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TEN PAGES IN ONE SECTION

The Lordsburg Liberal

VOLUME 79 NUMBER 52 LORDSBURG, HIDALGO COUNTY, NEW MEXICO, FRIDAY, NOVEMBER 11, 1966 5 CENTS

Reed Wells Banner Mailings P. O. Box 3603 Ariz. 85008

Mr. J. H. Courtright

S. H. C.

5/25/65

MR. JER, WES, RKR

READ AND RETURN

PREPARE ANSWERS ......HANDLE........

FILE .... INITIALS..........

J. H. C.
MAY 24 1965

S. I. B.
MAY 25 1965

May 24, 1965

Mr. C. E. Nelson, Vice President
American Smelting and Refining Company
120 Broadway
New York, New York 10005

BANNER-ANACONDA
LEASE TERMS

Dear Sir:

The 1964 Annual Report of the Banner Mining Company stated that Anaconda under their option agreement would lease, finance, explore, develop and operate Banner's properties in Pima County on a profit-sharing basis and that under the agreement:

"1. Anaconda is to advance funds, without interest, for exploration, development and mining operations until a mine is in commercial production -- which is expected to be in 1970. The accumulated expenditures will be amortized over the future operations of the property. The Agreement will result in a division of net income, after taxes, on an approximately equal basis between Banner and Anaconda.

"2. During 1964 Banner received from Anaconda a total of $3,636,617.63 representing amounts received on account of (a) Lease bonus, (b) Sale to Anaconda of stockpiled oxide ore, (c) Sale to Anaconda, at book value, of certain property and improvements in Pima County, Arizona, (d) Loans by Anaconda.

"3. In addition, on January 10, 1965, Banner received from Anaconda its first advanced royalty in the sum of $1,750,000.00. Advanced or minimum royalties of $1,750,000.00 are to be received annually for a minimum of four additional years, with provision for Anaconda to continue payments on a prorated basis for up to two additional years, or until the first mine reaches the production stage.

"4. Anaconda may recover the advanced and/or minimum royalties and the loans to Banner from net profit after the producing stage is reached, providing that Banner is paid the first $1,750,000.00 of its share of the net profits until at least the year 1976."

Yours very truly,
ORIGINAL SIGNED BY
T. A. SNEDDEN
T. A. Snedden
General Manager

cc: CENelson (2)
RBNeen
JHCourtright

rm 10 p.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

October 17, 1960

FILE MEMORANDUM

BANNER MINING COMPANY
Eisenhower Group Drilling

Courtright and I briefly examined some of the recent drill cores, east of Banner's Palo Verde shaft, October 17, 1960.

DDH 242

203 - 736'	Arg. Some cpy, low-grade
736 - 766'	Tactite. Weak cpy.
766 - 800'	Arg. Looks like Papago fm -- but may be the calc. arg. of the Pima.
800 - 867'	Tactite. Weak cpy. Andesite at bottom contact.
867 - 971'	Mb.

Bottom

DDH 246

Logged from 840 - 1075'	Arg. -- pebbly. Mineralization very weak.

Bottom

DDH 248

Logged from 600 - 640'	Arg. Weak cpy, no ore-grade.
640 - 738'	Tactite and diop. hf. Spotty cpy, locally plus 1% Cu est.
738 - 817'	Mb.

Bottom

DDH 249

Logged from 580 - 670'	Arg. Weak cpy -- probably no ore.
670 - 800'	Tactite. Galena-sphalerite near bottom. contact. Spotty cpy, locally 1% Cu+ (est)
800 - 905'	Mb.

Bottom

DDH 250

Logged from	562 - 638'	Meta-por. Some weak cpy.
	638 - 984'	Arg. Weak cpy (possibly .3-.6%) to 840'. Below 840' about 1% Cu est.
	984 -1027'	Tactite. Strong bornite and cpy. Plus 2% est.
	1027 -1086'	Mb.

Bottom

DDH 263

Logged from	500 - 560'	Arg. Weak cpy. No ore.
	560 - 566'	Tactite. Py plus a little cpy. Trace sphalerite.
	940 -1116'	Sandy arg and arkose. Tr. py. 940' - 960' shear zone.
	1116 -1129'	Black limestone.
	1129 - 1171'	Granite, sheared.

DDH 265, drilling

At about 400 - 450' saw metapor. and arg. weak cpy.

JOHN E. KINNISON

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

J. M. C.

July 7, 1960

JUL 18 1960

Mr. T. A. Snedden, Manager
American Smelting and Refining Company
Southwestern Mining Department
Tucson, Arizona

BANNER DRILL DATA
Eisenhower Claims

Dear Sir:

Attached is a memorandum by Mr. Courtright which contains a detailed analysis of Banner's core and sludge recoveries and assays.

It is concluded that the "accepted" assays derived by Banner using the Longyear formula are too low. We are upgrading these assays on composite logs now being prepared.

Courtright's memorandum was intended for attachment to the set of composite logs when they are completed. However, I am distributing copies of it now because it points out that Banner's drilling and sampling procedures should be improved. Since we doubtless will have to use their data eventually in making detailed open pit mining plans and ore reserve estimates, we should attempt now to persuade Banner to change their drilling and sampling techniques. Essentially this would consist of (1) using swivel barrels, (2) increasing their core size from AX and EX to NX, and (3) using mud circulation entirely with abandonment of sludge recovery. Although this will increase their costs somewhat it should improve their core recovery in low-grade ore to the point that sluge assays will not be needed.

