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

The following file is part of the

James Doyle Sell Mining Collection

ACCESS STATEMENT

These digitized collections are accessible for purposes of education and research. We have indicated what we know about copyright and rights of privacy, publicity, or trademark. Due to the nature of archival collections, we are not always able to identify this information. We are eager to hear from any rights owners, so that we may obtain accurate information. Upon request, we will remove material from public view while we address a rights issue.

CONSTRAINTS STATEMENT

The Arizona Geological Survey does not claim to control all rights for all materials in its collection. These rights include, but are not limited to: copyright, privacy rights, and cultural protection rights. The User hereby assumes all responsibility for obtaining any rights to use the material in excess of "fair use."

The Survey makes no intellectual property claims to the products created by individual authors in the manuscript collections, except when the author deeded those rights to the Survey or when those authors were employed by the State of Arizona and created intellectual products as a function of their official duties. The Survey does maintain property rights to the physical and digital representations of the works.

QUALITY STATEMENT

The Arizona Geological Survey is not responsible for the accuracy of the records, information, or opinions that may be contained in the files. The Survey collects, catalogs, and archives data on mineral properties regardless of its views of the veracity or accuracy of those data.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

June 14, 1954

FILE MEMORANDUM

PIMA DRILL PRACTICE

Mr. Kenyon Richard and I visited Pima on May 12 and discussed their experience in rotary drilling through the gravels. The equipment used by Pima is:

Drill rig — Joy HD 22, hydraulic feed
Mud pump — Gardner Denver 4½ x 6", Model #FG-X6
Ford Truck model F8 (truck model drive)

The procedure used is as follows: 2 pits 6' x 6' x 3' deep are excavated and mud mixed by using 4 or 5 bags of aquagell and 2 or 3 shovels full of lime. This mixture is adequate for rotary drilling through 200 feet of gravel to bedrock.

The "N" rods and a 3-7/8" rotary bit are used to reach bedrock. Then a 5-foot BX hole is drilled in bedrock with the diamond drill bit to form a seat for the AX casing. The mud in use is thinned down for this short run with the diamond bit. No caving of the gravels was experienced during this short run. After AX casing is installed it is anchored at the surface with angle iron.

Mr. Thurmond stated that the average time consumed for setting up, drilling to bedrock (200 feet), setting casing, and preparing to start coring was two 8-hour shifts. He said they occasionally encountered boulders possibly 8 or 10 inches in diameter and that they usually managed to crowd these outside of the hole and drill by them.

The churn drill now operating at Pima averaged 27 feet per shift for the month of May. This is for both bedrock and gravel drilling. The average for gravel drilling was around 50 feet per shift.

Original signed by
J. H. Courtright

J. H. Courtright

JHC:ar

cc: FVRichard

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

February 9, 1954

CONFIDENTIAL
FILE MEMORANDUM

UNITED GEOPHYSICAL COMPANY

Reference is made to Memorandum dated February 5 for Mr. Pope by Mr. F. V. Richard, subject above, particularly paragraph 2, page 1.

The loop traversed with the motorized magnetometer, or "Mo-Mag", Oracle-San Manuel-Mammoth-San Pedro River-Oracle, picked up the high and low zones of magnetic intensity in general correspondence with those shown on the government Total Intensity Aeromagnetic Map of Mammoth. The positions were displaced somewhat which was explained as being due to the height of the plane which made the government traverses. It would seem that the Mo-Mag would give more accurate and more detailed data than an airborne magnetometer if the matter of accessibility by truck is disregarded.

The continuous recording apparatus of the Mo-Mag may be motivated either by a clock or the truck wheel. This continuous record provides information on magnetic detail which is not obtained either with the airborne magnetometer or with the station-to-station readings of the conventional ground instrument. For example the continuous record of the Mo-Mag on the San Manuel traverse showed small, erratic close-spaced highs and lows over known Oracle granite. In contrast, over known Gila conglomerate the curves were relatively smooth. These distinctive characteristics of the two formations of course were not evident in the aeromagnetic survey, and they would not have been apparent in the average ground traverse because of too-wide spacing of stations. Thus, the Mo-Mag may provide a means of making formational distinctions under gravel cover where the other methods would not.

The principal disadvantage of the Mo-Mag is its limitation to terrain which can be traversed by the four-wheel drive truck. (The magnetometer is mounted on a boom projecting from the back of the truck to a height of about 15 feet above the ground). Assuming accessible terrain, the cost of $5.00 per mile of traverse is low, and the Mo-Mag would be a useful instrument for certain specific jobs. It would not be worthwhile as a replacement for aeromagnetic work in regional prospecting. I have no specific areas to recommend using it on at the present time. But as an example, if additional magnetometer work were again to be considered for the Organ District, the Mo-Mag should be the best equipment to use.

Original Signed By
K. Richard

KENYON RICHARD

KRisr

cc: CPPollock
FVRichard
WRLandwehr
TASnedden
RJLacy

J. H. COURTRIGHT

Aa-16.16.20A

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

January 25, 1954

Mr. W. R. Landwehr, Chief Geologist
Western Mining Department
Salt Lake City Office

PIMA MINE
New Drill Hole Data

Dear Sir:

Reference is made to my letter of January 16 to Mr. Pollock, discussing new drilling results, and in which it was stated that detailed sections would be compiled. Four sections are attached showing the geological relationship brought out by the four holes recently drilled by Pima. For convenience the plan map again is attached.

These four sections are revisions of sections in the October 12 geological report by Mr. Courtright and Mr. Hardie. As implied in that report, there seemed to be a reasonable possibility that Pima ore followed a limestone bed in the Permian series and that the footwall of significant mineralization was roughly defined by a metamorphosed shale horizon. Likewise, the hanging wall appeared to be hornfels (metamorphosed shale). However, due to the meager amount of drill data (lack of sufficient drill hole penetrations and/or lack of core samples) available at that time, these opinions were not well supported by good evidence.

Our study of the cores of the 4 recent holes has substantiated the opinions relative to the footwall, but has indicated that the hanging wall may be made up entirely of altered Cretaceous arkose. The significance of this is that the Pima mineralized zone follows a limestone bed and may be projected with more assurance than was formerly the case.

The footwall breccia zone follows the shale horizon and appears to be post-mineral in age.

Yours very truly,

Original Signed By
K. Richard

KENYON RICHARD

KR:ar

encs.
cc: WRLandwehr - 1 extra, w/attachments
FVRichard - w/o attachments
TASnedden - w/attachments
JHCourtright - w/o attachments

J. H. COURTRIGHT

Aa-16.16.20A

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

July 19, 1954

Mr. W. H. Landwehr, Chief Geologist
Western Mining Department
Salt Lake City Office

PIMA MINE
Maps & Sections
Joralemon Report

Dear Sir:

Today we received a complete set of prints of the Pima Mine plan maps, sections and drill logs. Also, we received a copy of a report dated May 27, 1954, of the Pima Mining Company by Ira Joralemon. Enclosed are three copies of this report.

We have done no more than glance at the Pima's maps and sections but it is our impression that Mr. Joralemon's report is unduly optimistic and very promotional in tone. Probably our eventual figures will be appreciably lower in tonnage of open pit ore with a corresponding increase in waste-ore ratio. Also, Mr. Joralemon's brief comments on geology are extravagant and obviously not based on careful observation.

This morning Mr. Spaulding told Mr. Courtright and me that the Anaconda men have not yet finished their examination and that he has promised Mr. Welker of Cypress Mines that he can come in and make an examination as soon as Anaconda is finished. We again told Mr. Spaulding that we would like to get started on our examination as soon as possible, and that we are prepared to go out at any time for a day or part of a day and do any phase of the examination work which would not interfere with either Anaconda or Cypress Mines. In other words, if no one was logging core then we would be able to go out immediately and start this phase, or if no one was underground then we could start that part of the work. Mr. Spaulding gave the impression that this might not be feasible, consequently it might be two weeks or more before we can begin our detailed examination work. Immediately prior to the time that Spaulding received word from his Pasadena office to release the recent drill hole information and start this second round of examinations, Mr. Snedden and I had been in touch with him several times and had emphasized the fact that we were anxious to obtain this new information and look at their underground development as soon as he could possibly let us do so. It is annoying that Anaconda and Cypress Mines were promised turns ahead of us. I think Spaulding did this deliberately. However, I believe that if it would now be attempted that pressure be brought to bear on Spaulding through his Pasadena office, it would only make our position here somewhat awkward.

While we are waiting to start the underground mapping and core logging we can begin preliminary drawing on our own sets of plan maps and sections. This will be rather an extensive job in itself.

Yours very truly,
Original Signed By
K. Richard
KENYON RICHARD

KR:ar
ncs. as above

C
O
P
Y

PROGRESS REPORT
Development at Pima Mine
to May 15, 1954

SUMMARY

Development in the past five months has made it certain that the copper orebody in the Pima Mining Company property can be economically mined by open pit methods. Indicated ore available for power shovel mining now totals 11,250,000 tons, averaging 1.5% copper. The estimated stripping that must be moved to permit mining this ore totals 11,700,000 cubic yards of semi-consolidated gravel and detrital material plus 7,860,000 tons of rock classed as waste. Much of the "waste" is oxidized material containing from 0.5% to 4% copper, which may be recovered at a profit either by flotation after sulphidization or by heap leaching, and further development may prove that part of the lean hanging wall material with disseminated sulphides is rich enough to mill. The widest part of the known orebody is at the eastern end of the developed area, and no limit can be set to the additional ore that may be found in this direction.

The operating profit after income tax on ore now indicated is estimated as $21,000,000 in 16 years. This makes no allowance for amortization of the estimated expenditure of $7,000,000 required to bring the property to production at the rate of 2,000 tons of ore per day. The present value of the expected profit will depend on the method of financing this preparatory expense. A fair estimate at the present stage of development is $4,000,000. The value is rapidly increasing as the orebody is extended by drilling.

ORE RESERVES

Ore reserves are based on development up to May 15, 1954. Drilling since that date has resulted in a material increase in tonnage. As nearly every hole drilled has found ore, the reserves are constantly growing.

The estimate was made by projecting the drill holes or other development to the nearest of twelve parallel north-south cross sections at 100-foot intervals; drawing boundaries of ore, waste and gravel for economical open pit mining on these sections; averaging the development to obtain the grade of ore on every section; and measuring the areas of ore, waste and gravel within pit limits on the sections. It was assumed that every section represents half the distance to the adjoining sections. Outlines of the main pit were extended to the 500 level, and the ore that can be mined by open pit methods between the 500 and 600 levels with no additional stripping was estimated separately. Pit slopes were drawn at 40 degrees in the semi-consolidated gravel, 50 degrees in rock above the 500 level, and 45 degrees below the 500 level. Waste in the slope at the west end of the pit, in Banner Mining Company property, is included in the estimate, but neither the ore in Banner ground nor the waste over or in slopes north and south of that ore is included. The accepted specific gravity factors are 12 cubic feet per ton for ore, which contains a large amount of heavy sulphide, and 12.5 cubic feet per ton for rock waste.

The drill holes are in some cases too far apart to prove the grade and size of ore between holes, and no crosscuts or raises have yet been run on drill holes to check the accuracy of drilling results. Assays of diamond drill hole core and sludge were combined according to the Longyear formula in stretches where sludge samples were taken, but frequently circulation was lost and no sludge was recovered. The core samples in such cases, often with only moderately good core recovery, are probably a little low. Because of the above uncertainties, ore must be classed as "indicated"

or "probable" rather than as "proven" or "developed". It seems likely that more complete development will increase both tonnage and grade of ore within the developed length.

All computations were by slide rule, as underlying data are accurate to the best of three significant figures.

Based on the above method of estimating, reserves of ore minable by open pit and of the accessory waste and gravel as of May 15, 1954, are estimated as follows:

ESTIMATE OF ORE, WASTE AND GRAVEL
TO BE MINED BY OPEN PIT AT
PIMA MINING COMPANY PROPERTY
AS OF MAY 15, 1954

Indicated ore above 500 level	9,615,000 T 1.5% Cu
" " 500 to 600 "	1,635,000 T 1.6% "
Total indicated ore	11,250,000 T 1.51% "
Included in ore are:	
High grade sulphide	1,200,000 " 4.55% "
Low " "	10,050,000 " 1.15% "
Rock stripping (including oxidized ore)	7,860,000 "
Gravel stripping	11,700,000 yds.
plus 0.7 tons waste per ton of ore.	

Before mining of sulphide ore at the rate of 2,000 tons per day can start, it will be necessary to strip an area about 400 feet long by 300 feet wide. If, as seems likely, this exposed area extends from section F-F to section J-J the pre-production stripping will total 2,600,000 cubic yards of gravel plus 300,000 tons classed as "waste". All of this "waste" will be oxidized ore, some of it containing 4% copper. It seems likely that milling of this oxidized capping, after sulphidizing, will yield a fair profit. Pending flotation tests to prove this, the material is classed as waste.

In section K, the fairly well developed section furthest east, the estimated ore is 690 feet wide just under the oxidized capping, from 210 to 270 feet below the surface, and 135 feet wide on the 600 level. Ore of the size indicated on this section will make about 14,300 tons per lineal foot. Development to the east is therefore increasing ore reserves rapidly.

GEOLOGY

The most interesting geological feature is the finding of unquestioned porphyry, probably a monzonite, in the eastern part of the 500 level. This proves the tentative conclusion reached six months ago, that the highly kaolinized material with inclusions of metamorphosed limestone or of quartzite found further west is also a highly altered porphyry that has partly "digested" the intruded rocks. There are several irregular dikes and cupolas of the porphyry, the ones furthest east barely coming up to the 400 level. They suggest a large parent mass of porphyry at somewhat greater depth, which may contain a much greater body of disseminated ore. A downward extension of drill hole C-20, at coordinates 5000 N, 5300 E, would go far toward proving this theory.

The porphyry body in the east end of the 500 level has apparently bent the ore zone to the north of east and widened it. This also supports the theory that a larger body of porphyry may be found at a few hundred feet greater depth.

The south dipping thrust fault that forms the footwall of the orebody is even wider than seemed likely from the shaft crosscuts. The crushed zone from which no core is recovered is up to 100 feet, in horizontal width. None of the horizontal holes have succeeded in reaching the footwall of the fault. Sludge samples suggest that much of the fault breccia is ore. The only development that is certainly in the footwall is the north station, crosscut and inclined drill hole on the 600 level. Material in these workings is chiefly barren quartzite, with thin limy beds that contain low copper values. One of two of the old surface holes furthest northwest may have passed through this fault, with ore below it. It is planned to continue the new churn drill hole C-18 through the fault to see if the footwall material is ore in this northeastern area.

The only indication as to the possible continuation of the main orebody to the east or northeast is the "Red Hill", 2500 to 3000 feet east of the present workings. This hill is made up of pyritic quartzite with porphyry or rhyolite dikes and with very low copper values. There are seams of oxidized copper ore in the north and south flanks of the hill. The low grade but thoroughly disseminated mineralization suggests, but does not prove, that workable ore may continue many hundred feet easterly from present development. Mineralization in old holes A-25 and A-32, north of the Red Hill, makes this possibility more attractive.

POSSIBLE RETURNS, COSTS AND PROFIT

While mill tests made thus far are not adequate, it seems likely from earlier tests that recovery will be 92% in a 27% concentrate. Milling results on other disseminated copper ores bear this out. As shown in the report of January 15, 1954 by the undersigned, freight, smelter treatment and deductions and smelting rate reduce the net receipt at the mill on copper in a 27% concentrate from an assumed 26 cents quotation to 16.7 cents per pound. The return at the mill on 1.51% ore will therefore be $5.20 per ton of ore.

The best basis for cost of open pit mining at the rate of 2000 tons per day is experienced at the Yellow Pine Mine of Bradley Mining Company in Idaho, where 2000 tons per day were milled. This mine is 75 miles by steep mountain road from the railway, and winters are extremely severe. In spite of this the 1951 mining cost was 62.5 cents per ton of material, with the cost per ton of ore a little higher than that per ton of rock stripping. With much more favorable conditions at Pima, but after a slight increase in wages, etc., since 1951, the mining cost should be 60 cents per ton ore and 55 cents per ton of the generally softer and shallower rock stripping. To this should be added a maximum of 15 cents for hauling ore to a mill.

The cost of stripping gravel, also based on Bradley costs, is estimated as 20 cents per cubic yard.

Milling by flotation, based on the cost of milling 2000 tons per day of quartzite ore at Bunker Hill with double lead-zinc flotation should be $1.00 per ton. Overhead, including state taxes, etc., will be about $0.50 per ton.

Returns and costs are therefore estimated as follows:

Return on 1.51% ore, at 26¢/Cu			$5.20 per ton	
Costs, without depreciation				
Mining - Ore	$0.60			
" - Rock Waste, 0.7 Ratio x .55	0.38			
" - Gravel, 1.04 Ratio x .20	0.21		1.19	" "
Transportation to mill			.15	" "
Milling			1.00	" "
Overhead			.50	" "
Total operating cost			2.84	" "
Operating profit per year on 700,000 tons		$1,650,000		
Income Tax, 50% x $1,650,000 less $440,000 depreciation and $550,000 percentage depletion		330,000		
Profit after tax but before depreciation		1,320,000 per year		
or		21,000,000 in 16 years		

ESTIMATED INVESTMENT

The additional money required to bring the property to production at the rate of 2000 tons per day is estimated as follows:

Construction of 2000 ton mill and accessories		$5,000,000
Pre-production stripping		
Gravel, 2,600,000 cu. yds.	$520,000	
Rock or ox. ore, 330,000 tons at .55	180,000	700,000
Camp, shops, additional development, etc.		$1,300,000
TOTAL		$7,000,000

No allowance is made above for the probable profit from milling the higher grade portion of the semi-oxidized ore.

POSSIBLE PRESENT VALUE

The present value of the expected profit will depend on the method of financing the $7,000,000 capital expenditure. By different amortization plans values of from $1,840,000 to $5,880,000 have been obtained, using the Hoskold formula with a 10% risk rate and a 3% reinvestment rate.

Recent practice has been to amortize funds for equipment by equal annual installments that will return the amount expended plus interest in a reasonable number of years. An interest rate of 5% and repayment in 10 years seems reasonable in the Pima case.

On this assumption the present value of the Pima orebody is computed as follows:

Operating profit after Income Tax, for 16 years	$1,320,000 per yr.
Estimated future expenditure for equipment, etc.	7,000,000 " "
Annual payment to amortize this expense plus 5% interest in 10 yrs.	906,000 " "
Remaining profit, first 10 years	414,000 " "
Present value of this at 10 and 3% factor 5.34	2,210,000
Profit for remaining 6 years	$1,320,000 per yr.
Present value of this at 10 and 3% factor 3.93, discounted 10 yrs. at 10%, factor 0.385	$1,990,000
Present value of orebody if financed as above	$4,200,000

Until the orebody is delimited and the method of financing is settled, the "present value" is so approximate that it should be used only as a basis for negotiations as to financing further work.

San Francisco, California
May 27, 1954

/s/ Ira B. Joralemon

Copied at Tucson, Arizona, July 19, 1954.

