traverse over the magnetic low did not show any anomalous response.

SUMMARY AND RECOMMENDATIONS

The I.P.-Resistivity and Aeromagnetic Surveys in the Gu Achi area adequately covered the outcrop areas showing weak alteration and mineralization and the surrounding covered areas. No significant anomalous responses were obtained. It is the author's opinion that the area contains very little sulfide mineralization to a depth of 1000 feet and no areas of strong alteration. I recommend that this area be dropped as a copper sulfide prospect.

Wayne G. Farley

WGF:lab

cc: RJLacy
WESaegart
JDSell

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

November 13, 1969

TO: J.H. Courtright

FROM: W. G. Farley

GEOPHYSICAL SURVEYS
GU ACHI (SANTA ROSA)
PIMA COUNTY, ARIZONA

On July 16, 1969 a report was submitted to you covering I.P., resistivity and aeromagnetic surveys over the Gu Achi copper prospect. The conclusions reached at that time were the geophysical surveys did not detect any significant responses. It was the author's opinion that the area contained very little sulfide mineralization to a depth of 1000 feet and no areas of strong alteration. The present I.P.-resistivity is normally not capable of investigating deeper than 1000 feet so the sulfide content below that depth is not known.

Following a discussion about the area with Asarco geologist, J. D. Sell, it was postulated that the weak aeromagnetic low just east of the epidote halo mapped by Mr. Sell might be indicating an alteration zone at depth. The decision was made to run a ground magnetic survey over the aeromagnetic low area before distributing the July 16, 1969 Geophysical Report. The ground magnetic survey has now been completed. A map of the response obtained is shown on Figure 3. Two weak areas of low magnetic response were obtained that might be indicating weak alteration. However, the location of these two zones were displaced about 2000 feet south of the aeromagnetic low. Evaluating the recent ground magnetics with the previous geophysical surveys, it is the author's opinion that the geophysical surveys do not indicate a drilling target. The recommendation in my July 16, 1969 report of dropping the area as a sulfide copper prospect still holds.

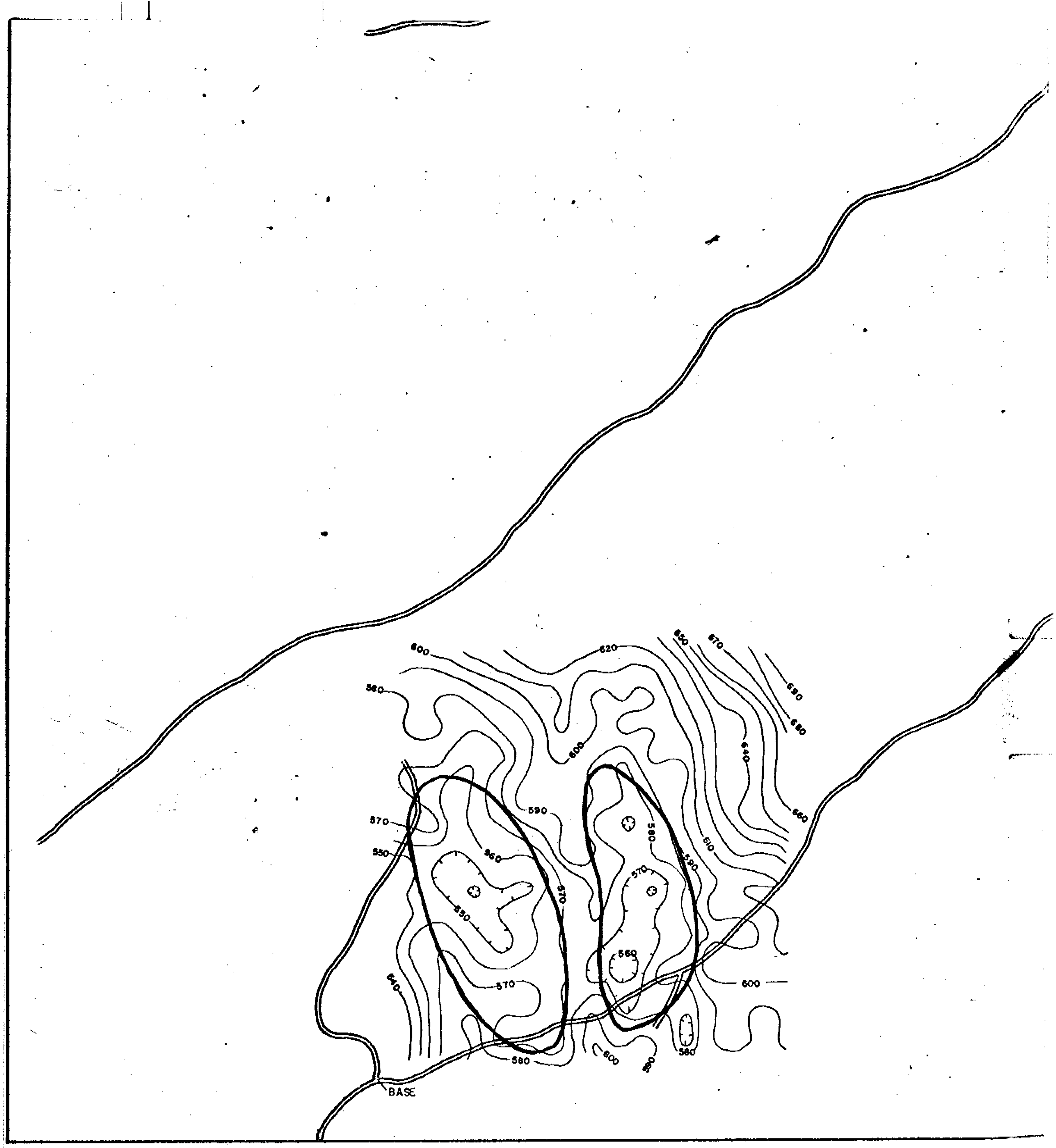
Wayne G. Farley

Wayne G. Farley

WGF:lab
cc: RJLacy
WESaegart
JDSell

TAB

Fig. 3



EXPLANATION

1. Magnetic readings relative to base
2. Readings taken on 500' grid
3. Con[illegible] Interval = 10 gammas
4. Smoothing performed by averaging station reading with surrounding eight station readings
5. Magnetometer used – Sharp Fluxgate Vertical Field
6. Postulated best mineralized and altered area

RELATIVE GROUND MAGNETIC[illegible]

NOIPA KAM AREA (Santa R[illegible]

GU ACHI QUADRANGLE

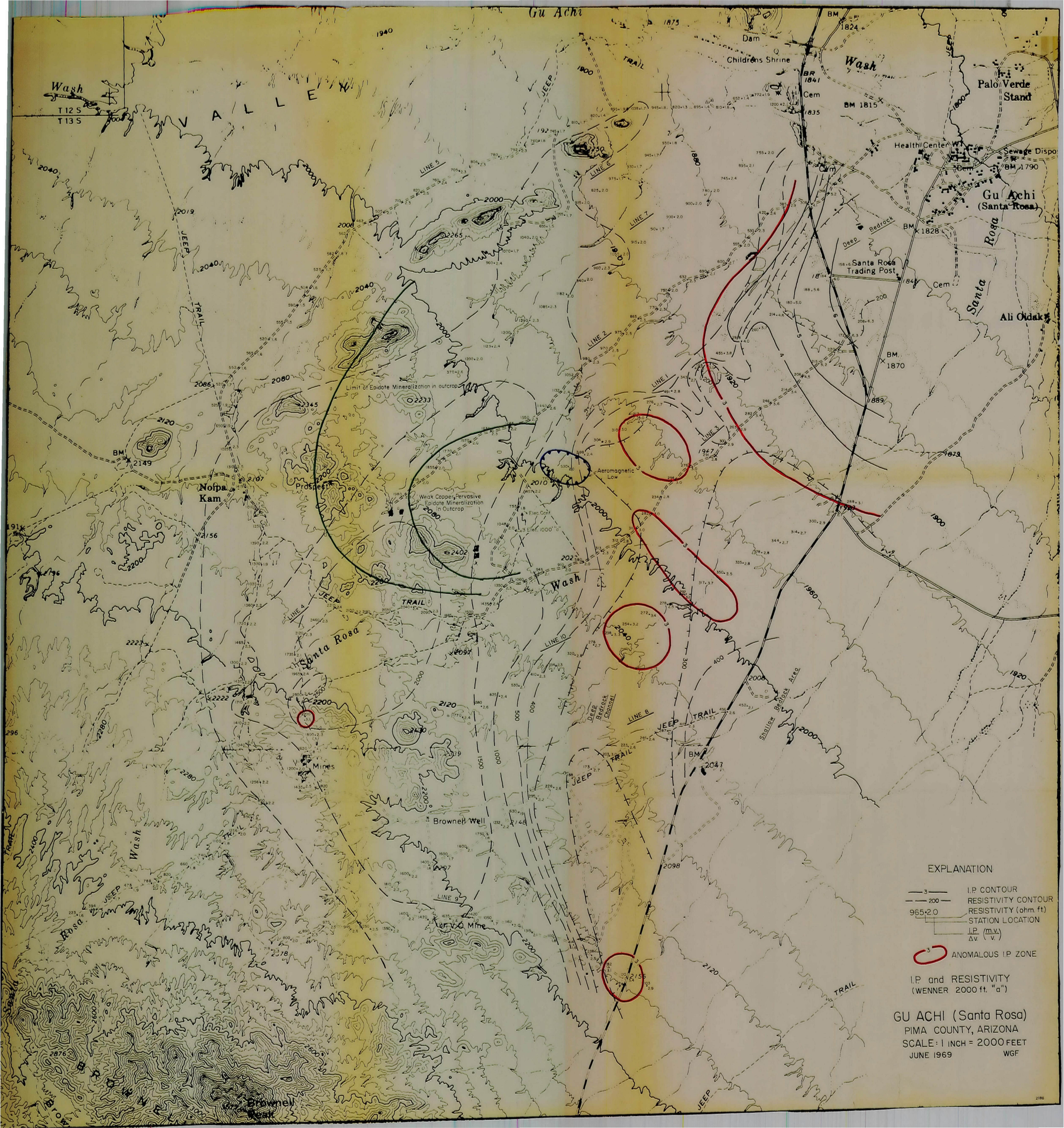
PIMA COUNTY, ARIZONA

SCALE: 1"=2000'

OCTOBER, 1969

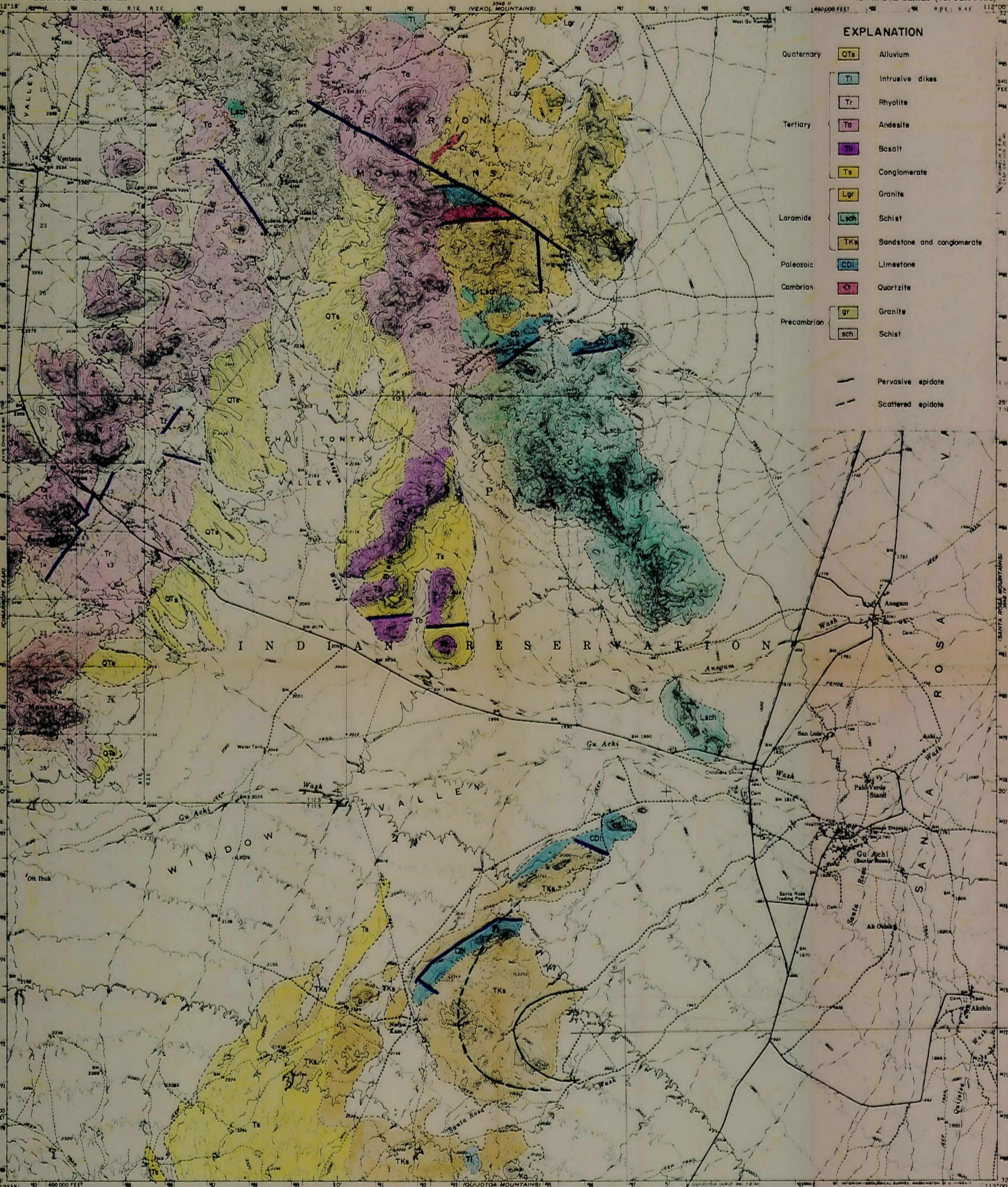
TAB

Fig. 1


Gu Achi
Dam
Childrens Shrine
Wash
Palo Verde Stand
Cem
BM 1815
Health Center
Sewage Dispo
BM 1790
Gu Achi (Santa Rosa)
BM 1828
Deep Bedrock
Santa Rosa Trading Post
Ali Oidak
Santa Rosa
BM 1870
VALLEY
T12 S
T13 S
LINE 1
LINE 2
LINE 3
LINE 4
LINE 5
LINE 6
LINE 7
LINE 8
LINE 9
LINE 10
JEEP TRAIL
Limit of Epidote Mineralization in outcrop
Weak Copper, Pervasive Epidote Mineralization in Outcrop
Prospect
Aeromagnetic Low
Nolpa Kam
Santa Rosa Wash
Deep Bedrock Channel
Shallow Bedrock Area
Mines
Brownell Well
Brownell
EXPLANATION
I.P CONTOUR
RESISTIVITY CONTOUR
965•2.0
RESISTIVITY (ohm. ft)
STATION LOCATION
I.P / Δv (m.v. / v.)
ANOMALOUS I.P ZONE
I.P and RESISTIVITY
(WENNER 2000 ft. "a")
GU ACHI (Santa Rosa)
PIMA COUNTY, ARIZONA
SCALE: 1 INCH = 2000 FEET
JUNE 1969
WGF

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

GU ACHI QUADRANGLE
ARIZONA–PIMA CO.
15 MINUTE SERIES (TOPOGRAPHIC)



Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1961. Field checked 1963

Polyconic projection. 1927 North American datum
10,000-foot grid based on Arizona coordinate system, central zone
1000-meter Universal Transverse Mercator grid ticks, zone 12, shown in blue

Where omitted, land lines have not been established

UTM GRID AND 1963 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:62500

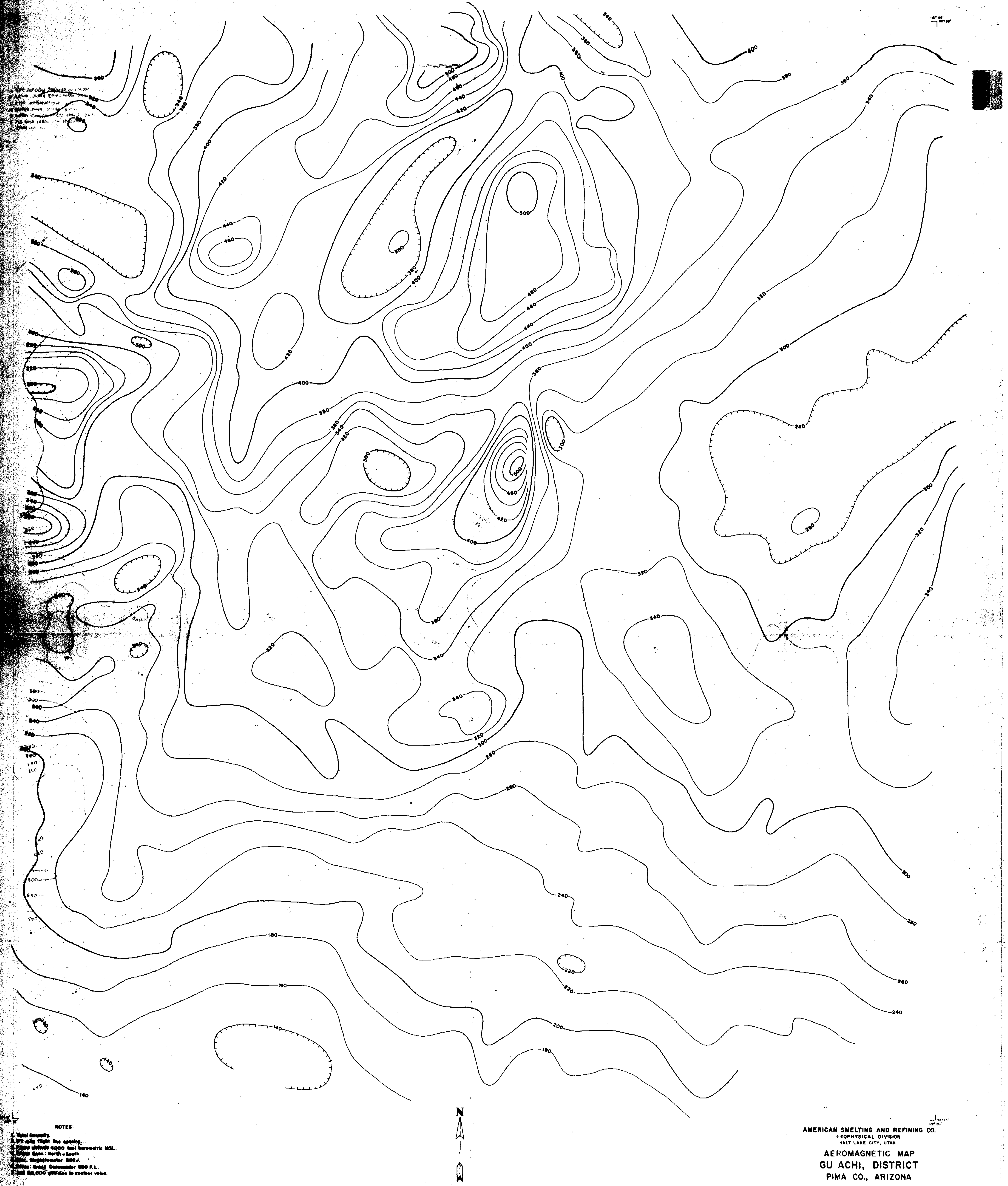
CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

QUADRANGLE LOCATION

ROAD CLASSIFICATION
Medium-duty Light-duty
Unimproved dirt

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER 25, COLORADO OR WASHINGTON 25, D. C.
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

GU ACHI, ARIZ.
N3215—W11200/15
1963
AMS 3548 I—SERIES V798


NOTES:
1. Total intensity.
2. 1/2 mile flight line spacing.
3. Flight altitude 4000 feet barometric MSL.
4. Flight lines: North–South.
6. Plane: Grand Commander 680 F.L.
7. Add 50,000 gammas to contour value.
N
SCALE 1:62500
1/2
0
32° 15'
112° 00'
AMERICAN SMELTING AND REFINING CO.
GEOPHYSICAL DIVISION
SALT LAKE CITY, UTAH
AEROMAGNETIC MAP
GU ACHI, DISTRICT
PIMA CO., ARIZONA
CONTOUR INTERVAL: 20 GAMMAS
Inst. J.M. Panek • Contoured J. Hofeman • Date: June 1969

Kennison's Sand Tank Volcanic Field Report
8/16/44

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona
September 28, 1966

Mr. K. E. Richard, Chief Geologist
American Smelting and Refining Company
120 Broadway
New York, N. Y. 10005

Dear Sir:

Enclosed is Mr. Kinnison's compilation of geological reconnaissance map coverage in the Sacaton-Sand Tank Mountain region and his recommendations for extending the field work southwesterly into land withdrawn for military use and into Papago Reservation land.

These areas lie within a broad southwest trending belt of porphyry copper occurrences which Kinnison has labeled the "Ray-Miami zones" (see map accompanying JEK memo).

Ground reconnaissance on the Papago Reservation southwest of the old Reward and Greenback mines is currently being carried out by Mr. Sell. Later he will work north of the Papago Reservation in the military reserve wherever access can be gained. Should a prospect of definite interest be turned up, then an attempt to acquire the necessary land could be initiated.

Yours very truly,

J. H. Courtright

J. H. COURTRIGHT

JHC/kw
Enclosure
cc: WESaegart
JDSell
JEKinnison

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

August 16, 1966

MEMORANDUM TO J. H. COURTRIGHT

PORPHYRY COPPER EXPLORATION
SAND TANK VOLCANIC FIELD

Porphyry copper exploration in Arizona has been generally limited in recent years to particular "mineral zones" which contain the known copper deposits. These zones, which we have discussed verbally, and which I sketched on the Sacaton memorandum of 2/13/61 (Blucher and Kinnison to Richard), serve to give priority in exploration. Three of particular note in company exploration are: two which trend northeast--the Miami and Ray zones--and the Silver Bell zone which trends northwest. The Miami and Ray mineral zones are close together and parallel, so that they have been treated as one during recent exploration. On the attached map (A), I have plotted the limits of reconnaissance mapping which has been done near these mineral zones by company geologists.

The Ray and Miami zones (combined), if projected southwest, pass through the region of Ajo. Between Sacaton and Ajo there are no operating mines, and most of the mountain ranges in that region are made of post-ore volcanics.

The subject region, which I here call the Sand Tank Volcanic Field for convenient use, is formed of connected plateaus and peaks. The terrain has been formed principally by erosion of flat-lying post-ore volcanic rocks. Erosion has incised beneath these in many places, and thus creating numerous small exposures of pre-mineral bedrock. I believe the chances to find a virgin porphyry copper deposit in this region to be very good. My reasons for this belief have been summarized above, and are: (1) that the Sand Tank region lies along a major mineral belt between Sacaton and Ajo, and (2) that although the volcanic cover dominates, erosion has produced small outcrops of pre-ore rock.