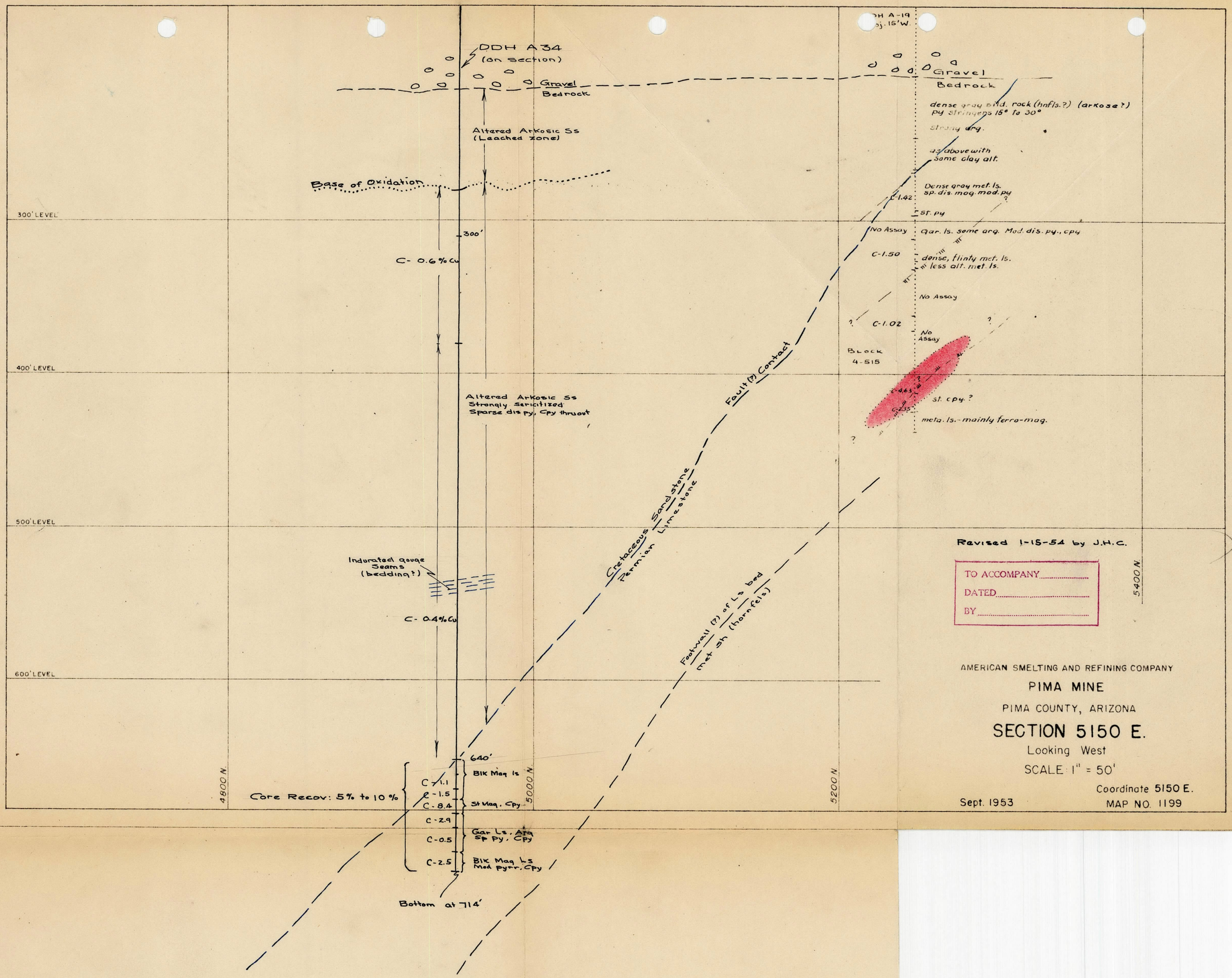
P.C. - Pima

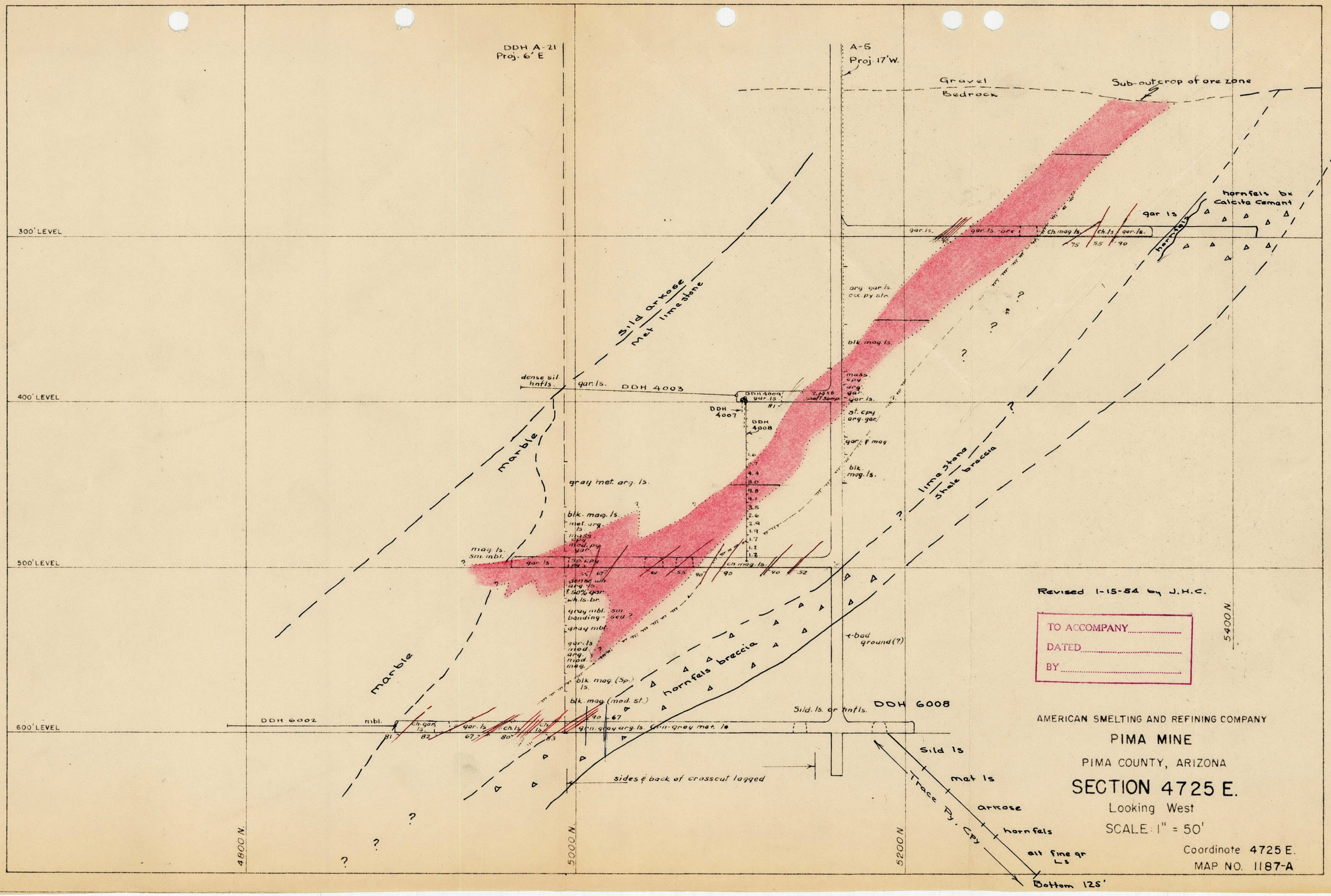
Mineralization and Alteration at Pima Mine– A Complex Porphyry Copper Deposit

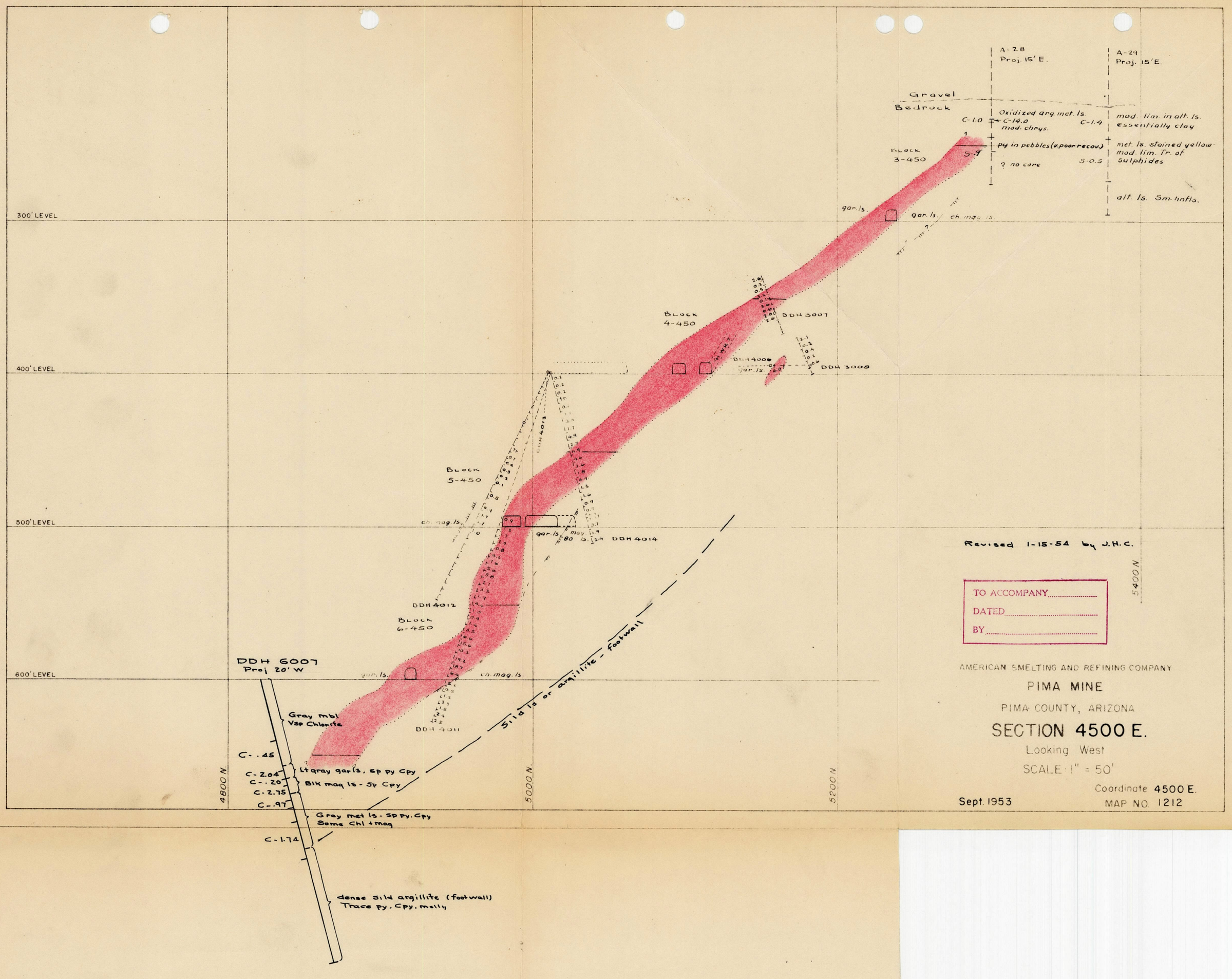
By Marshall D. Himes

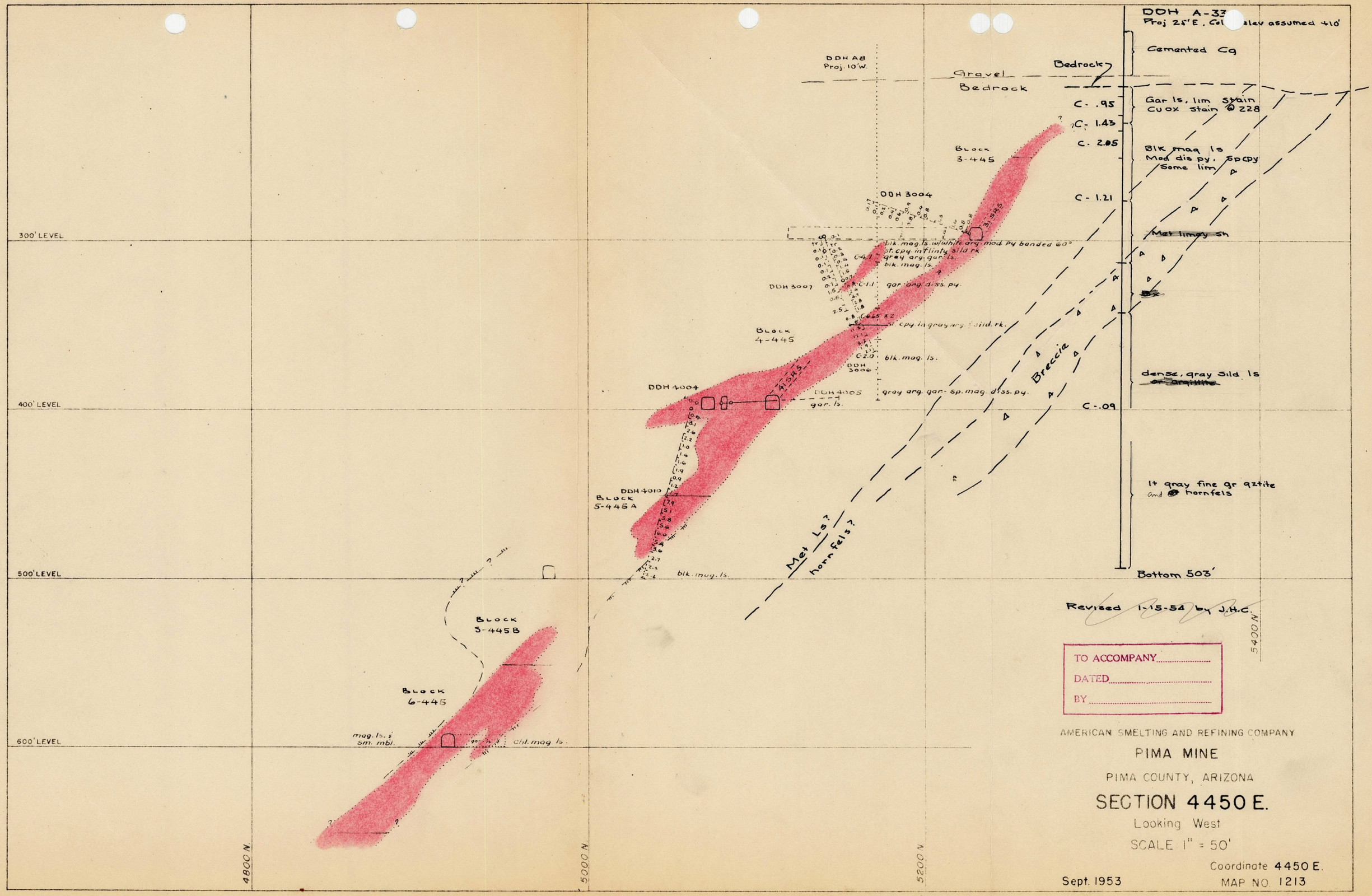
Lima Mining Co.

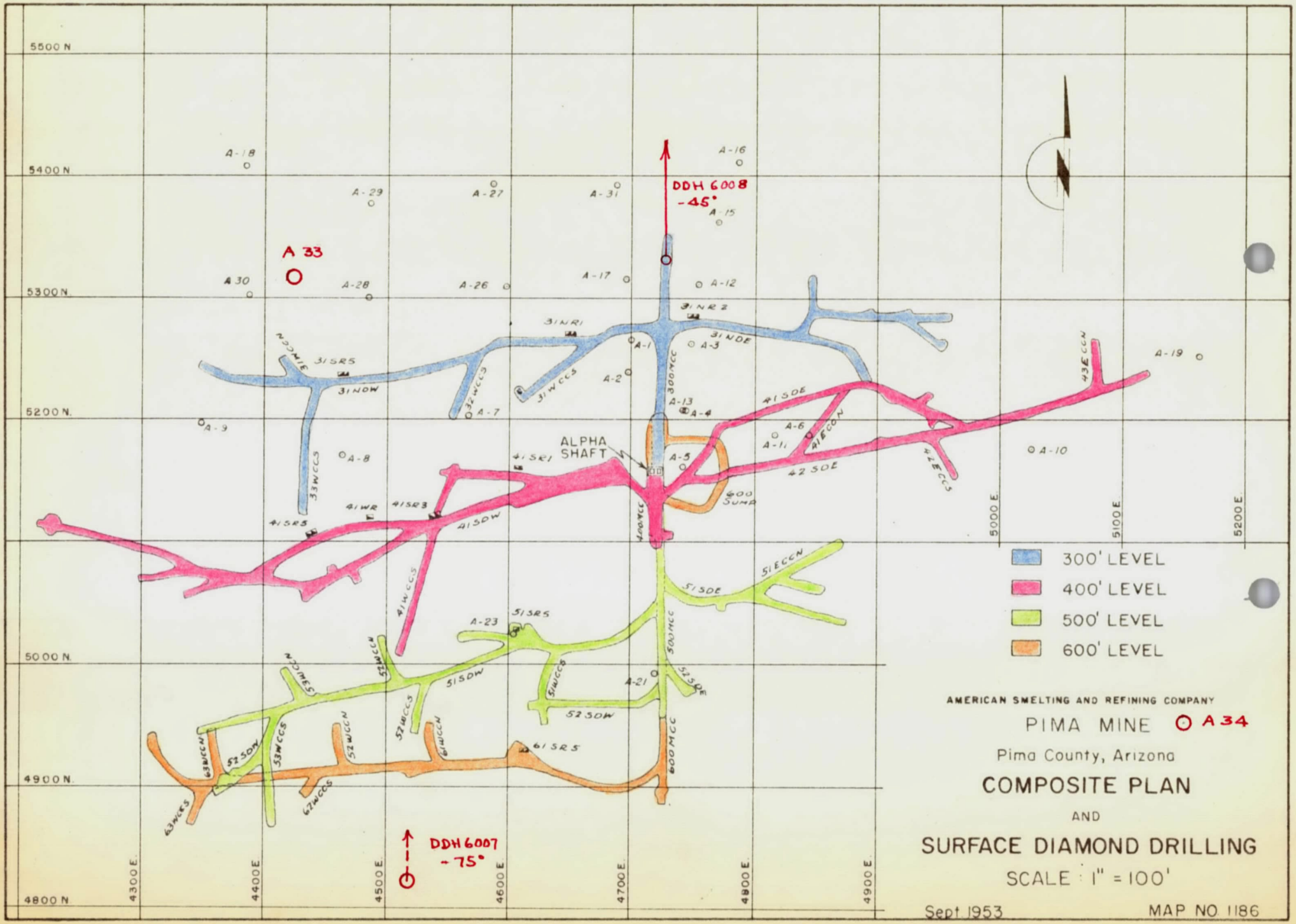
For more information, Circle No. 93 on PEP card.


DDH A34
(on section)
Gravel
Bedrock
Altered Arkosic Ss
(Leached zone)
Base of Oxidation
300' LEVEL
300'
C- 0.6% Cu
400' LEVEL
Altered Arkosic Ss
Strongly Sericitized
Sparse dis py, Cpy thruout
500' LEVEL
Indurated gouge
Seams
(bedding?)
C- 0.4% Cu
600' LEVEL
640'
Blk Mag ls
C - 1.1
C - 1.5
C - 8.4
St Mag. Cpy
C - 2.9
C - 0.5
Gar Ls. Arg
Sp Py, Cpy
C - 2.5
Blk Mag Ls
Mod pyrr. Cpy
Core Recov: 5% to 10%
Bottom at 714'
4800 N.
5000 N.
5200 N.
5400 N.
Cretaceous Sandstone
Permian Limestone
Fault (?) Contact
Footwall (?) of Ls bed
met Sh (hornfels)
DDH A-19
Proj. 15' W.
Gravel
Bedrock
dense gray sild. rock (hnfls.?) (arkose?)
py stringers 15° to 30°
Strong arg.
as above with
some clay alt.
Dense gray met. ls.
sp. dis. mag. mod. py
C-1.42
st. py
No Assay
Gar. ls. some arg. Mod. dis. py., cpy
C-1.50
dense, flinty met. ls.
less alt. met. ls.
No Assay
C-1.02
No
Assay
Block
4-515
C-4.63
C-2.35
st. cpy ?
meta. ls. - mainly ferro-mag.
Revised 1-15-54 by J.H.C.
TO ACCOMPANY
DATED
BY
AMERICAN SMELTING AND REFINING COMPANY
PIMA MINE
PIMA COUNTY, ARIZONA
SECTION 5150 E.
Looking West
SCALE 1" = 50'
Coordinate 5150 E.
Sept. 1953
MAP NO. 1199


DDH A-21
Proj. 6' E
A-5
Proj. 17' W.
Gravel
Bedrock
Sub-outcrop of ore zone
300' LEVEL
400' LEVEL
500' LEVEL
600' LEVEL
Sild arkose
Met limestone
marble
dense sil hnfls.
gar. ls.
DDH 4003
DDH 4009
gar. ls
7.4 x 6 shaft samp.
DDH 4007
DDH 4008
gray met. arg. ls.
blk. mag. ls.
met. arg. ls
mass. cpy
mod. py
gar.
mag. ls.
sm. mbl.
gar. ls
sp. cpy
py
67
55
90
ch. mag. ls.
52
dense wh. arg. ls.
± 50% gar.
wh. ls. br.
gray mbl. sin. banding - sed ?
gray mbl.
gar. ls
mod. arg.
mod. mag.
blk. mag (sp.) ls.
blk. mag (mod. st.)
horn fels breccia
arg. gar. ls.
occ. py str.
blk. mag. ls.
mass. cpy
arg. gar.
gar. ls.
st. cpy
arg. gar.
gar. ± mag
blk. mag. ls.
limestone
shale breccia
gar. ls.
gar. ls. ore
ch. mag. ls.
ch. ls
gar. ls.
75
35
40
gar ls
hornfels bx
Calcite Cement
hornfels
← bad ground (?)
DDH 6002
mbl.
ch. gar. ls.
gar. ls
ch. ls
ch. ls
81
82
67
80
83
grn. gray arg. ls
grn-gray met. ls
Sild. ls. or hnfls.
DDH 6008
sides & back of crosscut lagged
Sild ls
met ls
arkose
horn fels
all fine gr Ls
Trace Py. Cpy
Bottom 125'
4800 N.
5000 N.
5200 N
5400 N
Revised 1-15-54 by J.H.C.
TO ACCOMPANY
DATED
BY
AMERICAN SMELTING AND REFINING COMPANY
PIMA MINE
PIMA COUNTY, ARIZONA
SECTION 4725 E.
Looking West
SCALE: 1" = 50'
Coordinate 4725 E.
MAP NO. 1187-A


A-28
Proj. 15' E.
A-29
Proj. 15' E.
Gravel
Bedrock
Oxidized arg. met. ls.
C-1.0
C-14.0
mod. chrys.
C-1.4
mod. lim. in alt. ls.
essentially clay
py in pebbles (v. poor recov.)
met. ls. stained yellow
mod. lim. Tr. of sulphides
? no core
S-0.5
alt. ls. Sm. hnfls.
Block 3-450
S-9
gar. ls.
ch. mag. ls.
300' LEVEL
Block 4-450
DDH 3007
DDH 3008
400' LEVEL
Block 5-450
DDH 4013
ch. mag. ls.
gar. ls.
DDH 4014
500' LEVEL
DDH 4012
Block 6-450
DDH 6007
Proj 20' W
600' LEVEL
DDH 4011
Sild ls or argillite - footwall
Gray mbl
Vsp Chlorite
C-.45
C-2.04
C-.20
C-2.75
C-.97
Lt gray gar ls, sp py Cpy
Blk mag ls - sp Cpy
Gray met ls - sp py. Cpy
Some Chl + mag
C-1.74
dense sild argillite (footwall)
Trace py. Cpy. molly
4800 N.
5000 N.
5200 N.
5400 N.
Revised 1-15-54 by J.H.C.
TO ACCOMPANY
DATED
BY
AMERICAN SMELTING AND REFINING COMPANY
PIMA MINE
PIMA COUNTY, ARIZONA
SECTION 4500 E.
Looking West
SCALE 1" = 50'
Coordinate 4500 E.
Sept. 1953
MAP NO. 1212


DDH A-37
Proj 25' E, Col elev assumed +10'
Cemented Cg
Gar ls, lim stain
Cu ox stain @ 228
Blk mag ls
Mod dis py, sp cpy
Some lim
Met limey sh
dense, gray Sild ls
lt gray fine gr qztite
and hornfels
Bottom 503'
C - .95
C - 1.43
C - 2.05
C - 1.21
C - .09
Bedrock
Gravel
Bedrock
DDH A8
Proj. 10' W.
Block 3-445
DDH 3004
blk. mag. ls w/white arg. mod. Py banded 60°
st. cpy. in flinty sild rk.
gray arg. gar. ls.
blk. mag. ls.
DDH 3007
gar. ang. diss. py.
st. cpy. in gray arg. sild. rk.
Block 4-445
blk. mag. ls.
DDH 3006
gray arg. gar. sp. mag. diss. py.
DDH 4004
DDH 4005
gar. ls.
DDH 4010
Block 5-445A
blk. mag. ls.
Met Ls?
hornfels?
Breccia
Block 5-445B
Block 6-445
mag. ls. & sm. mbl.
chl. mag. ls.
300' LEVEL
400' LEVEL
500' LEVEL
600' LEVEL
4800 N.
5000 N.
5200 N.
5400 N.
Revised 1-15-54 by J.H.C.
TO ACCOMPANY
DATED
BY
AMERICAN SMELTING AND REFINING COMPANY
PIMA MINE
PIMA COUNTY, ARIZONA
SECTION 4450 E.
Looking West
SCALE 1" = 50'
Coordinate 4450 E.
Sept. 1953
MAP NO. 1213


5500 N
5400 N
5300 N
5200 N
5000 N
4900 N
4800 N
4300 E
4400 E
4500 E
4600 E
4700 E
4800 E
4900 E
5000 E
5100 E
5200 E
A-18
A-29
A-27
A-31
A-16
A-15
DDH 6008
-45°
A 33
A 30
A-28
A-26
A-17
A-12
31NR2
31NR1
31NDE
A-1
A-3
A-2
A-19
31SRS
31NDW
32WCCS
31WCCS
300MCC
A-13
A-4
41SDE
43ECCN
A-7
A-9
A-6
A-11
41ECCN
ALPHA
SHAFT
A-5
A-10
41SR1
A-8
33WCCS
42SDE
42ECCS
600
SUMP
41WR
41SR3
41SR5
41SDW
400MCC
51ECCN
51SDE
41WCCS
51SRS
A-23
500MCC
52WCCN
51SDW
52SDE
A-21
52WCCS
52SDW
61WCCN
61SRS
600MCC
63WCCN
63WCCS
67WCCS
DDH 6007
-75°
300' LEVEL
400' LEVEL
500' LEVEL
600' LEVEL
AMERICAN SMELTING AND REFINING COMPANY
PIMA MINE
A 34
Pima County, Arizona
COMPOSITE PLAN
AND
SURFACE DIAMOND DRILLING
SCALE 1" = 100'
Sept 1953
MAP NO 1186

11-21-74

file

slope and 30-ft benches except at the base of the

For page 44 and 45, Circle No. 74 on PEP card.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

July 7, 1960

J.H.C.
JUL 18 1960

FILE MEMORANDUM

PIMA PIT SLUMP

Slumping on the south side of the Pima open pit, which started 4 or 5 months ago with the appearance of a few minor cracks on bench surfaces, has now reached serious proportions. Bob Neen, Kenyon Richard and I made an inspection tour on May 11, taking photographs on the ground and, later, a few shots from the air.

The slump area is in the shape of an inverted "V", starting just below the south rim, and expanding downward to a width of about 400' on the uppermost bench in bedrock (3150 elev.). Evidence of rupture and sloughing continues down to the 2990 bench. On the surface, cracks in the alluvium have opened up as far as 200' south of the pit rim.

Some of the faults which are basically responsible for the development of this slump area can be seen in the aerial oblique, looking south (Att. B). Two sets of faults are present: one east-dipping and the other west-dipping. The two sets converge slightly in strike to the south, forming wedge-shaped blocks, whose troughs have steep dips to the north. Mining on the lower level of the pit has removed some support from these wedge-shaped blocks with a resulting tendency for the blocks to move slightly out into the pit. Only a minor amount of displacement (up to 2') has occurred on the main structures due to the fact that the troughs dip more steeply than the pit slope. But this is an unstable condition which has promoted movement on subsidiary faults and slips, the intersections of some of which emerge on bench faces. Thus, extensive disintegration of the bench faces has taken place, creating the appearance of a landslide. However, there has been only minor movement of large rock blocks, say those 10' or more in diameter, and there appears to be no reason to expect anything more than the slow-breaking-up that is now in progress. A sketch map of the pit (Att. A) shows the principal fault structures involved.

Reportedly, the Pima operators plan to strip the slump area and expand the pit farther south at its present slope. Presumably, they expect that this will take care of the problem, and it may do so temporarily because it will remove most of the broken and weakened rock. It appears probable, however, that this structurally weak zone will persist southward, and similar movements will again take place in the new benches. It would seem that future slumping can be prevented only by digging flatter overall pit slopes.

The main ore bearing formation of the Pima mine is a south-dipping bed of tactite and hornfels. This formation is rather firm in contrast to the overlying argillite (termed arkosite by the Pima staff) which breaks readily into small blocks due to the presence of numerous joints and slips.

This latter condition is particularly evident in the area of slumping which is entirely within the argillite (and the overlying gravels).

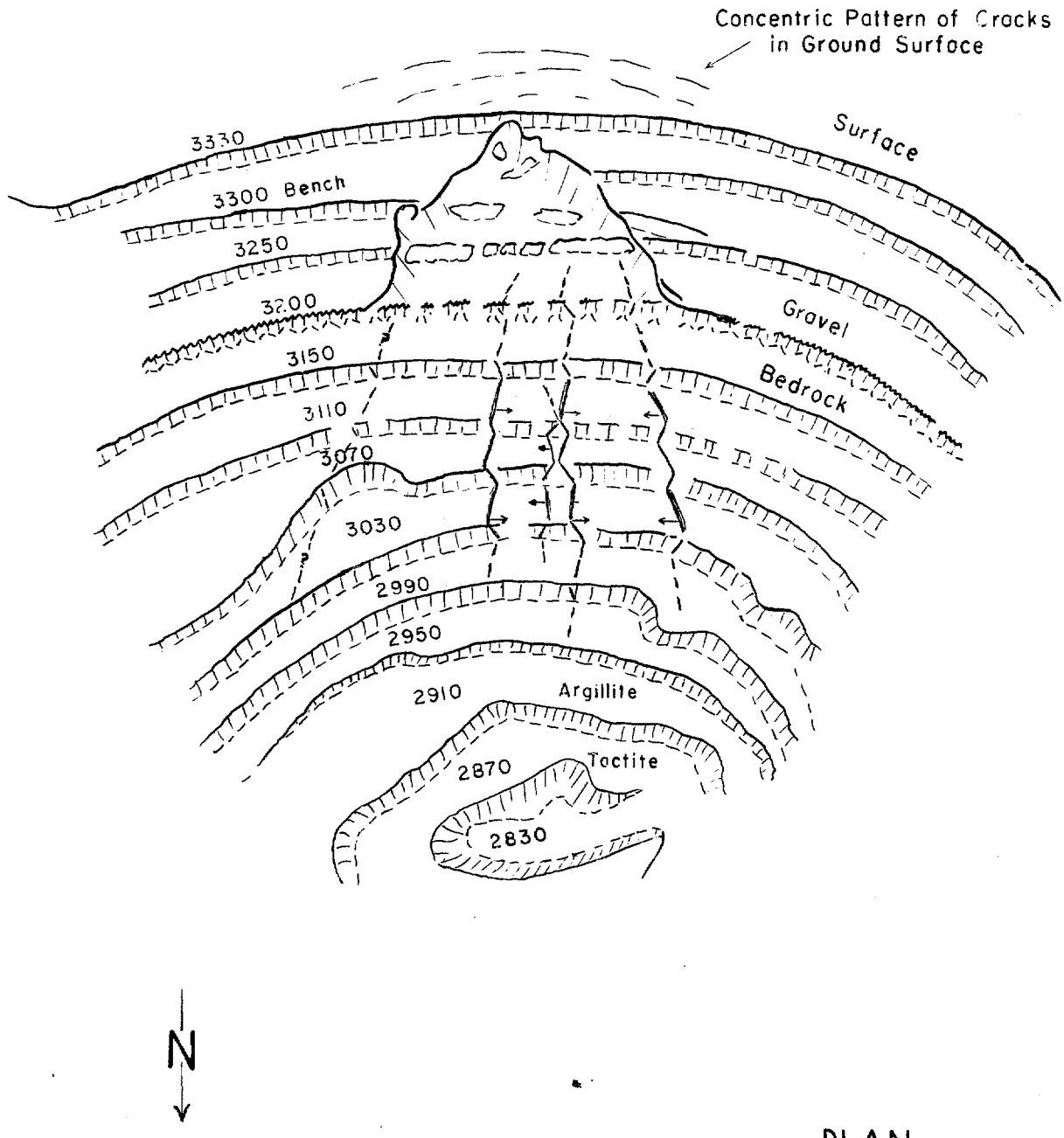
The Pima argillite and the Mission argillite, which occupies the shallower portion of much of the Mission ore zone, are similar in character and are regarded as parts of the same formation. Thus, bank failure should be expected in the Mission pit if strongly faulted and fractured zones are encountered there in the argillite. Our Mission drill core does not provide enough information to permit recognition and delineation now of any of these zones of weakness. By mapping and study of structure as the Mission pit progresses, however, such conditions may be anticipated to some extent, and plans for pit slopes revised accordingly. Should a structural condition in argillite more-or-less duplicating that in the slumped zone of the Pima pit be encountered, pit slopes of something like 30° may be required.

J. H. COURTRIGHT

JHC/Z
Atts: A - Sketch Map
B - Photographs
C - "

cc: DJPope - w/atts.
CPPollock - " "
RBMeen(3) - " "

File copy routed to:
TASnedden
ACHall
KERichard
JEKinnison



PLAN
SKETCH of SOUTH SIDE
of
PIMA PIT
SHOWING SLUMP AREA
AND PRINCIPAL FAULTS

Approx. Scale 1" = 200'

J.H.C. May, 1960

ATTACHMENT A

Gravel Beds

Bedrock
(argillite)

Aerial view of slump area on the south side
of the Pima Pit. Approx. scale 1" = 200'.

Plan view of Pima Pit
Approx. scale 1" = 400'

Looking westerly
along South Rim
of Pima Pit.

Open fissure on
3030 Bench
Pima Pit.

Showing displacement
on fault crossing
3070 Bench looking
easterly.

ATTACHMENT C

Oct 8, 1959

Visit to Pima Pit —

with Duffy, Hallbauer —

Jim Oakes - Chief Eng.

Grade during year 1.50 % Cu

mining rate 3300 tpd

Current bedrock ratio 3:1

plus 2000 yds gravel per day

Mining costs - bedrock —

60-70 ¢ per yd = 30-35 ¢ per ton

RESUME OF MINING OPERATION

PIMA MINING COMPANY

Open Pit Division, A.I.M.E.

April 25, 1958

HISTORY

The Pima ore body was the first base metal deposit of any magnitude in the western United States to be located by geophysical methods. Exploration engineers for United Geophysical Company made their first discovery in this area in 1950, using equipment primarily designed for use in exploration for buried mineral deposits. Subsequent preliminary drilling indicated a deposit of medium size and grade which could be worked by underground methods.

In January 1952 an underground development program was initiated and carried on until approximately the middle of 1954. During the latter phase of this program, it became apparent that the medium size high grade ore body could be more economically exploited if the halo zone of low grade material were incorporated as a part of the entire ore body. After extensive study, it was decided that the deposit could be more profitably worked as an open pit mine.

In the Fall of 1955, Cyprus Mines Corporation exercised its option and assumed management of Pima Mining Company. Union Oil Company retained a 25 percent interest and a 25 percent interest was obtained by Utah Construction Company.

In November 1955, Utah Construction Company started removal of the overburden over the main ore body. In April 1956, Pima started its own stripping operation along side the contractor. Utah completed its stripping contract on 1 October 1956 after having stripped 6 million yards of alluvium and waste rock. (Pima had stripped an additional 3 million yards of waste material during the time Utah was working in the pit.)

On December 15, 1956, the first load of rock was dumped into the crusher for a preliminary tryout. The mill turned over for the first time on December 21st - and on December 28th, the first concentrates were made.

GEOLOGY

The Pima deposit includes two distinct types of ore:

1. A highly altered limestone, strongly mineralized and relatively high grade, and

2. Low grade disseminated ore mineralization in volcanic-sediments.

The high grade ore occurs in what was originally a dolomitic limestone which has been thoroughly altered by igneous action to a calcium silicate rock called "hornfels"; the latter was subsequently impregnated with the ore minerals.

The ore formation dips about 45 degrees to the south and trends east-west, curving from a northwesterly bearing on the west to a slightly northeasterly direction on the east. It is quite variable in thickness but probably averages about 200 feet. In the main part of the mine it has been developed over a lateral extent of 1,600 feet, extending into neighboring property on the west and being cut off by a fault to the east. Its lower limits have not been determined, but it has been intersected by drill holes at vertical depths of around 800 feet.

Enclosing the "hornfels" band is a thick series of detrital rocks, essentially a mixture of sediments and volcanic material, known as "pyroclastics". These have likewise been altered and mineralized, but the ore values are more sparsely distributed, yielding a low grade disseminated ore minable only by low-cost (i.e. open pit) methods. This type of ore is found in most extensive development to the east and northeast of the main high grade ore body. It shows no well-defined structural form, but occurs in irregular masses.

The principal ore mineral at Pima is chalcopyrite. There are also small amounts of sphalerite and molybdenite, neither of which is recovered at present. Pyrite and magnetite (magnetitic iron ore) are accessory minerals. For a short distance below the bedrock surface, the copper sulfides have been oxidized to form the green copper silicate, chrysocolla, and the black copper oxide, tenorite.

Various types of igneous rocks have been recognized in the Pima Mine, but none shows any direct connection with the ore values. It is generally believed that the entire region is underlain at fairly shallow depths by a granite mass which may be the source of the ore solution. Granite has been penetrated by drill holes a short distance west of the Pima property but has not been found to date in any of the Pima holes.

GENERAL MINE DESCRIPTION

The mining operation is planned for production of 3,500 tons per day of 1.93% copper ore at 0.60% cut off, and sufficient stripping of alluvium and waste rock to maintain developed ore.

The pit development is laid out for a final over-all slope of 1.2 to 1 in the alluvium, 50' bank heights, 0.6 to 1 bank slopes, 30' benches except at the base of the alluvium where an 85' bench is left as a measure of protection from excessive sloughing. Final slopes in rock are laid out at 1 to 1 with 40' bank heights, 0.375 to 1 bank slopes, and alternate 10' and 40' benches.

Present daily production is approximately as follows:

Ore mining - - - - - - - - - - - - - - - - -	1,600 cubic yards
Rock stripping and oxidized ore - - - - - -	4,400 cubic yards
Alluvial stripping - - - - - - - - - - - - -	6,000 cubic yards
TOTAL - - - - - - - - - - - - -	12,000 cubic yards

The mine is operated on a 3-shift basis and equipment maintenance and repair is also on a 3-shift basis. At this time the total mine force consists of 115 men and the maintenance force consists of 43 men. These figures include supervision.

The present stripping ratio is a little over 3 cubic yards per ton of ore. The stripping ratio for the remaining life of the mine is 2.6 cubic yards/ton of ore.

Mining equipment selected to accomplish scheduled production is as follows:

	PRODUCTION CAPACITY
Alluvial Stripping:	
6 - DW-21 Caterpillar Carryalls - - - - (rubber-tired)	75.3 cubic yards/hour/unit
2 - D-8 Caterpillar Tractors - - - - - (pushcats)	
1 - D-8 Caterpillar Tractor - - - - - - (ripper-dozer)	

PRODUCTION CAPACITY

Rock Stripping and Ore Mining:

3 - 54-B Bucyrus-Erie Diesel Shovels - 2½ cubic yard capacity	123.5 cubic yards/hour/unit
7 - 802 Kenworth Rear Dump Trucks - - -	45.8 cubic yards/hour/unit
4 - 802-B Kenworth Tractor-Trailer Rear Dump Trucks - - - - - - - - - -	59.0 cubic yards/hour/unit
1 - D-8 Caterpillar Tractor (dozer) - -	
1 - Westfall Rubber Tired Dozer - - - -	
1 - 40-R Bucyrus-Erie Rotary Blast Hole Drill - - - - - - - - - -	45.0 feet/hour/unit

General:

1 - No. 12 Caterpillar Motor Grader
1 - GMC Water Truck - 3,500 gallon capacity
1 - GMC Flatbed Truck - 1½ ton capacity
3 - GMC Pickups - 3/4 ton capacity

In addition to the above listed equipment, a rockover skip system is used to hoist ore and waste from the 3070 bench to the surface (3315'). The double drum hoist for the system is powered by four 500 H.P. (1750 RPM) wound rotor AC motors. The hoist is somewhat unique in that high speed AC motors are used. The two 20 ton skips are normally hoisted in balance but may be operated separately (when not loaded) by unclutching the drums. The hoist rope speed is 1650'/min.

The inclined railway for the system has been placed on the north side of the pit on what is considered to be a final slope. The maximum capacity of the system is 2800 cubic yards per shift.

The 802 Kenworth trucks are used mainly in the pit hauling from the shovels to the skip loading structure and the Kenworth 802-B trucks are used mainly on the surface hauling from the headframe to the crusher or the waste dump.

At this time mining has progressed to the 2950 bench. This bench is roughly 400 feet below the surface.

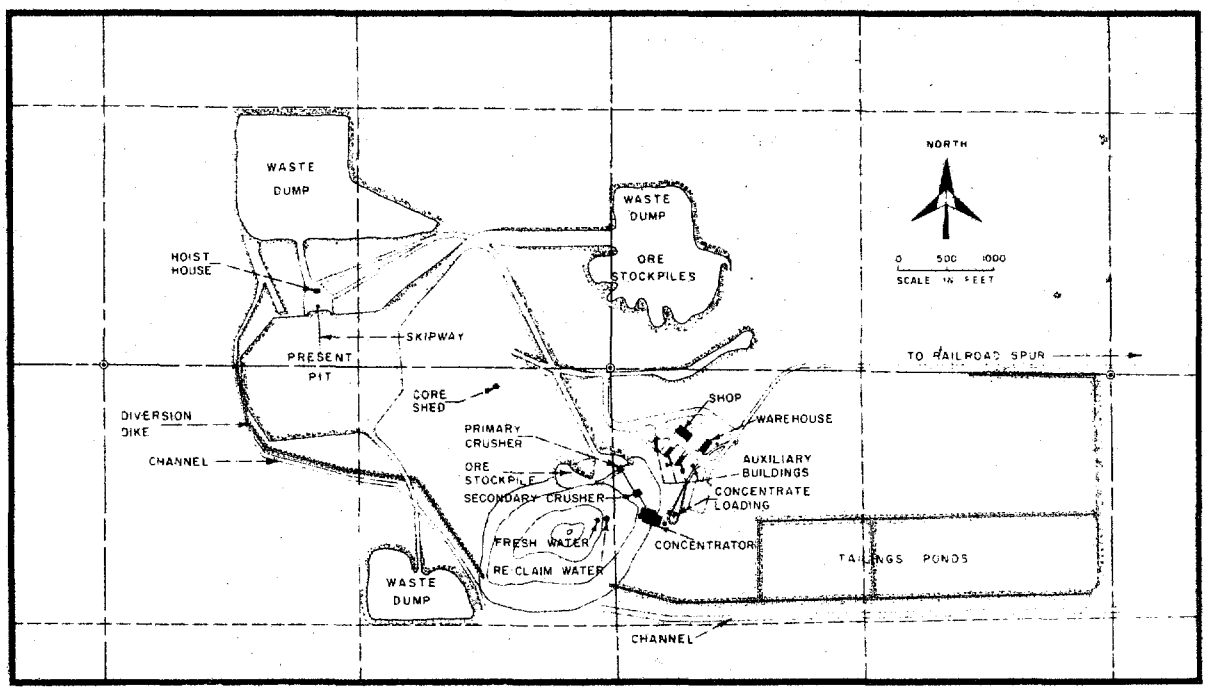
The ore being mined varies considerably in grade and blending is a problem. Usually one shovel is worked in high grade ore running from 3% to 7% copper and one shovel is worked in low grade running from 0.6% to 1.0% copper. These classes of ore are being blended to about 1.85% copper mill head.