Mr. Sell initiated reconnaissance on the east side of the Sand Tank region (Attachment A), at Table Top Mountain, and has extended his mapping into most of the Sand Tank Mountains. Other reconnaissance has been made along the eastern part, where Newmont's new prospect is currently being drilled, but much more has not yet been mapped or seen.

The land status is not appealing, but neither do I regard it as a status which is completely final. The Papago Indian land is currently in a state of policy change. The military withdrawals are final, insofar as any federal executive order may be so considered. Part of the military withdrawal may be entered for reconnaissance (as shown on Attachment A).

Mr. Whaley has made a preliminary investigation in regard to military land access, and his memoranda are appended for reference. His inquiries were avoided each time with a "you can't do this" attitude. The local military base commanders do not have authority to do other than follow the appropriate executive orders now existing, nor do they appear to have legal knowledge of any exceptions which might exist. To my knowledge no one has ever placed a request for ammendment to the existing executive orders through legislative or executive channels in Washington.

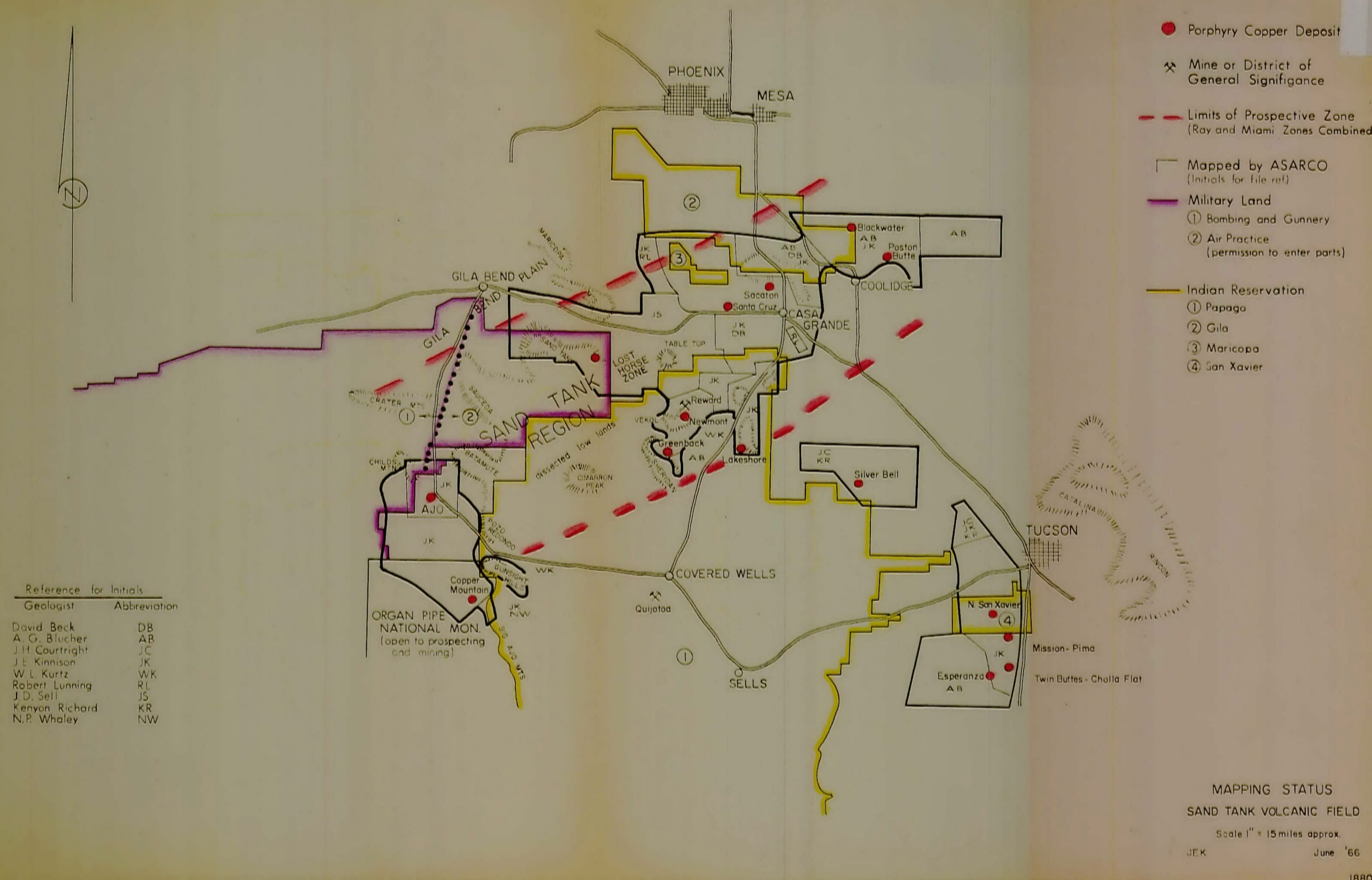
JOHN E. KINNISON

JEK/pjc
Attachments
cc: JHCourtright, 2X
WESaegart, w/ attachments

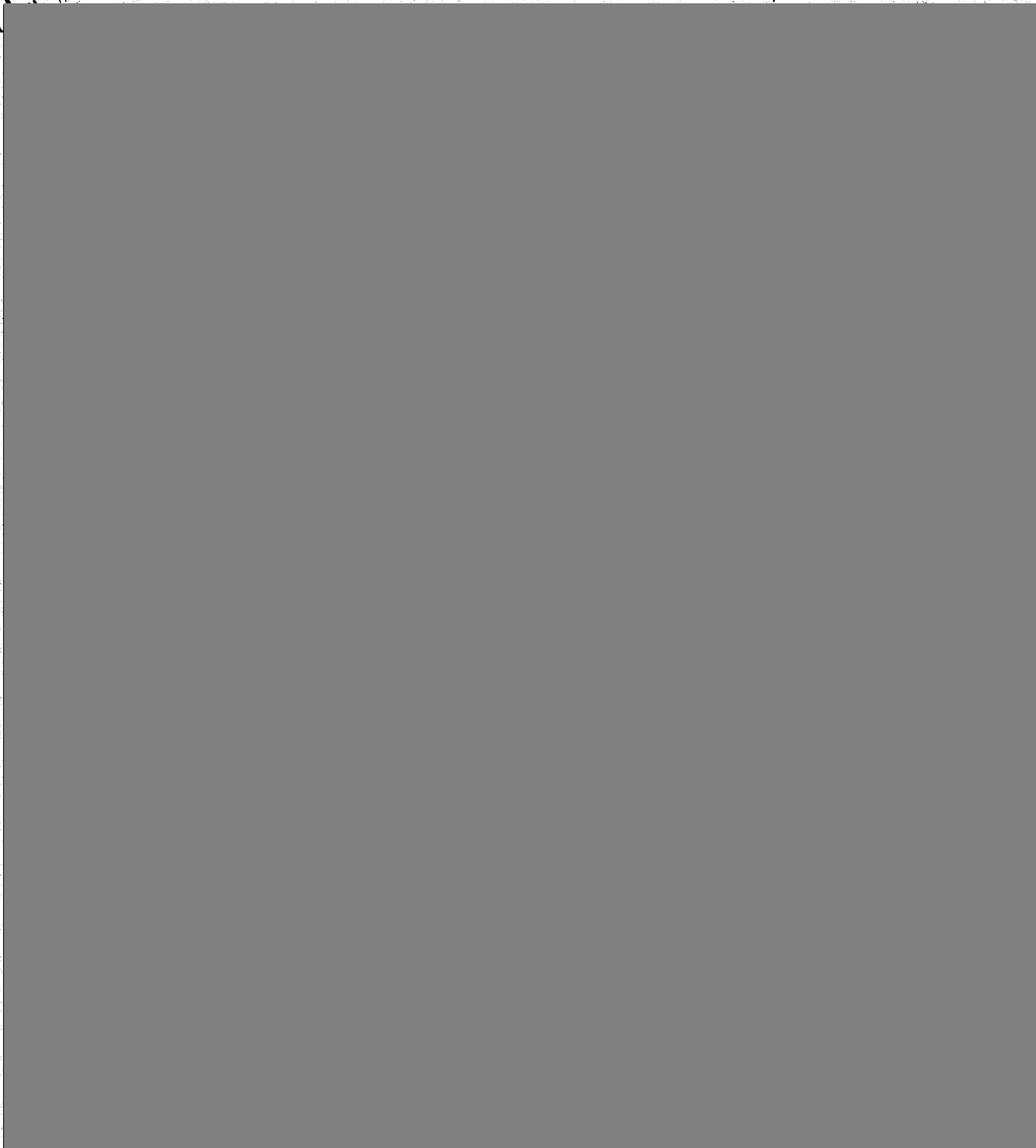
TAB

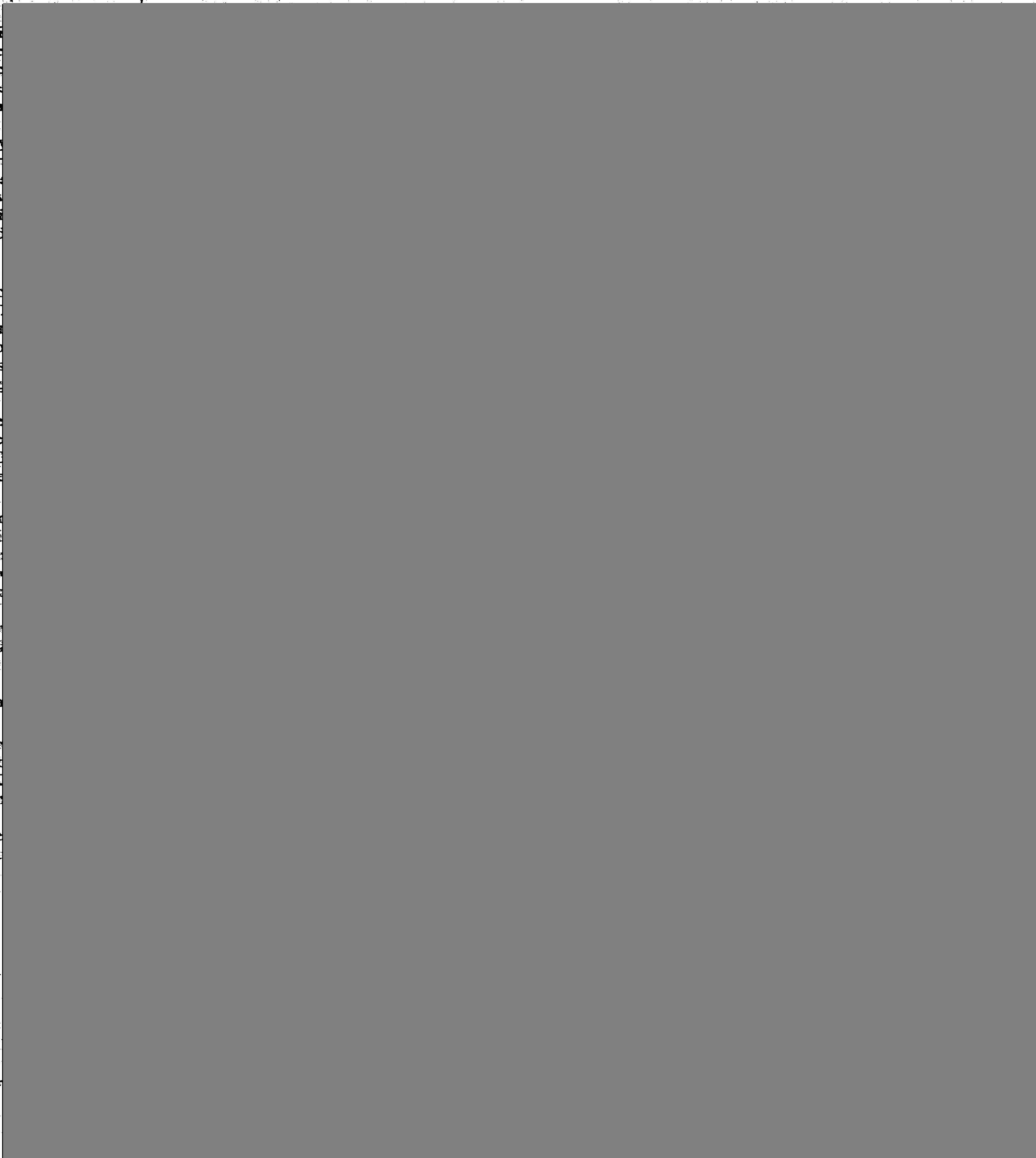
A.

ATTACHMENT A



2 copies. F.T. Graybeal.





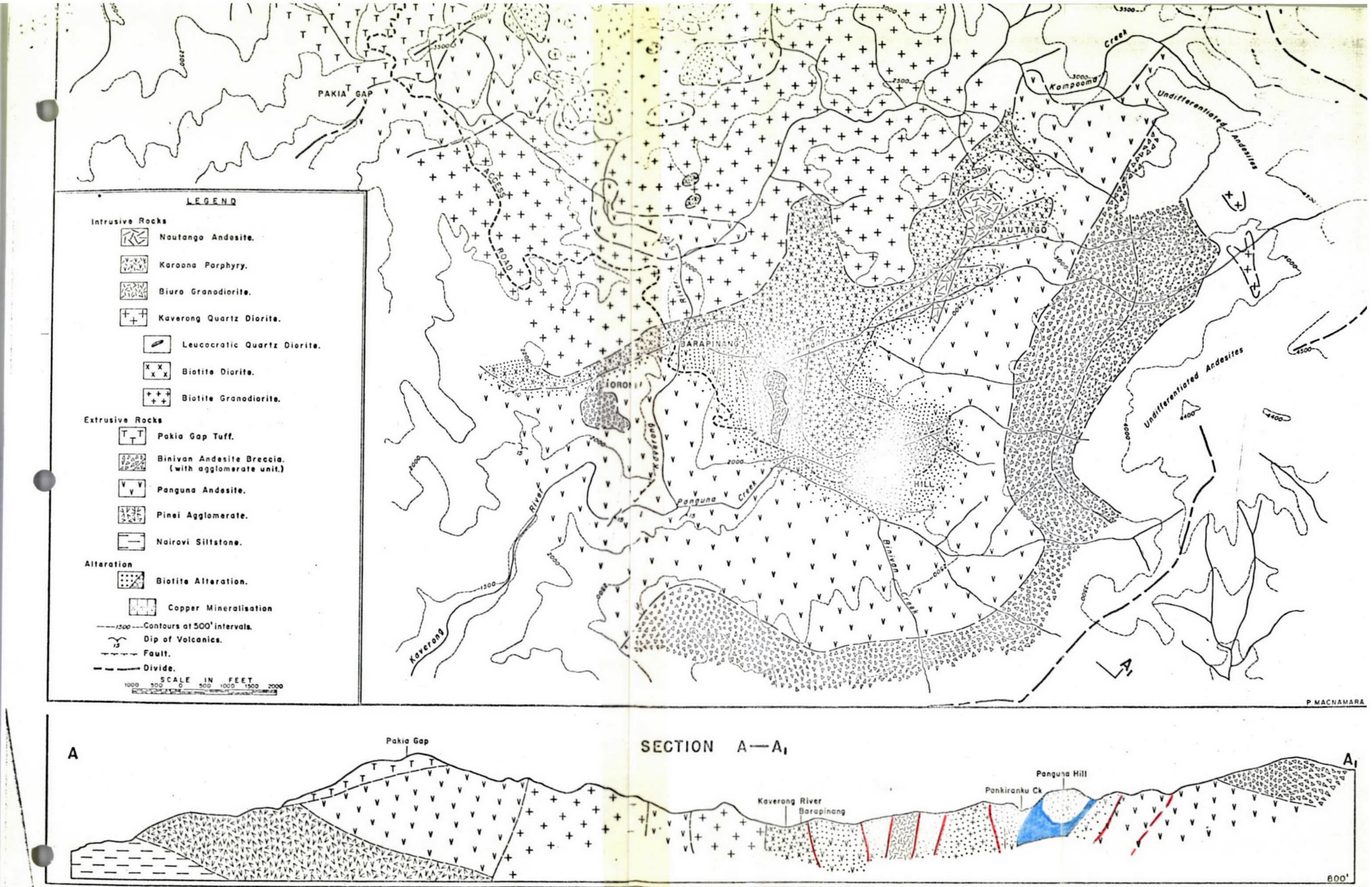
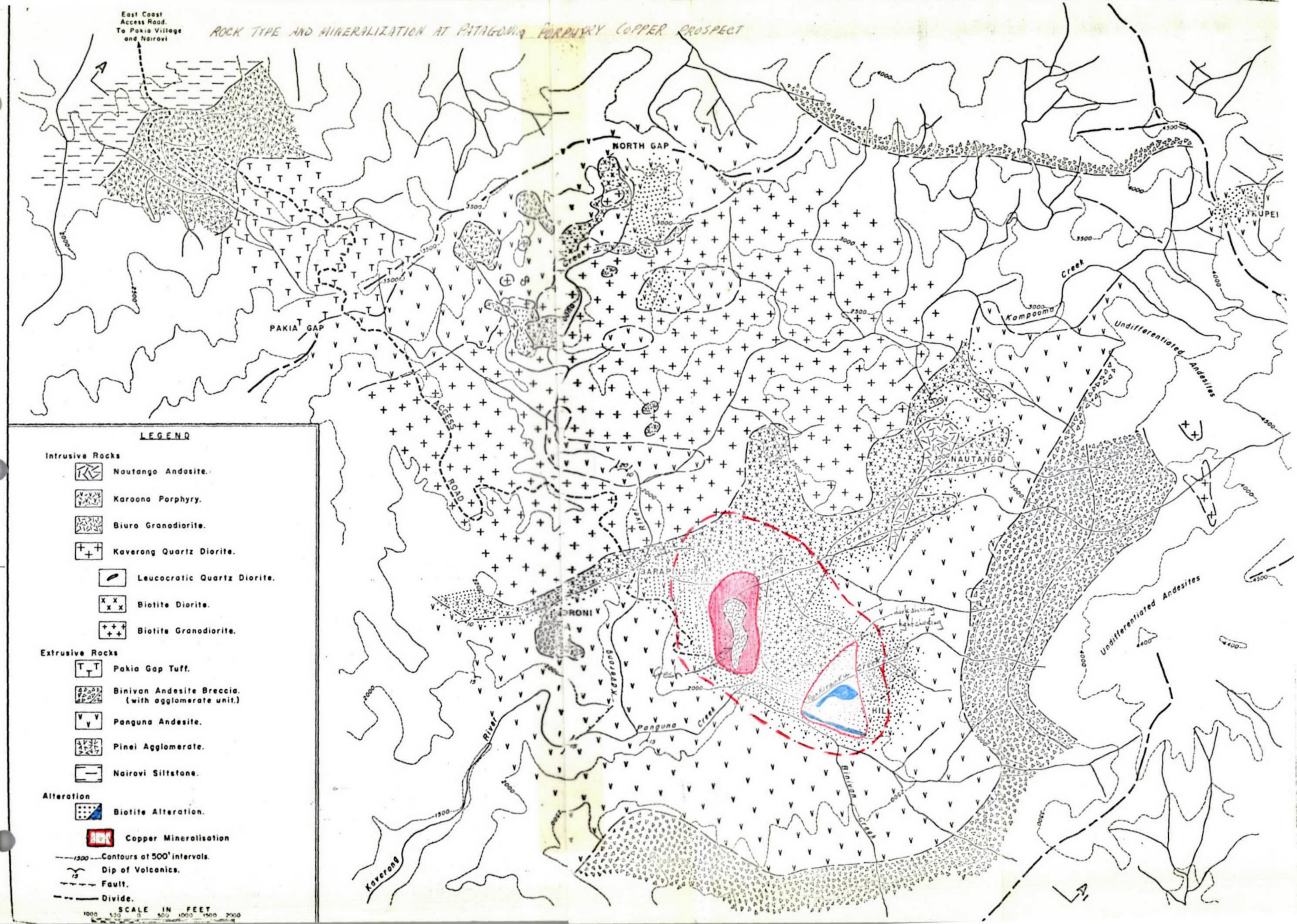


FIG. 3—Rock type and mineralization (plan and section) of Panguna area, Bougainville Island, T.P.N.G.
Scale: 1 in. = 1000 ft


ROCK TYPE AND MINERALIZATION AT PATAGONIA PORPHYRY COPPER PROSPECT
East Coast Access Road. To Pakia Village and Nairovi
NORTH GAP
PAKIA GAP
ACCESS ROAD
Creek
Kampaoma
Undifferentiated Andesites
Undifferentiated Andesites
NAUTANGO
BARAPINANG
ORONI
dark shading
light shading
Creek
HIL
Panguna Creek
Kaverong River
Kaverong
River
Biniyan Creek
LEGEND
Intrusive Rocks
Nautango Andesite.
Karoona Porphyry.
Biuro Granodiorite.
Kaverong Quartz Diorite.
Leucocratic Quartz Diorite.
Biotite Diorite.
Biotite Granodiorite.
Extrusive Rocks
Pakia Gap Tuff.
Binivan Andesite Breccia. (with agglomerate unit.)
Panguna Andesite.
Pinei Agglomerate.
Nairovi Siltstone.
Alteration
Biotite Alteration.
Copper Mineralisation
1500 Contours at 500' intervals.
Dip of Volcanics.
Fault.
Divide.
SCALE IN FEET
1000 500 0 500 1000 1500 2000

WLK
JDS

LEE WESTERN, INC.

2602 SOUTH 24th ST. • (602) 275-6221
PHOENIX, ARIZONA 85034

November 30, 1973

Robert B. Crist
American Smelting & Refining Company
Mining Department
Post Office Box 5747
Tucson, Arizona 85703

Dear Mr. Crist,

I am sorry that I was unavailable to meet with you on Thursday. I appreciate your effort to come into the office.

Enclosed are some small maps of the Lee Western, Inc. mining properties, on the Papago Indian Reservation. They should serve to locate our property for you, eventhough they are drawn to a very small scale. We have a great deal of additional information in the form of I P logs, drill holes, and maps. If after reviewing these maps you feel that it would be advantageous for American Smelting & Refining to look deeper into the properties, we can set up a meeting with you where we can review our information.