To date 1,372,092 tons of ore averaging 1.74% copper have been mined and milled.

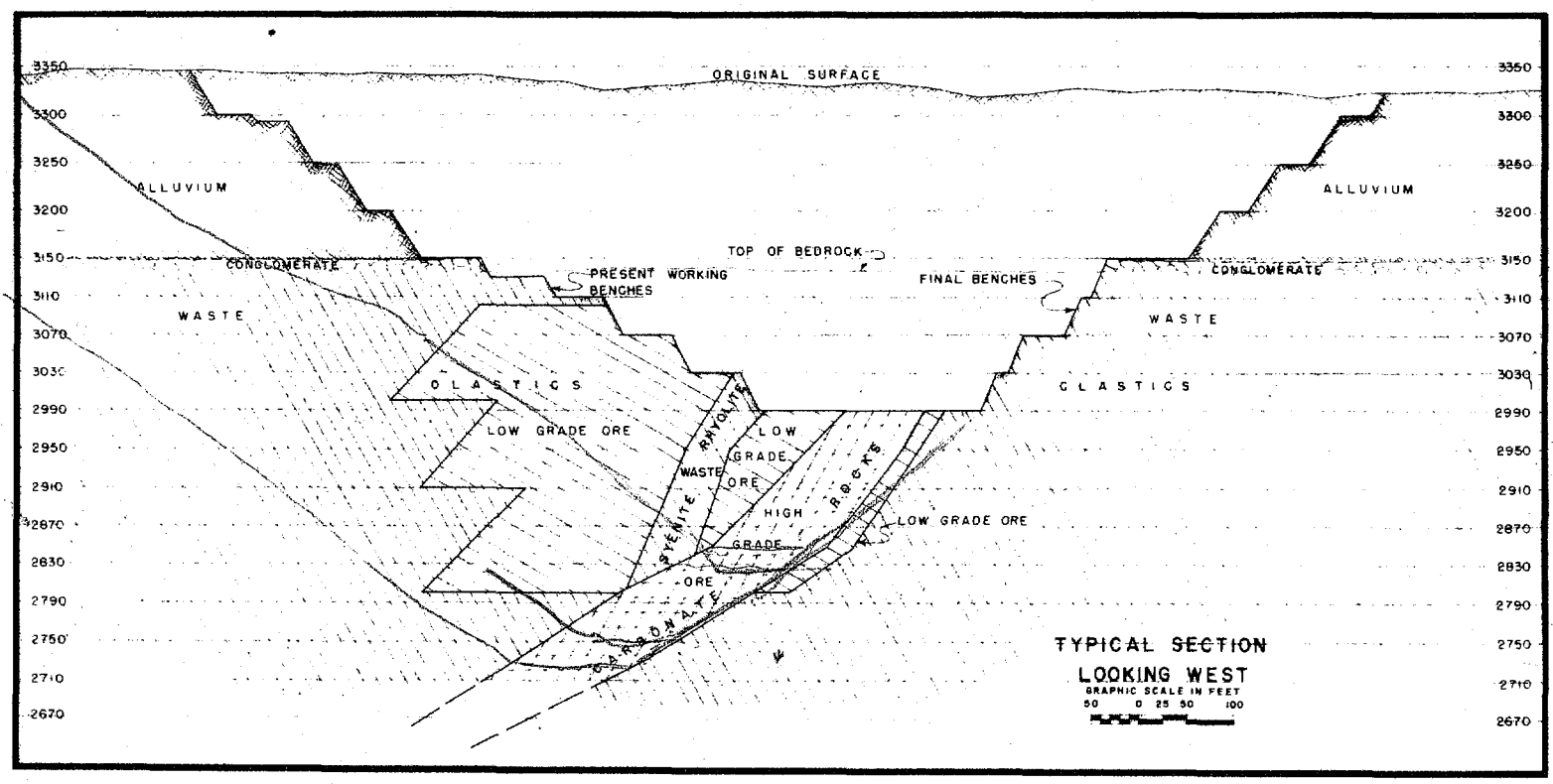
PIMA MINING COMPANY

PIMA MINE

TUCSON, ARIZONA



GENERAL AREA MAP



10-15' cg

AIME OPEN PIT SECTION
ANNUAL SPRING MEETING
APRIL 25, 1958

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

March 12, 1958

FILE MEMORANDUM

PIMA MINE
Pima County, Arizona

A visit to the Pima Mine was made on March 3 by Kenyon Richard and myself. Bill Pill and Mike Martin, engineers, and Drex Spaulding, Manager, discussed various features of the open pit with us.

Milling at a rate of 3000 tpd was started late in 1956 and the first concentrates shipped to El Paso in January, 1957.

	Tons	Grade
Production to 3-1-58	1,350,000(approx.)	1.70% Cu(approx.)

Mill Recovery - 87% (91.5% recovery of sulphides, including native copper)
Grade of Conc. 24% Cu (approximate)

Final pit slopes are 1.2 to 1, or about 38 degrees in the gravel overburden (200 feet thick) and 1 to 1, or 45 degrees in bedrock. A 50-foot wide bench in the caliche conglomerate just above bedrock is left as a safety measure. The caliche conglomerate, about 20 feet thick, forms a tough, hard protective layer over the bedrock, the latter being relatively less firm due to the presence of numerous faults and fractures.

The ore, composed largely of garnetized limestone, breaks coarse and blocky. Spacing of the 9-inch rotary blast holes varies from 12 ft. to 15 ft. The arkosic beds (containing some low grade ore) in the hanging wall of the main ore zone do not require such close spacing of holes, as much better fragmentation is obtained in blasting them.

They plan to mine to the 600 level, or the 2750' elevation. Currently mining of ore is being carried out on four 40 ft. benches, the bottom bench being a narrow (75 ft. wide) drop cut at the 2950 elevation (400 ft. level). They are stripping at the rate of 8/1, W/O, but are in a very tight situation with insufficient low grade ore opened up to permit proper blending to achieve the desired average grade (presumably 1.70% Cu). Apparently they are behind schedule in the stripping because (1) they had planned to mill most of the first bench in bedrock but were forced to stockpile this oxidized ore, and some of the material on lower levels which had been calculated as sulphide ore, proved to be too high in non-sulphide (chrysocolla --- reportedly, good recoveries are made of native copper values), and (2) the milling rate has been somewhat above the anticipated rate (as high as 3500 tpd at times).

MEMO
Pima Mine

The overall stripping ratio reportedly will be 6 to 1, using 15.3 cubic feet per ton for the gravel and 12.25 cubic feet per ton for the bedrock. The latter figure is questionable; tests conducted by the milling department determined the mill heads to average 10.3 cu. ft. per ton.

Although the blast hole sampling appeared rather crude (a slot about 10 inches wide is dug out of the sand pile around the hole), grade calculated from the blast hole samples agrees very closely with mill heads, for example: for May through October, 1957 the blast holes gave an average of 1.72% cu and the mill heads, 1.70% cu. And, for the month of February, 1958 (85,000 tons milled) the blast hole grade was 1.74% cu and the mill heads 1.73% cu.

So far, it is quite uncertain as to how extraction is checking out with estimated reserves. Judging from the sections which we saw, geological features were not taken into account; some arbitrary, mechanical method involving straight lines drawn between assay cutoff points was apparently used to outline the ore blocks. As mined, the grade and distribution of ore varies considerably in places with that depicted on the sections.

In the matter of dilution at ore-waste contacts, it was stated that a fairly clean separation has been achieved in mining along the footwall of the ore body, but some dilution has occurred in mining along hanging-wall contacts. Where ore could be distinguished from waste by eye-inspection there was less dilution of the ore, they stated. Apparently there has so far been little reason to be concerned about dilution, since the main problem has been to uncover enough low grade material to hold the average grade mined down to the desired level. Consequently they could supply us with little factual data on the amount of dilution that has occurred.

J. H. COURTRIGHT

cc: DJPope
LHHart
DRPurvis
RMeen
WOSchubel
RWelch

g.H.C.

NOTES ON PIMA DRILL CORES - LOG JANUARY 14, 1956

By Richard and Courtright

DDH A-54

From	To	
230	255	Light gray - medium granular - pebbly arkose sparse disseminated pyrite, chalcopyrite(?).
255	285	Light gray fine grained silty quartzite and siltstone. Sparse disseminated pyrite chalcopyrite(?).
285	300	Light and dark gray siltstone - some fine quartzite. Sparse disseminated sulphides pyrite and chalcopyrite.
300	332	Light and dark gray siltstone - some fine quartzite. Sparse disseminated sulphides pyrite and chalcopyrite. (dense hornfels) Some fine quartzite. Sparse disseminated sulphides(pyrite &chalcopyrite)
332	421	Alternating arkose and siltstone (hornfels) light and medium gray - sparse disseminated sulphides.
bottom		

DDH A-52

231	237	Leached zone - Fine grained arkose 12" limey bed (dark gray) Brown limonite and chrysocolla.
237	313	Gray to dark - sandy siltstone and fine grained arkose - all "silicified" - some dark mottled- may be fine biotite - (or cg?). Trace cc at 240'. Fair disseminated chalcopyrite - and .6% copper - some weaker from 305' to bottom.
A-53 to	287	Leached - brown limonite. No copper stain.
to	309	Fine arkose - and siltstone arkose at bottom. Sparse disseminated sulphides.
bottom		
A-51 214 to	400	Fine grained siltstone. Disseminated sulphides.
A-49		Siltstone. Some chalcopyrite (600' deep)

DDH A-50

From	To	
210	245	Caliche conglomerate.
245	277	Leached - brown and pale yellow limonite. Traces of copper stain. Fine arkose and quartzite.
277	350 bottom	Gray to dark gray silicified - arkose - some silty(?) sections - sparse disseminated sulphides pyrite and chalcopyrite - bedding(?) at 30° at 340'.

DDH A-56

214	221	Dark gray hornfelsic siltstone. Sparse disseminated sulphides - 6" cc (disseminated) at at 227'.
221	256	Medium grained arkose - some pebbly, some disseminated chalcopyrite.
256	328	Alternating gray arkose and dark siltstone. Very dark limey siltstone 290-95'. Sparse disseminated sulphides - sparse chalcopyrite.
A-40 100	332	Breccia or conglomerate at 208'. Dark porphyry at 257. Arkose at 332' (altered).
100	184	Leached.
A-39 174	205	Arkose(?).

DDH A-48

207	240	Leached Zone. Arkose (some QFM?) Brown limonite - some live limonite.
240	260	Arkose and QFM(?). Sparse cc - sparse pyrite.

Aa.16.16.20A

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

January 16,1954

AIR MAIL

Mr. C.P.Pollock, Manager Exploration
American Smelting and Refining Company
120 Broadway
New York 5, N.Y.

PIMA MINE
New Drill Hole Data

Dear Sir:

Mr. Spaulding of the Pima Mining Company has just released to us the results of the 4 holes they drilled recently on Mr. Joralemon's recommendation. Mr. Courtright and I have examined the cores.

At Mr. Pope's request I am writing direct to you and enclosing a plan map and longitudinal section showing the positions of these holes. More detailed sections and descriptions will be compiled and distributed within a few days, but it is not expected that this later, detailed information will contain any additional features which will affect the overall evaluation of this property.

Of the 4 holes, the most critical is A-34, shown on the lower right corner of both of the attached maps. This cut two lenses of typical ore on the projection of the ore zone some 300 feet away from previously known ore. No sludge and only 10 or 15% of the core was recovered. Following is a tabulation of core assays:

661' to 667'	-	1.48% Cu
667' to 677'	-	8.42% Cu
677' to 679'	-	3.42% Cu
679' to 681'	-	1.94% Cu
681' to 686'	-	3.21% Cu
686' to 691'	-	.35% Cu
691' to 701'	-	.60% Cu
701' to 711'	-	2.45% Cu

This hole was stopped in mineralized material about 70 feet short of the projected footwall.

Due to the poor recoveries, these assays cannot be accepted as being representative, and since only the upper part of the ore zone was penetrated, the entire result is inconclusive. However, this hole demonstrates continuity of the ore zone for an important distance.

Another significant feature of this hole is that it cuts arkose strongly altered to quartz, sericite and clay from the base of the gravels at 205 feet to the hanging wall of mineralized limestone at a depth of 640 feet. The upper 70 feet of this segment is leached but retains some copper as silicates and carbonates (no assays are available). The remainder contains disseminated chalcopyrite and pyrite. (No chalcocite was visible despite the overlying leached zone. This is awkward to account for). For the top 100 feet of the sulphide zone the average assay is .60% Cu. Assays for the entire sulphide-arkose column of 370 feet range within .2 and .7 and average .45% Cu.

The occurrence of primary disseminated copper mineralization of this continuity and grade (about the same as the primary grade at Oxide and El Tiro) lends strength to the possibility that a disseminated ore body exists near the Pima ore body.

The other surface drill hole, A-33, apparently was drilled to test a parallel mineralized zone indicated by a couple of former holes in the footwall of the Pima ore body. Hole A-33 cuts garnetized limestone with sparse sulphides, but no ore. The highest assay was 2.86% Cu. Including prior information, the footwall zone of mineralization appears to be unimportant in the west portion of the property.

An underground hole, 6008, was drilled 125 feet north at -45° from the pump station near the shaft on the 600 level. At this point this constitutes a total penetration of 280 feet into the footwall of the ore body. Only weak sulphide mineralization was encountered.

Hole No. 6007 was drilled at -70° North from a hanging wall crosscut on the 600 level. Ore-type mineralization was cut between 58 feet and 115 feet. The grade of the core appeared to be sub-marginal, although assays are not yet available. This indicates continuity of the ore zone below

the 600 level, but copper mineralization appears to be weaker than on the 600 level.

encl: plan map
Long. Section

Yours very truly,
Original Signed by
KENYON RICHARD
Kenyon Richard

cc: D.J.Pope - encl (2)
F.V.Richard " (2)
W.R.Landwehr " (2)
T.A.Snedden " (2)

KR:blc

PIMA MINING COMPANY

TOUR STATISTICS

	Monthly Man Hours Worked	Average Number of Men
Payroll:		
Average number of employees:		
Mine	23,476	145
Mill	11,103	59
Mechanical and electrical	12,014	65
Other	6,454	37
Total	53,047	306
Annual payroll contribution to Tucson's economy		$ 1,910,000

Shifts operated:

Mill	21/week
Mine	18/week

Pit Production in September:

Cubic yards:		
Alluvium		307,000
Rock and ore	≠ 4000 tpd at 1.0% cu	152,500
Total		459,500

712 tons of material moved to get 1 ton of pure copper

Pit Production to date (5 years):

Approximately 22,800,000 cubic yards

or 250,000,000 garden wheelbarrow loads

or 1,000 Egyptian slaves working every day for some 12 years.

Supplies used during September:

Explosives	58 tons
Fuel (enough to last an average driver 100 years)	85,000 gallons
Crusher and mill liners and rods and balls	230,000 pounds steel
Water - both fresh and recirculated	44,000,000 gallons
Power - received at plant sub @ 44,000V	3,000,000 KWH

Strip ratio - 7/1 (costumer - 6/1)

10/25/60

Mining costs (7 × 35) = 2.45 per ton ore
Milling .85
indirect .45
3.75

Income per ton
2016 cu at 24¢ = 4.80
cost — 3.75
1.05 per ton op profit
less amort. 1.00

J. H. COURTRIGHT

C
O
P
Y

WESTERN MINING DEPARTMENT
Salt Lake City, Utah

December 24, 1953

AIR MAIL

Mr. C. P. Pollock, Exploration Manager
American Smelting and Refining Company
120 Broadway
New York 5, N. Y.

ARIZONA, PIMA COUNTY
PIMA MINING DISTRICT
PIMA MINE
ESTIMATED OUTCOME

Dear Sir:

After the estimated outcome of October 21, 1953 prepared in Tucson and the revised outcome prepared here in Salt Lake were submitted to New York, the question was raised by you and Mr. Pope as to whether the Pima ore body could be mined to produce a grade of 5.85% copper due to the irregularity of the higher grade ore outline.

Mr. Pope subsequently requested that another ore reserve be prepared based on a more regular and continuous ore outline than derived for the October estimate. Mr. Tainter of this office calculated a new ore reserve on this basis, copy of which is attached to his letter of November 30, 1953 (Attachment 11). This new ore reserve estimate indicates 910,000 tons of measured and indicated ore assaying 5% copper as compared to the comparable October 1953 estimate of 660,000 tons of 5.85% copper. No inferred ore was estimated on this new basis since insufficient data was available to change the October estimate in this category. Mr. Tainter has also assumed certain probable pillar and dilation factors as outlined in his letter which results in a second more conservative estimate of measured and indicated ore of 980,000 tons assaying 4.5% copper.

Both of these estimated reserves have been used as a basis for making a new estimate of outcome on a production of 13,000 tons per month mined 25% by conventional square set methods (6 tons per manshift in stopes) and 75% by sublevel caving (15 tons per manshift) for the approximate areas shown on Attachment 12. The details of this new estimate of outcome are shown on Attachments 1-A through 10-B. This new estimate required a complete re-estimate of all costs except the cost of additional work to develop the measured and indicated reserves which has been retained at $0.75 per ton. As in the revised October 1953 estimate, no allowance is made in the costs for exploration other than reasonable extensions of the presently known ore zone.

It is interesting to note that the total outcome on the new lower grade measured and indicated ore reserves are greater, in all but one case, at the same metal prices than on the higher grade reserves used in the October 1953 estimate as tabulated below.

Dec. 24, 1953

Mr. C. P. Pollock

Pima Mine - Estimated Outcome

	Measured and Indicated Reserves		Total Costs per ton			Total Outcome 29.97¢ Cu	(before depreciation, depletion & inc.Tax) 24.5¢ Cu	
	Tons	Grade % Cu	Oper.	Capital	p/ton	Amount	p/ton	Amount
Oct.1953 Revised Est.	660,000	5.85	$13.20	$2.28	$8.86	$5,849,900	$3.18	$2,101,100
Present Est.	910,000	5.0	10.87	2.14	8.36	7,611,000	3.37	3,070,100
Present Est.	980,000	4.5	10.87	1.98	6.21	6,082,200	1.75	1,711,400

The main factor in maintaining lower costs and an improved outcome over the previous estimate, in spite of lower grade ore, is the higher monthly tonnage rate made possible by greater ore reserves and an ore outline suitable to a more efficient stoping method. The sublevel caving extraction method (sometimes erroneously called sublevel top slicing) used in estimating stoping costs for 75% of the ore body is the critical factor. Success of this method depends on a hanging wall that will cave as the ore is removed and an ore which can be fragmented to slusher handling size without excessive blasting. I would estimate that fragmentation of the ore will not be a problem as the ore body is well cut up with minor faults and slips, and timber is required in most cases to support it. Although the hanging wall is reasonably firm and may not cave until a relatively long strike length of support is removed, there is hanging wall faulting and we would start mining under the gravels and these would follow the mat downward until the hanging wall starts breaking. Once this wall starts breaking, it should continue to break as stoping progresses downward. It might even be possible if the gravels will cave to the surface, that they would follow the mat downward for several hundred feet.

We were somewhat worried that this mining method would not be applicable to an ore deposit dipping 45°, however, we found on review of the deposits mined by this method that a large proportion of these were 45° or flatter as the method was used most extensively on the Iron Range. The ideal dip for this method is about 60°, however, a 45° deposit can be mined with very good productivity, but somewhat more matting is required as the mats encounter the footwall more often than on steeper deposits. This mining method, in addition to the advantage of good productivity per manshift, is also much safer than overhead mining methods, development cost is low as one raise will serve 200 feet of strike length, and maintenance of mining openings is extremely low. The main disadvantage is that mining has to progress systematically downward all along the strike, and as a result in deposits having erratic distribution of values, there is little flexibility in controlling ore grade. This, however, would not be a difficult problem at Pima due to the relatively uniform grade from block to block along the strike.

Although the production on this estimate is based on 13,000 tons per month, which is approximately 435 tons per day on 30 days per milling month, we have estimated the capital cost of the mill on the basis of 500 tons per day, using two 7' x 7' ball mills.

The list of manpower requirements (Attachment 7) is approximate only and was used mainly in estimating general expense items. Most of the cost estimates were based on experience at operating units projected to the expected conditions at Pima and

Dec. 24, 1953

Mr. C. P. Pollock

Pima Mine - Estimated Outcome

reconciled to the total labor cost indicated by the manpower requirements in a general way.

This estimate, though based on different conditions than the October 1953 estimate, was derived independently of that estimate and can be considered a general check on the valuation of this mine. It would be my opinion that the mine could be operated under either of the proposed mining rates and ore reserves outlined in the October and this estimate.

Very truly yours,

/s/ F. V. RICHARD

FVR:bm
Encl.

cc: DJPope w/encl.
TASnedden "
KERichard, no encl.

Copied at Tucson December 28, 1953, for J. H. Gourtright.

AMERICAN SMELTING AND REFINING COMPANY

RESEARCH DEPARTMENT

SOUTH PLAINFIELD, N. J.

AIR MAIL December 10, 1953

Mr. Kenyon Richard
SOUTHWESTERN DIVISION
TUCSON, ARIZONA

Subject: Pima Mine Sample (SA7162)

This refers to your letter of November 30 to Dr. A. J. Phillips regarding the Pima Mine sample.

The elements indium, cadmium, cobalt which we classed as "low" and tin which we classed as "moderately low," are well below commercial importance. Our spectrographer cannot give an exact quantitative figure for them but he says they are definitely below 0.005%.

A petrographic examination of the sample indicated a few flakes of molybdenite but there was no indication of scheelite.

You are quite right in stating that the amount of material which was actually used on the spectrograph was quite small and if there were only a few scattered minerals in a fairly large sample, they could very easily have been missed.

A. A. SMITH, JR.

AAS:MTB

cc Dr. AJPhillips
DJPope
WRLandwehr
TASnedden
JHCourtright

Dec 5, 1955

FILE MEMORANDUM:

PIMA MINE
Pima County, Arizona

During a recent meeting here with Mr. Spaulding it was learned that Cypress drove some 2600 feet of drift to check-sample Pima diamond drill results. All muck from this drifting was crushed and sampled. Results, as compared to those from the diamond drill holes, were consistently low. The net outcome was a reduction of 10% in the grade of the open pit ore body. The amount of this reduction is interesting, since it is precisely the same as the reduction factor which we applied to the grade of this ore body after analyzing their diamond drill results (see Pima Mine report of Sept. 17, 1954, by Kenyon Richard).

Cypress plans to mine ore at a rate of 3000 tons per day for an "8 to 10 year period". Judging from our information on the ore body, this indicates that they have calculated around 10 million tons at a grade of about 1.50% copper. A .60% cutoff will be used; material between .40% and .60% will be stockpiled separate from the waste dumps.

Spaulding also mentioned that the ultimate pit bottom will be on the 600 mine level, that skip haulage from the pit is being considered, and that the mill was designed so that it could be expanded to 4500 tons per day.

Original signed by
J. H. Courtright

J. H. COURTRIGHT

cc: FVRichard
~~WHandwehr~~
~~TASudden~~
~~KERichard~~

J. H. COURTRIGHT ✓

Aa-16.16.20A

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

December 4, 1953

Mr. W. H. Landwehr, Chief Geologist
Western Mining Department
Salt Lake City Office

CHILSON CLAIMS
Pima Mining Dist.
Pima County, Ariz.

Dear Sir:

This letter will bring to date our negotiations with Chilson.

After a conversation with Chilson on November 23rd regarding his Kino Group of 17 claims adjoining the Pima Mining Company's claims on the northeast, I gave you by telephone his principal terms for a lease and option. These terms were as follows:

Purchase price of $10,000 per claim, or a total of $170,000.

Royalty of 5% on net smelter returns.

Minimum advance royalty of $250 per month for first two years; $500 per month thereafter.

Fifteen of Chilson's claims are Federal locations; two are on State ground. For about half of his Federal claims, only a few days remained of the 90-day period during which he could validate his claims by doing the location work. He said it would be difficult for him to arrange to finance this work; and as part of the deal he wanted us to pay him $100 per claim to have this work done.

On November 25th Mr. F. V. Richard informed Mr. Snedden and me by telephone that we were not to agree to pay Chilson for his location work.

Following your telephoned advice of December 1st to try to improve these terms, Mr. Courtright and I talked with Chilson yesterday. In the meantime he had managed to arrange to have the location work done on 13 of his claims (by back-hoe shovel for probably $20 per claim). His attitude, now that the pressure is off him for a time, is one of indifference. He would not consider anything but his original terms.

Yours very truly,

Original Sign.
K. Richard

KENYON RICHARD

KR:ar
cc: FVRichard
TASnedden
JHCourtright ✓

J. M. COURTRIGHT

Aa-16.16.20A

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

December 1, 1953

Mr. F. V. Richard, Manager
Western Mining Department
Salt Lake City Office

PIMA MINE
Pima County, Ariz.

Dear Sir:

The attached memorandum by Mr. Courtright is in answer to your letter of November 25th, requesting additional comment on ground conditions with reference to top slicing.

In addition to the trouble of getting the hanging wall to cave in some areas we could expect difficulty in advancing the stope floors to the hanging wall in other areas that might have a tendency to cave in a blocky manner, and some ore might be lost, but in general we believe a top slice system could probably be used for about 70% of the ore body. The greatest disadvantage is that we would be continually working into a new hanging wall and the mat will repose on the footwall rather than follow down with stope advance.

Where the walls are reasonably good and the ore is below average width, cut and fill, with low timber consumption, offers a possibility of better costs than top slicing.

Very truly yours,

T. A. SNEDDEN

TAS:ar

enc: Mr. Courtright's report
of November 30th, 1953

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

November 30, 1953

MEMORANDUM FOR MR. T. A. SNEDDEN

PIMA MINE
Pima County, Ariz.

Reference is made to Mr. F. V. Richard's request (letter, November 25th) for comment on ground conditions at Pima and the possible application of top-slice mining.

As described in the geologic report of October 12th, the hanging wall rock is composed of both garnetized and "fresh" limestone containing numerous fractures and slips at random attitudes. This type of ground is characteristically non-uniform in firmness and is not apt to cave evenly, or progressively, as would be required in top-slice mining. Experience in cave mining operations has shown that such ground is difficult to cave without long-hole blasting, due to its tendency to hang up in very large, resistant blocks.

However, the low-angle dip of the Pima ore body presents a somewhat different problem than that encountered in bodies with sufficiently large dimensions in the vertical range. As each successive slice is taken, new ground, beyond the protection of the timber mat would be opened up on the hanging wall side. It may be feasible to drill and blast this exposed strip along the hanging wall, thereby providing a cushion of protection against erratic caving. The hazards of possible delayed action in caving are, of course, considerably reduced by the low (45°) dip which limits the height of an opening which might form vertically over the map to a distance approximately equivalent to the stope width.

The additional cost involved in the drilling and blasting of the hanging wall would be difficult to estimate closely in advance, but it should not be much over $0.50 per ton of ore extracted, assuming that an average ten-foot thickness of hanging wall was broken (average ore width, around thirty feet).

Possibly about 30% of calculated Pima ore tonnage occurs in bodies too narrow or discontinuous to be mined by the top-slice method.

JHC:ar

J. H. Courtright

J. H. COURTRIGHT

As-16.16.20A

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

November 30, 1953

Dr. A. J. Phillips, Vice President
American Smelting and Refining Company
Research Department
S. Plainfield, New Jersey

PIMA MINE SAMPLE 7162

Dear Sir:

Reference is made to Mr. A. A. Smith's letter of October 27th to me.

It is noted that in your spectrographic analysis the elements indium, cadmium and cobalt are classed as "low" and tin as "moderately low". The question has been asked if these metals could be in quantities of commercial importance. In order to answer this question we would like to know what percentage ranges are represented by your various classifications.

Also, molybdenite and scheelite have been identified in this ore and we had expected these elements to show up as more than "nil". Quite likely, the explanation for this is that the amount of material you actually use in your spectrographic test is so small that it could not be expected to be completely accurate. In any event, if you believe that any of these six metals is present in amounts which could have commercial significance, we would appreciate having you make quantitive analyses of them and send the results to me, with copy to Mr. W. R. Landwehr.

Yours very truly,

Original Signed By
K. Richard

KENYON RICHARD

KR:ar

cc: DJPope
WRLandwehr
TASnedden
JHCourtright

WESTERN MINING DEPARTMENT
Salt Lake City, Utah

November 25, 1953

AIR MAIL

Mr. T. A. Snedden, Manager
Southwestern Mining Division
American Smelting and Refining Company
813 Valley National Building
Tucson, Arizona

PIMA MINE
PIMA COUNTY, ARIZONA

Dear Sir:

I have been doing some additional thinking on the possibilities of having to estimate the outcome on the Pima Mine using a lower grade ore reserve, say somewhere in the range of 4.5% to 5%. It is quite obvious, if a reasonable outcome is to be made using this grade ore, that a mining method other than square set will have to be considered.

Two mining methods which have the possibility of producing fairly substantial tonnage per man shift are the sublevel top slice system used at Resurrection, and a modification of the sublevel blasting system used at Trench. The former of these methods requires that the hanging wall cave and come down gradually with the mat so that air pockets are not developed above the mat. The second method requires that the stoped area between pillars stays open long enough to withdraw the ore and place fill if this is needed.

I would appreciate your comments and those of Kenyon Richard and Harold Courtright on the wall characteristics which might have some bearing on these two methods. It should be kept in mind in considering this that the sublevel top slice system would involve starting at the top of the ore under the gravels and mining the ore downward over the full length of the ore body strike without leaving any pillars other than low grade material. Under these conditions, even a reasonably firm wall will collapse, whereas the same wall might likewise stand using the other system and pillars.

Very truly yours,

ORIGINAL SIGNED BY
F. V. RICHARD

F. V. RICHARD

FVR:bm
cc: K.E.Richard

C
O
P
Y

J. H. COURTRIGHT

WESTERN MINING DEPARTMENT
Salt Lake City, Utah

November 21, 1953

AIR MAIL

Mr. C. P. Pollock, Exploration Manager
American Smelting and Refining Company
120 Broadway
New York 5, N. Y.

ARIZONA, PIMA COUNTY
PIMA DISTRICT
PIMA MINE

Dear Sir:

I am enclosing copy of Messrs. Richard and Courtright's letter of November 19 to Mr. Landwehr with attached maps, and also copy of Mr. Yaeger's memorandum to Mr. Snedden of October 30.

Mr. Landwehr and I have reviewed this latest data briefly, but have not had time to study it in sufficient detail to offer any comments. We are passing on the data anyway so that you will have the opportunity to use the various plan maps and sections to study open pit possibilities.

As soon as we have studied the data more thoroughly, we will offer our comments on the various recommendations that have been made, particularly those relative to locating additional claims to the east. In the meantime, however, I would appreciate your opinion as to the advisability of locating these claims now, prior to negotiations with the United Geophysical Company. If we knew that United Geophysical Company were not interested in this eastern area, we could probably locate claims now without prejudicing our relationship with them. I would, however, question the advisability of locating these claims without giving them prior notice, and I am somewhat in doubt as to the advisability of mentioning this to them at the present time, and would, therefore, appreciate your comments.

I am passing on the copy of Mr. Yaeger's memorandum to Mr. Snedden of October 30 on the Pima development costs in the October 21 economic report, as it clarifies their thoughts on this. I do not, however, think that Mr. Yaeger's comments will make any change in the development cost figures of 75¢ per ton for measured indicated ore and $2.05 per ton for inferred ore, as tabulated in the revised estimated outcome sent you recently.

Very truly yours,

/s/ F. V. RICHARD

FVR:si
cc: DJPope)
TASnedden) without enc.
KERichard)

P. S. - Since writing the above, Mr. Kenyon Richard has advised Mr. Landwehr that Mr. Spalding, of Pima Mining Company, is reportedly getting nervous about the claim locating to the east, and may be getting prepared to locate claims for Pima Mining Company. Also it is reported that Mr. Joralemon has mentioned to the local people the possibility of disseminated copper mineralization in porphyry.

F. V. R.

WORK SHEET FOR LOW-GRADE ORE ESTIMATE

FROM 550 LEVEL TO 650 LEVEL 2% CUT-OFF

Section	Area (ft^2) of +2% (Planim.) A	Area (ft^2) of +3% (Planim.) B	Net Area (A-B) C	Volume (C x 50) D	Adjusted Vol.* E	Tons E/10 F	Assay Tons (F x 2.5%) G
4800	825	0	825	41,250	41,250	4,125	10,313
4750	1000	0	1000	50,000	50,000	5,000	12,500
4700	425	0	425	21,250	21,250	2,125	5,313
4600	3425	459	2966	148,300	148,300	14,830	37,075
4550	4200	1926	2274	113,700	119,255	11,926	29,815
4500	6775	3834	2941	147,050	147,050	14,705	36,763
4450	6375	3240	3135	156,750	156,750	15,675	39,188
4400	6225	2682	3543	177,150	177,150	17,715	44,288
4350	3250	0	3250	162,500	149,500	14,950	37,375
					Total	101,051	252,630

*Compensating for adjustments made in plus 3%, and for irregularities in outline of plus 2%

WORK SHEET FOR LOW-GRADE ORE ESTIMATE

FROM 450 TO 550 LEVEL 2% CUT-OFF

Section	Area (ft^2) of +2% (Planim.) A	Area (ft^2 of +3% (Planim.) B	Net Area (A-B) C	Volume (C x 50) D	Adjusted Vol.* E	Tons E/10 F	Assay Tons (F x 2.5%) G
4950	4600	657	3943	197,150	197,150	19,715	49,288
4900	3525	2088	1437	71,850	71,850	7,185	17,963
4850	5475	1953	3522	176,100	196,335	19,634	49,085
4800	7300	4230	3070	153,500	98,060	9,806	24,515
4750	6775	4869	1906	95,300	110,300	11,030	27,575
4700	10225	7380	2845	142,250	192,250	19,225	48,063
4650	3425	1872	1553	77,650	64,650	6,465	16,163
4600	6400	2880	3520	176,000	173,550	17,355	43,388
4550	4625	2709	1916	95,800	62,255	6,226	15,565
4500	7425	2907	4518	225,900	225,900	22,590	56,475
4450	7675	0	7675	383,750	375,650	37,565	93,913
4400	6525	2439	4086	204,300	209,495	20,950	52,375
4350	2825	0	2825	141,250	120,250	12,025	30,063
					Total	209,771	524,431

*Compensating for adjustments made in plus 3%, and for irregularities in outline of plus 2%

J. H. COURTRIGHT
Aa-16.16.20A

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

November 19, 1953

Mr. W. R. Landwehr, Chief Geologist
Western Mining Department
Salt Lake City Office

PIMA MINE
SUPPLEMENTAL EXPLORATION DATA

Dear Sir:

Enclosed are six maps, a book of 18 sections, and other data showing the additional information you requested by telephone, November 7th. Also, copy of Mr. Pollock's letter of November 9th to Mr. F. V. Richard has been received and taken into account in compiling these data. This material supplements the geological report of October 12th.

PIMA ORE BODY AND POSSIBLE EXTENSIONS:

The outlines of plus-1% Cu and plus-2% Cu are shown on the four Assay Level Maps and on the sections. These outlines are generalized at best, and to a considerable extent they are long projections because assay information is scanty. While the richer portions of the deposit are surrounded, for the most part, by low grade material, the decrease in copper content is not uniformly gradational. The sharpest drop is usually near 3% copper; and therefore, this natural cut-off was the one used in our first estimate.

In the original geological report the problem of ore availability to open-cut mining was not analyzed. The principal reason for this was that the ore tonnage was considered to be too low to support (1) the capital cost of a mill sufficiently large to show a profit on the lower grade of ore and (2) the capital cost of the pre-mine stripping involved in such an extremely high waste/ore ratio. We still believe this to be the case. The following figures are an estimate of combined measured, indicated, and inferred ore, as requested:

	Plus-1% Cu			Plus-2% Cu	
Block	Tons (Millions)	Grade (% Cu)	Waste/ore*	Tons (Millions)	Grade (%Cu)
250-450 lev.	2.567	2.54	10/1	1.193	3.74
250-550 lev.	3.648	2.55	11/1	1.593	3.90
250-650 lev.				1.761	3.91

*Very approximate

The above figures represent recalculations using the sections and plans in the same manner as they were used in the calculations of the original report. Areas of plus-1% and plus-2% were measured on the sections by planimeter. Areas of plus-3% (previously measured) were subtracted from these to obtain the net areas of plus-1% and plus-2%. After taking into account the adjustments applied previously to the plus-3% volumes, the lower cut-off volumes were converted to tons, using a factor of 10 cubic feet, and to grade tons using 1.5% Cu and 2.5% Cu respectively as the average grade of the material between 1% and 2% and between 2% and 3%. An arithmetical average of all assays between the 2% and 3% lines on the plans gave 2.6%; however, since the samples were more often bunched near the 3% line, the theoretical average of 2.5% was used. Top and bottom limits of material of both classes are shown as horizontal lines on

the sections placed halfway between the levels.

Large proportions of the tabulated tonnages are in the inferred category. In order to "measure" the plus-1% Cu material for the purpose of planning an open-cut mining system, approximately 9000 feet of diamond drill holes would be needed —six surface holes at 500 feet ($10/ft.), 40 underground holes at 100-200 feet ($3.50/ft.). Cost: $51,000.00.

To define the grade and limits of the plus-2% Cu for the sole purpose of underground mining, only about 25 underground holes would be needed at a cost of $10,000.00. (In this case no surface holes would be needed within the immediate area of mine development.)

As we understand the second paragraph of Mr. Pollock's letter, consideration may be given to mining the ore body underground, using a 2% Cu cut-off rather than the 3% we had originally outlined. We do not think that underground mining costs will permit using such a low cut-off. However, if it were to be considered possible to do so for the purpose of being able to stope a continuous mass of ore of regular shape, the tonnages of plus-2% ore given in the above tabulation would not apply. The reason for this is that these plus-2% tonnages include large masses of material which are only slightly above 2% Cu in average tenor. If stoping were to be planned so that the 3% cut-off would apply to most of the stope margins with 2% being used where it would permit stopes to be continuous and regular in shape, then the ore tonnage to the 650 level would be approximately 1.0 million and the grade, 5.0% Cu. This manner of considering the problem in effect increases the dilution factor from the 15% originally used to 50%.

In the second paragraph of his letter, Mr. Pollock expresses doubt that the estimated grade of 5.65% Cu can be maintained without dilution greater than 15%. In their estimate of development costs, Mr. Snedden and Mr. Yaeger included a considerable amount of diamond drilling. This drilling would be done to determine the ore limits ahead of stoping. We are confident this information would permit mining with no greater dilution than 15%. This presupposes that stoping will have a close engineering-geological control. Attached copy of a Memorandum by Mr. Yaeger to Mr. Snedden dated October 30th explains, among other things, the amount of this diamond drilling cost and how it was included in the original estimate of development expense.

Exploration proposal No. 1, down dip on the known ore zone below the 600 level, is shown on the attached Composite Plan. The 200-foot crosscut is planned as the main haulage connection with a new shaft, so this crosscut would be a development rather than exploration cost. As stated in the original report, 4 down-pointed holes were planned. This has been increased to five holes having a total footage of 2000 feet. Cost: $7,000.00.

If at least two of these holes cut ore, main shaft development could be extended to the 800 level. If they all show weak mineralization, the ore projections below the 600 level would probably be developed by winzing.

On considering the possible extension of the orebody to the east, that portion containing inferred ore (between coordinates 4900 E and 5200 E) would be explored and developed by drifts, crosscuts, and short underground diamond drill holes. This would

not be strictly in the exploration category, and costs should be charged to mine development, as has already been taken into account by the cost estimates of Mr. Snedden and Mr. Yaeger. Eastward beyond this block the problem is entirely exploration — to determine if any ore exists. Six holes are planned at intervals of 500 feet along the projection of the ore zone. (See attached Claim Map, Proposal 2a). Cost, $36,000. All of these holes would be drilled only if ore-type mineralization were found to be continuous. If ore is encountered it should be explored by additional holes up and down dip and then blocked out by extending present levels eastward along the indicated trend of mineralization. It is inappropriate to attempt now to estimate the cost or plan of these workings.

ORE CONTROLS

Lack of evidence of ore controls is mentioned in the third paragraph of Mr. Pollock's letter. As stated in the geological report of October 12th (page 9, paragraph 5), specific structural controls were not found in our underground mapping. To quote: "While the strongest shears and fractures in the mine coincide with this trend (E-W, south dipping) no clear evidence was found to indicate that the ore zone occupied a major regional fault. Such a structure may have controlled — but have been obliterated by — the garnet-magnetite zone. The east-west fissures, as well as those at divergent angles, lack (visible) continuity in any direction". The generally weak, discontinuous faults (both pre- and post-mineral), observed in the mine, appear on the geologic plans and sections accompanying the October 12th report in what we consider to be their proper perspective.

Continuity of the ore-bearing zone to the 800-level was assumed to be a reasonable expectation in view of the demonstrated persistence of similar nearby zones, to quote: "Neither the Mineral Hill nor the San Xavier ore body has been bottomed at their respective depths of 700 and 900 feet, and in both cases the short axis is the horizontal one; the dip length of the Mineral deposit thus far is well over twice the strike length. On this basis the ultimate bottom of the Pima deposit would be very deep, ——."

It can be further rationalized that although a major structural control is not evident, neither is there evidence of important discontinuity. The Pima mineralized zone as a whole is extensive and has a persistent attitude. These conditions alone justify geometrical projection for a reasonable distance.

FOOTWALL EXPLORATION POSSIBILITIES

Excepting the 600 level crosscut which terminated in barren hornfels, none of Pima's underground exploration reached an unmineralized footwall. However, a number of surface holes (A-18, A-29, A-27, A-31, A-16) encountered barren limestone or hornfels about 150 feet in the footwall on the 300 level, indicating the probable limits of the Pima ore-type mineralization. Farther west, near the Banner property line, a hole (4025) drilled from the 400 level showed a zone of slightly pyritic garnet and magnetite extending over 200 feet in the footwall with one fifteen-foot intercept of possibly 4.0% in copper value. (Drill hole samples were not assayed.) This prospect is one that should eventually be explored further, but is not considered of immediate concern because such small, spotty occurrences of copper are common in outcrops on Banner ground to the west. Longer range possibilities in the footwall are, of course, wide open to speculation since the nearest outcrop to the north is several miles distant, and the outcrops to the west are in a structurally different block. Unless geophysical methods can be usefully applied in this area, the small size (as compared to the extent of this gravel-covered area) of

the possible ore bodies precludes blind exploratory drilling.