Very truly yours,

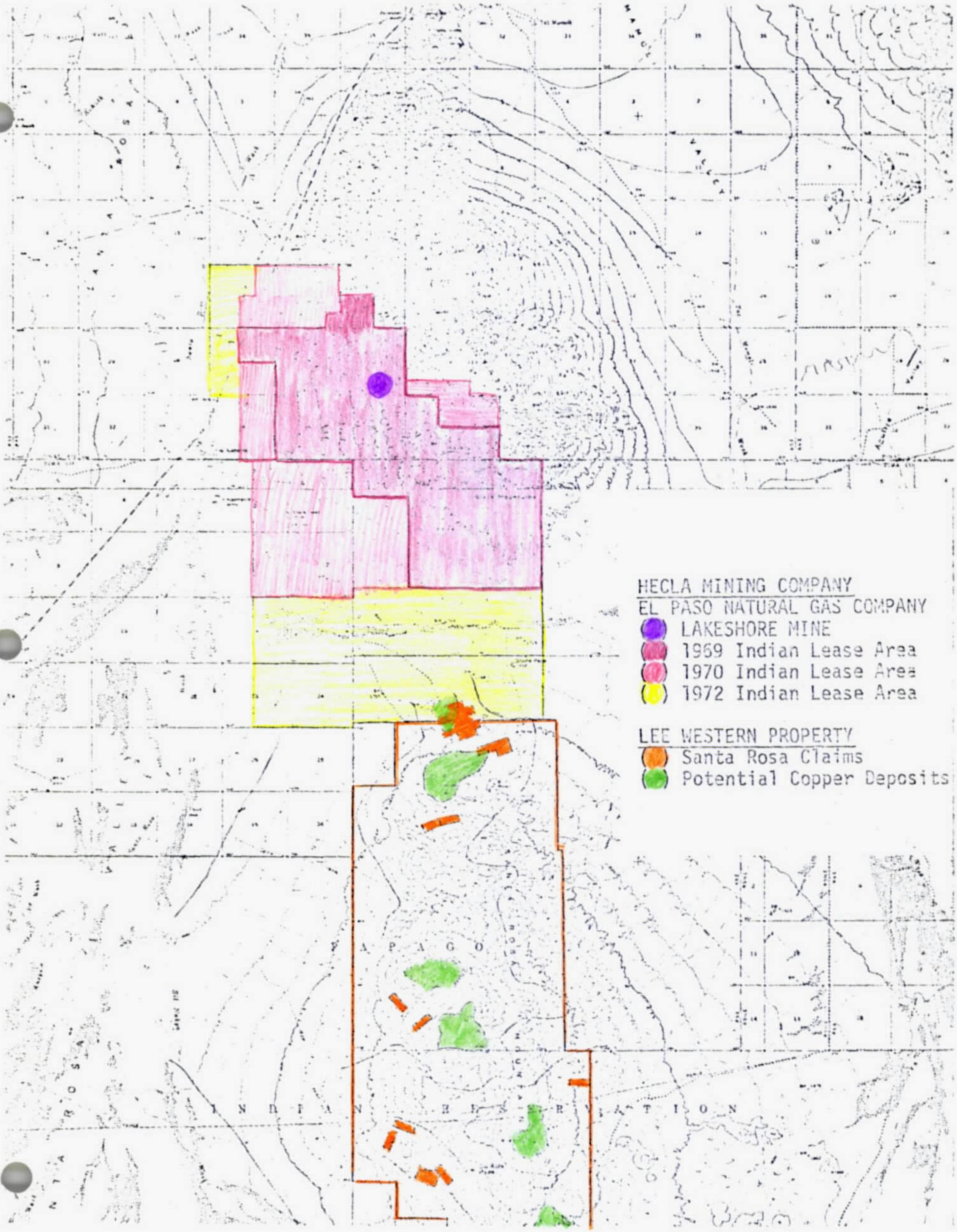
Lee Western, Inc.

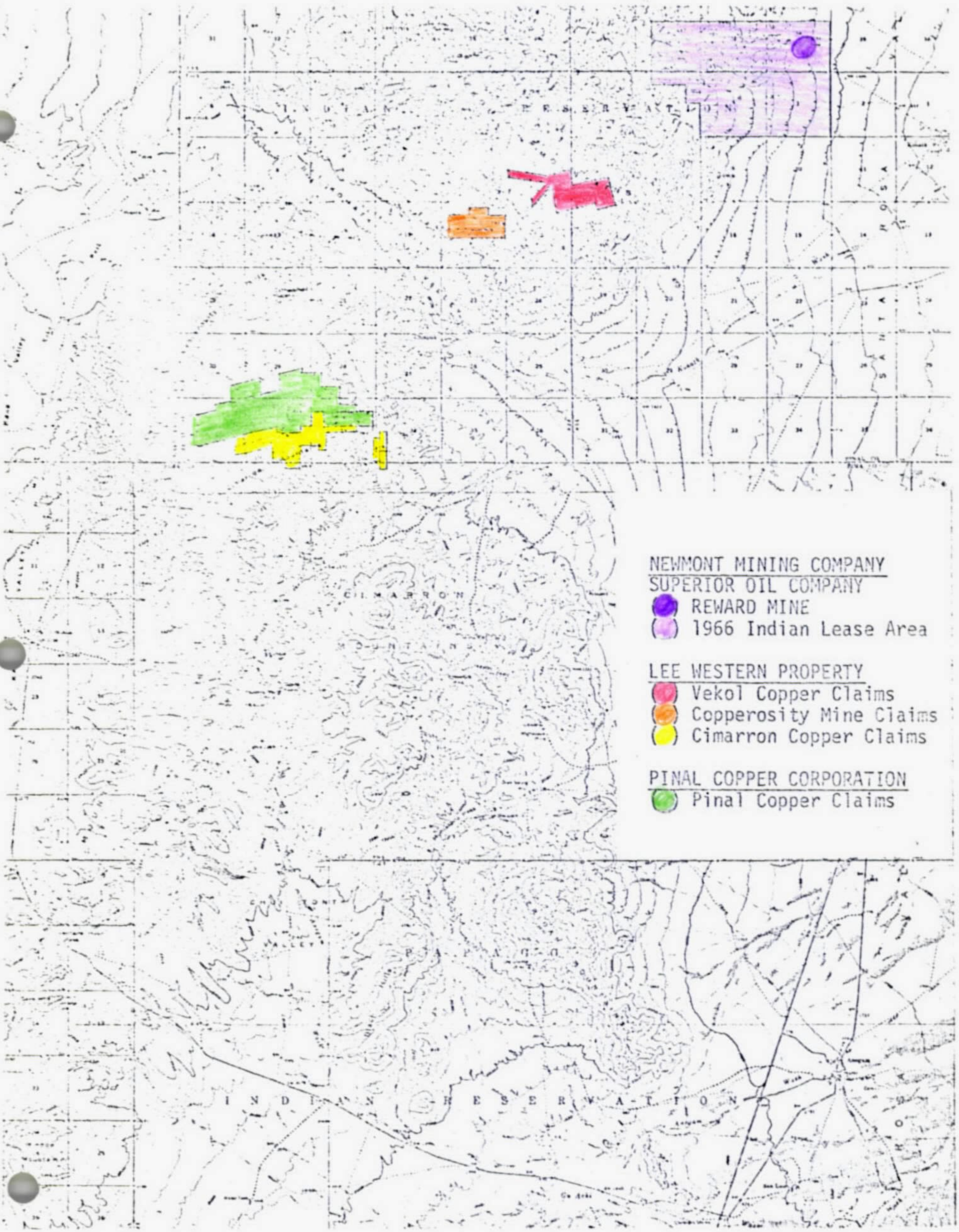
Don J. Northern /nj

Don J. Northern
Executive Vice President

DJN:nj

Enclosures


HECLA MINING COMPANY
EL PASO NATURAL GAS COMPANY
LAKESHORE MINE
1969 Indian Lease Area
1970 Indian Lease Area
1972 Indian Lease Area
LEE WESTERN PROPERTY
Santa Rosa Claims
Potential Copper Deposits
P A P A G O
I N D I A N R E S E R V A T I O N


NEWMONT MINING COMPANY
SUPERIOR OIL COMPANY
REWARD MINE
1966 Indian Lease Area
LEE WESTERN PROPERTY
Vekol Copper Claims
Copperosity Mine Claims
Cimarron Copper Claims
PINAL COPPER CORPORATION
Pinal Copper Claims
CIMARRON
MOUNTAINS
INDIAN RESERVATION

ASARCO

Southwestern Exploration Division

February 6, 1980

TO: F. T. Graybeal

FROM: J. D. Sell

Pinal Copper Corp.
Greenback Deposit
Papago Indian Reservation
Pinal County, Arizona

The above property has been advertized for sale.

Asarco has done considerable work on it and, based on the mid-Tertiary age, quartz veining, minor copper and gold, and retro-grade phyllic alteration in the deep drill core, we should reevaluate the area in light of the porphyry moly model. Additional samples may be necessary to test for the moly pathfinders which were probably not evaluated in the earlier studies.

James D. Sell

James D. Sell

JDS:lb

JDSell

→ F.T.G

GRI

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COMMERCIAL □ INDUSTRIAL □ MINERAL

100 SOUTH MINNESOTA □ ST. PETER, MN 56082 U.S.A.
(AC 507) 931-5530 or 931-2507

report to WLK from JESS July 19, 1973

MINING DEPT
JAN 14 1980
TUCSON

COPPER PROPERTY

ATTENTION:

Metal Mining Division
Exploration
Geology
Real Estate

F O R   S A L E

PINAL COPPER CORP.

CASA GRANDE, ARIZONA, U.S.A.

1,240 acres in Pinal Co. Arizona, which the company owns, by right of discovery under United States Law. 64 contiguous unpatented mining claims situated on the Papago Indian Reservation in Pinal County, Arizona, approximately 52 miles south and west of Casa Grande and about 30 miles north and east of Ajo.

All claims are evidenced by appropriate documents of title, recorded in the office of the county recorder of Pinal County, Arizona.

Charles H. Dunning, an outstanding mining engineer, completed a report on this property in 1956 and in the conclusion of his report stated, **"You have a large but not definitely measurable tonnage of commercial ore, and very large areas of probable ore. If development and operation is carried on according to good engineering practice the project should be very successful."**

The Lakeshore Mine (Noranda-Hecla) is approximately fifteen (15) miles east; Newmont Mining Corp. has property five (5) miles north; the Phelps-Dodge Ajo Mine is about thirty (30) miles southwest of Pinal. The Pinal property appears to be on a sort of triangle with the above mentioned mines, and geologists believe it to be on the same strike as the others.

It has been known that eight of the sixty four claims contained gold and molybdenum has been found in some areas.

The Board of Directors and Officers of Pinal Copper Corp. feel the asking price for this property is very reasonable considering the current market and monetary conditions.

All interested parties — please contact: John Verkennes for arrangements for inspection and exploration. This property will be sold for terms, cash, or exchange of stock approved by the Pinal Corp. Board of Directors.

213 624-6357

~~5010~~
510 W 6th

TAB

Avizona Naipokam Geophysical.

Assay [illegible] submitted [illegible] Feb [illegible]

Au-15.0.0. Rock & Geochem Sampling [illegible] Kam Hills, Pima

County, Arizona. Feb. 2, 1967. [illegible]

	Gold	Silver	Cu	Mo	ppm Cu	ppm Mo
RC-1	Trace	0.08	0.14	None		
RC-2	None	None	0.01	None		
RC-3	0.012	0.25	0.21	None		
RC-4	0.005	0.18	0.79	None		
RC-5	Trace	0.10	0.02	None		
RC-6	0.015	1.03	2.52	0.025		
GC-51	-	-			250	<5
GG-52	-	-			38	<5
GC-53	-	-			60	5
GE-54	-	-			105	<5

Table 2

NOIPA KAM AREA

Bulk Rock Sampling for Cu, Mo, Au, Ag - Hawley & Hawley

RC-1	Conglomerate; with epidote & minor chalcocite, & copper carbonate & silicate
RC-2	Conglomerate; no epidote, nor apparent copper mineralization
RC-3	Conglomerate; 4½ foot fault zone with copper silicate; zone cuts conglomerate which is also mineralized
RC-4	Conglomerate; abundant epidote, some chalcocite and chrysocolla from dumps of 3 pits and shallow bench
RC-5	Conglomerate (siltstone phase); abundand epidote, no apparent mineral
RC-6	Limestone; white, dense, metamorphosed, lying under latite sill, light apple (uranium) green coloration and seams

Geochemical Sampling for Cu, Mo

GL-51	Latite sill or dike separating conglomerates of samples RC-1 and RC-2
GG-52	Granite boulder in conglomerate below sill and near sample RC-2
GC-53	Silica and limonite veinlet-stringers in metamorphosed limestones
GE-54	EX core, limestones with limonite streaks. No hole collar found but may be from same area as RC-6

HAWLEY & HAWLEY

HAWLEY & HAWLEY
SINCE 1914
Registered Assayers

ASSAYERS AND CHEMISTS, INC.

1700 WEST GRANT ROAD - TELEPHONE 622-4836 - POST OFFICE BOX 5934
TUCSON, ARIZONA 85703

THE SOUTHWEST'S LEADING ASSAYERS AND REPRESENTATIVES

Branch Representatives at Buyer's Plants:
Phelps Dodge Corp., Douglas, Arizona; ASARCO, El Paso, Amarillo, Texas and Hayden, Arizona

K.V.D.S
AUG 21 1969

IDENTIFICATION	Gold ozs.	Silver ozs.	Lead %	Copper %	Zinc %	Mo. %
	ppm	ppm	ppm	ppm	ppm	ppm
MK - B Series:						
1	Nil	Nil	76	128	54	< 5
2	Nil	Nil	26	52	20	< 5
3	Nil	Nil	82	66	134	< 5
4	Nil	Nil	36	22	62	< 5
5	Nil	Nil	42	12	48	< 5
6	Nil	Nil	32	24	36	< 5
7	Nil	Nil	74	164	72	< 5
8	Nil	Nil	30	62	60	< 5
9	Nil	Nil	34	20	46	< 5

Fire assay
+
atomic absorption

NOTE: For Au & Ag, one ton assay charge used for each sample.

9 Au & Ag, singles @ $4.00	$ 36.00
9 Pb, Cu, Zn, geochem @ $2.50	22.50
9 Mo, geochem @ $1.50	13.50
9 samples prepared @ $.85	7.65

CC: American Smelting & Refining Company
ADD: P. O. Box 5795
CITY: Tucson, Arizona 85703
ADD: Attn: Mr. Jim Sells
CITY:

REMARKS:

Analysis Cert. By [signature]

Preparation $ 7.65
Analysis $ 72.00

ACC: AMERICAN SMELTING & REFINING CO. | Date Spl. Received 8/15/69 | Date Compl. 8/20/69 | TUC 343336 | $ 79.65

[redacted]

Shurocun
me 3884

19NK-5-1. Highly epidotized, fine grained – no cu,
-2 Scattered epi in fine grained – no cu. SW of #3.
-3 Feldspar hornblende [illegible], scattered epi repl of feldspar etc. no. Cu.
-4. Scattered epi in fine grained to med cgl no Cu.
-5. fine granular [illegible] type persistent epi – No Cu. Prob is cgl!!!
-6. Coarse granular cgl w/ epi (abundant) + minor Cu.

SRDavis ✓

AMERICAN SMELTING AND REFINING CO.

EL PASO ORE TESTING AND ASSAY LABORATORY

ASSAY CERTIFICATE

J. H. C.

JUN 25 1969

DATE June 24 1969

MARKED TUCSON OFFICE SAMPLES

SRDavis 5/29/69

LOT NO. UNIT	LOT NO. SMELTER	GOLD OZ	SILVER OZ	Cu %	Pb %	Zn %	Cd %	Fe %	Mn %	%	S %	SiO_2 %	CaO Total %	CaO Avail. %	%
					Cu-ppm		Pb-ppm		Zn-ppm		Mo-ppm				
NK-S	1	Nil	Tr		35		495		230		1.1				
	2	Nil	Tr		31		468		620		1.1				
	3	Nil	Tr		342		2050		520		1.7				
	4	Nil	Tr		63		1160		144		1.1				
	5	Nil	.28		68		256		970		.88				
	6	Tr	.16		440		508		144		1.7				
NK-D	1	Tr	.10		28		930		220		1.4				
	2	Tr	.10		67		244		600		1.4				
	3	Tr	.06		112		302		41		1.7				
	4	Tr	.10		39		480		59		1.4				
	5	Tr	.09		20		880		26		.88				
	6	Nil	.08		20		775		77		1.4				
	7	Tr	.07		66		640		206		1.4				
	8	Tr	.06		60		845		32		3.7				
	9	Nil	.10		65		441		94		1.7				
	10	Nil	.08		11		216		51		.88				
	11	Nil	.08		36		336		19		4.9				

Noipa Kam – Papago Res.

SRDavis-2x
VKudryk
GWBossard
File

HILL PRINTING CO.—EL PASO

BY

A. Jiménez S. CHIEF CHEMIST

SRDavis

AMERICAN SMELTING AND REFINING CO.

EL PASO ORE TESTING AND ASSAY LABORATORY

ASSAY CERTIFICATE

J. H. C.

JUN 25 1969

DATE June 24 1969

MARKED TUCSON OFFICE SAMPLES

SRDavis 5/29/69

LOT NO. UNIT	LOT NO. SMELTER	GOLD OZ	SILVER OZ	Cu %	Pb %	Zn %	Cd %	Fe %	Mn %	%	S %	SiO_2 %	CaO Total %	CaO Avail. %	%
					Cu-ppm		Pb-ppm		Zn-ppm		Mo-ppm				
NK-S	1	Nil	Tr		35		495		230		1.1				
	2	Nil	Tr		31		468		620		1.1				
	3	Nil	Tr		342		2050		520		1.7				
	4	Nil	Tr		63		1160		144		1.1				
	5	Nil	.28		68		256		970		.88				
	6	Tr	.16		440		508		144		1.7				
NK-D	1	Tr	.10		28		930		220		1.4				
	2	Tr	.10		67		244		600		1.4				
	3	Tr	.06		112		302		41		1.7				
	4	Tr	.10		39		480		59		1.4				
	5	Tr	.09		20		880		26		.88				
	6	Nil	.08		20		775		77		1.4				
	7	Tr	.07		66		640		206		1.4				
	8	Tr	.06		60		845		32		3.7				
	9	Nil	.10		65		441		94		1.7				
	10	Nil	.08		11		216		51		.88				
	11	Nil	.08		36		336		19		4.9				

Noipa Kam – Papago Res.

SRDavis-2x
VKudryk
GWBossard
File

HILL PRINTING CO.—EL PASO

BY

A. Jiménez S. CHIEF CHEMIST

To: Mr. T.D. Henderson
El Paso Ore Testing and Assay Laboratory
American Smelting and Refining Company
P.O. Box 895
El Paso, Texas 79999

(For Customer's Use)

From: Steven R. Davis

Exploration Department
American Smelting and Refining Company
P.O. Box 5795
Tucson, Arizona 85703

* Please run fire assay for gold & silver; geochem for lead, copper, zinc & moly

- [ ] Single Analysis
- [ ] Verified Analysis*
- *[X] Geochemical Analysis
- [ ] Spectrographic Analysis

*Verified Analysis will be run unless otherwise specified

May 29 1969

Page 1 of 1 pages

Interval	Sample No.	Au	Ag	Pb	Cu	Zn	Mo		
NK-S	1	X	X	X	X	X	X		
	2	X	X	X	X	X	X		
	3	X	X	X	X	X	X		
	4	X	X	X	X	X	X		
	5	X	X	X	X	X	X		
	6	X	X	X	X	X	X		
NK-D	1	X	X	X	X	X	X		
	2	X	X	X	X	X	X		
	3	X	X	X	X	X	X		
	4	X	X	X	X	X	X		
	5	X	X	X	X	X	X		
	6	X	X	X	X	X	X		
	7	X	X	X	X	X	X		
	8	X	X	X	X	X	X		
	9	X	X	X	X	X	X		
	10	X	X	X	X	X	X		
	11	X	X	X	X	X	X		

From S.R. Davis

To J.D. Sell

To the south of the previously mapped area, we found Rhyolite, latite and andesite porphyry intruding or capping arkosic sediments and quartzites near the old Brownell Mine. North of the Brownell well an andesite, andesite porphyry and andesitic agglomerate complex covers the arkosic sediments. Between the andesitic and rhyolitic complexes a rather elongate plug of granodiorite intrudes the sediments and possibly even the volcanics, but the contact was not exposed. Epidote is present in varying amounts, but pervasively so in a wedge-shaped area adjoining and north and east of the granodiorite plug, and in a limited arkose exposure adjoining alluvium at the east end of exposure.

The western area is chiefly arkose, quartzite, sandstone and some agglomerate, limited and poor exposure of limestone, (paleozoic) and schist, (Laramide) are very possibly fault blocks and seem to have no particular relationship to one another.

The Poor Boy (Stebbins) Prospect area was mapped by RDK & Myself and consists of a large color zone which closely parallels the contact between the Quartz Monzonite Porphyry and the surrounding acidic volcanics (probably latite & rhyolite). Also present along the contact as an elongate body is a "quartz porphyry" essentially quartz eyes in a quartz groundmass. Pyrite was identified in the qtz po and

— over —

specularite and chrysocolla in the latite, which probably accounts for the color anomally.

During road reconaissance indications from the alluvial content of fanglomerate and washes would lead me to believe that the next major area to the south yielding any considerabl amount of epidote would be the small granitic stock about one mile south of the V.O. ~~Mine~~. The presence of epidote over such a large area and which appears to be more elongate than originally thought, opens up a much larger area for the possibly concealed source stock. Also possible would be a north-south deposition channel which we are along the west periphery of, with the source area being north or south of us.

J. R. Davis

ATTACHED SAMPLE LIST & DESC.

Sample No.	Rock Type	Description
NK - D1	Lar. Granite	Lgr - Med grain with weak Hem & Lim, Tr Silica Alt
- D2	Arkose	Fine to med grain with silty zones, 10-15% Epi
- D3	Arkose	Silty to fine grain, 10-15% massive Epi, Tr CuOx?
- D4	Arkosic Qtzt	AQtzt, pink to tan, almost silty 10-15% Epidote as Vns & inc
- D5	Arkose	Fine to med gr, red to purple, no Epidote.
D6	Arkose	Med to coarse gr, reddish purple, no Epi, wk calcite.
D7	Arkose	Med grain, locally pebbly, granular epidote = 3-5%
D8	Pre€ Granite	Coarsely crystalline, wk [illegible] alt, Tr Hem, wk Lim & mod-str silica.
D9	Rhyolite Porphyry	Volcanic? Possible very wk feldspar alt, [illegible] fresh, granite
D10	Arkose	Med grain, locally Qtzitic, 1-3% granular Epi, wk Epi veneer.
D11	Qtzt	Sugar texture, light orange-pink, slight Hem stain, mod. Qtz vnlts.
NK - B1	Volcanic (An?)	Mineralized zone in volcanic (An?) from Brownell dump.
B2	Altered Volcanic	Bleached volc from shear zone, Hem & sulfur stained.
B3	Volcanic (An?)	Dump grab sample, dark zone east of Brownell shaft.
B4	Arkose	[illegible] grey, med grain, includes some red siltstone, no Epidote.
B5	Quartz Latite	Light grey to [illegible], essentially unaltered.
B6	Volcanic (Rhy?)	[illegible] altered, includes weak clay, Hem, & limonite.
B7	Arkosic Cgl	Med [illegible], contains sign. (±15%) Epi, orthoclase & Qtz eyes.
B8	Granodiorite	Relatively fresh, Med to [illegible], wk [illegible]
B9	Conglomerate	[illegible] to [illegible], [illegible] strongly [illegible]

Afternoon: SRD 6/13/69

Hills - ~~East~~ Side ~~of~~ Rd.

Walked to ridge - predominantly cgl. - Large dump and prospect cut. (Noted by X on map) Sunk along an E-W fault or fracture system which dips 73° N. (2 shafts ± 100' deep) Noted scattered azurite/malachite w/scat'd py in andesite fragments.