PORPHYRY COPPER EXPLORATION:

Before undertaking exploration of the porphyry copper possibilities we must have control of a large amount of ground. The reason: We have been unable to recognize any pronounced structural trends or other geological conditions which could be projected beneath the gravel cover and which would narrow the field of exploratory interest. Geophysical work might be of some help, as will be discussed farther along. But for the time being it is recommended that we attempt to acquire the area shown on the accompanying claim map, about four square miles. This would include the following groups, as shown on the map:

Pima Mining Company: Though the possibility is rather remote, there is "room" on this property alone for a small porphyry copper orebody. The six holes spotted along the easterly projection of the Pima orebody would shed considerable light on this possibility.

United Geophysical: An attempt should be made to acquire this group separately if negotiations for the Pima Group are unsuccessful.

Chilson Group: The positions of these claims are uncertain. Chilson has done no location work or cornering. He says he has an anomaly running northwesterly through the Kino 6, 7 and 8. This anomaly was obtained with his own electro-magnetic equipment. It may be a valid anomaly, but there is considerable doubt as to its cause. The United Geophysical crew is now running their own electro-magnetic equipment over Chilson's claims. He says that they have a verbal agreement with him to the effect if they can check his anomaly they will option his claims — probably with a monthly payment of about $500.00. His purchase price is $10,000.00 per claim, or a 5% royalty on net smelter return without an upset price. If, after their tests, the Pima people are not interested in his ground, we will be in position to deal with Chilson immediately. He has suggested that he will deal with us on the remainder of his claims if Pima wants part of them. We have objected to this. He says he plans to locate claims covering most of the remainder of Section 31. Also, he mentioned having found an anomaly in the northeast corner of Section 6, and he may locate a few claims there.

Nauman Group: Mr. L. M. Nauman is an electronics expert who does geophysical prospecting for himself as a sideline. He claims to have obtained an electro-magnetic anomaly and has located a group of 10 claims with the intention of drilling this anomaly (trending E-W between his Golden West Nos. 4 and 5). Messrs. Snedden, Richard and Hill have discussed a lease and option with him involving 3% royalty on net smelter returns (this overrides an automatic 5% royalty to the State of Arizona) with minimum royalty payments of $250.00 per month beginning two months after the date of the lease, all to apply on a purchase price of $125,000.00; no work requirements. Mr. Hill is preparing a tentative lease and option on this basis. Of course, we are committed to nothing until New York approves, except that we may give him some help in monumenting his claims to be sure it is done correctly.

Ortiz Group: The position of this group of three claims is uncertain. We have as yet made no attempt to contact the owner, but this group should be optioned if the Chilson ground is acquired.

The remainder of the area of interest is open for location; Sections 5, 32

and 36 are State land; the rest is Federal. A total of 75 to 80 claims would be needed, assuming that Chilson or others have not located additional ground in the meantime. Of these, 32 would be on State land requiring $15 advance yearly rental but no location work. Cost of locating all of this ground is estimated as follows:

Surveying and Monumenting	$6,000.00
Location work on 45 claims	1,400.00
Recording fees and rental	600.00
Total	$8,000.00

Although the country is rather brushy, the bulk of the ground probably could be surveyed and monumented quickly and rather cheaply. The final task of cleaning up all open fractions would probably require some slow surveying, which accounts for the rather high cost estimate above.

From the standpoint of porphyry copper exploration, the Pima property would be valuable, but Chilson's property and the open ground probably are the most critical. If these latter are obtained, a minimum program of four surface diamond drill holes should be undertaken. The locations are shown on the attached Claim Map (proposal 2b). These holes would average 600 feet in depth. Cost of the four holes: $25,000.00. If all of these holes encounter little or no alteration and disseminated sulphides and no intrusive rocks such as monzonite, the program can be abandoned. If encouraging results (say, something similar to Pima's hole A32) are obtained in any one of these holes, more holes will be needed. Though a close estimate of the number of these additional preliminary holes cannot be made, it should be planned that it would amount to six holes.

SUMMARY OF COST ESTIMATES:

1. Pima Ore Body "Measurement":

Plus-1% Cu (open-cut mining):	
Surface diamond drilling	$30,000.00
Underground " "	21,000.00
	$51,000.00
or	
Plus-2% Cu (underground mining):	
Underground diamond drilling	10,000.00

2. Exploration:

Proposal (1) - (Pima ore body, down dip):	
Underground diamond drilling -	7,000.00
Proposal (2a) - (Pima orebody, eastward extension):	
Surface diamond drilling	36,000.00
Proposal (2b) - (Porphyry copper, preliminary surface diamond drilling):	
Minimum.....	25,000.00
Additional.....	35,000.00
Total exploration...	$103,000.00

3. Claim Location:

Total surveying, etc.	8,000.00

It is emphasized that we are recommending that only the Exploration and

Aa-16.16.20A
November 20, 1953

Mr. W. R. Landwehr

the Claim Location work be carried out.

GEOPHYSICAL PROSPECTING

Mr. Lacy is acquainted in general with the problems involved, and Mr. Moss has done some experimental magnetometer work south of Red Hill. Prior to the detailed study of the Pima ore body, it was concluded that there was little, if any, chance that geophysical work would be useful in the search for porphyry copper ore. However, with more information available, there may be remote, theoretical possibilities that electro-magnetic, seismic, and/or gravimetric methods would be helpful in the search for extensions or parallel occurrences of the Pima ore zone as well as for porphyry copper alteration zones. We would like to have Mr. Lacy review the geological report and this letter, and offer comments.

Yours very truly,

Kenyon Richard
KENYON RICHARD

J. H. Courtright
J. H. COURTRIGHT

KR, JHC:ar

Attachments:
18 Sections — 5150, to 4250, incl.
Assay Plans — 300, 400, 500 and 600 levels
Composite Plan
Claim Map
Copy Memorandum J. A. Yaeger to T. A. Snedden
Calculation work sheets

cc: FVRichard with attachments
WRLandwehr " "
TASnedden " "

C
O
P
Y

J. H. COURTRIGHT

November 9, 1953

AIR MAIL

Mr. F. V. Richard, Manager
American Smelting and Refining Company
600 Pacific National Life Bldg.
Salt Lake City, Utah

Pima Mine, Pima County, Arizona

Dear Sir:

As I explained by telephone Friday, after reviewing here the geological report on the Pima Mine by Messrs. Courtright and Hardie, we believe consideration should be given to the possibility of open-pit mining or other cheaper methods. This will require ore reserve estimates in addition to Mr. Courtright's estimate using 3% copper cutoff grade. Therefore if you will have estimates prepared, one based on 1% and another on 2% cutoff, sent to me as quickly as possible with new sections, I shall ask Mr. Belliveau for his opinion as to possible open-pit operations, also for an estimate of costs including both operating and capital outlays.

Mr. Pope has some doubt as to the estimated outcome based on the selective mining of a number of disconnected lenses and using an average grade of 5.65% copper. He thinks a lower grade and increased tonnage is more likely to result in an operation of this kind. While I am inclined to agree with this view, I believe it is desirable nevertheless to determine the grade and tonnage of the more continuous ore body indicated by the lower cutoff limits suggested above before arbitrarily increasing the 15% dilution factor.

From our study of the geological maps accompanying Mr. Courtright's report we are unable to find apparent structural controls indicating probable ore extensions either at depth or laterally, and for this reason I asked you to have Mr. Landwehr and Mr. Kenyon Richard review the maps with Messrs. Courtright and Hardie in an attempt to clarify the situation if this is possible. If it can safely be assumed the deposit dips with a favorable bed and will not terminate abruptly as it might do if the mineralized structure is cutting across the formations, the projection of ore to the 800 level seems reasonable. This is not clearly indicated however. Furthermore, Mr. Hart and I cannot see from the mapping any significant fracture pattern to indicate structural control of ore deposition. There is a vague suggestion of fissuring, but this is not emphasized sufficiently for us to be able to project ore extension possibilities with reasonable certainty. I believe this structural picture can be clarified by the geologists, perhaps without additional mapping.

I also think a little further elaboration by Mr. Courtright of exploration possibilities would be helpful. He does not, for instance, recommend a specific program to test the mineralization indicated in the footwall of the main Pima zone. It may be difficult at the outset to lay out the exploration program precisely, but we should know approximately the minimum program required to test individual targets, together with the estimated cost to complete the work.

The property seems important enough to me to warrant some extra attention in regard to these matters. Since we have a few extra days to study the reports, I believe it worth while to ask our engineers for further clarification.

Yours very truly,

/s/ C. P. POLLOCK

cc: TASnedden A/M
WRLandwehr A/M
Kenyon Richard - Tucson A/M

C
O
P
Y

November 6, 1953

MEMORANDUM TO: Mr. F. V. Richard

ARIZONA, PIMA COUNTY
PIMA DISTRICT
PIMA MINE

I have studied the geological report of October 12, 1953 on the Pima mine by Courtright and Hardie, and have the following comments:

The report is well prepared and it is evident that it is the result of careful assembling and analyzing all pertinent data.

The estimate of measured and indicated ore is based upon good geological and engineering practices. The results of our spot-check of a number of ore blocks was very close to the tonnages used in the report. The method used in delimiting the various blocks introduces a factor of safety, but it is not deliberately unreasonable.

We similarly checked the average grade of a number of ore blocks, and in all cases our result was higher than that of the report, the difference being due no doubt to less knowledge of details on our part.

The estimate of inferred ore down to the 800 level also seems reasonable in view of the diminution in the grade of the mineralization between the 500 and 600 levels between coordinates 4600 E. and 4800 E.

As brought out in the report, the possibilities for additional ore of the replacement type are in down-dip extensions of the ore zone as presently developed, and in the easterly extension of the zone. There is also an indication that another mineralized zone may exist a short distance in the footwall of the Pima zone.

Mineralization of the Pima type, although often erratic in the distribution of the valuable content, should persist to a considerable depth. The Pima mineralization probably extends for a considerable depth below the elevation of the 800 level unless an unfavorable structure exists such as the granite in the San Xavier Mine.

The eastward extent of the mineralized zone has not been determined. Undoubtedly the eastern limit of Pima's surface drilling marks the limit of the geophysical anomaly that resulted in the discovery of the ore body, but, for reasons given on page 15 of the report, this may not necessarily mark the limits of mineralization. From the evidence on hand, I am of the opinion that chances for additional appreciable amounts of ore to the east are good.

There is a possibility of another mineralized bed a short distance in the footwall of the Pima bed.

As emplasized in the report, and also by Mr. Richard in his covering letter, the Pima body may be peripheral to commercial porphyry-type copper mineralization in

Mr. F. V. Richard

monzonite. The positive indications are sufficient to make this an attractive exploration possibility and one that should be taken into consideration in evaluating the Pime mine. It should be considered separately even though we do not acquire that property.

We should make every reasonable effort to acquire the Pima property.

WRL:si /s/ W. R. LANDWEHR

cc: K.E.Richard

Copied at Tucson, Arizona for J. H. Courtright and B. S. Hardie.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

October 30, 1953

MEMORANDUM FOR
Mr.T.A.Snedden

PIMA MINE
ESTIMATED OUTCOME

I refer to Mr. F.V.Richard's letter to you of October 26th on the above subject, and have the following comments to make:

In general Mr. Richard believes that our estimated cost of $2.30 per ton for development is high. This estimated cost is for all development (mining and exploration) and diamond drilling. Possibly we should have broken this cost down further in the economic report, and also commented on the amount of diamond drilling that Mr. Courtright estimated would have to be done for mining and exploration purposes, but which is not stated in his report. He estimated that approximately 2500 feet of diamond drilling per month would be necessary. It was on this basis that my estimate of four diamond drillers and helpers would be needed with total wages amounting to $39,694.74 per year. Following is a breakdown of the $2.30 per ton for all development (including diamond drilling) and based on an estimated cost of $40 per foot for drifts and raises, and 29,000 feet of development for exploration and mining of 660,000 tons:

1. $40 x 29,000 = $1,160,000 total cost for exploration and mining development of 660,000 tons.

2. $\frac{\$1,160,000}{660,000 \text{ tons}}$ = $1.76 per ton for development exclusive of diamond drilling.

3. $2.30 - $1.76= $.54 per ton for diamond drilling.

4. $.54 x 660,000 = $356,400 total cost for exploration and mining diamond drilling.

5. $\frac{6 \text{ (years)} \times \$39,694 \text{ (labor cost diamond drilling per year)}}{660,000 \text{ tons}}$ = $.36/ton labor cost for diamond drilling.

6. $.54 - $.36 = $.18 per ton cost for diamond drilling supplies, etc., exclusive of labor, or 33% of the total cost.

7. Estimated diamond drilling cost per foot is $2.00, therefore $\frac{\$356,400}{\$2.00}$ = 178,200 feet of diamond drilling for exploration and mining development while mining 660,000 tons.

8. $\frac{178,200 \text{ feet}}{6(\text{yrs}) \times 12(\text{mos})}$ = 2475 feet of diamond drilling per month, or approximately the amount Mr. Courtright told us he estimated.

SUMMARY OF BREAKDOWN OF $2.30 PER TON DEVELOPMENT COST

	Cost Per Ton
Development (raises, drifts, cross-cuts, winzes)	$1.76
Diamond drilling labor cost (67% of total diamond drilling cost).....	.36
Diamond drilling supplies, etc., cost.....	.18
Total cost all development	$2.30

It is interesting to note that Ground Hog had the following costs for 1952:

Diamond drilling cost per ton of ore broken...	$ .62
Diamond drilling cost per foot drilled.....	3.88
Development cost per foot (exclusive of diamond drilling).....	$43.23

In the fifth paragraph of Mr. Richard's letter he states that our $2.30 per ton cost is derived by taking the summation of the following development footage as shown on the lower half of Page 7 of the "Economic Report".

	Feet
1. Development and Exploration footage through July 1953.....	6,820
2. Proposed Pre-Production Development	2,670
3. Estimated footage of development work to be done currently with mining operations - 4,800 feet per 108,000 tons of ore mined.....	29,000
T o t a l	38,490

and multiplying this total (38,490 feet) by $40. per foot, and dividing by 660,000 tons, this gives a figure of $2.33, and it is merely a coincidence that it came out that way. Since our figure of $2.30 was not derived as Mr. Richard assumed, his assumption that a portion of pre-production development cost is included in the estimated $2.30 per ton development cost is incorrect.

In the last paragraph of his letter he states that our proposed pre-production development cost should not include shaft cross-cuts, ore pass, and waste pass. I am not in agreement with him on this point as these pieces of development work must be done to put the mine in condition to break and ship the estimated 660,000 tons, and are just as much of a capital expense as the shaft, stations and pockets. Furthermore, the shaft cross-cuts must be driven in order to raise the shaft and are therefore an integral part of the entire program. Also, the ore and waste passes are necessary for mining the entire 660,000 tons.

It must be remembered that the estimated operating costs as set forth in the Economic Report were based on various assumptions such as: the estimated cost of diamond drilling of $2.00 per foot; $40. per foot for development (raises, drifts, etc); 29,000 feet of lineal development for mining and exploration; and 2000-2500 feet per month of diamond drilling for exploration and outlining of known ore zones for planning mining details, etc. By varying these assumptions estimated operating costs can be increased or decreased.

I believe that the foregoing explanation will serve to clarify the questions brought out in Mr. Richard's letter.

AJY:blc

A. J. YAEGER

WORK SHEET FOR LOW GRADE ORE ESTIMATE

FROM 250 LEVEL TO 450 LEVEL 1% CUT OFF

Section	Area (ft^2) of +1% (Planim.) A	Area (ft^2) of +2% (Planim.) B	NET AREA (A-B) C	VOLUME (C x 50) D	TONS (E/10) E	ASSAY TONS (E x 1.5%) F
5150	5950	2850	3100	155,000	15,500	23,250
5100	16800	7100	9700	485,000	48,500	72,750
5050	22225	7875	14350	717,500	71,750	107,625
5000	24825	5925	18900	945,000	94,500	141,750
4950	26100	7925	18175	908,750	90,875	136,312
4900	33025	14440	18585	929,250	92,925	139,388
4850	34250	19350	14900	745,000	74,500	111,750
4800	34625	14350	20275	1,013,750	101,375	152,062
4750	26525	15175	11350	567,500	56,750	85,125
4700	28875	21500	7375	368,750	36,875	55,312
4650	31650	20925	10725	536,250	53,625	80,438
4600	36975	25925	11050	552,500	55,250	82,875
4550	36750	18,625	18,125	906,250	90,625	135,938
4500	38300	20,325	17975	898,750	89,875	134,812
4450	34225	17675	16550	827,500	82,750	124,125
4400	41500	12650	28850	1,442,500	144,250	216,375
4350	39250	4475	34775	1,738,750	173,875	260,812
					1,373,800	2,060,699

WORK SHEET FOR LOW-GRADE ORE ESTIMATE

FROM 250 LEVEL TO 450 LEVEL 2% CUT-OFF

Section	Area (ft^2) of +2% (Planim.) A	Area (ft^2 of +3% (Planim.) B	Net Area (A-B) C	Volume (C x 50) D	Adjusted Vol.* E	Tons E/10 F	Assay Tons (F x 2.5%) G
5150	2850	1197	1653	82,650	92,226	9,223	23,058
5100	7100	3049	4051	202,550	202,550	20,255	50,638
5050	7875	2538	5337	266,850	266,850	26,685	66,713
5000	5925	0	5925	296,250	276,250	27,625	69,063
4950	7925	4392	3533	176,650	248,610	24,861	62,153
4900	14400	3663	10737	536,850	507,630	50,763	126,908
4850	19350	13023	6327	316,350	450,000	45,000	112,500
4800	14350	2925	11425	571,250	484,625	48,463	121,158
4750	15175	6804	8371	418,550	470,400	47,040	117,600
4700	21500	7650	13850	692,500	667,500	66,750	166,875
4650	20925	8262	12663	633,150	616,365	61,637	154,093
4600	25925	10062	15863	793,150	793,150	79,315	198,288
4550	18625	7068	11557	577,850	581,985	58,199	145,498
4500	20325	6084	14241	712,050	740,050	74,005	185,013
4450	17675	5904	11771	588,550	688,675	68,868	172,170
4400	12650	1260	11390	569,500	531,500	53,150	132,875
4350	4475	720	3755	187,750	187,750	18,775	46,938
					Total	780,614	1,951,541

*Compensating for adjustments made in plus 3%, and for irregularities in outline of plus 2%

WORK SHEET FOR LOW-GRADE ORE ESTIMATE

FROM 450 LEVEL TO 550 LEVEL 1% CUT-OFF

Section	Area (ft^2) of +1% (Planim.) A	Area (ft^2) of +2% (Planim.) B	Net Area (A-B) C	Volume (C x 50) D	Tons (E/10) E	Assay Tons (E x 1.5%) F
4950	13550	4600	8950	447,500	44,750	67,125
4900	16825	3525	13300	665,000	66,500	99,750
4850	18175	5475	12700	635,000	63,500	95,250
4800	19175	7300	11875	593,750	59,375	89,063
4750	16100	6775	9325	466,250	46,625	69,938
4700	17350	10225	7125	356,250	35,625	53,438
4650	16975	3425	13550	677,500	67,750	101,625
4600	14750	6400	8350	417,500	41,750	62,625
4550	12575	4625	7950	397,500	39,750	59,625
4500	13025	7425	5600	280,000	28,000	42,000
4450	18200	7675	10525	526,250	52,625	78,938
4400	19575	6525	13050	652,500	65,250	97,875
4350	16,675	2825	13850	692,500	69,250	103,875
				Total	680,750	1,021,127

Pima Mine Sample

SPECTROGRAPHIC ANALYSES

AMERICAN SMELTING AND REFINING COMPANY
CENTRAL RESEARCH LABORATORIES
SOUTH PLAINFIELD, N. J.

~~October 27, 1953~~

Ore from Pima Mine - Tucson, Arizona (SA7162)

SAMPLE No.	SA7162									
Ac	nil		Hf	nil		Rh	nil		Zn	S
Al	S		In	L		Rb	nil		Zr	nil
Sb	Trace		Ir	nil		Ru	nil			
As	L		Fe	HC		Se	nil			
Ba	L		La	nil		Si	HC			
Be	nil		Pb	Trace		Ag	HL			
Bi	Trace		Li	nil		Na	HS			
B	L		Mg	S		Sr	nil			
Cd	L		Mn	HS		Ta	nil			
Ca	S		Hg	nil		Te	Trace			
Ce	nil		Mo	nil		Tb	nil			
Cs	nil		Nd	nil		Tl	nil			
Cr	nil		Ni	Trace		Th	nil			
Co	L		Os	nil		Sn	nil			
Cb	nil		Pd	nil		Ga	HL			
Cu	HC		P	nil		Ti	L			
Er	nil		Pt	nil		W	nil			
Eu	nil		K	L		U	nil			
Ge	nil		Pr	nil		V	nil			
Gd	nil		Re	nil		Yb	nil			
Au	T		Rh	HC		Y	nil			

R81

CODE:

CMC	=	Chief major constituent
MC	=	Major constituent
LMC	=	Low major constituent
S	=	Strong lines
MS	=	Moderately strong lines
M	=	Moderate
ML	=	Moderately low
L	=	Low
Tr	=	Trace
FTr	=	Faint trace
VFTr	=	Very faint trace
Nil	=	Nil

E.P. $280,830.91

Hayden 164,919.39 may

445,750.