Examined rock types on N.W. trending ridge - for the main part poorly sorted conglomerate consisting of lms, qtzite fragments.

(3) Conspicuous bleached dike occurring on slopes within pass and on both sides of road. - rhyolite.

Observed a "wedge" of ~~granite~~ monzonite? within saddle and appears overlain by conglomerate. Appears fresh and unaltered. w/sc'd epidote.

(4) Observed also some epidote within the cgl. — N80°E/84° N.W. Appears as scattered coatings & dissem's.

(5). Small exp. of latite as shown by (5) on map. Appears discontineous.

Extreme E. end of cgl. exposure N 70°E/77° N.W. still cgl. Beyond high point small prominotary principally light colored altered latite in direct contact w/cgl which bears 160°. Dip not possible to determine but seems steeply angled.

To: **HAWLEY & HAWLEY**
Assayers and Chemists, Inc.

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- [ ] Single Analysis
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- [ ] Geochemical Analysis
- [ ] Spectrographic Analysis

*Verified Analysis will be run unless otherwise specified

..........196 ....

Page..........of..........pages

Interval	Sample No.	Au	Ag	Pb	Cu	Zn	Mo		

6/12/69

BROWNELL MINE

RHL

NK-B-1 Contineous chip sample taken over a distance of 18' approx 20' S.E of shaft on large dump. Rock is characterized by st. alt. bleached appearance - mod to st. clay development, wk sericite. wk-mod FeOx noted principally along fractures. Rock displays porphyritic textures and seems devoid of qtz. Volc. porph (Andesite?) N.B. ± 1/4" veinlets of alunite or anhydrite traverse exp. (dense, white, fairly soft) N 75°E / 47 S.E.

O/c. above workings - a conspicuous northerly trending ridge - displays well laminated characteristics, - alt. remains strong. Num. hem. smeared slickensided surfaces. Lamination strikes N 10°E. / 45-50° S.E. Perhaps an expression of a fracture zone? ± 75' wide - 150' wide. Variably silicified

NK-B-2 Taken at NSMM #037. ± 12' contineous chip sample across "lamination". Bleached, alt. Volc. rock. st. clay. Conspic. iron stained (primarily hematite w/perhaps turgite ... irridescent colours on fracture surfaces). Occ. yellowish-brown stain. Cannot determine original rock type.

Note: old dumps show typical color of oxidized pyrite, but only sparse amounts were noted. Could be mostly microscopic.

Alteration becomes somewhat weaker when travelling N. Rock appears more granular; remains light colored w/vague stratification or "flow layering" ~ rhyolite? (*Davis suggested latite)

NK-B-3. Grab sample from large dump from shaft on East side. Variably iron stained having a dk greenish to almost black groundmass. Wk silicif as qtz. veinlets. Fragments occ. display slickensided surfaces. Probably an andesite.

To: **HAWLEY & HAWLEY**
Assayers and Chemists, Inc.

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☐ Spectrographic Analysis
*Verified Analysis will be run unless otherwise specified

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Page.........of.........pages

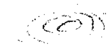
Interval	Sample No.	Au	Ag	Pb	Cu	Zn	Mo		

BROWNELL MINE - CONT'D.

Along strike of shear zone more prospects, such as open cuts, trenches, shafts. Wk. Cu min. such as azurite with some malachite.

Shear zone narrows rapidly beyond last prospect pit to the North. On either side of this zone lies volc. porph. (andesite?) wkly chloritized.

Some exposure of shear zone at side of wash. Further north outcrops sparse.
O/c. on road. St. silicified, aphanitic matrix. Appears as a "strand" of original shear zone.* *No!

Southern slope of hillside appears primarily as a strongly altered volcanic rock. w/variable FeOx and hematite staining. Groundmass generally strongly bleached. Occ. Liesegang rings  on weathered ~~fracture~~ surfaces.

Afternoon - traverse South. - small hill. Unmin'd. Fine gr'd, dense somewhat pinkish groundmass. Rhy? → Latite.

Pronounced sh'd zones in this area. To the East of South Hill "pockets" of andesite porphyry but aereal extent too small for map.

The Northerly Prospect on the East side (marked by X) is a dense, silicified rock w/pronounced flow layering.

To: **HAWLEY & HAWLEY**
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....196 ....

Page.........of.........pages

Interval	Sample No.	Au	Ag	Pb	Cu	Zn	Mo		

Returned by 3 p.m. to north side location. Rock: altered latite porphyry. Weak shearing as indicated. Approx 200' N o/c. as noted display strong fracturing w/st FeOx along them. Rock is quite silicified and qtz. phenocrysts were noted.

Abrupt contact w/float as noted on map w/ heavy pencil line. No o/c. noted but marked boundary w/red float such as lms. qtzite, cgl. o/c. observed which shows rock to be an arkosic cgl.

Strongly sheared lms (prospect shows sparse CuOx) strikes approx due W w/35° S dip. (orange line on map). No further o/c. observed on top of this ridge. Judging from float distribution there is an increase in lms, qtzite prop. towards the N.W.

June 13/69.

<u>Morning</u> - start East side of ridge examined yesterday (but bounded
(1) on East side by road) Characteristic rusty-brown on weathered surface. Groundmass f.gr'd, w/scat'd silicification. Latite.

Crossed contact w/shale (deep purplish color; strongly laminated) and is interbedded w/arkose and lms. Dip of units ∠45° N.W and strike N10°E. Shale is strongly hematized.

Noted sh'd zone ±30' wide within latite just W of road. Possibly an extension of Brownell Mine? (Orange Line)

(2) Hill - Arkose and conglomerate intimately mixed. Fragments elliptical in shape to subangular. Limestone and qtzite pebbles & boulders predominate. Float: mainly lms, qtzite.

To: **HAWLEY & HAWLEY**
Assayers and Chemists, Inc.

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From: ....

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- [ ] Verified Analysis*
- [ ] Geochemical Analysis
- [ ] Spectrographic Analysis

*Verified Analysis will be run unless otherwise specified

..............................196 ....

Page.........of.........pages

Interval	Sample No.	Au	Ag	Pb	Cu	Zn	Mo		

6920 Taos Place
Tucson, Arizona
June 28, 1969

Mr. James D. Sell
ASARCO
Tucson, Arizona

Subject: Billing for study of rock suite
NK-1 - NK-10.
Service Billed at $15.00/hr.

	Hours
Binocular Microscopic Examination and sawing for sample material.	1.5
Petrographic Examination	5.0
Report Preparation	2.5
Total	9.0
Billing (Discount 1 hr)	$120.00

Billing from National Petrographic Service for 9 thin and 2 polished sections will be forwarded when received.

Sincerely,

Spencer R. Titley

Spencer R. Titley
Registered Geologist
Ariz. No. 4066

6920 Taos Place
Tucson, Arizona
June 28, 1969

Mr. James D. Sell
American Smelting And Refining Co.
Tucson, Arizona

Dear Jim:

Enclosed is my report on the suite of rocks that you brought to my office. I found them quite interesting but I was unable to come up with a solid answer on the occurrence of the sulfides in them. I feel that they are transported to the rock rather than detrital in them. I feel that the sulfides represent enrichment rather than primary deposition of chalcocite from a deeply derived fluid but I cannot prove to my own satisfaction such a process. I believe that an origin by downward or laterally travelling fluids from a source of primary copper is the best bet.

I can't, however, rule out a primary origin for the copper - that is direct deposition of the chalcocite although it requires a rather un usual fluid and environment to do it if the material was derived at depth.

The alteration could be either hydrothermal or metamorphic and I suspect we may be seeing a combination of both. I feel the alteration preceeds the copper, one more reason for ruling out a primary origin although a tenuous one.

I trust I have helped in providing some answers to you although I regret not being able to come up with the really important ones. If you have questions, please do not hesitate to contact me and I'll be pleased to review what I have done with them and further explain anything you might wish.

Sincerely yours,

Spencer R. Titley

Spencer R. Titley

Encl.

PETROGRAPHIC EXAMINATION OF ASARCO ROCKS - J. D. SELL June 26, 1969

Made by and reported by S. R. Titley

Sample NK-1 ASARCO No. "?"

Megascopic Description: Equigranular qtz-feldspar-epidote rock with oriented fabric. Large irregular feldspar grains and nearly equigranular elongated quartz grains. Epidote fills interstices. Appears sedimentary originally. Color is variable but striking on sawed surface with soft green and pink. No opaques visible.

Petrography: The rock is a plagioclase (25%),- quartz (35%), - orthoclase (10%), - unknown fine-grained (5%) rock. The rock appears fragmental with grains of feldspar and quartz cemented with fine-grained material (possibly silt) that is now in great part epidote or silica. Quartz grains subrounded to subangular but generally elongated to ellipsoidal. Epidote occurs as a replacement of Na spar and as a replacement of matrix. Low level but extensive alteration of plagioclase to unidentified clay.

Interpretation: Rock appears to be metamorphosed (altered) arkose. Affinities are closer to sedimentary origin than to volcanic origin, the other possibility. If clasts are a representative example of the weathered original rock, it may have been an andesite tuff.

Sample NK-2 ASARCO No. M-2

Megascopic Description: Fine grained (1.5 mm or less) orthoclase-quartz-epidote rock. General color tends toward pale green. Much like NK-1 except for smaller grain size and apparent greater content of K-spar and absence of obvious primary structure.

Petrography: Rock is 50% matrix (smaller than 0.01mm) and 50% fragments larger than 0.1mm. Appears fragmental with fragments of fine-grained quartz, microcline, orthoclase and plagioclase. Intense and pervasive alteration of only plagioclase to clay-sericite(?). Very thin alteration rim around many plagioclase crystals that may represent weathering. Some selvages appear opaque (Hematite)(?). A few crystals of magnetite now altering to hematite. Fragment composition approximately quartz-40%, orthoclase,microcline-20%, plagioclase-30%, epidote-10%. Much of the original groundmass probably altered to epidote. Matrix or groundmass composition indeterminate with equipment available but probably silt with qtz-clay and minor carbonate.

Interpretation: Sedimentary rock (arkose) much like NK-1; more equigranular and orthoclase with more fine-grained material than NK-1.

Sample NK-3

Megascopic Description: Poorly sorted clastic rock - arkose with prominent rounded pink orthoclase fragments up to 4 mm. Fine grained green matrix. About 30% of obvious fragments greater than 1mm.

Sample NK-3 (Cont'd)

Petrography: Largely the same as NK-2 except that grain size is smaller and there are small fragments of a quartz-orthoclase rock. This rock may represent a sample of the clastic source (in part). The quartz-orthoclase rock is granophyric and could have been a quartz-latite or very fine-grained quartz-monzonite. Epidote alteration of both groundmass and plagioclase is widespread.

Interpretation: Probably a sedimentary rock (arkose) now altered to a quartz-feldspar-epidote rock.

Sample NK-4

Megasoopic Description: Coarse fragmental rock with obvious quartz, feldspar and epidote. A minor amount of green copper stain rimming both quartz and feldspar fragments.

Petrography: The rock is fragmental, consisting of large fragrments of orthoclase and small fragments of plagioclase (olig), quartz and microcline. Groundmass of silty material makes up about 50% of total rock if much of the epidote is considered to represent original material. Widespread unidentified clay and a few coarse crystals of calcite that appear detrital. Feldspars prominently rounded. Unidentifed non-metallic, pink-reflecting, opaque mineral. Copper mineral appears to be malachite and is associated with hematite. Possibly it is a replacement of quartz crystals but I cannot be certain. There aso appears to be some recrystallization of the feldspar.

Interpretation: Metamorphosed or altered arkose.

Sample NK-5 ASARCO No. "Dike"

Megascopic Description: Dull, dark green, fine-grained porphyritic rock with pale green oriented laths of feldspar. Phenocrysts range from 0.5 to 2 mm size. Some are equant but most are tabular on the one sawed face. The rock appears igneous without much question.

Petrography: The rock is largely an epidote-plagioclase rock with epidote making up more than 50% of the section surface. Magnetite is present at around 2-4%. Some chlorite replacement of what were probably mafic minerals (hornblende and biotite?) Many small felty laths of plagioclase in the groundmass, some of which have been replaced by epidote. The coarse plagioclase crysts are about 50% replaced by fine-grained epidote.

Interpretation: The rock was probably an andesite porphyry but is now an epidote-plagioclase rock.

Sample NK-6

Megascopic Description: Poorly sorted quartz-orthoclase-epidote rock. Numerous large epidotized fragments of plagioclase(?). A rather large amount of hematite (relatively) about 1% Some green dopper stain on the surface and surrounding orthoclase fragments.

Sample NK-6 (Cont'd)

Petrography: Epidotization considerably farther advanced than in other samples of this suite. Remnants of plagioclase occur in clusters of "islands" surrounded by coarse epidote. This sample also contains fragments of quartzite or very fine-grained sandstone, that is now an orthoquartzite. Veins of hematite and magnetite(?). Much calcite (3%) remains in the rock. There are a few patches of malachite in the section that may be replacement of limestone or calcite fragments.

Interpretation: Altered or metamorphosed arkose. This rock appears to be a more calcareous phase of the sediment but one which still retains some silt and has been more strongly altered or metamorphosed. Origin of the copper stain is not known as no sulfides were recognized in the rock. It is probably transported.

Sample NK-7

Megascopic Description: Brownish laminated, apparently sedimentary rock. Consists of thin (4mm) bands of very fine brown material separated by 1mm bands of light colored grains less than a mm in width. Looks like a well sorted arkose and of the type that makes of a low energy stream or lake environment.

Petrography: Well sorted sedimentary rock of quartz-feldspar-silt composition. An arkose. Quartz-feldspar ration 1:1. About 1% epidote. Abundant hematite(?) or limonite(?) in the silts. Fragments of quartz and orthoclase mostly anhedral.

Interpretation: Well sorted sediments, possibly minor calcareous cement with some iron oxides in the environment Feldspar content of coarse material about the same proportionately as the other rocks in this suite. Bedding obvious. Stream sediment?

Sample NK-8

Megascopic Description: Fine grained poorly sorted arkosic rock with opaques and epidotization of Groundmass. Feldspar=quartz, fragments angular. Rather less epidote than others in the suite. Much silt and very minor carbonate.

Petrography: Fragmental rock with quartz=orthoclase=plagioclase. Epidote in the groundmass only about 25% and less than 5% of plagioclase affected. Less epidote than others of this suite. Groundmass or matriz of the rock consists of quartz and unidentified clay Possible hornblende fragments in the rock and 1-2% opaques, apparently all magnetite. Afew small opaques may be chalcocite.

Interpretation: Altered or metamorphosed arkose.

Sample NK-9 ASARCO No. red "+"

Megascopic Description: The rock appears to be an andesite with reddish-purple groundmass. with hornblende and both tabular and rounded feldspar phenocrysts. Feldspars weathering or altering to chalky blobs on the weathering surface.

Sample NK-9 (Cont'd)

Petrography: The rock is epidotized with marked selective alteration of the plagioclase which is in the range oligoclase-andesine. Some biotite development from hornblende. One xenolith of quartzite and possibly a fragment of the arkose in the rock. The rock was an andesite porphyry that has been subjected to conditions forming epidote in the Plagioclase and red-staining of the groundmass that is probably hematite.

INTERPRETATION SUMMARY

With the exception of those rocks noted above that are obviously igneous, the suite consists of altered arkosic rocks. They are all remarkably similar, varying only in the extent to which they have been modified by epidote. The source of the clastic material appears to have been the same for all of them. The abundance of plagioclase is noteworthy and suggests either an adesitic tuff source or coincidence of sedimentation and volcanic activity with the plagioclase fragments deposited directly from the air. The remarkable state of preservation of the plagioclase with only minor surface modification suggests that the material did not travel far.

Although arguments can be advanced for considering the rocks volcanic primarily, the sedimentary character of bedding, rounding and the presence of what I believe to be silt as a groundmass weighs against this interpretation.

There appears to have been some rhyolite in the source area as well andesite and some pre-existing fine-grained sandy sediments or sedimentary rocks. The inclusion of both these rock types in the andesite (NK-9) attests to the later age of that rock and the presence of these rocks near the igneous body. Except for the pervasive and relatively intense epidote alteration, the rocks appear quite similar to, and thus of the same origin, as those units such as Claflin Ranch or Amole Arkose.

The small amount of carbonate in the sediments is probably significant in terms of the alteration. Although little is now left in the rocks, I have a feeling that there may have been considerable calcite in the matriz.

Alteration: All specimens are altered to varying degree by epidote. Considered alteration, the development of that mineral could also be metamorphic but it seems unlikely in view of the selectivity of the alteratin in many specimens of the plagioclase, where iron would have to be added to the system. Contact metamorphism or localized heating and remobilization cannot be ruled out.

Also noteworthy is the fact that virtually all of the plagioclase is altered to clay and, in a few cases, possibly sericite. In general the more epidote in the rock the more the plagioclase appears to be altered. Orthoclase, by comparison, is little affected although some of it shows slight alteration to clay. My feeling is that the clay-sericite alteration of the feldspars has taken place since sedimentation rather than before although I cannot be certain.

There is much microcline in some of the specimens and about the only way I can reasonably account for it is through some metamorphism or low temperature potash metasomatism. It could be detrital microcline derived from a granophyre or a similar rock. I have no unequivocal explanation for it.

In summary, alteration or metamorphism is pronounced in all rocks of the suite. My impression is that the mineralogy present is more the effect of alteration brought about by pore water movement than it is metamorphism (dry) or long range movement of fluids from some other source. That it was brought about under conditions of anomalously elevated temperatures and some burial there seems little doubt.

Mineralization: No primary sulfides were seen in the specimens examined. Chalcocite is present in hand specimens but the cuts on the sections asked for revealed nothing diagnostic about its occurrence. Several alternatives may be considered to explain its presence.

It could be detrital, together with the other minerals of the sedimentary rock. This seems doubtful as some of the chalcocite occurs as very thin veins that wrap around quartz grains and wander for short distances through the ground mass. If detrital it has been subject to remobilization after lithification of the rock.

It could represent in situ alteration of primary sulfide. I found no primary sulfide in this rock except for the possible primary origin of the chalcocite.(See below). No pyrite or chalcopyrite was observed. If primary sulfide were present, it could have been detrital (very unlikely) or introduced after lithification (no evidence).

The chalcocite could be primary. This is possible but the chalcocite in the sample is not characteristic of the chalcocite known to be primary such as at Magma. This should not, however, rule at this possibility. Because of the absence of textures indicating it and the absence of any primary sulfide such as pyrite or chalcopyrite, I have to conclude that the chalcocite is a replacement of the silicate or carbonate rock forming minerals, rather than a sulfide in the rock. Thus the primary origin has to be considered a possibility.

The copper and sulfur are transported to the rock. This seems the most reasonable explanation although I have no geologic information to suggest the probability of this process. The mineralogy of the rock and the petrographic evidence suggest only that the copper could have been transported in a ferrous sulfate-water system and deposited chalcocite and limonite-hematite at the proper level in the system.

Aa-16.0.16

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona
August 25, 1969

TO: Mr. J.H. Courtright

FROM: Mr. J.D. Sell

Geologic Reconnaissance Mapping
Noipa Kam Area, (Gu Achi)
Papago Indian Reservation
Pima County, Arizona

SUMMARY AND CONCLUSIONS

Mapping and sampling of a large Laramide volcanic-sedimentary sequence of units in the Noipa Kam area has confirmed the presence of an anomalous area of epidote alteration, with some copper, in units tentatively equated with the Claflin Ranch Formation.

The present model suggests that a high volatile heat source, such as a mineralized porphyry, is responsible for the addition of epidote-copper values in the conglomerate. This source, based on epidote facies boundaries and partially supported by an airborne magnetic closure, is covered by an unknown thickness of alluvial material and lies east of the outcropping area.

The pervasive or abundant-type epidote occurrence open ends eastward facing alluvium of the broad Santa Rosa Valley and grades westward into a scattered and patchy epidote occurrence which also forms a broad horseshoe outline open to the east. The patchy zone passes into conglomerate areas essentially devoid of any epidote occurrence. Copper, as oxide, silicate, and sulfide (chalcocite), although not abundant, tends to favor the heaviest epidote areas and often the moderately coarse conglomerate facies.

In the south central part, between Brownell Well and Brownell Mines, two zones of epidote were mapped. One is in Claflin Ranch conglomerate and is apparently spatially related to the Laramide granodiorite intrusive, which also carries epidote, while the other has no apparent intrusive source but has epidote in both Claflin Ranch and Silver Bell-type units. No copper was noted with these occurrences.

In the far south the large Laramide granite mass contains numerous streaks and shears, trending N50°W filled with epidote and some quartz-specularite mineralization. Otherwise the granite has a very fresh and unaltered appearance of the most part. Some very small patches of epidote are found outside the named occurrences and generally in the Claflin Ranch or Silver Bell-type units.

A number of rock samples were collected and fire assayed for gold-silver and geochemically analysed for copper-moly-lead-zinc. In general, the geochemical values within the pervasive epidote area of the conglomerate are higher (average 135 ppm Cu and 932 ppm Mo+PB+Zn) than in the spotty epidote area (average 50 ppm Cu and 720 ppm Mo+PB+Zn). Outside the zonal area, in the andesite arkose units, the average values are lower still (averaging 33 ppm Cu and 494 ppm Mo+PB+Zn).

The intrusive rocks within the epidote zone also show a 3 to 5 fold increase in geochemical values over intrusives outside the zone.

Samples around the Brownell Mine area also show an increase in values where associated with epidote areas verses non-epidote areas but overall have a lower magnitude of values, especially in the combined ppm Mo+PB+Zn, than the samples east of Noipa Kam.

Samples were collected in the main anomalous area and submitted to Dr. S. Titley for petrographic study. In his tentative conclusions regarding the alteration (and the occurrence of epidote), Titley reported they ".....could be either hydrothermal or metamorphic and I suspect we may be seeing a combination of both.....". He further feels".....the alteration preceeds the copper.....". In regard to the copper mineralization, Titley reported that he felt that the mineralization was ".....transported to the rock rather than derital in them....." and that "..... the origin by downward or laterally traveling fluids from a source of primary copper is the best bet."

ASARCO geophysical investigations include I.P., resistivity, and airborne magnetics. The results of the surveys are being reported by W. Farley in a separate memorandum. The I.P. and resistivity data revealed no anomalous source or response within 1,000 feet of the surface other than a resistivity trough extending northward, and lying eastward, out under alluvium.

Airborne magnetics define a small closure situated as a near bulls-eye to the continued circular closure of the two epidote isograd lines. Interpretation of this closure is not firm. It might represent a somewhat deeper portion of the resistivity trough or it might be the expression of a buried pluton. Ground magnetics and gravity would be an aid to interpretation and such studies are recommended over and surrounding the airborne magnetic closure.

Although to date all geologic, geochemical, and geophysical work is non-definitive for the specific target location, the data available does support an anomalous area containing a metamorphic-alteration addition of epidote-copper in a conglomerate sequence and further suggests that a source area lies to the east under alluvial cover. It is recommended that the area be considered for exploration drilling when leasing or acquisition rights can be favorably secured from the Papago Indians.