5

22,28,750

Pima Mine

Spaulding – 11-1-55

Caryalles will dig ±100'
plan skip haulage on north side of pit
which will bottom at 600 ~~[illegible]~~ level
will mine 3000 Ton/day of ore
stockpile .4 to .6 % – 8 to 10 gr
life on plus .6 % – (± 10 mil
tons @ 1.5 % Cu –)
mill will have capacity to
expand to 4500 tons –
Cyrus drove ± 2600 feet
of drift on DD holes – bulk
sample results were consistently
low – "means 10 % reduction
in grade of the ore body"

No. X-8 Rag Content Paper
Goldsmith Bros., 77 Nassau St., N. Y. 8

Form 371
2M 2-49 Cairns

MINE Alpha Shaft. PLANT

SHIPPER Pima Mines.

LOCATION Pima Mng Dist. SHIPPING POINT

CLASSIFICATION Ore

DEPARTMENT Copper.

MONTH	DRY AVOIR. TONS		ASSAY AU OZS.	AG OZS.	PW WET	CU WET	ANALYSIS INS	SiO2	FE MN	TOTAL CAO	ZN	S	AL2O3		AS	SB	BI	MARGIN PER TON		COST PER TON	
Jan.		Total																			
Feb.																					
March																					
April																					
May	212			.7		6.73	39.6	32.8	17.8	13.0	1.3	9.5	6.8		.3	.10					
June	1817	2029		1.0		9.09	32.8	26.8	21.0	18.0	.8	8.5	5.0		.08	.20					
July	2159	4188		1.0		7.01	33.0	26.8	21.0	18.2	.5	9.0	6.2		.09	.03					
August	2356	6544		.7		5.20	33.2	26.8	21.8	18.1	.5	8.5	6.0		.04	.02					
Sept.	1895	8439		.6		4.26	42.8	27.6	15.0	24.1	1.4	8.5	14.5		.10	.12					
Oct.	1597	10036		.9		6.66	42.4	27.6	15.2	21.2	.6	8.4	14.2		.08	.10					
Nov.	2207	12243		1.0		8.13	38.2	23.2	15.0	17.5	1.1	8.5	14.1		.15	.10					
Dec.																					
Year				.86		6.70	36.8	26.5	18.3	21.2	.8	8.6	9.7		.09	.09					

C
O
P
Y

WESTERN MINING DEPARTMENT
Salt Lake City, Utah

October 24, 1953

AIR MAIL

Mr. Kenyon E. Richard, Chief Geologist
Southwestern Mining Division
American Smelting and Refining Company
813 Valley National Building
Tucson, Arizona

ARIZONA, PIMA COUNTY
PIMA DISTRICT
PIMA MINING COMPANY

Dear Sir:

This will acknowledge the receipt of your letter of October 12, transmitting the geological report of the same date by Messrs. Courtright and Hardie. Both are to be complimented on the concise manner of presentation.

We also received today the economic report by Messrs. Snedden and Yaeger.

Very truly yours,

WRL:si

/s/ W. R. LANDWEHR

C
O
P
Y

cc JAC

WESTERN MINING DEPARTMENT
Salt Lake City, Utah

October 21, 1953

AIR MAIL

Mr. C. P. Pollock, Exploration Manager
American Smelting and Refining Company
120 Broadway
New York City 5, N. Y.

PIMA MINING DISTRICT
PIMA COUNTY, ARIZONA

Dear Sir:

As you know, we have been examining the Pima Mine at the request of the United Geophysical Company in anticipation that our Company might wish to make an offer for the property. We have completed the geological work, and Mr. Snedden has about completed a report on the economic aspects. It will probably be another 10 days after we receive Mr. Snedden's report to evaluate the data and make recommendations. However, since the United Geophysical Company has stated that they would like to dispose of the property prior to January 1, 1954, and we may be somewhat pressed for time, I am attaching copy of Messrs. Courtright's and Hardie's very excellent geological report which you may wish to study in the meantime.

Judging from this report, the property appears to have considerable merit as a moderately high grade copper mine and also as to lower grade disseminated copper possibilities.

Since Mr. Hart's visit to Tucson last week, we have contacted Mr. Chilson, who has reportedly located some claims northeast and east of the Pima property, on the chance that we might be able to tie these up. Mr. Chilson, however, informed our people in Tucson that United Geophysical has an indirect tie on his claims and he is not, therefore, free to deal with an outside party. He did, however, mention that a friend of his had located some ground to the east in one of the State sections and that this property had no tie-up with United Geophysical. Since this ground would be of interest in connection with porphyry copper possibilities, we will attempt to get it tied up.

Very truly yours,

/s/ F. V. RICHARD

FVR:bm
Encl.(1)
cc: DJPope - no encl.
TASnedden " "
KERichard " "

C
O
P
Y

WESTERN MINING DEPARTMENT
Salt Lake City, Utah

October 21, 1953

AIR MAIL

Mr. T. A. Snedden, Manager
Southwestern Mining Division
American Smelting and Refining Company
813 Valley National Building
Tucson, Arizona

PIMA MINING DISTRICT
Pima County, Arizona

Dear Sir:

I have just completed reading Messrs. Courtright's and Hardie's very excellent report of October 12th, and I was quite impressed with the possibilities of tonnage of +1% material within the present Pima ore zone. If there is sufficient tonnage of this material, there may be some possibility of mining the Pima ore body by open pit methods. We discussed this over the telephone several days ago, and I assume you are making some sort of an outcome estimate using this method.

In the meantime, however, I would appreciate a set of the assay plans and also a set of the cross sections showing the limits of the 1% material both in plan and section. These limits, due to incomplete data, muct of necessity be laid out only approximately. However, Mr. Hardie in Mr. Courtright's absence certainly should have formed an impression of this deposit which would permit him to assign these approximate limits on the plans and sections. I would also like some surface elevation points over the known ore zones so that we can make an estimate here of the ore-waste ratios.

If you had already planned to submit the above-mentioned information with your economic report, it will not be necessary to duplicate it. However, if your report does not include the above described plans and sections I would like them separately as soon as possible.

Very truly yours,

/s/ F. V. RICHARD

FVR:bm
cc: K. Richard

SOUTHWESTERN ORE PURCHASING OFFICE
Tucson Arizona

October 2,1953

FILE MEMORANDUM

PIMA MINING COMPANY, PIMA DISTRICT
PRODUCTION MAY 1952 TO SEPT.18,1953

Total receipts at El Paso Plant from Pima Mining Company for the period May 22, 1952 to September 18, 1953, are shown below.

Period	Dry Tons	Weighted Avg. Assays Ag-oz	Cu-%	Metal Content Silver oz.	Copper lbs.
May 1,1952 - Jan.13,1953	14,017.5	0.82	6.30	11,539	1,775,005
Apr.27 to Sept.18,1953	15,274.0	.88	5.49	13,372	1,676,266
Total	29,291.5	.85	5.89	24,911	3,451,271

Period	Value after Smelting Total	Per Ton	Net at Mine Total	Per Ton	Avg. Cu Cathode Quot. Per pound
May 1,1952 Jan.13,1953	$260,212.20	$ 18.56	$214,954.85	$ 15.33	24.075¢
Apr.27 to Sept.18,1953	312,926.39	20.49	236,031.65	15.45	29.54
	573,138.59	19.57	450,986.50	15.40	

REED F. WELCH

cc:TASnedden
KRichard
HCourtright
BDRoberts

SOUTHWESTERN ORE PURCHASING OFFICE
Tucson Arizona

July 24, 1953

Mr. T. A. Shedden, Manager
Southwestern Division Mining Dept.
Tucson

PIMA MINING COMPANY, PIMA DISTRICT, ARIZONA

Dear Sir:

In view of the impending visit of Mining Department personnel from New York and Salt Lake City offices I made a trip yesterday to the Pima Mine and obtained information which may be of interest to Mr. Landwehr in his anticipated visit to the mine.

The mine management must soon decide to invest more capital to sink a new shaft and install a mill or to carry on in a small way with present facilities. The mine is developing into a large tonnage producer and undoubtedly will require enlargement of facilities.

Since Mr. Landwehr expects to visit the property I will leave to him any comments on the mine. However, I have compiled the following production figures which may be of assistance in any consideration that may be given the property at this time.

Period	Dry Tons	Wt.Avg.Assays Ag-oz	Wt.Avg.Assays Cu-%	Metal Content Ag-oz	Metal Content Cu-lbs	Net Return* Total	Net Return* Per Ton
5-22-50 to 1-13-53	14,017.5	0.8	6.33	11,539	1,775,005	$214,954.85	15.33
4-27 to 7-7-53	6,616.6	.99	6.18	6,542	817,603	125,053.22	18.90
Total	20,624.1			18,081	2,592,608	340,008.07	

*After deducting smelting, freight, hauling and representation at smelter.

Shipments were suspended from January 10th to April 24, 1953 during sinking of the shaft from the 400 to the 600 foot level.

I am advised that United Geophysical Company has advanced $500,000 cash to Pima Mining Company. To date the Mining company has received from smelter returns in excess of $340,000, all of which has been put back into the operation, making a total investment of $840,000.

In view of the need for a considerable amount of new capital in order to make the mine a steady producer it is possible the Mining Department may want to make an offer to Pima Mining Company for operating control. Early next week Mr. Herbert Hoover, Jr. and Guy Edwards, consulting engineer, will be in Tucson. If this is of interest to the Mining Department the time is opportune to make a proposal to the owners of Pima Mining Company.

Yours very truly,

REED F. WELCH

REED F. WELCH

cc: CFPollock
DJPope
FVRichard
NHLandwehr
KRichard
JDMacKenzie
EMcLittmann
EDRoberts

WESTERN MINING DEPARTMENT
Salt Lake City, Utah

April 4, 1953

AIR MAIL

Mr. T. A. Snedden, Manager
Southwestern Mining Division
American Smelting and Refining Company
813 Valley National Building
Tucson, Arizona

ARIZONA, PIMA COUNTY
TWIN BUTTES DISTRICT
COPPER QUEEN MINE

Dear Sir:

This will acknowledge the receipt of your letter of April 2, transmitting Mr. Courtright's memorandum of April 1 describing the recent developments at the Copper Queen mine. The new discovery was quite interesting, and this, together with the new ore found at Mineral Hill and in the Pima, may be sufficient to justify a mill.

I note that the Banner people are confident they will be able to obtain financial assistance from the government in building the mill, but I believe there still may be a chance for us to enter the picture. It is, therefore, important that we obtain permission to examine in detail both the properties of the Banner Company.

Very truly yours,

ORIGINAL SIGNED BY
W. R. LANDWEHR

W. R. Landwehr

WRL:si
cc:KERichard
JHCourtright

Mr. Courtright
Aa-16.16.0

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

March 10, 1953

Mr. W. R. Landwehr, Chief Geologist
Western Mining Department
Salt Lake City Office

GEOPHYSICAL PROSPECTS
Pima Mining District
Pima County, Arizona

Dear Sir:

As we have discussed by phone, I have delayed reply to your letter of February 7th until all of us here have had an opportunity to discuss, together, the geophysical prospects indicated in the northern part of the Pima District.

Mr. Snedden is forwarding this letter to you, together with Mr. Courtright's Memorandum of February 27th and Kenyon Richard's comments of March 11th. Mr. Hewitt's Memorandum of March 5th — referring to the proposed magnetometer reconnaissance — was delivered to you by Mr. Hewitt. My earlier letter of January 26th excluded, as you instructed, consideration of the area east of San Xavier and Pima, referred to below.

I believe that we here are in general accord that the following possibilities in the northern part of the Pima District can be listed. Ranked in the order of their apparent importance, these are:

1. The possibility that an extensive zone of alteration, in which disseminated copper mineralization might occur may lie beneath the gravel cover, east or southeast of United Geophysical's Pima Mine. See Mr. Courtright's Memorandum of February 27th.

2. Tabular or replacement-type deposits similar to the Pima (United) and San Xavier (Eagle Picher) orebodies could exist in projections easterly of (a) Pima-Mineral Hill fault zone (b) the San Xavier structure and, (c) the fracture zone which projects across the south end of Helmet Peak.

With reference to the latter structure, I feel that the possibility the Helmet Peak zone might produce replacement-type ore in Section 11, or the Southwest quarter of Section 12, can be set aside pending investigation of the greater targets listed above. However, the continued projection of this structure easterly, across Section 12 into Section 7, should not be ignored and, I believe, should be bracketed in the proposed magnetometer survey.

The relatively smaller ore targets of the Mineral Hill or San Xavier types — along linear structures — may not be determinable in a magnetic survey, but it should be possible to recognize the enclosing fault structure itself, if it exists with any magnitude in the covered area. In this regard — to reduce the possibility that stations might straddle the structure — it would be desirable to plan magnetic readings spaced closer than the reconnaissance interval of 500 feet, where the traverse lines cross the projected position of the Pima, San Xavier and Helmet Peak fractures.

It is recommended that a magnetic survey be made of Sections 6 and 7, the south half of 31 and the open portions in the east of Sections 1 and 12 (Map #1125);

Aa-16.16.0
March 10, 1953

Mr. W. B. Landwehr

traverses to be run north-south, spaced 1,000 feet apart, with readings at distances of not more than 500 feet. Traverses can be run by pace and compass concurrently with the taking of magnetometer readings. Total costs are estimated by Mr. Hewitt at less than $250.00

Mr. Courtright has suggested that we might consider staking this ground first, with about 90 claims. The area in question is rather heavily covered with a scattering of tall sagebrush and other desert growth and is relatively flat. It is difficult for one man to see another unless working rather close together. I believe that it would be possible for an experienced Company man — not known to most residents of the area — to complete all, or a large part of the magnetic survey in less than the estimated time of 8 days and without much, if any, detection. Therefore, I have suggested — and recommend — that we attempt to do this. Thereafter, results of the survey probably will indicate whether or not the locating of claims appears warranted. United Geophysical did not choose to locate any of this ground and we can presume that they have made some geophysical investigation of their own which apparently did not impress them.

Very truly yours,

L. KENNETH WILSON

LKW:ar

cc: DJPope
TASnedden
RJLacy
KERichard
JHCourtright

Aa-16.16.0

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

March 10, 1953

Mr. W. R. Landwehr, Chief Geologist
Western Mining Department
Salt Lake City Office

PIMA DISTRICT
Area east of San Xavier

Dear Sir:

Reference is made to Mr. Courtright's memo of February 27th and Mr. Wilson's letter of March 10th.

It is my opinion that the magnetometer work, as outlined by Mr. Wilson, should be done first. It may be possible for Mr. Moss to do this work without detection by the companies in the district; and in any event it may be possible for him to avoid identification with this Company.

The decision of whether or not to stake a large number of claims as suggested by Mr. Courtright is a critical one. The magnetometer work is not expected to provide important answers to the problems involved, but information of some interest may result.

There should be emphasis of Mr. Courtright's statement that chances for finding either replacement or disseminated ore are based on geologic permissibility rather than probability.

If the magnetometer work is approved, Mr. Courtright and I will line out Mr. Moss in the field and at that time I will plan to make a reconnaissance of certain parts of the area, particularly the southern slope of "Arkose Hill" if that seems feasible.

Yours very truly,

KR

KENYON RICHARD

KR:ar

cc: DJPope
TASnedden
LKWilson
JHCourtright
RJLacy

AMERICAN SMELTING AND REFINING COMPANY
Patagonia Arizona

March 5, 1953

MEMORANDUM TO:
W.R.Landwehr
T.A.Snedden
D.K.Wilson
R.J.Lacy

Re: PIMA MINING DISTRICT
Area East of San Xavier

In conjunction with a Memo of February 17, 1953, the possibility of using Geophysics to facilitate geologic information obtained in the area east and southeast of the Pima Mines has been suggested.

Since United Geophysical has done a considerable amount of work in the area in question it may be concluded after noting that no property was taken up, no anomalies of the type present at the Pima mine were found. From this standpoint any Geophysical work on our part in an attempt to duplicate United Geophysical's work would be wasted.

With the magnetometer it may be possible to determine the areal extent of intrusive rocks beneath the valley fills. If, of course, the results of a reconnaissance magnetic survey prove the presence of intrusive rock within the valley the existing limits for ore possibilities could be extended.

It has been pointed out that possibilities of having a large objective, such as a porphyry copper, might exist. It may be that a magnetic low (a susceptible decrease) is found to coincide with the pyritic altered arkosic sandstone southeast of the Alpha Shaft. Providing a magnetic low is found to exist in this altered area one might assume that this altered zone could be traced magnetically under the valley alluvium.

If a magnetic survey of the reconnaissance type were to be made, a grid system covering the east quarter of section 1, east quarter of section 12, all of section 6, all of section 7, and possibly section 31 should be set up. The traverse lines would be 1000 feet apart in an east-west direction, and 500 feet between stations in a north-south direction. With this grid system small orebodies such as the San Xavier and Pima would be missed. The main purpose for such a large grid pattern is to obrain data on the basement rock, or information concerning altered areas. The cost

of such a survey is given below:

Setting in Base Line 1/2 day	=	1/2 day
Pacing Stations and Mag.Sruvey	=	8 days
Total	=	8.5 days
Salary 1 Geophysicist 8.5 days	=	$125.00
Salary 1 Helper	=	105.00

CONCLUSIONS:

If it is felt that such a regional type of explorational program can be sponsored, the cost of the preliminary magnetic survey is quite small. Any results which may indicate a favorable prospecting horizon would necessitate a secondary detailed geophysical program. From the practical point of view the area is not a number one target for geophysics until some preliminary work has been accomplished.

Loyd A. Hewitt

~~Mr. J. D. MacKenzie~~

SOUTHWESTERN ORE PURCHASING OFFICE
Tucson Arizona

February 27, 1953

Mr. T. A. Shedden, Manager
Southwestern Division, Mining Department
Tucson

PIMA MINING DISTRICT, PIMA COUNTY, ARIZONA

Dear Sir:

At various times we have had discussions and there have been numerous reports on current developments in the Pima Mining District.

On January 14, 1953, through Mr. Allan Bowman, Banner Mining Company offered us Mrs. Grimes' controlling stock in Banner Mining Company. The price of $7.50 per share asked is ridiculous and unjustified, but I have been advised by Mr. Bowman that no communication on the subject has been received by him from our Mining Department.

Since that time diamond drilling on the east property line of Mineral Hill ground has cut 40 feet of copper ore on the projection from the Pima Mine structure, which has a sludge assay of 6% Cu. Sections of the core indicate that widths of 5 to 10 feet will assay in excess of 10% to 12% Cu. The diamond drill rig has been moved about 100 feet west and another hole is in the process of drilling.

Concurrently with the diamond drilling Sherwin Kelly is conducting a geophysical survey on the east section of the Mineral Hill claims using magnetometer, self-potential and resistivity methods. The magnetometer survey particularly shows a good anomaly over the known ore body at the shaft and the east side-line drill hole. I have been advised the east ore body anomaly extends in excess of 2000 feet westerly.

Diamond drilling now being carried on in the Queen Mine at Twin Buttes has cut 50 feet of 6% Cu and may indicate a large tonnage of similar grade.

With these new developments the Banner Mining Company has been given a shot in the arm and their optimism is sky high. Messrs. Allan and Ernest Bowman are leaving today for Oklahoma City to consider financing offered by an undisclosed mining firm whose interest has been stimulated by Mr. Travis, part owner of Banner Mining Company. I understand this potential investor is not interested in buying Mrs. Grimes' stock but is willing to join Banner in matching promised government DMPA funds for exploration and mill construction.

Such a program will undoubtedly kill the effectiveness of the proposed joint operation suggested in my letter of December 12, 1952, and will result in a new shaft on the east property line of the Mineral Hill ground and possibly two new shafts on the Pima Mine with each operation having an independent mill.

Although the Mining Department does not feel justified in accepting the proposition offered by Mrs. Grimes, we should have a counter proposal to make immediately to ward off this duplication of shaft and mill construction and invasion of this area by another mining company. If we do not have a proposal to make on the basis of the new ore bodies being developed in the Mineral Hill and Twin Buttes properties we will lose our opportunity to effect a joint and economical operation in the Pima Mining Distruct and possibly be at a disadvantage in dealing with Pima Mining Company for an operating agreement on the Pima Mine.

Yours very truly,

REED F. WELCH

cc: CPPollock
JDMacKenzie
DJPope
WRLandwehr
LKWilson
BDRoberts

Aa-16.16.0

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

February 27, 1953

PIMA MINING DISTRICT
PIMA COUNTY, ARIZ.
(Area East of San Xavier)

Memorandum to Mr. T. A. Snedden

INTRODUCTION

In a recent memo (Jan. 5th) concerning the Pima Mining Company's copper deposit mention was made of pyritic alteration observed in a small hill of arkosic sandstone outcropping in the gravels one-half mile southeast of the Alpha Shaft.

Some further study of the area has been made and a generalized geologic map prepared, showing the principal elements of structure and mineralization. The following contains a brief review of features to be considered in attempting evaluation of exploration possibilities beneath the gravel cover.

GEOLOGY

The district is situated about 20 miles south of Tucson in an area of low relief broken by a few small knobs of more resistant (chiefly limestones) sedimentary rocks rising abruptly from the alluvial slopes on the west side of the Santa Cruz Valley.