James D. Sell

James D. Sell

JDS:ir
cc: WESaegart
WGFarley

GENERAL

The index map of Figure 1 shows the location of the Noipa Kam area southwest of the village of Santa Rosa (Gu Achi) in the central part of the Papago Indian Reservation. It is located some 50 miles south of Casa Grande and 11 miles north of the Indian village of Quijotoa. The area of main interest is in T13S,R3E (unsurveyed).

A study of the epidote-copper occurrence was proposed as part of the Papago Central Project based on an earlier survey and sampling (Sell, Aa-16.0.0, Noipa Kam Hills). S. Davis assisted in much of the present study while R. Karvinen and R. Luning aided in mapping of the Brownell Mine and Poor Boy Prospect areas.

The aerial geology of the Noipa Kam area is displayed on Attachment A. A diverse group of rock units are involved and have been mapped in ten major groups: 1) Precambrian granite, 2) Paleozoic limestone and quartzite units, 3) Cretaceous (Glance) conglomerate, arkose and quartzite, 4) Laramide conglomerate (Claflin Ranch type), andesite arkose with quartzite and limestone blocks (Silver Bell type), and a rhyolite-andesite-silicic-acid volcanic complex, 5) Laramide intrusive rocks including granite, quartz monzonite, latite, porphyritic latite, rhyolite porphyry, granodiorite, plagioclase-hornblende porphyry, and andesite porphyry, 6) Laramide schist complex, 7) Tertiary andesite dikes, 8) acidic volcanics, 9) a red ferrugineous conglomerate, and 10) undifferentiated Quaternary gravel, sand, and silt.

ROCK UNITS

The small Precambrian granite (Pegr) outcrop west of the Noipa Kam village is probably related to the trend block of Paleozoic limestone and quartzite units. Visible contacts between the granite and the adjacent limestones are nebulous and it is probable that the limestones represent isolated blocks within the Laramide conglomerate and arkose and not as normal sedimentary units deposited above the Precambrian basement, although as discussed later, the limestones may be in sedimentary contact with the granite.

The larger blocks of Paleozoics (Pal) trending northeastward form a strong linear system of nearly isoclinally folded strata. These units are highly sheared with evident plastic flowage and contain a myriad of jasper veinlets and masses. Iron is associated with the veinlets as well as some manganese, but other metallic values appear to be lacking.

Cretaceous Glance conglomerate (Kgc) is found to the south of the Brownell Mine area, generally with steep bedding features, but the base was not exposed.

Laramide conglomerate and arkoses are exposed over much of the mapped area. The lower unit (Lcg) is equated with the Claflin Ranch formation. It is predominantly a conglomerate with a variety of rock types as pebbles to boulders in fine silt. Volcanics are common but are not a dominant part of this unit. Some Paleozoic blocks are found surrounded by the conglomerate units and it is believed that they represent outcrop blocks being buried by the inflow of conglomerate material. This thought is based largely on the evident change to a sandy or limey matrix in the conglomerate as the Paleozoic limestone-quartzite outcrop is approached. The unit is broken by faults and apparently folded into several northwest-trending gentle anticline and syncline structures. The epidote-copper alteration-mineralization anomalous area is within the Laramide conglomerate (Lcg) unit.

The upper unit of andesitic arkose (Laa) is predominantly an andesitic volcanic composed of volcanic flows and flow breccias which were deposited by and within water as shown by some obvious sedimentary features. Some very large blocks of quartzite and limestone have been incorporated in the makeup of the unit. The predominant coloration to the unit is purple or purplish-red and the unit is tentatively related to the Silver Bell type vulcanism-sedimentation sequence.

Overlying the conglomerate and arkose units is a volcanic agglomerate (Lva) of andesite to rhyolitic affinity composed of general large fragments in a matrix of similar material. A few bedded features were noted. It is probable that the above three Laramide units are part of a continuing cycle of sedimentation through vulcanism and as such are all interrelated.

Based on a few observations and general appearance it is probable that structural activity involving faulting and disturbance of numerous blocks took place after the volcanic agglomerate units were deposited. During the next extrusive stage a volcanic complex (Lvc) of units were emplaced along fault slivers (in part completely surrounding small sliver blocks of Paleozoic limestones) and poured out as massive flows. The complex ranges from rhyolite with contorted flow structure, to massive andesites, to small squirts and masses of silicic volcanics, and to non-descript acid volcanics. Some very minor copper-bearing shears are found in this unit. At the VO Mine, in the southern part of the map, a quartz porphyry tuff (appearing to be related to the volcanic sequence) is strongly sheared and carries the visible copper oxide mineralization. Several churn drill holes have been put down in the general area of the open cut at the VO Mine. No values appear in the cuttings from visual observation.

A variety of intrusives were next emplaced within the Noipa Kam area. The exact sequence is unknown from the scattering of exposures. The Laramide andesite porphyry (Lap) in the Brownell Mine sub-area intrudes and is deposited on units of the andesitic arkose, volcanic agglomerate, and the volcanic complex flows. In part, segments of the andesite porphyry was emplaced along faults but was also guided by bedding or flow features in the arkoses and volcanics.

In the northern alteration-metamorphic area are two small isolated plugs (shown as one outcrop on the map) of hornblende porphyry (Lhp). As they are involved in the alteration, the parent affinity of these bodies are unknown.

The granodiorite (Lgd) of the Brownell Mine area was also apparently emplaced along a pre-existing north-trending fault zone. It cuts Laramide conglomerate and intrudes into and along a part of the Laramide volcanic complex. The granodiorite contains epidote and is probably the cause of an epidote zone in the area.

Latite (Llt) is extensive throughout the area. In the north it forms dikes and sills within the Laramide conglomerate as well as definite flows poured out on the conglomerate surface. In general the latite left no observable metamorphic effect on the conglomerates where it was emplaced as sills. Around the Brownell area the latite was largely emplaced along north-trending fault structures although also as sills in the Laramide conglomerate. To the far south in the Brownell Mountain range extensive flows and intrusive bodies of latite were mapped. In all areas the latite varied from aphanitic to fine-grained to porphyritic and often carried abundant quartz eyes.

Two small rhyolite porphyry (Lrp) bodies were mapped. One occurs immediately west of Noipa Kam while the other is in the Brownell Mine area. Both appear to be fault controlled in their emplacement.

Laramide granite (Lgr) as mapped on the northwest is restricted to small outcrops along the trend of the Paleozoic series. The granite is intruded along the limestone blocks as well as occurring as isolated outcrops in the Laramide conglomerate. On the far south a large mass of Laramide granite occupies the northeast side of the mountain range.

Quartz monzonite porphyry (Lqm) is in the southwest corner of the map in an area called the "Poor Boy Prospect" in the Stebbins report. The monzonite is relatively dry and unaltered. A pyritized quartz porphyry parallels the contact of the monzonite and the latite and is thought to be a facie of the monzonite.

On the upper side of the map several hills of Laramide schist (Lsc) were mapped. These are the southern extremity of a large schist block which extends northward for some eight miles to the vicinity of the Drew Springs manganese area. The strongly foliated schist-gneiss complex, of unknown basic affinity, is the most evident unit. Also noted is a less schistose unit which resembles a rhyolite ignimbrite with remnant eutaxitic structures (in part similar to the rhyolite around the VO Mine). A sheared conglomeritic unit containing bedded epidote is also shown. Minor quartz shears and pods have been prospected on in the area.

All the above mentioned units are pre-mineral in age. Only a few post-mineral units are known. The Tertiary andesite dikes (Tad) occur cutting limestone on the north and cutting Laramide conglomerate around Brownell Mine. A small patch (unmapped) was also found capping latite on the south end of the hills southeast of Noipa Kam.

Acid volcanics (Tav), mainly of rhyotile to andesitic basalt composition, flank the Brownell Mountains on the southwest side of the mapped area. They appear to be capping part of the monzonite and latite, but in part are in fault contact with the latite. Some prospect pits are in the unit but widespread weak alteration effects are found only in the adjacent latite.

A well-cemented ferruginous conglomerate (Qfc) was noted in one drainage adjacent to the southern latite and covered by blanket gravels. It contained weakly altered granite and latite fragments as well as numerous volcanic fragments.

Quaternary gravel, sand, and silt (uncolored on the map) is extensive throughout the mapped area. Often the gravels are caliche cemented and the entire debris effectively covers and isolates numerous blocks of mappable units throughout the southern half of the quadrangle.

STRUCTURE AND SEDIMENTATION-VULCANISM

The Noipa Kam area can be basically divided into three divisions: 1) the northeast Laramide schist block, 2) the southwest massive intrusive block with capping volcanics, and 3) the central Paleozoic and early Laramide sedimentary-volcanic block with attendant intrusives.

The Paleozoic limestones and quartzites probably are Devonian to Mississippian in age. Whether Precambrian and Cambrian sedimentary rocks were deposited in this area is unknown. A 1500-2000 foot sequence of these lower rocks are known in the Vekol and Slate Mountain areas twenty miles northward but none south of these ranges. Preliminary isopach studies suggest that sedimentation took place in the area during Precambrian time then, possibly during Cambrian time, the area was subjected to uplift and erosion. A more careful study around the limestone area surrounding the Precambrian granite outcrop west of Noipa Kam would shed more light on the sedimentation features. The exposed Paleozoics are quite clean quartzites and limestones suggesting that sedimentation was of the low-energy environment.

The Cretaceous Glance conglomerate now occurs in isolated outcrops with no lower contacts noted. They are generally highly tilted blocks which may have been the result of the same forces which deformed the Paleozoics.

The intense uplift and deformation responsible for the nearly isoclinally folded spine of northeast-trending Paleozoics apparently preceeded the main sedimentation period recorded by the deposition of the Laramide conglomerate of Claflin Ranch type.

The lower Laramide conglomerate sequence east of Noipa Kam has two northwest-trending anticlinal structures and associated synclinal feature as recorded by dip and strike determinations. The beds trend at near right angles to the Paleozoic blocks but there is strong evidence that fine debris from the limestone-quartzites was incorporated in the matrix of the conglomerate.

Some faulting and uplift undoubtedly took place to set the stage for the next andesitic arkose and volcanic flow breccia sequence of units. Large blocks of quartzite and limestone are found completely engulfed (in plan) by the arkosic. These blocks parallel bedding and other planar features of the arkose, and, adjacent to the one large Paleozoic outcrop in the spine region, both the included blocks and the andesitic arkose bedding parallels the bedding of the Paleozoic mass.

The Noipa Kam region was a busy place during the next stage of massive vulcanism and intrusive activity. Limestone fault slivers are evident in several locations involving units of the volcanic complex and the latite. All the intrusives show strong fault control in various parts of the area but especially west of Noipa Kam and around the Brownell Mine.

A strong northwest-trending structural control was undoubtedly influencing the emplacement of the granite, latite, and monzonite in the southwest part of the area. Regional maps show this strong faulting extending through the Baboquivari Mountains on the southeast up into the Quijotoa-Noipa Kam area and passing northwestward through the Sauceda Mountains.

This regional grain in the Noipa Kam area is well shown by numerous epidote filled shears, pods, and streaks in the massive granite on the south and the abundant specularite with minor chrysocolla in the granite, latite, and monzonite to the west. Diabase and dioritic dikes also follow this trend in the massive granite.

ALTERATION-MINERALIZATION

The most tantalizing alteration-mineralization target in the Noipa Kam area is the horseshoe of pervasive epidote addition with minor chalcocite mineralization in the Laramide conglomerate. The pervasive area is surrounded by a similar horseshoe outline of weak and spotty epidote addition with rare copper noted. Outside the second zone the epidote is found only in conjunction with late Laramide intrusive masses. A Laramide hornblende porphyry is within the spotty zone and is itself strongly epidotized and has a halo of strong epidote surrounding it.

As a potential exploration target it is assumed that a volatile heat source, such as a mineralized porphyry, is responsible for the epidote-copper addition to the conglomerate. The isograd lines of epidote content would reflect as halos from the buried heat-mineralizing source. As shown on Attachment A, the postulated source would lie eastward from the outcropping areas and be buried under the alluvial gravels and sands.

The epidote is probably a hydrothermal-metamorphic event and is strongly controlled by bedding features in the conglomerate; but also well demonstrated is veinlets of epidote which crosscuts bedding. The coarse conglomerates are favored for the epidote addition more than are the fine-grained varieties and undoubtedly reflect increased permeability factors. Copper mineralization, as oxide, silicate, and chalcocite, is found in varying amounts with the strongest mineralization (chalcocite masses) generally restricted to the areas of intense epidote development.

Samples of the various rock features in the epidote-copper area were collected and submitted to Dr. Spencer R. Titley, professor of geology, University of Arizona, for petrographic study. Titley's interpretations summary is reproduced below and the full text, sample description, etc. is included in Appendix I.

START OF QUOTE:

"INTERPRETATION SUMMARY

With the exception of those rocks noted above that are obviously igneous, the suite consists of altered arkosic rocks. They are all remarkably similar, varying only in the extent to which they have been modified by epidote. The source of the clastic material appears to have been the same for all of them. The abundance of plagioclase is noteworthy and suggests either an adesitic tuff source or coincidence of sedimentation and volcanic activity with the plagioclase fragments deposited directly from the air. The remarkable state of preservation of the plagioclase with only minor surface modification suggests that the material did not travel far.

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The small amount of carbonate in the sediments is probably significant in terms of the alteration. Although little is now left in the rocks, I have a feeling that there may have been considerable calcite in the matrix.

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The chalcocite could be primary. This is possible but the chalcocite in the sample is not characteristic of the chalcocite known to be primary such as at Magma. This should not, however, rule out this possibility. Because of the absence of textures indicating it and the absence of any primary sulfide such as pyrite or chalcopyrite, I have to conclude that the chalcocite is a replacement of the silicate or carbonate rock forming minerals, rather than a sulfide in the rock. Thus the primary origin has to be considered a possibility.

The copper and sulfur are transported to the rock. This seems the most reasonable explanation although I have no geologic information to suggest the probability of this process. The mineralogy of the rock and the petrographic evidence suggest only that the copper could have been transported in a ferrous sulfate-water system and deposited chalcocite and limonite-hematite at the proper level in the system."

END OF QUOTE

Attachment B. shows the location of the petrographic samples (NK-Series), the assay-geochemical data locations, and the isograd lines of mapped limit of pervasive epidote and limiting epidote. Tabulation of the assay and geochemical sample results are reported in Table I. Gold-silver was determined by fire assay on all samples except the G-Series. The R-Series were large bulk samples and cut for copper-moly determination by regular wet methods during the earlier sampling program. All other samples were analysed for Cu-Mo-Pb-Zn by geochemical methods except where not reported. Bulk samples collected in the epidote-copper area had copper values ranging from 0.01% to 2.52% in a high grade area. Elsewhere in the horseshoe limit area, geochem values indicated the strongest anomalous area as being within the pervasive zone (or adjacent to intrusives with very strong epidote development adjacent to them), and near anomalous values in the surrounding halo. Outside the halo the values were still higher than those taken at a considerable distance, as reflected in the Brownell Mine Area samples, from the posulated heat-mineralizing source area.

The geophysical results are reported separately in a memo by Wayne Farley. I.P. results were negative using a 1000-2000 foot spacing. Resistivity data outlined a trough basin underlying the surface gravels and extending northeasterly but neither method outlined a potential source area responsible for the epidote-copper. Airborne magnetics were also flown over the area and shows a distinct small closure low in an otherwise quite flat magnetic area. Also noted is a strong north-south deflection pattern which passes near the closure.

Additional work, such as a lower level air magnetic traverse, or a ground magnetics, and a gravity survey over the suspected magnetic closure, is needed to clarify the nature of the closure as to its actual extent and possible depth to its top as it may not be at the bedrock surface.

Mapping and sampling of the Noipa Kam area has confirmed the mineral and geochemical value and the anomalous character of the epidote area in comparison to similar units to the west and south, the petrographic works supports and defines the nature of the alteration metamorphism-mineralization and suggests a lateral migration of fluids in an elevated temperature environment, and the airborne magnetics show a low which is often characteristic of mineralized and altered porphyry body. Present information does not provide us with a depth factor to the proposed source nor its probable shape and extent in three dimension.

Two other areas of weak to patchy pervasive epidote alteration-addition are found in the Brownell Mine area. The one northeast of the mine is in association with an epidotized Laramide granodiorite. The other, north of Brownell Well, is a weak zone in Laramide conglomerate and andesitic arkose. Neither zone is pervasive nor carries noticeable copper values.

Surrounding the Brownell Mine is an argillic alteration zone limited to the outcrops of Laramide volcanic complex, andesite porphyry, and latite units. As shown by Attachment A the area contains numerous diggings and shafts. Copper-silver values have been produced in this area from shears and small veinlets structures during the turn of the century.

In the southwest corner of the map is the "Poor Boy " prospect. Coloration and specularite-copper oxide mineralization is mainly confined to the Laramide latite and the quartz porphyry border phase in contact with the quartz monzonite. The color zone, as iron coloration along shears, actually extends throughout the latite into Brownell Peak and also patchy iron-alteration in the Laramide granite adjacent to the latite. Specularite-epidote is a common feature as exemplified throughout the Quijotoa District to the south.

Stebbin's Mineral Survey of the Papago Reservation (Aa.16.0.16) reported that Miami Copper put one churn drill hole down in the Poor Boy area. Stebbins also did geophysical and geochemical work over the Poor Boy and Brownell Mine areas. No encouraging results were obtained in any of their work or ours.

The alteration-mineralization at the VO Mine is of very limited extent and weak in character. At least two churn drill holes are in the mine area and another located just east of the limestone outcrop located 5000 feet southwesterly from the VO workings.

The Arizona State Land Department Water Resources Report number 9 (1961) lists a number of wells in the Noipa Kam area but none penetrated units other than what has been mapped in this report.

CONCLUSIONS

Further geophysical work should be undertaken to clearly define the character and extent of the airborne magnetic low closure, the depth of surface gravels, and the depth to the closure phenomenon.

The extent of the epidote-copper halos suggest a source area of sufficient magnitude to be of interest as an exploration target.

Although the present Papago Indian bid-lease arrangements are not the most favorable for exploring for this speculated target, I recommend that the area be considered as one of interest and the area be placed for bid at sometime when other properties are also being placed for bid in the reservation area. All future Indian releases on prospective bidding areas should be carefully checked to see if this area is included by other parties.

TABLE 1

Assay & Geochem Sample Results

Sample No.*	Rock Unit**	ozAu	ozAg	%Cu	%Mo	ppmCu	ppmMo	ppmPb	ppmZ
D-1	Lgr.	Tr	0.10	--	--	28	1.4	930	220
-2	Lcg, w/epi	Tr	0.10	--	--	67	1.4	244	600
-3	Lcg, w/min	Tr	0.06	--	--	112	1.7	302	41
-4	Lcg, w/epi	Tr	0.10	--	--	39	1.4	480	59
-5	Lcg.	Tr	0.09	--	--	20	0.9	880	26
-6	Laa.	Nil	0.08	--	--	20	1.4	775	77
-7	Lcg, w/epi	Tr	0.07	--	--	66	1.4	640	206
-8	pegr.	Tr	0.06	--	--	60	3.7	845	32
-9	Lrp.	Nil	0.10	--	--	65	1.7	441	94
-10	Laa, w/epi	Nil	0.08	--	--	11	0.9	216	51
D-11	Qzite in Laa.	Nil	0.08	--	--	36	4.9	336	19
S-1	Lcg, w/epi	Nil	Tr	--	--	35	1.1	495	230
-2	Lcg, w/epi	Nil	Tr	--	--	31	1.1	468	620
-3	Lhp.	Nil	Tr	--	--	342	1.7	2050	520
-4	Lcg, w/epi	Nil	Tr	--	--	63	1.1	1160	144
-5	Lcg, W/epi	Nil	0.28	--	--	68	0.9	256	970
S-6	Lcg, w/min.	Tr.	0.16	--	--	440	1.7	508	144
G-51	Llt.	--	--	--	--	250	-5	--	--
-52	gr in Lcg.	--	--	--	--	38	-5	--	--
-53	Pal, limonite	--	--	--	--	68	5	--	--
G-54	Pal core.	--	--	--	--	105	-5	--	--
R-1	Lcg, w/min.	Tr	0.08	0.14	None	(1400)	--	--	---
-2	Lcg.	None	None	0.01	None	(100)	--	--	--
-3	Lcg, min. fault	0.012	0.25	0.21	None	(2100)	--	--	--
-4	Lcg, w/min	0.005	0.48	0.99	None	(9900)	--	--	--
-5	Lcg, w/epi	Tr	0.10	0.02	None	(200)	--	--	--
R-6	Pal, w/min.	0.015	1.83	2.52	0.025	(25,000)	--	--	--
B-1	Lvc? (dump)	Nil	Nil	--	--	128	-5	78	54
-2	Lap, alt.	Nil	Nil	--	--	52	-5	56	20
-3	Lvc? (dump)	Nil	Nil	--	--	46	-5	82	134
-4	Laa.	Nil	Nil	--	--	22	-5	36	62
-5	Llt, fresh	Nil	Nil	--	--	32	-5	42	48
-6	Lvc	Nil	Nil	--	--	24	-5	32	36
-7	Lcg w/epi	Nil	Nil	--	--	164	-5	74	72
-8	Lgd	Nil	Nil	--	--	62	-5	30	60
B-9	Lcg.	Nil	Nil	--	--	20	-5	34	46

*D-and S- Series by ASARCO, El Paso Lab.
G-, R-, and B- Series by Hawley & Hawley, Tucson, Lab.
R-Series were large bulk samples for wet assay on copper-moly.

** Rock Units:

pe gr.	Precambrian granite
Pal	Paleozoic limestone and quartzite
Laa	Andesitic arkose (Silver Bell type)
Lap	Andesite porphyry
Lcg	Conglomerate (Claflin Ranch type)
Lgd	Granodiorite
Lgr	Granite
Lhp	Hornblende porphyry
Llt	Latite
Lrp	Rhyolite porphyry
Lvc	Volcanic complex

6920 Taos Place
Tucson, Arizona
June 28, 1969

Mr. James D. Sell
American Smelting And Refining Co.
Tucson, Arizona

Dear Jim:

Enclosed is my report on the suite of rocks that you brought to my office. I found them quite interesting but I was unable to come up with a solid answer on the occurrence of the sulfides in them. I feel that they are transported to the rock rather than detrital in them. I feel that the sulfides represent enrichment rather than primary deposition of chalcocite from a deeply derived fluid but I cannot prove to my own satisfaction such a process. I believe that an origin by downward or laterally travelling fluids from a source of primary copper is the best bet.

I can't, however, rule out a primary origin for the copper - that is direct deposition of the chalcocite although it requires a rather un usual fluid and environment to do it if the material was derived at depth.

The alteration could be either hydrothermal or metamorphic and I suspect we may be seeing a combination of both. I feel the alteration preceeds the copper, one more reason for ruling out a primary origin although a tenuous one.

I trust I have helped in providing some answers to you although I regret not being able to come up with the really important ones. If you have questions, please do not hesitate to contact me and I'll be pleased to review what I have done with them and further explain anything you might wish.

Sincerely yours,

Spencer R. Titley

Spencer R. Titley

Encl.

PETROGRAPHIC EXAMINATION OF ASARCO ROCKS - J. D. SELL June 26, 1969

Made by and reported by S. R. Titley

Sample NK-1 ASARCO No. "?"

Megascopic Description: Equigranular qtz-feldspar-epidote rock with oriented fabric. Large irregular feldspar grains and nearly equigranular elongated quartz grains. Epidote fills interstices. Appears sedimentary originally. Color is variable but striking on sawed surface with soft green and pink. No opaques visible.

Petrography: The rock is a plagioclase (25%),- quartz (35%), - orthoclase (10%), - unknown fine-grained (5%) rock. The rock appears fragmental with grains of feldspar and quartz cemented with fine-grained material (possibly silt) that is now in great part epidote or silica. Quartz grains subrounded to subangular but generally elongated to ellipsoidal. Epidote occurs as a replacement of Na spar and as a replacement of matrix. Low level but extensive alteration of plagioclase to unidentified clay.

Interpretation: Rock appears to be metamorphosed (altered) arkose. Affinities are closer to sedimentary origin than to volcanic origin, the other possibility. If clasts are a representative example of the weathered original rock, it may have been an andesite tuff.

Sample NK-2 ASARCO No. M-2

Megascopic Description: Fine grained (1.5 mm or less) orthoclase-quartz-epidote rock. General color tends toward pale green. Much like NK-1 except for smaller grain size and apparent greater content of K-spar and absence of obvious primary structure.

Petrography: Rock is 50% matrix (smaller than 0.01mm) and 50% fragments larger than 0.1mm. Appears fragmental with fragments of fine-grained quartz, microcline, orthoclase and plagioclase. Intense and pervasive alteration of only plagioclase to clay-sericite(?). Very thin alteration rim around many plagioclase crystals that may represent weathering. Some selvages appear opaque (Hematite)(?). A few crystals of magnetite now altering to hematite. Fragment composition approximately quartz-40%, orthoclase,microcline-20%, plagioclase-30%, epidote-10%. Much of the original groundmass probably altered to epidote. Matrix or groundmass composition indeterminate with equipment available but probably silt with qtz-clay and minor carbonate.

Interpretation: Sedimentary rock (arkose) much like NK-1; more equigranular and orthoclase with more fine-grained material than NK-1.

Sample NK-3

Megascopic Description: Poorly sorted clastic rock - arkose with prominent rounded pink orthoclase fragments up to 4 mm. Fine grained green matrix. About 30% of obvious fragments greater than 1mm.

Sample NK-3 (Cont'd)

Petrography: Largely the same as NK-2 except that grain size is smaller and there are small fragments of a quartz-orthoclase rock. This rock may represent a sample of the clastic source (in part). The quartz-orthoclase rock is granophyric and could have been a quartz-latite or very fine-grained quartz-monzonite. Epidote alteration of both groundmass and plagioclase is widespread.

Interpretation: Probably a sedimentary rock (arkose) now altered to a quartz-feldspar-epidote rock.

Sample NK-4

Megasoopic Description: Coarse fragmental rock with obvious quartz, feldspar and epidote. A minor amount of green copper stain rimming both quartz and feldspar fragments.

Petrography: The rock is fragmental, consisting of large fragrments of orthoclase and small fragments of plagioclase (olig), quartz and microcline. Groundmass of silty material makes up about 50% of total rock if much of the epidote is considered to represent original material. Widespread unidentified clay and a few coarse crystals of calcite that appear detrital. Feldspars prominently rounded. Unidentifed non-metallic, pink-reflecting, opaque mineral. Copper mineral appears to be malachite and is associated with hematite. Possibly it is a replacement of quartz crystals but I cannot be certain. There aso appears to be some recrystallization of the feldspar.

Interpretation: Metamorphosed or altered arkose.

Sample NK-5 ASARCO No. "Dike"

Megascopic Description: Dull, dark green, fine-grained porphyritic rock with pale green oriented laths of feldspar. Phenocrysts range from 0.5 to 2 mm size. Some are equant but most are tabular on the one sawed face. The rock appears igneous without much question.

Petrography: The rock is largely an epidote-plagioclase rock with epidote making up more than 50% of the section surface. Magnetite is present at around 2-4%. Some chlorite replacement of what were probably mafic minerals (hornblende and biotite?) Many small felty laths of plagioclase in the groundmass, some of which have been replaced by epidote. The coarse plagioclase crysts are about 50% replaced by fine-grained epidote.

Interpretation: The rock was probably an andesite porphyry but is now an epidote-plagioclase rock.

Sample NK-6

Megascopic Description: Poorly sorted quartz-orthoclase-epidote rock. Numerous large epidotized fragments of plagioclase(?). A rather large amount of hematite (relatively) about 1% Some green copper stain on the surface and surrounding orthoclase fragments.

Sample NK-6 (Cont'd)

Petrography: Epidotization considerably farther advanced than in other samples of this suite. Remnants of plagioclase occur in clusters of "islands" surrounded by coarse epidote. This sample also contains fragments of quartzite or very fine-grained sandstone, that is now an orthoquartzite. Veins of hematite and magnetite(?). Much calcite (3%) remains in the rock. There are a few patches of malachite in the section that may be replacement of limestone or calcite fragments.

Interpretation: Altered or metamorphosed arkose. This rock appears to be a more calcareous phase of the sediment but one which still retains some silt and has been more strongly altered or metamorphosed. Origin of the copper stain is not known as no sulfides were recognized in the rock. It is probably transported.

Sample NK-7

Megascopic Description: Brownish laminated, apparently sedimentary rock. Consists of thin (4mm) bands of very fine brown material separated by 1mm bands of light colored grains less than a mm in width. Looks like a well sorted arkose and of the type that makes of a low energy stream or lake environment.

Petrography: Well sorted sedimentary rock of quartz-feldspar-silt composition. An arkose. Quartz-feldspar ration 1:1. About 1% epidote. Abundant hematite(?) or limonite(?) in the silts. Fragments of quartz and orthoclase mostly anhedral.

Interpretation: Well sorted sediments, possibly minor calcareous cement with some iron oxides in the environment Feldspar content of coarse material about the same proportionately as the other rocks in this suite. Bedding obvious. Stream sediment?

Sample NK-8

Megascopic Description: Fine grained poorly sorted arkosic rock with opaques and epidotization of Groundmass. Feldspar=quartz, fragments angular. Rather less epidote than others in the suite. Much silt and very minor carbonate.

Petrography: Fragmental rock with quartz=orthoclase=plagioclase. Epidote in the groundmass only about 25% and less than 5% of plagioclase affected. Less epidote than others of this suite. Groundmass or matriz of the rock consists of quartz and unidentified clay Possible hornblende fragments in the rock and 1-2% opaques, apparently all magnetite. Afew small opaques may be chalcocite.

Interpretation: Altered or metamorphosed arkose.

Sample NK-9 ASARCO No. red "+"

Megascopic Description: The rock appears to be an andesite with reddish-purple groundmass. with hornblende and both tabular and rounded feldspar phenocrysts. Feldspars weathering or altering to chalky blobs on the weathering surface.

Sample NK-9 (Cont'd)

Petrography: The rock is epidotized with marked selective alteration of the plagioclase which is in the range oligoclase-andesine. Some biotite development from hornblende. One xenolith of quartzite and possibly a fragment of the arkose in the rock. The rock was an andesite porphyry that has been subjected to conditions forming epidote in the Plagioclase and red-staining of the groundmass that is probably hematite.

INTERPRETATION SUMMARY

With the exception of those rocks noted above that are obviously igneous, the suite consists of altered arkosic rocks. They are all remarkably similar, varying only in the extent to which they have been modified by epidote. The source of the clastic material appears to have been the same for all of them. The abundance of plagioclase is noteworthy and suggests either an adesitic tuff source or coincidence of sedimentation and volcanic activity with the plagioclase fragments deposited directly from the air. The remarkable state of preservation of the plagioclase with only minor surface modification suggests that the material did not travel far.

Although arguments can be advanced for considering the rocks volcanic primarily, the sedimentary character of bedding, rounding and the presence of what I believe to be silt as a groundmass weighs against this interpretation.

There appears to have been some rhyolite in the source area as well andesite and some pre-existing fine-grained sandy sediments or sedimentary rocks. The inclusion of both these rock types in the andesite (NK-9) attests to the later age of that rock and the presence of these rocks near the igneous body. Except for the pervasive and relatively intense epidote alteration, the rocks appear quite similar to, and thus of the same origin, as those units such as Claflin Ranch or Amole Arkose.

The small amount of carbonate in the sediments is probbly significant in terms of the alteration. Although little is now left in the rocks, I have a feeling that there may have been considerable calcite in the matrix.

Alteration: All specimens are altered to varying degree by epidote. Considered alteration, the development of that mineral could also be metamorphic but it seems unlikely in view of the selectivity of the alteratim in many specimens of the plagioclase, where iron would have to be added to the system. Contact metamorphism or locallized heating and remobilization cannot be ruled out.

Also noteworthy is the fact that virtually all of the plagioclase is altered to clay and, in a few cases, possibly sericite. In general the more epidote in the rock the more the plagioclase appears to be altered. Orthoclase, by comparison, is little affected although some of it shows slight alteration to clay. My feeling is that the clay-sericite alteration of the feldspars has taken place since sedimentation rather than before although I cannot be certain.

There is much microcline in some of the specimens and about the only way I can reasonably account for it is through some metamorphism or low temperature potash metasomatism. It could be detrital microcline derived from a granophyre or a similar rock. I have no unequivocal explanation for it.

In summary, alteration or metamorphism is pronounced in all rocks of the suite. My impression is that the mineralogy present is more the effect of alteration brought about by pore water movement than it is metamorphism (dry) or long range movement of fluids from some other source. That it was brought about under conditions of anomalously elevated temperatures and some burial there seems little doubt.

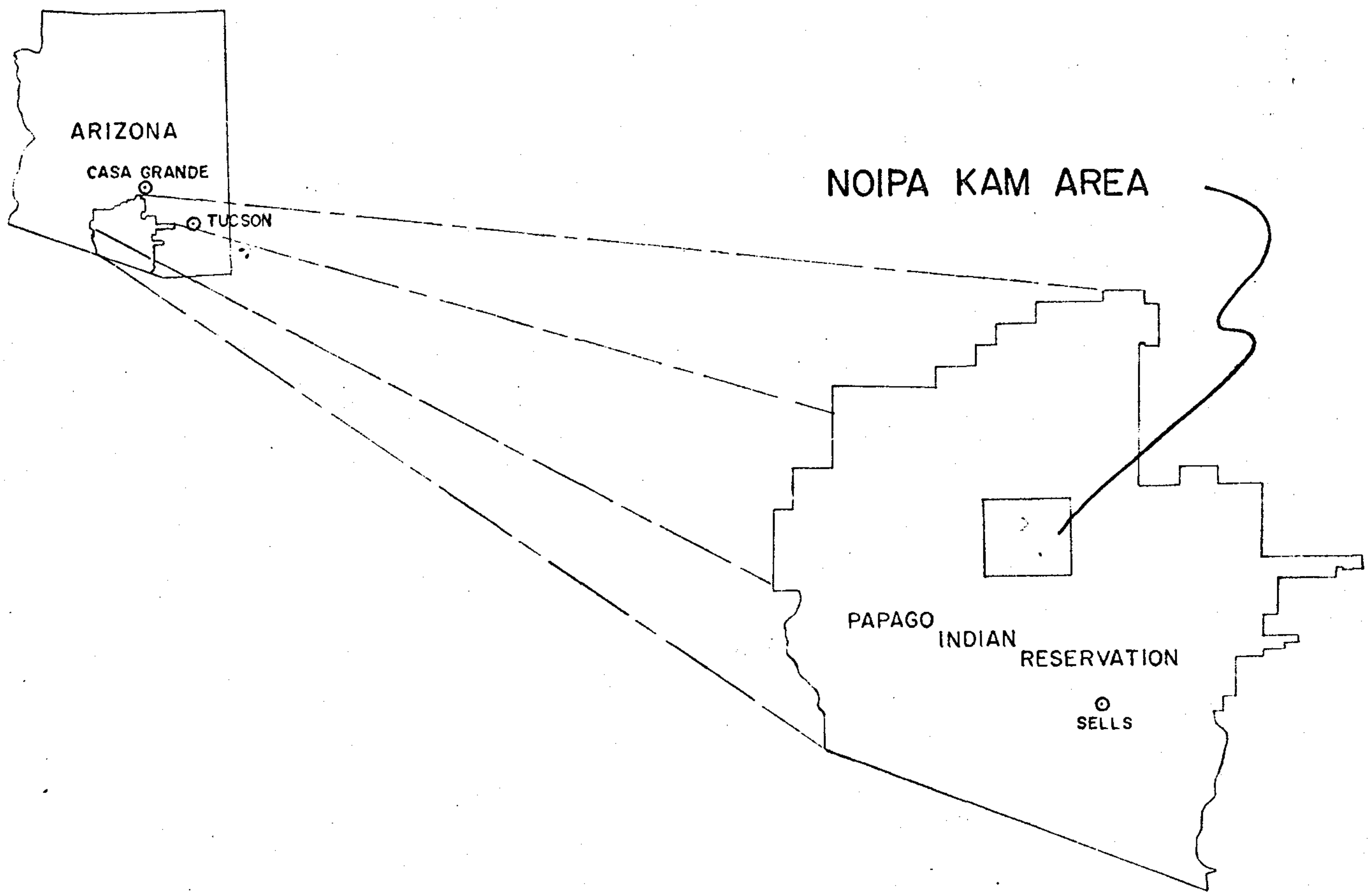
Mineralization: No primary sulfides were seen in the specimens examined. Chalcocite is present in hand specimens but the cuts on the sections asked for revealed nothing diagnostic about its occurrence. Several alternatives may be considered to explain its presence.

It could be detrital, together with the other minerals of the sedimentary rock. This seems doubtful as some of the chalcocite occurs as very thin veins that wrap around quartz grains and wander for short distances through the ground mass. If detrital it has been subject to remobilization after lithification of the rock.

It could represent in situ alteration of primary sulfide. I found no primary sulfide in this rock except for the possible primary origin of the chalcocite.(See below). No pyrite or chalcopyrite was observed. If primary sulfide were present, it could have been detrital (very unlikely) or introduced after lithification (no evidence).

The chalcocite could be primary. This is possible but the chalcocite in the sample is not characteristic of the chalcocite known to be primary such as at Magma. This should not, however, rule out this possibility. Because of the absence of textures indicating it and the absence of any primary sulfide such as pyrite or chalcopyrite, I have to conclude that the chalcocite is a replacement of the silicate or carbonate rock forming minerals, rather than a sulfide in the rock. Thus the primary origin has to be considered a possibility.

The copper and sulfur are transported to the rock. This seems the most reasonable explanation although I have no geologic information to suggest the probability of this process. The mineralogy of the rock and the petrographic evidence suggest only that the copper could have been transported in a ferrous sulfate-water system and deposited chalcocite and limonite-hematite at the proper level in the system.



NOIPA KAM AREA
Papago Indian Reservation, Arizona

TAB

Appendix

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona
April 2, 1964

MEMORANDUM TO J. E. KINNISON JEK

SOUTHWESTERN ARIZONA
ACCESS INVESTIGATIONS

Since your original interest in this area stimulated my desire to see it and prompted the subsequent investigations of accessibility I thought you might be interested in a resume of the inquires to date.

March 11, 1964: Call to Col. Moore, Base Condr., Luke AF Base. Col. Moore was absent so consequent conversation w/Col. R. B. Cypert (cī'prīt), Vice Comdr. My affiliation was identified and a request for permission for access made. Although he was cooperative, he stated he could not grant such permission. However, he would present the request to Col. Moore and their legal advisors. Suggested I call back in a few days.

March 16, 1964: Visit to Col. Cypert at Luke AF Base. Pleasant discussion, w/my stated position that of desiring to observe local structural relationships for support of regional studies.

Col. Cypert contended he had been informed by their legal advisors that they (at the base) did not have the authority to grant permission for access. A formal request would have to be made through AF Hgqs. in Washington, D. C. I was given the intentional impression that AF Hgqs. had always supported the policy of exclusion.

The most negative aspect was the number of training programs being accommodated by the gunnery complex. Not only was Luke AF Base conducting a number of them, but the area was being used by Marana, Davis Monthan AF Base, and the Arizona Air Nat'l. Guard. Chances of coordinating entry with demands of these programs seemed improbable.

During the return trip to Tucson possibilities inherent in one of Col. Cypert's remarks crystallized. He had said that the only exception to this policy of exclusion was the Arizona Game & Fish Dept. when making their annual game population-distribution surveys.

Since I knew a number of their men and had one good friend in their Phoenix office the possibility of accompanying one of their technicians was not too remote.

March 17, 1964: Visit to Mr. Ted Knipe of the Tucson office of the Arizona Game & Fish Dept.

Mr. Knipe was only academically familiar with the area, but introduced me to one of their young technicians, Dave Brown, who had been involved in their past surveys throughout SW Arizona.

Mr. Brown seemed to feel that there was no problem of access any time of the year throughout at least most of the Cabeza Prieta Wildlife Refuge. This however, was a generalization and for more specific information he referred me to the following:

Norman Simmons
U.S. Fish & Wildlife Ser.
Cabeza Prieta Game Range
1116 2nd Avenue
Ajo, Arizona

Paul Le Roux
Arizona Game & Fish Dept.
Gila Bend, Arizona Tel: 683-2674

Don Smith
Arizona Game & Fish Dept. (Regional Office)
907 East 25th Place
Yuma, Arizona

Lynn Cool (Guide)
Ask around Gila Bend, Arizona for whereabouts

March 19, 1964: Trip to Ajo and Gila Bend.

Both Mr. Simmons of the U.S. Fish & Wildlife Ser. and Mr. Le Roux of the Arizona Game & Fish Dept. were in the field. Via telephone Mrs. Le Roux reported her husband was on a sheep survey (possibly in the restricted area, since Mr. Simmons was also out).

By this time I had begun to suspect that Col. Cypert may have been too inclusive in our conversation re Restricted Area R-2301, and that some of this area, while restricted for air traffic, might be accessible via ground vehicle.

With this in mind I stopped at Gila Bend AF Base identified by an elev. of 858 on the Phoenix Sectional Aeronautical Chart, Jan. 9, 1964, and had a discussion w/a Lt. Crock.

Again my affiliation was identified, and a request made to have the boundaries of their gunnery complex specifically located for the purpose of avoiding intrusion while looking at as much of the country as possible.

He referred me to an aerial mosaic (Scale 1"=3NM) w/a plastic overlay containing a boundary outline which, with the exception of extensions to the west and southwest, appeared to coincide w/that shown on the Land Status, Arizona, Dept. of Agriculture, S.C.S., 1942, map in our files.

Uncertainty of the exact boundaries of these extensions in conjunction w/Lt. Crock's statement that the Marine air station in Yuma was utilizing an unknown portion of the country to the west indicated that it might be wise to visit the Bureau of Land Management in Phoenix to resolve the question of legal withdrawals for military use.

March 20, 1964: Trip to Phoenix and the Bureau of Land Management.

Presented a private citizen's desire to establish land status.

This status has been established by a series of EO (Executive Order) and PLO (Public Land Order) decrees.

In part, at least, they are listed below:

Cabeza Prieta Game Range
EO 8038, 25 Jan., 1939.

EO 8892, 5 Sept., 1941.

PLO 56, 6 November, 1942.

PLO 96, 16 March, 1943.

To date I have not had the opportunity to plot the descriptions in detail, nor determine whether they include the entire area of R-2301.

As soon as this is done, I will prepare a copy of the descriptions and an index map for you.

N. P. Whaley

N. P. WHALEY

NPW/jk

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

May 1, 1964

JEK

MEMORANDUM TO J. E. KINNISON

LAND WITHDRAWALS FOR MILITARY PURPOSES - SOUTHWESTERN ARIZONA

Am attaching a list describing lands withdrawn for military purposes in southwestern Arizona.

I do not believe that these are all of the withdrawals by any means, but they do represent all that I have been able to locate to date.

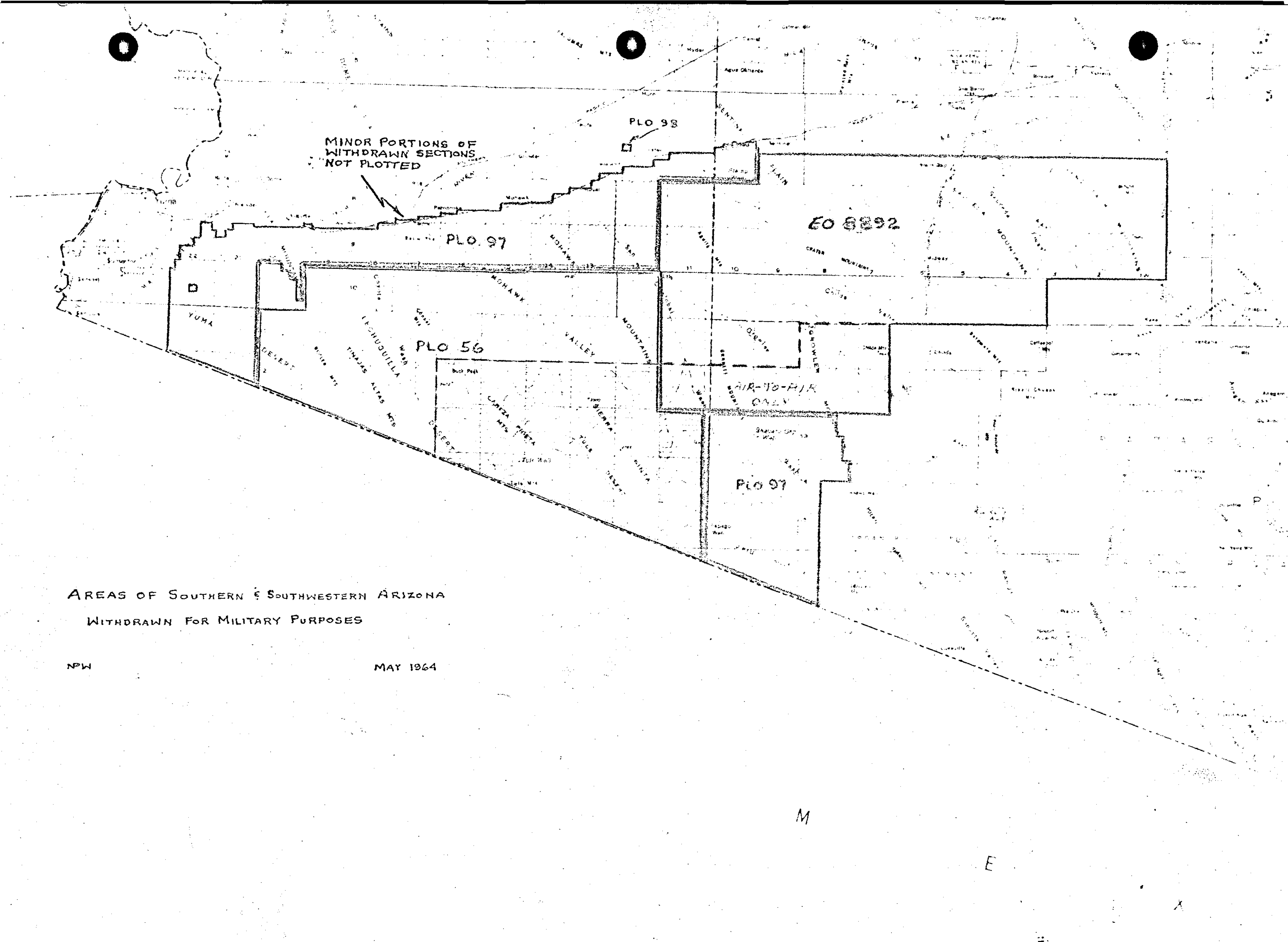
The Cabeza Prieta Game Range is not shown, since it is outlined on many maps.