The principal rock units are:

Gravels	- Recent	(Post-mineral)
Volcanics (Chiefly flows)	- Tertiary (?)	(Pre-mineral)
Shales, Arkosic sandstones	- Cretaceous	(ditto)
Limestone and quartzite	- Paleozoic	(ditto)
Granite - intrusive	- Laramide	(ditto)

A complex structural history is evidenced by the random arrangement of certain recognizable rock units. The predominating trend of the major faults ---Mineral Hill, San Xavier and South Helmet Peak---is easterly. The principal ore deposits, lead-zinc and copper, occur as replacement bodies in limestone in or near these faults (excepting south Helmet Peak) along the east fringe of the intrusive granite mass. Granite contacts at depth are reported in the Mineral Hill and San Xavier mines.

Pyritic alteration with minor amounts of copper is confined for the most part to two areas: (1) in the southern portion of the district where it is associated with the lead-silver veins, and (2) in the low hill one-half mile southeast of the Alpha Shaft. This hill, composed of pale reddish-brown colored, east-dipping arkose and conglomerate beds, is completely surrounded by valley fill. Minor amounts of limonite after chalcocite are present in the leached outcrops. Occasional chalcocite, coating disseminated pyrite grains in sericitized arkose is visible on two small prospect dumps located on the southeast edge of the hill where mineralization is relatively strong. A sample of the pyritic material (no visible chalcocite) assayed .6 oz. Ag and .02% Cu. indicating extremely low values in primary copper.

Oxidation is shallow, extending twenty or thirty feet beneath the outcrops.

One mile southwest of the arkose hill (on the lower northeast slope of Helmet Peak) a zone of metamorphosed shale outcrops along the edge of the valley fill. Copper mineralization in the form of silicates and oxides is scattered throughout. This and the mineralized limestone gossan on the east end of San Xavier hill are probably related to an eastward continuation of the San Xavier structure as noted on the accompanying map.

The narrow lead-silver veins and associated alteration appear to die out southwest of Helmet Peak, however, possible continuity of the structure is indicated by the easterly displacement of limestone beds at the south tip of Helmet Peak.

Small outcrops of unaltered sandstone and conglomerate are shown in the southeast corner of the accompanying map. These quite likely represent more resistant spots in a very broad mountain pediment. Within this pediment area---over three miles wide---the average thickness of gravel cover should not be great, possibly less than 500 feet.

MINES OF THE DISTRICT

A brief summary of file information on the more important of the known ore occurrences follows:

Mineral Hill Mine

Located on the south edge of Mineral Hill and owned by the Banner Mining Company, the mine has produced something over 50,000 tons of oxidized copper ore and is credited with sulphide reserves of 500,000 tons of 2.5% copper. Minor values in tungsten and molybdenum are associated with the copper which occurs in a south-dipping zone of garnetized limestone. Development, which extends to the 700 level, is in progress, but there is no current production.

Pima Mine

This deposit, concealed by over 200 feet of gravel cover, bears a close resemblance structurally and mineralogically to the Mineral Hill deposit, situated some 4000 feet to the west. The grade of the copper ore in the Pima Mine is considerably higher, however.

The drill exploration, which made the discovery, was reportedly based on a magnetic anomaly obtained in surveys conducted within the past three years by the United Geophysical Company. Development to a depth of 600 feet has indicated a reserve of 500,000 tons of 5% copper sulphide ore. Exploration possibilities appear promising along strike and down dip.

San Xavier Mine

The deposit is a lead-zinc-copper replacement of limestone, which has been developed to a depth of 900 feet by Eagle Picher. Past production amounted to something over 500,000 tons of crude ore. The mine is idle at present.

PROPERTY

The eastern limits of Pima and Eagle Picher Mining Company properties

held under location, taken from a property map compiled by Mr. L. K. Wilson, are shown on the attached map. Mr. Wilson has also advised that no mining claims have been recorded (as of Feb. 20, 1953) on the State and Federal land continuing easterly for over three miles from the present mining locations, and has secured the numbers and locations of several grazing patents in the area. Except for possible unrecorded locations which might exist, all ground east of the present known property limits appears to be open for location.

CONCLUSIONS

Exploration possibilities beneath the gravel cover depend essentially on projection of the known ore-bearing structures into a large area which may contain an extensive zone of alteration; at least, the limits of alteration are not visible in the only existing outcrop (Arkose hill). There appears to be little chance of commercial grades of copper ore in the hill itself, but it could be part of an extensive alteration zone within which stronger copper mineralization of the disseminated type might occur, particularly if granitic intrusives are present.

Deposits comparable to the San Xavier and Pima are not sufficiently large to justify any particularly big risk in exploration, however, these, in combination with a larger objective---such as a porphyry copper deposit---offer more favorable odds for an exploration gamble. The chances of finding either type of deposit are, however, quite long, being based on geologic permissibility rather than probability.

United Geophysical has tested at least part, if not all, of the gravel covered pediment, using various methods including seismic for depth-to-bedrock determinations. Apparently, they found nothing of interest east of their present claim boundaries. However, as pointed out in the above mentioned memorandum (Jan. 5th), since a positive magnetic anomaly reportedly led to discovery of the magnetite bearing Pima deposit, no significance may have been attached to negative anomalies which may indicate disseminated sulphide mineralization where the magnetite content is lower than normal due to alteration effects.

In considering action that might be taken, it is not likely that the Company could conduct geophysical surveys in the area without attracting attention which might result in serious competition in property acquisition. Since the area of possible interest involves several sections of land, covering it completely with mining claim locations would be a sizeable undertaking. As a first step, we might consider staking a central block consisting of Sec. 7 and the open portions of Sections 1, 6 and 12, plus the south half of 31. This coverage would require about 90 claims, 600' x 1500' each.

A factor to be taken into account is the effect that competitive action by the Company might have on relations with the Pima Mining Company in connection with negotiations for their property. A decision on this aspect of the case is needed at this time.

J. H. COURTRIGHT

J. H. Courtright

JHC:ms
cc: DJPope with map
WRLandwehr "
KRRichard "
LKWilson "
RJLacy "

WESTERN MINING DEPARTMENT
Salt Lake City, Utah

February 7, 1953

AIR MAIL

Mr. L. Kenneth Wilson, Chief Geologist
Southwestern Mining Division
American Smelting and Refining Company
813 Valley National Building
Tucson, Arizona

ARIZONA, PIMA COUNTY
PIMA DISTRICT
GEOPHYSICAL PROSPECTS

Dear Sir:

I have your letter of January 26 on the subject district, in which you state that you consider the area covering the easterly extension of the fissures exposed in the vicinity of the Olivette mine as holding possibilities for the application of geophysics. You point out that the individual fissures are weak, with which I agree, but that the general zone of fissuring is persistent for about two miles up to the point where they disappear in alluvial in Section 11. However, when I was in Tucson last week, Mr. Courtright stated that he had been over the area and found several outcrops of bedrock in the so-called alluvial area directly along the extension of the fissure zone, but found no fissures.

Mr. Hewitt will be in Tucson next week, and I wish you and Mr. Courtright would discuss the matter with him, and that you would again write me.

Mr. Hewitt will return the map enclosed with your letter.

Very truly yours,

ORIGINAL SIGNED BY
W. R. LANDWEHR

W. R. Landwehr

WRL:si
cc:J.H.Courtright
R.J.Lacy

WESTERN MINING DEPARTMENT
Salt Lake City, Utah

January 29, 1953

Mr. C. P. Pollock, Assistant to Vice President
American Smelting and Refining Company
120 Broadway
New York 5, New York

ARIZONA, PIMA COUNTY
PIMA MINING COMPANY

Dear Sir:

I am attaching copies of Mr. T. A. Snedden's letter of January 12, addressed to me and Mr. Courtright's memorandum of January 5, to Mr. Snedden, both dealing with the Pima copper deposit.

Mr. Courtright's analysis of the geological relationships is essentially the same as those of Mr. Lacy, (See memorandum-January 13, 1953). Courtright quotes the ore reserve estimate by Mr. Drex Spaulding, manager of the property as:

	Tons	% Cu
Indicated (To 450 L)	580,000	3.4
Inferred (450 to 600 L)	187,500	5.0
Total	767,500	3.8

Mr. Lacy's estimate of the reserves in the same section of the mine is:

	Tons	% Cu
Reasonably Assured	309,000	4.3
Probable	299,000	3.8
Total	608,000	4.05

(Smaller tonnage due to use of narrower widths)

Assuming selective mining of the higher grade ore above the 350 level, Mr. Courtright believes 500,000 tons of 5% Cu to be a reasonable expectancy at this stage of development.

Mr. G. P. Pollock, Assistant to Vice President January 29, 1953

Pima Mining Company

Mr. Snedden's outcome calculations indicate a little better than break even on 5% Cu ore at the current 24.5 cent copper price.

From a surface reconnaissance, Mr. Courtright points out that the surrounding covered area may contain other minable deposits, and that further investigation of the possibilities is planned.

Yours very truly,

ORIGINAL SIGNED BY
D. J. POPE

D. J. POPE

Encl. (2)

cc:WRLandwehr
TASnedden
LKWilson
RJLacy
✓JHCourtright

Aa-16.16.20A

JHC Copy

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

January 5, 1953

MEMORANDUM TO:
Mr.T.A.Snedden

PIMA MINING COMPANY
Pima County, Arizona

The following notes are based on observations during our visit to the Pima Mining Company's property on December 30,1952. The history of this recent discovery and data available concerning the deposit have been recorded in file memos by Messrs. Welch, Richard and Wilson at various times during the past year. We were able to examine a small amount of new development, but otherwise were not provided with much information in addition to that previously obtained.

Present development extends 300 feet east and 400 feet west of the shaft -- about 300 feet from the Banner property on the west. A short stub drift has been cut on the 500, and sinking to the 600 is in progress (See attached section).

As observed on the 300 and 400 levels, copper values occur as chalcopyrite in a somewhat irregular zone of garnet, chlorite and clay. The higher grade portions (plus 5% Cu) show considerable massive chalcopyrite; the copper in the lower grade (from 1 to 5%) is present mainly as small grains and stringers of chalcopyrite. Minor amounts of magnetite and very minor amounts of pyrite were visible.

Fresh or slightly altered limestone was observed in both the foot and hanging wall on the 400 level; much chloritized limestone occurs within the ore zone as well as on the fringes. Although members of the local University staff have reportedly examined all the drill cores, and determined the ore to occur in an arkose (coarse feldspathic sandstone) formation, I did not recognize any of this type of rock in unaltered areas on either level. It is entirely possible that some of the strongly mineralized portions were formed in sandstone, but identity of such would necessarily require microscopic study. Without having had an opportunity to examine the drill cores, my impression is that the Alpha deposit is mineralogically and geologically comparable to the Banner lying to the west of Mineral Hill. Both deposits appear to occur within an east-west trending, south dipping, zone of faulting. The grade in the Banner is lower (500,000 tons at 2.6% Cu).

The strongest fault structures roughly parallel the zone of ore mineralization both in strike and dip.

Total shipments of direct smelting ore from development through the period May to December of 1952 averaged as follows: (Reported by Mr. Welch)

Dry Tons	Ag	Cu	Ins	Fe	CaO	Zn	S	Al_2O_3
12,243	.86	6.70	36.8	18.3	21.2	.8	8.6	9.7

This analysis shows very little pyrite to be present. Part of the excess iron (above that in the chalcopyrite) is present in the ferromagnesian minerals which have replaced the sediments. The balance of the iron is probably oxide, indicating about 5% as the magnetite content of the ore. Small amounts of molybdenite and scheelite accompany the copper values.

Indicated ore reserves, according to Mr. Drex Spaulding, Manager, are:

From a depth of 220' to 350'

A block 500' long, 130' deep, 70' wide = 455,000 tons @ 3.00%Cu. (10 cu. ft. per ton).

From 350' to 450'

A block 500' long, 100' deep, 25' wide = 125,000 tons @ 5.00% Cu. (10 cu. ft. per ton).

Some underground drilling has encountered ore between the 500 and 600 levels. In view of this and the extent of ore demonstrated on the 400 level, continuity to the 600 may reasonably be expected.

Classed as inferred ore:

From 450' to 600'

A block 500' long, 150' deep, 25' wide = 187,500 tons @ 5.00% Cu.

Total (Indicated and inferred) = 767,500 tons @ 3.8% Cu.

Assuming selective mining of the higher grade in the block above the 350 level, 500,000 tons @ 5.0% Cu appears to be a reasonable expectancy at the present stage of development. The chances appear

fairly good for continuity of structure, and ore, down dip below the 600 level. Surface drilling reportedly did not extend below the 400.

The operators expect to continue development laterially beyond the present limits, indicating that surface drilling has found at least some ore in these areas.

Although for the most part the development drifts have required no timber support, the ground is not particularly firm due to the presence of numerous fractures and slips at all angles. Except in areas of massive garnet, clay alteration has produced a rather soft friable condition in the ore. This effect is probably supergene, consequently it should not persist very far below the present development.

Currently the mine is making about 350 g.p.m. of water.

SURFACE RECONNAISSANCE:

Other than the limestone, quartzite and granite on Mineral Hill, the only outcrop in the vicinity is on a low hill about one-half mile S. 60° E. of the Alpha Shaft. This hill, about one-third of a mile in length, is composed entirely of east-dipping arkose sandstone. The most interesting feature observed was the presence of alteration and the evidence of previously existing disseminated sulphide mineralization throughout. Minor amounts of limonite after chalcocite were noted. On the southeast edge of the hill where mineralization is somewhat stronger, the dumps of two old prospect shafts show that disseminated pyrite was reached at about 25 feet below the leached outcrops. Minor amounts of chalcocite were visible in some specimens.

It is possible that mineralization and alteration in this hill are related to the Alpha zone which projects through about one-fourth mile to the north, however, a few scattered outcrops of sandstone extending to within a few hundred feet of an easterly projection of the Alpha, showed no particular increase in the intensity of mineralization. There is also the possibility that the disseminated mineralization in this isolated outcrop is part of a larger zone extending beneath the gravel cover to the south and east. The nearest outcrops in these two directions are about four miles distant. As yet I have not examined these.

While the hill itself does not appear to hold potentialities, the surrounding gravel may conceal altered intrusive rocks and associated mineralization of possible commercial grade.

United Geophysical has conducted surveys over this covered area and apparently found nothing of interest between Twin Buttes and the Alpha. This may be of little significance however, since their success

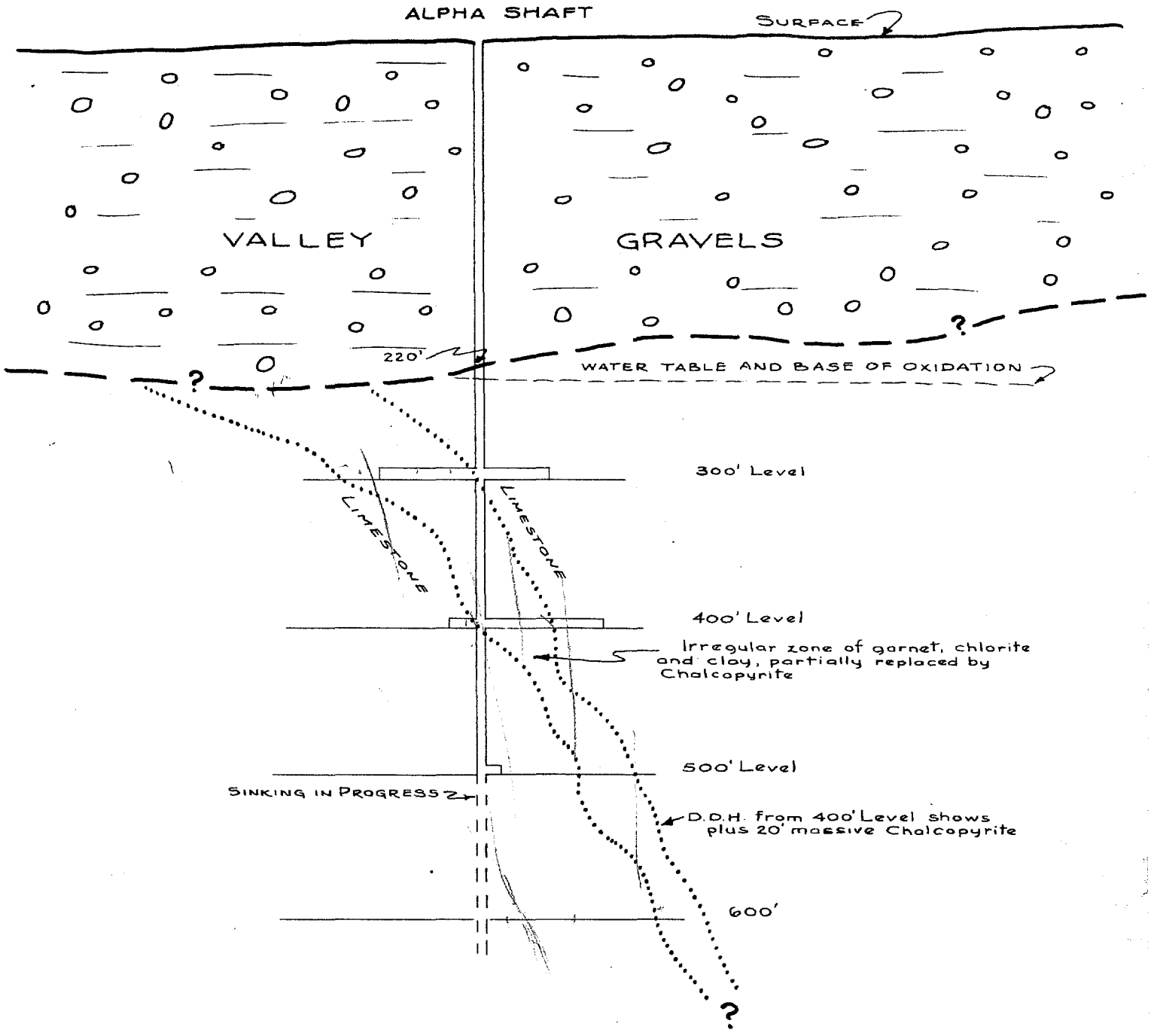
in finding the Alpha presumably was due to a positive magnetic anomaly produced by magnetite associated with contact-type mineralization, while anomalies over porphyry-type copper deposits are more apt to be negative due to the loss of accessory and other magnetite through conversion to pyrite during hydrothermal alteration.

Pima Mining Company claims cover the arkose hill but apparently do not extend east of a line running due south.

A further investigation of the surface and of property status in the area is planned in the near future.

JHC

J. H. COURTRIGHT



TO ACCOMPANY Report
DATED 1-5-53
BY J.H.C. - T.A.S.

DIAGRAMMATIC SECTION
LOOKING EASTERLY
ALPHA SHAFT
PIMA MINING COMPANY
PIMA COUNTY, ARIZONA
SCALE: 1" = 100'
DEC. 31, 1952 J.H. COURTRIGHT

Extra file.

Aa-16.16.20 A

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

July 20, 1951

CONFIDENTIAL

Mr. W. R. Landwehr, Chief Geologist
Western Mining Department
Salt Lake City Office

UNITED GEOPHYSICAL COMPANY
Pima Mining District
Pima County, Arizona

Dear Sir:

I have learned recently that the subject Company - a wholly owned subsidiary of Union Oil Company - has been conducting geophysical studies in the Helmet Peak and Twin Buttes areas of the Pima Mining District, at intervals during the past year.

Since February of this year, the company has been drilling two anomalies with a rotary shot drill, completing fourteen holes in two areas as of yesterday. Both of the areas drilled show "mineralization" according to Robert E. Thurmond and W. E. Heinrichs, Jr., principals of the three-man geophysical party, but Thurmond declined to admit that either area could be termed ore. (Both of these men are Colorado School of Mines graduates, Heinrichs in 1940 and Thurmond in 1943).

A mining engineer for the United Geophysical Company, Mr. Drew Spaulding, claims that one copper orebody of about 75,000 tons is indicated and some credence might be attached to his report inasmuch as he is currently arranging to sink a 400-foot shaft, blueprints for which were shown to me. The shaft, to be known as the Alpha, in two compartments, is to be contracted by Mr. Sam Caldren, formerly of Marsman and other Philippine companies and currently in charge of a small Twin Buttes operation financed by Warren Hassler of Los Angeles and known here as Tucson Mining Company. It is estimated by Mr. Caldren that work will be started about September first.

Location of the proposed Alpha (400-foot) shaft and the reported "orebody" of 75,000 tons, is one mile due east of Banner Mining Company's Mineral Hill venture and about one mile northeast of Eagle Picher's San Xavier Mine in Sec. 1, T. 17 S., R. 12 E. The second "area of mineralization" is located five miles southeast of the San Xavier Mine and one mile due north of the Copper Queen Mine in Section 31, T. 17 S., R. 13 E. Please see attached map.

Grade of the reported ore was withheld during my interview with Thurmond at the property but it is reasonable to assume that it is similar to the nearby Mineral Hill, where 100,000 tons may average about 3% copper in mixed oxides and some chalcopyrite. As I mentioned above, Mr. Thurmond advised me that he preferred to describe the area as "mineralized" as he did not believe the term "ore" was applicable. I inspected 26 feet of core drilled yesterday, which the drill runner believed to represent a part of the southernmost mineralized