A hastily prepared sketch map shows these areas graphically.

Norman P. Whaley

NORMAN P. WHALEY

NPW/jk



AREAS OF SOUTHERN & SOUTHWESTERN ARIZONA
WITHDRAWN FOR MILITARY PURPOSES

NPW MAY 1964

EO 8892 Gila & Salt River Meridian

T. 7 S., R. 1 W., Sec. 13 to 36 inclusive
Tps. 8 & 9 S., R. 1 W., all
T. 7 S., R. 2 W., Sec. 13 to 36 inclusive
T. 8 and 9 S., R. 2 W., all
T. 7 S., R. 3 W., Sec. 13 to 36 inclusive
Tps. 8 & 9 S., R. 3 W., all
T. 10 S., R 3 W., Sec. 4 to 9, 16-21 & 28 to 33 inclusive
T. 7 S., R. 4 W., Sec. 13 to 36 inclusive
Tps. 8, 9, & 10 S., R. 4 W., all
T. 7 S., R 5 W., Sec. 13-36 inclusive
T. 8, 9 & 10 S., R. 5 W., all
T. 7 S., R. 6 W., Sec.13-36 inclusive
Tps. 8, 9, & 10 S., R. 6 W., all
T. 7 S., R. 7 W., Sec. 13-36 inclusive
Tps. 8 to 12 S., R. 7 W., all
T. 7 S., R. 8 W., Sec. 13-36 inclusive
Tps. 8 to 12 S., R. 8 W., all
T. 7 S., R. 9 W., Sec. 13-36 inclusive
Tps. 8 to 12 S., R. 9 W., all
Tps. 8 to 12 S., R. 10 W., all
Tps. 8 to 12 S., R. 11 W., all
Tps. 8 & 9 S., R. 11½ W., all

The areas described, including both public & non-public lands, aggregate approx. 1,077,500 acres.

The lands in T. 11 S., Rs. 7 & 8 W., T. 12 S., Rs. 7 to 11 W., shall be used by the War Dept. for aerial gunnery and tow-target firing and for no other type of firing.

PLO 56 Gila & Salt River Meridian

Tps.	13 to 16 S.,	R.	11 W.,
	10 to 15		12
	10 to 15		13
	10 to 15		14
	10 to 14		15
	10 to 14		16
	10 to 14		17
	10 to 13		18
	10 to 13		19
Tps.	11 to 13 S.,	R.	20 W.

The areas described aggregate approx. 949,000 acres.

...shall designate at least 2 dys/mo on which there will be no firing affecting the lands in Tps. 13 to 16 S., R. 11 W., Tps. 12 to 15 S., Rs. 12 to 14 W., and Tps. 12 to 14 S., Rs 15 & 16 W., to enable field personnel of the Fish & Wildlife Ser. to carry out normal patrol & maintenance activities.

PLO 56 (cont'd.)

On the lands in Tps. 13 to 16 S., R. 11 W., Tps. 12 to 15 S., Rs. 12 to 14 W., and Tps. 12 to 14 S., Rs. 15 & 16 W. bombing shall be confined...to the valley floors, and shall not be permitted in the mountain areas...nor within a one-mile radius of all water holes, springs, wells, or tanks, including the Tule Wall, Cabeza Prieta Tanks, & the Tinajas Altas Tanks,

PLO 96

Not found as of 4-28-64.

PLO 97

Photocopy attached - U. of A., 4-28-64.

PLO 98

Photocopy attached - U. of A., 4-28-64.

punishable by a fine of not more than $5,000 or by imprisonment for not more than one year, or by both such fine and imprisonment.

Dated, March 24th, 1943.

R. R. SAYERS,
Director.

[F. R. Doc. 43-4591; Filed, March 25, 1943; 11:44 a. m.]

General Land Office.

[Public Land Order 97]

ARIZONA

WITHDRAWING PUBLIC LANDS FOR USE OF THE WAR DEPARTMENT AS AN AERIAL GUNNERY AND BOMBING RANGE

By virtue of the authority vested in the President and pursuant to Executive Order No. 9146 of April 24, 1942, and to section 1 of the act of June 28, 1934, as amended, 48 Stat. 1269 (U. S. C., title 43, sec. 315), and also to section 3 of the act of June 17, 1902, 32 Stat. 388 (U. S. C., title 43, sec. 416), *It is ordered*, As follows:

Subject to valid existing rights, the public lands in the following-described areas are hereby withdrawn from all forms of appropriation under the public-land laws, including the mining and mineral-leasing laws, and reserved for the use of the War Department as an aerial gunnery and bombing range:

GILA AND SALT RIVER MERIDIAN

T. 14 S., R. 7 W.,
Secs. 6, 7, and 18.
T. 13 S., R. 8 W.,
Secs. 2 to [illegible], inclusive, and
Secs. [illegible] to 36, inclusive, unsurveyed.
T. 14 S., R. 8 W.,
Secs. [illegible] to 21, inclusive, and
Secs. 28 to 33, inclusive, unsurveyed.
T. 15 S., R. 8 W.,
Secs. 4 to 9, inclusive;
Secs. [illegible] to 21, inclusive, and
Secs. [illegible] to 33, inclusive, unsurveyed.
T. 16 S., R. 8 W.,
Secs. 4 to 9, inclusive;
Secs. 16 to 21, inclusive, and
Secs. 28 to 33, inclusive, unsurveyed.
T. 17 S., R. 8 W.,
Secs. 4, 5, 6, and 9, unsurveyed.
Tps. 13 to 17 S., R. 9 W., unsurveyed.
T. 7 S., R. 10 W.,
Sec. 1, lots 1, 5, 6, and 7, SW¼NE¼, S½NW¼, SW¼, and W½SE¼;
Sec. 2, S½NE¼, SE¼NW¼, and S½;
Sec. 3, S½;
Sec. 4, S½SW¼ and SE¼;
Sec. 5, S½S½;
Secs. 7 to 30, inclusive.
Tps. 13 S., to 16 S., R. 10 W., unsurveyed.
T. 7 S., R. 11 W.,
Sec. 7, S½SE¼;
Sec. 8, S½S½;
Sec. 9, S½;
Sec. 10, S½;
Sec. 11, S½N½ and S½;
Sec. 12, [illegible], S½NW¼, and S½;
Secs. [illegible] to 36, inclusive.
T. 7 S., R. 12 W.,
Sec. 14, S½[illegible], and S½;
Sec. 15, [illegible]NE¼, and S½;
Sec. 16, [illegible];
Sec. [illegible], SE¼[illegible], and SE¼;
Sec. 20, NE¼, S½[illegible], and S½;
Sec. 21, NE¼, and S½;
Secs. 22 to 36, inclusive.
Tps. 8 and 9 S., R. 12 W.
T. 7 S., R. 13 W.,
Sec. 25;
Sec. 26, S½;
Sec. 27, SE¼SE¼;
Sec. 32, S½SE¼;
Sec. 33, S½NE¼ and S½;
Secs. 34, 35, and 36.
T. 8 S., R. 13 W.,
Secs. 1, 2, 3, and 4;
Sec. 5, lot 1 and S½;
Sec. 6, SE¼SE¼;
Sec. 7;
Secs. 8 to 36, inclusive.
T. 9 S., R. 13 W.
T. 8 S., R. 14 W.,
Sec. 11, S½SE¼;
Sec. 12, S½NE¼ and S½;
Secs. 13 and 14;
Sec. 15, [illegible]NE¼ and S½;
Sec. 16, S½SW¼ and SE¼;
Secs. 19 to 36, inclusive.
T. 9 S., R. 14 W.
T. 8 S., R. 15 W.,
Sec. 19, [illegible];
Sec. 20, [illegible]N½ and S½;
Secs. 21 to 36, inclusive.
T. 9 S., R. 15 W.
T. 8 S., R. 16 W.,
Sec. 23, S½S½;
Sec. 24, S½;
Secs. 25 to 28, inclusive;
Sec. 29, S½NE¼ and S½;
Sec. 30, S½;
Secs. 31 to 36, inclusive.
T. 9 S., R. 16 W.
T. 8 S., R. 17 W.,
Sec. 25, S½;
Sec. 26, S½SE¼;
Sec. 31, S½S½;
Sec. 32, S½;
Sec. 33, S½NE¼ and S½;
Secs. 34, 35, and 36.
T. 9 S., R. 17 W., partly unsurveyed.
T. 9 S., R. 18 W.,
Secs. 1 and 2;
Sec. 3, S½N½, and S½;
Sec. 4, S½N½, and S½;
Sec. 6, S½;
Secs. 7 to 36, inclusive.
T. 9 S., R. 19 W.,
Sec. [illegible], S½SW¼ and SE¼;
Sec. [illegible], [illegible]SW¼;
Sec. 6, [illegible];
Secs. 7 to [illegible], inclusive.
T. 9 S., R. [illegible] W.,
Sec. 1, SW¼[illegible]W¼, and S½;
Sec. 2, lot [illegible], [illegible]N½, and S½;
Sec. 3, lots [illegible] and 2, S½N½, and S½;
Sec. 4, E½[illegible];
Secs. 7 to 36, inclusive.
T. 10 S., R. 20 W.,
Secs. [illegible] to 3, 11, 12, 13, 24, and 25, unsurveyed.
T. 9 S., R. 21 W.,
Sec. 7, W½;
Sec. 8, [illegible], N½NW¼, and SE¼;
Secs. 9, 10, and 11;
Sec. 12, [illegible];
Secs. 13 to 17, inclusive;
Sec. 18, NE¼, S½NW¼, and S½;
Secs. 19 to 36, inclusive.
Tps. 10, 11, and 12 S., R. 21 W.
T. 9 S., R. 22 W.,
Sec. 11;
Sec. 12, W½ and W½E½;
Secs. [illegible] and 14;
Sec. 15, SE¼;
Sec. 2[illegible], E[illegible] and E½SW¼;
Secs. 22 to [illegible], inclusive;
Secs. 32 to 36, inclusive.
T. 10 S., R. 22 W.,
Secs. 1 to 5, inclusive;
Sec. [illegible], [illegible];
Secs. 7 to 20, inclusive;
Sec. 21, W[illegible];
Sec. 22, E½;
Secs. 23 to 36, inclusive.
Tps. 11 and 12 S., R. 22 W.

The areas described, including both public and nonpublic lands, aggregate approximately 705,300 acres.

This order shall be subject to (1) the reservation made by the Proclamation of May 27, 1907, reserving all public lands within 60 feet of the international boundary between the United States and the Republic of Mexico, and (2) the transmission line withdrawal under Federal Power Commission Project No. 482, so far as such reservations affect any of the above-described lands.

This order shall take precedence over, but shall not rescind or revoke, (1) the withdrawal for classification and other purposes made by Executive Order No. 6910 of November 26, 1934, as amended, (2) the withdrawal made by Executive Order No. 8038 of January 25, 1939, establishing the Cabeza Prieta Game Range, (3) the order of the Secretary of the Interior of March 14, 1929, withdrawing certain lands for reclamation purposes, and (4) the order of the Secretary of the Interior of July 14, 1938, establishing Arizona Grazing District No. 3, so far as such orders affect any of the above-described lands. After the present national emergency has been officially terminated, this order, so far as it affects lands heretofore withdrawn for reclamation purposes, shall be ineffective upon notice to the War Department by the Secretary of the Interior that such lands are needed for reclamation purposes; and it is intended that all of the above-described public lands shall be returned to the administration of the Department of the Interior, when they are no longer needed for the purposes for which they are reserved.

The Commanding Officer, Yuma Aerial Gunnery Range, will, after consultation with the local representatives of the Fish and Wildlife Service, Department of the Interior, designate at least two days each month on which there will be no firing affecting the lands in T. 14 S., R. 7 W., Tps. 13 to 17 S., R. 8 W., Tps. 13 to 16 S., Rs. 9 and 10 W., to enable the field personnel of the Fish and Wildlife Service to carry out normal patrol and maintenance activities.

On the lands in T. 14 S., R. 7 W., Tps. 13 to 17 S., R. 8 W., Tps. 13 to 16 S., Rs. 9 and 10 W., bombing shall be confined by the War Department to the valley floors, and shall not be permitted in the mountain areas, which are the important mountain sheep habitats, nor within a one-mile radius of all water holes, springs, wells, or tanks. Any roads and trails on such lands which may be damaged by War Department use shall be restored to good condition by the War Department upon return of the lands to the administration of the Department of the Interior.

ABE FORTAS,
Acting Secretary of the Interior.

MARCH 16, 1943.

[F. R. Doc. 43-4592; Filed, March 25, 1943; 11:44 a. m.]

[Public Land Order 98]

ARIZONA

WITHDRAWING PUBLIC LAND FOR USE OF THE WAR DEPARTMENT FOR AVIATION PURPOSES

By virtue of the authority vested in the President and pursuant to Executive Order No. 9146 of April 2[illegible], 1942, and to section 3 [illegible] the act of June 17, 1902, 32 Stat. 388 (U. S. C., title 43, sec. 416), *It is ordered*, As follows:

Subject to valid existing rights, the following-described public land is hereby withdrawn from all forms of appropriation under the public-land laws, including the mining and mineral-leasing laws, and reserved for the use of the War Department for aviation purposes:

GILA AND SALT RIVER MERIDIAN

T. 7 S., R. 12 W., sec. 7.
The area described contains 627.90 acres.

This order shall take precedence over, but shall not rescind or revoke, the order of March 14, 1929, of the Secretary of the Interior, withdrawing certain lands for reclamation purposes, so far as such order affects the above-described land. After the expiration of the six months' period following the termination of the unlimited national emergency declared by Proclamation No. 2487 of May 27, 1941 (55 Stat. 1647), this order shall become ineffective upon notice to the War Department by the Secretary of the Interior that the land is needed for reclamation purposes.

ABE FORTAS,
Acting Secretary of the Interior.

MARCH 17, 1943.

[F. R. Doc. 43-4593; Filed, March 25, 1943; 11:45 a. m.]

[Public Land Order 99]

CALIFORNIA

WITHDRAWING PUBLIC LANDS FOR USE OF THE NAVY DEPARTMENT AS A NAVAL SUPPLY DEPOT

By virtue of the authority vested in the President and pursuant to Executive Order No. 9146 of April 24, 1942, *It is ordered*, As follows:

Subject to valid existing rights and to the transmission-line withdrawal under Federal Power Project No. 882, the following-described public lands are hereby withdrawn from all forms of appropriation under the public-land laws, including the mining and mineral-leasing laws, and reserved for the use of the Navy Department as a naval supply depot:

SAN BERNARDINO MERIDIAN

T. [illegible] N., R. [illegible] W.,
Sec. 14, [illegible];
Sec. 15, $E\frac{1}{2}NE\frac{1}{4}NE\frac{1}{4}$.

The areas described aggregate 340 acres.

This order shall take precedence over, but shall not rescind or revoke, the withdrawal for classification and other purposes made by Executive Order No. 6910 of November 26, 1934, as amended, so far as such order affects the above-described lands.

It is intended that the lands described herein shall be returned to the administration of the Department of the Interior, when they are no longer needed for the purpose for which they are reserved.

ABE FORTAS,
Acting Secretary of the Interior.

MARCH 17, 1943.

[F. R. Doc. 43-4594; Filed, March 25, 1943; 11:44 a. m.]

[Public Land Order 100]

MONTANA

WITHDRAWING PUBLIC LANDS FOR USE OF THE WAR DEPARTMENT FOR MILITARY PURPOSES

By virtue of the authority vested in the President and pursuant to Executive Order No. 9146 of April 24, 1942, *It is ordered*, As follows:

Subject to valid existing rights, the public lands in the following-described areas are hereby withdrawn from all forms of appropriation under the public-land laws, including the mining and mineral-leasing laws, and reserved for the use of the War Department for military purposes:

PRINCIPAL MERIDIAN

T. 26 N., R. 4 E.,
Secs. 11 to 14, inclusive.
T. 27 N., R. 3 E.,
Secs. 4, 5, 8, 9, 16, 17, 20, and 21.
T. 28 N., R. 3 E.,
Secs. 28, 29, 32, and 33.

The areas described, including both public and non-public lands, aggregate 10,241.20 acres.

This order shall take precedence over, but shall not rescind or revoke, the withdrawal for classification and other purposes made by Executive Order No. 6910 of November 26, 1934, as amended, so far as such order affects the above-described lands.

It is intended that the public lands herein described shall be returned to the administration of the Department of the Interior, when they are no longer needed for the purpose for which they are reserved.

ABE FORTAS,
Acting Secretary of the Interior.

MARCH 17, 1943.

[F. R. Doc. 43-4595; Filed, March 25, 1943; 11:45 a. m.]

Office of the Solicitor.

[Order No. 1790]

COMMISSIONER OR ASSISTANT COMMISSIONER OF GENERAL LAND OFFICE

AUTHORIZATION TO ACT IN CERTAIN MATTERS

MARCH 19, 1943.

Pursuant to sections 161, 453 and 2478 Rev. Stat. (5 U.S.C. sec. 22 and 43 U.S.C. secs. 2, and 1201 respectively), *It is hereby ordered*, As follows:

I. The Commissioner or Assistant Commissioner of the General Land Office may hereafter act in relation to the following classes of matters without obtaining Secretarial approval, unless the Secretary in any particular matter determines otherwise, subject in any event to an appeal to the Secretary according to the rules of practice and subject to the provisions of Part II of this order:

(a) Applications to lease public lands for public airports under the act of May 24, 1928 (45 Stat. 728; 49 U.S.C. secs. 211-214), and the issuance, assignment, modification or cancelation of such leases.

(b) Applications to lease public lands for a home, cabin, camp, health, convalescent, recreational, or business site under the act of June 1, 1938 (52 Stat. 609; 43 U.S.C. sec. 682a), and the issuance, assignment, modification or cancelation of such leases.

(c) Applications to lease public lands in Alaska for fur farms under the Act of July 3, 1926 (44 Stat. 821; 48 U.S.C. secs. 360, 361), and the issuance, assignment, modification or cancelation of such leases.

(d) Applications to lease public lands in Alaska for grazing purposes under the act of March 4, 1927 (44 Stat. 1452; 48 U.S.C. secs. 471, 471a-471o), and the issuance, assignment, modification or cancelation of such leases.

(e) Applications by States, counties or municipalities to lease public lands for recreational use under the act of June 14, 1926 (44 Stat. 741; 43 U.S.C. sec. 869), or the act of April 13, 1928 (45 Stat. 429; 43 U.S.C. sec. 869a), and the issuance, modification or cancelation of such leases.

(f) Applications to use public lands under right-of-way permits for tramroads under the act of January 21, 1895 (28 Stat. 635; 43 U.S.C. sec. 956), and the issuance, assignment, modification or cancelation of such permits.

(g) Applications to use public lands under permits for rights-of-way under the act of February 15, 1901 (31 Stat. 790; 43 U.S.C. sec. 959 and 16 U.S.C. sec. 79), and the issuance, assignments, modification or cancelation of such permits: *Provided, however*, That cancelation shall be only in the circumstances specifically prescribed in regulations of the Secretary. The authority herein prescribed shall not relate to applications or permits involving lands within national parks, Indian or other reservations of the United States.

(h) Applications to use public lands under right-of-way easements under the act of March 4, 1911 (36 Stat. 1235, 1253-54; 43 U.S.C. sec. 961), and the issuance and assignment of such easements. The authority herein prescribed shall not relate to applications or permits involving lands within national parks, Indian or other reservations of the United States, nor to the modification or revocation of any easements granted under the act of March 4, 1911.

(i) Approvals of clear lists of State selections under the act of February 28, 1891 (26 Stat. 796, 43 U. S. C. sec. 851), and section 2449, Rev. Stat. (43 U. S. C. sec. 859).

VO Mine Area

AMERICAN SMELTING AND REFINING COMPANY
SOUTHWESTERN EXPLORATION DIVISION
P. O. BOX 5747, TUCSON, ARIZONA 85703

1150 NORTH 7TH AVENUE
TELEPHONE 602-792-3010

May 2, 1972

Mr. Lester Cox
P. O. Box Y
Miami, Arizona

Dear Lester:

Attached are the assay results from your percussion drilling in the VO Mine area.

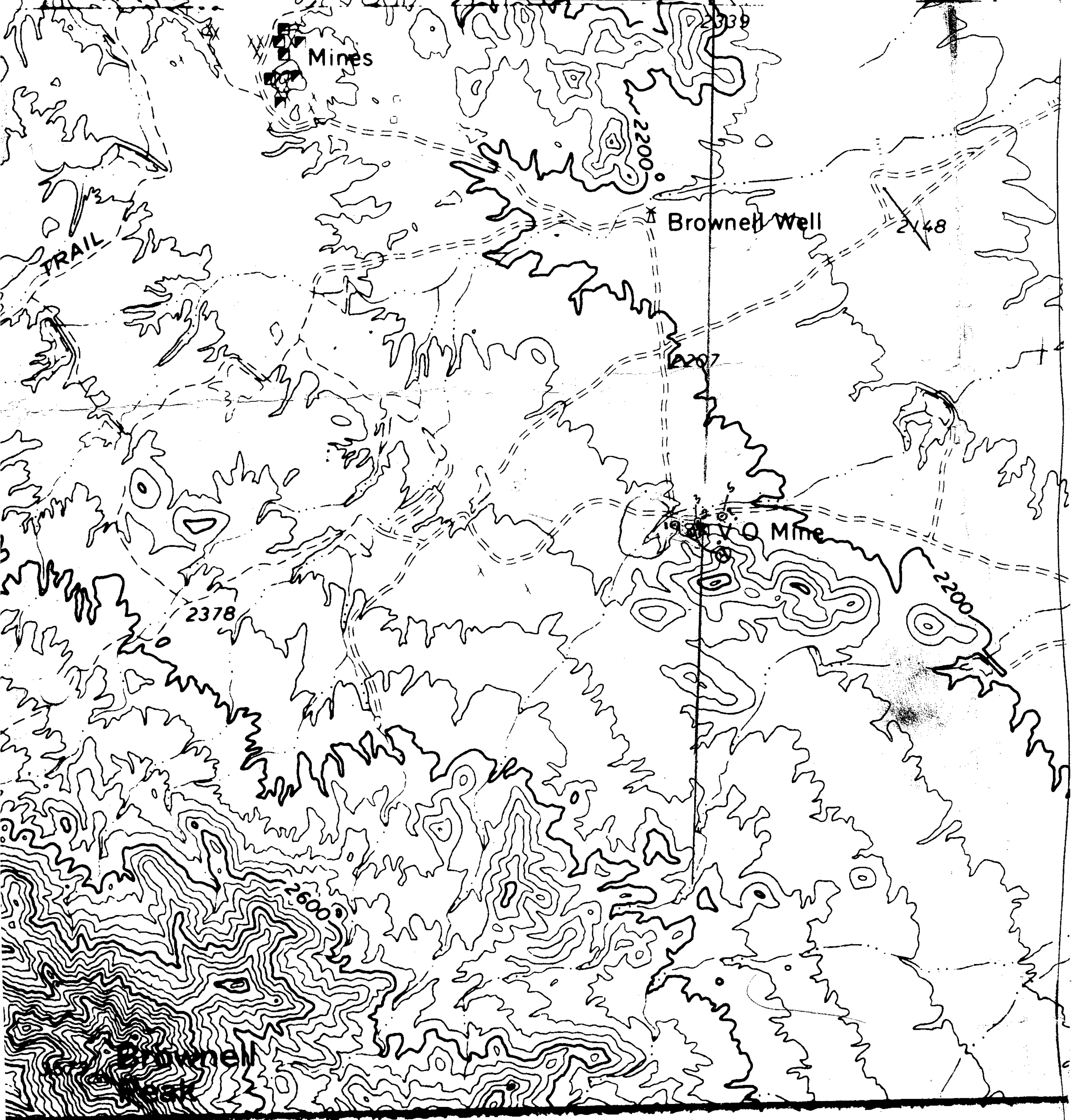
As verbally reported, the copper assays are very low and the gold-silver values hardly get up into the interesting range.

I'll be back in the Globe area later this week and hope to get together with you and look at a few more properties.

Regards,

James D. Sell
James D. Sell

JDS:lad
Attachs.



V. O. Mine

from Shaft. depth.

90'

#1 N 80½ W - 306' 105'

#2 N 82 W - 33' 105'

#3 N 27 W - 124' 105'

#4 N 62 W - 102'

1" = 2000'

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

April 25, 1972

TO: W. L. Kurtz

FROM: J. D. Sell

VO Mine Drilling
Gu Achi Quad.
Papago Indian Reservation
Pima County, Arizona

Mr. Les Cox of Miami (lives south of Sutton Summit) drilled five rotary percussion holes around the VO Mine, approximately ten miles south and west of Gu Achi (Santa Rosa). ASARCO supplied a sampler part time and assayed the cuttings in exchange for the information.

The general geology of the area is given in the report: "Geologic Reconnaissance Mapping, Noipa Kam Area (Gu Achi)", submitted to J. H. Courtright on August 25, 1969 by J. D. Sell. The VO Mine is in the south central part of the mapped area.

Oxide copper is noted at the surface and a small pit developed with minor production. Silver was reported to run several ounces and Mr. Cox was testing the possibilities below the pit level.

Samples were cut on five-foot intervals and assayed for copper, moly, gold, and silver. All results were low and extension possibilities were negated.

Table 1 lists the drill holes in relation to the shaft on the property. Table 2 reports the values received.

James D. Sell

James D. Sell

JDS:lad
Attachs.

TABLE 1

Location of Drill Holes, and Depth, from Shaft

VO#	Direction	Distance	Depth
1	N80-1/2°W	306 feet	90 feet
2	N82°W	33 feet	105 feet
3	N27°W	124 feet	105 feet
4	N62°W	102 feet	205 feet
5	N48°E (?)	380(?) feet	125 feet

TABLE 2

Assay Results

VO Hole Depth	#1 PPM Cu	#1 PPM CuOx	#2 PPM Cu	#2 PPM CuOx	#3 PPM Cu	#3 PPM CuOx	#4 PPM Cu	#4 PPM CuOx	#5 PPM Cu	#5 PPM CuOx
0-5	--	--	1978	1900	--	--	314	150	135	--
5-10	--	--	4800	4500	85	69	58	45	68	--
10-15	--	--	2600	2400	57	51	31	30	22	--
15-20	--	--	85	--	66	62	38	31	10	--
20-25	--	--	61	--	70	67	70	--	8	--
25-30	24	11	40	--	102	100	41	--	7	--
30-35	22	7	25	--	340	--	36	--	4	--
35-40	23	9	25	--	156	--	33	--	6	--
40-45	25	9	228	--	107	--	18	--	4	--
45-50	14	--	1060	--	143	--	24	--	6	--
50-55	15	--	233	--	480	--	16	--	7	--
55-60	32	--	850	--	2900	--	17	--	8	--
60-65	20	--	541	--	611	--	41	--	5	--
65-70	15	--	883	--	531	--	23	--	3	--
70-75	11	--	44	--	203	--	14	--	5	--
75-80	18	--	36	--	69	--	64	--	4	--
80-85	19	--	27	--	709	--	175	--	3	--
85-90	17	--	17	--	306	--	74	--	3	--
90-95	TD.	TD.	19	--	68	--	39	--	12	--
95-100			48	--	202	--	695	--	59	--
100-105			730	--	3900	--	680	--	208	--
105-110			TD.	TD.	TD.	TD.	90	--	181	--
110-115							29	--	120	--
115-120							28	--	63	--
120-125							20	--	54	--
125-130							17	--	TD.	TD.
130-135							77	--		
135-140							46	--		
140-145							29	--		
145-150							29	--		
150-155							20	--		
155-160							44	--		
160-165							29	--		
165-170							22	--		
170-175							194	--		
175-180							767	--		
180-185							647	--		
185-190							508	--		
190-195							476	--		
195-200							440	--		
200-205							312	--		
							TD.	TD.		

Table 2 -
Page 2

VO Hole Depth	#1 PPM Mo	#2 PPM Mo	#3 PPM Mo	#4 PPM Mo	#5 PPM Mo
0-5	--	2344	--	54	28
5-10	--	305	28	31	29
10-15	--	61	19	60	14
15-20	--	29	18	60	14
20-25	--	45	25	33	15
25-30	13	26	29	35	11
30-35	21	46	11	39	11
35-40	19	30	10	33	17
40-45	19	80	18	40	12
45-50	19	328	14	29	16
50-55	23	31	31	32	19
55-60	30	24	62	22	16
60-65	21	27	130	30	17
65-70	15	25	31	28	20
70-75	18	74	41	37	14
75-80	20	80	35	96	7
80-85	21	37	217	138	11
85-90	20	25	123	107	9
90-95	TD.	41	34	69	12
95-100		200	25	260	37
100-105		45	87	166	30
105-110		TD.	TD.	NA.	60
110-115					29
115-120					21
120-125					16
					TD.

Depth	#1 oz/ton Au	#1 oz/ton Ag	#2 oz/ton Au	#2 oz/ton Ag	#3 oz/ton Au	#3 oz/ton Ag	#4 oz/ton Au	#4 oz/ton Ag	#5 oz/ton Au	#5 oz/ton Ag
0-5	--	--	Tr.	1.05	--	--	Tr.	0.19	0.003	0.05
5-10	--	--	Tr.	1.36	Tr.	0.08	Tr.	0.23	0.001	0.33
10-15	--	--	Tr.	0.65	Tr.	0.10	Tr.	0.23	Tr.	0.14
15-20	--	--	Tr.	0.18	Tr.	0.10	Tr.	0.11	Tr.	0.12
20-25	--	--	Tr.	0.18	Tr.	0.05	Tr.	0.07	Tr.	0.01
25-30	Tr.	0.02	Tr.	0.27	Tr.	0.21	Tr.	0.07	Tr.	0.17
30-35	Tr.	0.13	Tr.	0.16	Tr.	0.87	Tr.	0.10	Tr.	0.08
35-40	Tr.	Tr.	Tr.	0.12	Tr.	0.35	Tr.	0.16	Tr.	0.10
40-45	Tr.	0.05	Tr.	0.16	Tr.	0.29	Tr.	0.02	Tr.	0.13
45-50	Tr.	0.10	0.001	0.59	Tr.	0.30	Tr.	0.02	Tr.	0.09
50-55	Tr.	0.10	Tr.	0.10	Tr.	0.13	Tr.	0.17	Tr.	0.04
55-60	Tr.	0.03	Tr.	0.36	Tr.	1.10	Tr.	0.04	Tr.	0.01
60-65	Tr.	0.06	Tr.	0.26	Tr.	0.27	Tr.	0.14	Tr.	0.01
65-70	Tr.	0.16	Tr.	0.29	Tr.	0.43	Tr.	0.09	Tr.	0.01
70-75	Tr.	0.07	Tr.	0.26	Tr.	0.29	Tr.	0.12	Tr.	0.03
75-80	Tr.	0.13	Tr.	0.11	Tr.	0.07	Tr.	0.26	Tr.	0.01
80-85	Tr.	0.03	Tr.	0.12	Tr.	0.59	Tr.	0.32	Tr.	0.05
85-90	Tr.	0.09	Tr.	0.10	Tr.	0.27	Tr.	0.21	Tr.	0.10
90-95	TD.	TD.	Tr.	0.14	Tr.	0.06	Tr.	0.20	Tr.	0.01

VO Hole	#1		#2		#3		#4		#5	
Depth	oz/ ton Au	oz/ ton Ag	oz/ ton Au	oz/ ton Ag	oz/ ton Au	oz/ ton Ag	oz/ ton Au	oz/ ton Ag	oz/ ton Au	oz/ ton Ag
95-100			Tr.	0.20	Tr.	0.23	Tr.	0.17	Tr.	0.12
100-105			Tr.	0.39	0.001	2.37	Tr.	0.42	Tr.	0.13
105-110			TD.	TD.	TD.	TD.	Tr.	0.13	Tr.	0.01
110-115							Tr.	0.02	Tr.	0.10
115-120							Tr.	0.10	Tr.	0.05
120-125							Tr.	0.02	Tr.	0.07
125-130							Tr.	0.03	TD.	TD.
130-135							Tr.	0.03		
135-140							Tr.	0.02		
140-145							Tr.	0.08		
145-150							Tr.	0.15		
150-155							Tr.	0.04		
155-160							Tr.	0.02		
160-165							Tr.	0.03		
165-170							Tr.	0.10		
170-175							Tr.	0.23		
175-180							0.001	0.45		
180-185							Tr.	0.33		
185-190							0.001	0.36		
190-195							0.002	0.42		
195-200							0.001	0.38		
200-205							0.001	0.21		
							TD.	TD.		

3226 East 46th Street
Phone 624-0049

AMERICAN ANALYTICAL and RESEARCH LABORATORIES

ASSAYERS - CHEMISTS - METALLURGISTS

TUCSON, ARIZONA 85713

SAMPLE SUBMITTED BY American Smelting & Refining Company

DATE Feb. 25, 1972

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PPM COPPER	PERCENT LEAD	PERCENT ZINC	PPM MOLYBDENUM	PERCENT IRON	PPM Ox Cu
Vol-1 25-30	Trace*	0.02	24			13		11
30-35	Trace	0.13	22			21		7
35-40	Trace	Trace	23			19		9
40-45	Trace	0.05	25			19		9
45-50	Trace	0.10	14			19		
50-55	Trace	0.10	15			23		
55-60	Trace	0.03	32			30		
60-65	Trace	0.06	20			21		
65-70	Trace	0.16	15			15		
70-75	Trace	0.07	11			18		
75-80	Trace	0.13	18			20		
80-85	Trace	0.03	19			21		
85-90	Trace	0.09	17			20		

*Trace indicates less than .001 oz./ton

REGISTERED ASSAYER CERTIFICATE NO. 6852 PETE S. FLORES Date Signed 2/25/72 Arizona U. S. A.

Invoice # 7369

CHARGES $ 95.00

ASSAYER-CHEMIST

3226 East 46th Street Phone 624-0049

AMERICAN ANALYTICAL and RESEARCH LABORATORIES

ASSAYERS - CHEMISTS - METALLURGISTS

TUCSON, ARIZONA 85713

SAMPLE SUBMITTED BY American Smelting & Refining DATE Feb. 25, 1972

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PPM COPPER	PERCENT LEAD	PERCENT ZINC	PPM MOLYBDENUM	PERCENT IRON	Percent Ox Cu
Vol-2 0-5	*Trace	1.05	1978					0.19
5-10	Trace	1.36	2000+			305		0.45
10-15	Trace	0.65	2000+			61		0.24
15-20	Trace	0.18	85			29		
20-25	Trace	0.18	61			45		
25-30	Trace	0.27	40			26		
30-35	Trace	0.16	25			46		
35-40	Trace	0.12	25			30		
40-45	Trace	0.16	228			80		
45-50	.001	0.59	1060			328		
50-55	Trace	0.10	233			31		
55-60	Trace	0.36	850			24		
60-65	Trace	0.26	541			27		
65-70	Trace	0.29	883			25		
70-75	Trace	0.26	44			74		
75-80	Trace	0.11	36			80		
80-85	Trace	0.12	27			37		
85-90	Trace	0.10	17			25		
90-95	Trace	0.14	19			41		
95-100	Trace	0.20	48			200		
100-105	Trace	0.39	730			45		

*Trace indicates less than .001 oz/Ton

Invoice # 7369

CHARGES $ 151.00

REGISTERED ASSAYER
CERTIFICATE NO. 6852
PETE S. FLORES
Date Signed 2/25/72
Arizona U. S. A.

ASSAYER-CHEMIST

3226 East 46th Street

Phone 624-0049

AMERICAN ANALYTICAL and RESEARCH LABORATORIES

ASSAYERS - CHEMISTS - METALLURGISTS

TUCSON, ARIZONA 85713

SAMPLE SUBMITTED BY American Smelting & Refining Company

DATE Feb. 25, 1972

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PER CENT COPPER	PERCENT LEAD	PERCENT ZINC	PERCENT MOLYBDENUM	PERCENT IRON	
Vol-2 0-5						.2344		
5-10			0.48					
10-15			0.26					

REGISTERED ASSAYER CERTIFICATE No. 6852 PETE S. FLORES Date Signed Arizona U. S. A.

2/25/72

ASSAYER-CHEMIST

Invoice # 7369

CHARGES $ 7.25

3226 East 46th Street K.V.D.S. 3 1972 Phone 624-0049

AMERICAN ANALYTICAL and RESEARCH LABORATORIES

ASSAYERS - CHEMISTS - METALLURGISTS

TUCSON, ARIZONA 85713

SAMPLE SUBMITTED BY American Smelting & Refining Company DATE Feb. 29, 1972

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PPM COPPER	PERCENT LEAD	PERCENT ZINC	PPM MOLYBDENUM	PERCENT IRON	PPM Ox Cu
VO:3 5-10			85			28		69
10-15			57			19		51
15-20			66			18		62
20-25			70			25		67
20-30			102			29		100
30-35			340			11		
35-40			156			10		
40-45			107			18		
40-50			143			14		
50-55			480			31		
55-60			2000+			62		
60-65			611			130		
65-70			531			31		
70-75			203			41		
75-80			69			35		
80-85			709			217		
85-90			306			123		
90-95			68			34		
95-100			202			25		
100-105			2000+			87		

REGISTERED ASSAYER CERTIFICATE NO. 3962 PETE S. FLORES Date Signed Arizona U.S.A.

2/29/72

Invoice # 7387

CHARGES $ 75.00

ASSAYER-CHEMIST

3226 East 46th Street
Phone 624-0049

AMERICAN ANALYTICAL and RESEARCH LABORATORIES

ASSAYERS - CHEMISTS - METALLURGISTS

TUCSON, ARIZONA 85713

SAMPLE SUBMITTED BY American Smelting and Refining Company

DATE March 7, 1972

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PER CENT COPPER	PERCENT LEAD	PERCENT ZINC	PERCENT MOLYBDENUM	PERCENT IRON	
VO #3 55-60			0.29					
VO #3 100-105			0.39					

K.V.D.S.
MAR 9 1972

REGISTERED ASSAYER
CERTIFICATE NO. 6272
PETE S. FLORES
Date Signed 3/7/72
Arizona U. S. A.

#7417

CHARGES $ 3.00

ASSAYER-CHEMIST

3226 East 46th Street Phone 624-0049

AMERICAN ANALYTICAL and RESEARCH LABORATORIES

ASSAYERS - CHEMISTS - METALLURGISTS

TUCSON, ARIZONA 85713

VO #3

SAMPLE SUBMITTED BY American Smelting and Refining Company DATE March 3, 1972

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PER CENT COPPER	PERCENT LEAD	PERCENT ZINC	PERCENT MOLYBDENUM	PERCENT IRON	
5–10	Trace	0.08						
10–15	Trace	0.10						
15–20	Trace	0.10						
20–25	Trace	0.05						
20–30	Trace	0.21						
30–35	Trace	0.87						
35–40	Trace	0.35						
40–45	Trace	0.29						
45–50	Trace	0.30						
50–55	Trace	0.13						
55[illegible]	Trace	1.10						
60–65	Trace	0.27						
65–70	Trace	0.43						
70–75	Trace	0.29						
75–80	Trace	0.07						
80–85	Trace	0.59						
85–90	Trace	0.27						
90–95	Trace ~~.001~~	0.06 ~~2.37~~						
95–100	Trace	0.23						
100–105	0.001 ~~Trace~~	2.37 ~~0.06~~						

K.V.D.S.
MAR 6 1972

REGISTERED ASSAYER
CERTIFICATE NO. 6862
PETE S. FLORES
Date Signed 3/3/72
Arizona U. S. A.

#7396

CHARGES $ 70.00

ASSAYER - CHEMIST

3226 East 46th Street Phone 624-0049

AMERICAN ANALYTICAL and RESEARCH LABORATORIES

ASSAYERS - CHEMISTS - METALLURGISTS

TUCSON, ARIZONA 85713

K.V.S. MAR 3 1972

SAMPLE SUBMITTED BY American Smelting & Refining Company DATE Feb. 29, 1972

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PPM COPPER	PERCENT LEAD	PERCENT ZINC	PPM MOLYBDENUM	PERCENT IRON	PPM Ox Cu
Vo:4 0-5			314			54		150
5-10			58			31		45
10-15			31			60		30
15-20			38			60		31
20-25			70			33		
25-30			41			35		
30-35			36			39		
35-40			33			33		
40-45			18			40		
45-50			24			29		
50-55			16			32		
55-60			17			22		
60-65			41			30		
65-70			23			28		
70-75			14			37		
75-80			64			96		
80-85			175			138		
85-90			74			107		
90-95			39			69		
95-100			695			260		
100-105			680			166		

REGISTERED ASSAYER CERTIFICATE NO. 6854 PETE S. FLORES Date Signed Arizona U. S. A.

2/29/72

Invoice # 7387

CHARGES $ 77.50

ASSAYER-CHEMIST

3226 East 46th Street

Phone 624-0049

AMERICAN ANALYTICAL and RESEARCH LABORATORIES

ASSAYERS - CHEMISTS - METALLURGISTS

TUCSON, ARIZONA 85713

VO #4

SAMPLE SUBMITTED BY American Smelting and Refining Company

DATE March 3, 1972

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PER CENT COPPER	PERCENT LEAD	PERCENT ZINC	PERCENT MOLYBDENUM	PERCENT IRON	
0-5	Trace	0.19						
5-10	Trace	0.23						
10-15	Trace	0.23						
15-20	Trace	0.11						
20-25	Trace	0.07						
25-30	Trace	0.07						
30-35	Trace	0.10						
35-40	Trace	0.16						
40-45	Trace	0.02						
45-50	Trace	0.02						
50-55	Trace	0.17						
55-60	Trace	0.04						
60-65	Trace	0.14						
65-70	Trace	0.09						
70-75	Trace	0.12						
75-80	Trace	0.26						
80-85	Trace	0.32						
85-90	Trace	0.21						
90-95	Trace	0.20						
95-100	Trace	0.17						
100-105	Trace	0.42						

K.V.D.S.
MAR 6 1972

REGISTERED ASSAYER
CERTIFICATE NO. 6852
PETE S. FLORES
Date Signed 3/3/72
Arizona U. S. A.

#7396

CHARGES $ 73.50

ASSAYER-CHEMIST

3226 East 46th Street Phone 624-0049

AMERICAN ANALYTICAL and RESEARCH LABORATORIES

ASSAYERS - CHEMISTS - METALLURGISTS

TUCSON, ARIZONA 85713

SAMPLE SUBMITTED BY American Smelting and Refining Company DATE March 13, 1972

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PPM COPPER	PERCENT LEAD	PERCENT ZINC	PERCENT MOLYBDENUM	PERCENT IRON	
VO #4 105-110	Trace	0.13	90					
110-115	Trace	0.02	29					
115-120	Trace	0.10	28					
120-125	Trace	0.02	20					
125-130	Trace	0.03	17					
130-135	Trace	0.03	77				K.V.D.S.	
135-140	Trace	0.02	46				MAR 16 1972	
140-145	Trace	0.08	29					
145-150	Trace	0.15	29					
150-155	Trace	0.04	20					
155-160	Trace	0.02	44					
160-165	Trace	0.03	29					
165-170	Trace	0.10	22					
170-175	Trace	0.23	194					
175-180	.001	0.45	767					
180-185	Trace	0.33	647					
185-190	.001	0.36	508					
190-195	.002	0.42	476					
195-200	.001	0.38	440					
200-205	.001	0.21	312					

Invoice # 7442

CHARGES $ 65.00

REGISTERED ASSAYER CERTIFICATE No. 6852 PETE S. FLORES Date Signed 3/13/72 Arizona U. S. A.

ASSAYER-CHEMIST

3226 East 46th Street
Phone 624-0049

AMERICAN ANALYTICAL and RESEARCH LABORATORIES

ASSAYERS - CHEMISTS - METALLURGISTS

TUCSON, ARIZONA 85713

SAMPLE SUBMITTED BY American Smelting & Refining Company

DATE March 31, 1972

SAMPLE MARKED	GOLD OZ./TON	SILVER OZ./TON	PPM COPPER	PERCENT LEAD	PERCENT ZINC	PPM MOLYBDENUM	PERCENT IRON	
VO#5 0-5	.003	0.05	135			28		
5-10	.001	0.33	68			29		
10-15	Trace	0.14	22			14		
15-20	Trace	0.12	10			14		
20-25	Trace	0.01	8			15		
25-30	Trace	0.17	7			11		
30-35	Trace	0.08	4			11		
35-40	Trace	0.10	6			17		
40-45	Trace	0.13	4			12		
45-50	Trace	0.09	6			16		
50-55	Trace	0.04	7			19		
55-60	Trace	0.01	8			16		
60-65	Trace	0.01	5			17		
65-70	Trace	0.01	3			20		
70-75	Trace	0.03	5			14		
75-80-	Trace	0.01	4			7		
80-85	Trace	0.05	3			11		
85-90	Trace	0.10	3			9		
90-95	Trace	0.01	12			12		
95-100	Trace	0.12	59			37		
100-105	Trace	0.13	208			30		
105-110	Trace	0.01	181			60		
110-115	Trace	0.10	120			29		
115-120	Trace	0.05	63			21		
120-125	Trace	0.07	54			16		

Invoice # 7511

CHARGES $ 175.00

REGISTERED ASSAYER CERTIFICATE 6852 PETE S. FLORES Date Signed Arizona U. S. A.

3/31/72

ASSAYER-CHEMIST