Yours very truly,

Kenyon Richard

KENYON RICHARD

KR:S

Attach: Courtright Memo
cc: DJPope - W/Att.
CPPollock - "
RBMeen - " (3)
ACHall - "
JHCourtright - "
SVonFay - "
JEKinnison - "

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

July 7, 1960

FILE MEMORANDUM

BANNER DRILL DATA

Our studies of Banner drill information indicated that many of their combined (core-sludge) assay values were erroneously low. Certain adjustments have been made by us to correct this condition; these revised values are incorporated in the set of Banner composite logs which we are now compiling. The upward revision of values amounts to as much as 20% in a single drill intercept, but the overall effect is an increase of no more than .03% copper in the average grade of the ore in the Eisenhower group. General information on Banner's sampling practice and on our analysis of their results is given in the following:

Banner's Drilling and Sampling Practice

(1) All holes for which we have logs were drilled with standard AX or EX size barrels.

(2) Sludges were collected in 3 compartment steel tanks (15" deep, 21" wide, and 72" long) holding about 90 gallons. The sludge sample was passed through 3-tier splitter (churn drill type). This 1/8 product was filtered and dried, then passed twice through a Jones splitter. The assay sample thus represented 1/32 of the original sludge. Sludge weights (dry wt. of 1/8 split) were recorded for part of the drilling,* but recoveries were not calculated by them.

(3) According to MacKenzie, Banner's geologist, a second sludge tank was normally used as a sump from which water was pumped back down the hole.

(4) Percentage core recovery was determined by linear measurement. Cores were logged, then split, one-half going to storage, the other being crushed and split for assay. The weight of the crushed core sample was recorded in all but the earlier holes, as in the case of the sludge samples.

(5) For each drill intercept Banner's logs show a core assay, a sludge assay, and an "accepted assay". This latter value was determined by combining core and sludge assays according to the Longyear formula in all cases where the core recovery was less than 85%**. Where core recovery was 85%, or higher, the core assay became the accepted assay.

*Core weights not taken for holes 82, 84, 89, 91, 92, 93, 95, 98, 104, 107, 108 and 110.

**Very approximate. In many cases, the cutoff point was either higher, or lower, ranging between 80% and 90% recovery.

Our Analytical Procedures

As a first step, all available core and sludge weights were obtained from Banner. Specific gravities were assigned to the various rock types as indicated by Mission data. These, and the sample weights, were used to calculate sample recoveries. It was found that many of Banner's core recoveries (based on linear measurement) were erroneously high.

To evaluate sample accuracy, samples having core assays of .30% copper, or more, (992 samples representing 6754' of drilling) were segregated into groups representing various core recovery ranges -- 100%, 85 to 99%, 70 to 84%, etc. For each group the difference between the average of the core assays and the average of the sludge assays was recorded as a percentage. For example, in Table I there are 59 EX samples having 100% core recovery; the assays of sludges in the group average 14% less than the cores. In Table II the samples over 1.0% copper are grouped separately from those under 1.0% copper.

Table I reveals a bias in the core-sludge assay relationship, the sludges being consistently low in all core recovery ranges above 50%. Now, the core sample having 100% recovery is the theoretically perfect sample. In any one interval the corresponding sludge sample might be high or low, but these differences should balance out in the average of a number of samples -- if the sludge samples are accurate. Thus, the AX and EX 100% recovery groups indicate a sludge error of 12% to 14% on the low side. The discrepancy is somewhat greater, on the average, between 99% and 70% recovery. Below 70%, there is a sharp break in the trend, the difference becoming negligible under 50% recovery. Table II shows that the sludge error occurs principally in the stronger coppermineralization and that it is actually 24%, rather than 12% to 14%. In the low-grade (minus 1.0% Cu), core and sludge are in close correspondence (in all ranges of core recovery, including 100%). It is also apparent that the strongly mineralized rock cored much better than the low-grade rock.

Banner sludge recoveries were generally poor, ranging mainly between 50% and 80%. The erroneously low sludge values are probably due in part to loss of sulphides through cracks in the walls of the drill hole. That is, when sludge velocity is reduced to a certain point by a leak in the hole wall, the sulphides, being heavier, tend to settle and be drained off while the gangue continues to rise.

It is to be noted that the relationship between Banner sluge and core values is just the reverseof that commonly encountered; that is, the sludge usually assays higher than the core. In most cases, however, the principal ore mineral is chalcocite (Silver Bell, Bagdad, Toquepala, etc.), a relatively soft mineral which is susceptible to selective grinding in the core with consequent enrichment of the sludge. Also, chalcocite, particularly

the sooty variety, mingles with the slime in the sludge and is not subject to classification as in the case of chalcopyrite particles.

Recirculation of slimes may have been in part responsible for Banner's sludge error. As noted on one occasion in the field, slime-bearing water was being pumped down the hole from one end of a tank while sludge from the collar of the hole was being discharged into the other end. Also, Banner's drill logs show numerous instances where the sludge assay values "lag behind" the core values. This is evidence of incomplete cleaning of the hole at the end of a sludge run.

As noted in the foregoing, the analysis indicated that the sludge error was confined largely to the stronger copper mineralization. Thus, only a minor part of the assay results needed revision. We employed a rather simple method wherein it was assumed that core samples having recoveries as low as 70% were more reliable than the corresponding sludge samples. Accordingly, in all results representing core recoveries of 70%, or higher, the core assay was substituted for the combined, or accepted assay used by Banner. This involved only those samples between 70% and 85% recovery, as Banner had already applied this method to those in the 85% to 100% range.

Theoretically, the accuracy of a core sample decreases as the recovery falls below 100%. The Longyear formula takes this into account; but it makes no allowance for possible inacurracies in the sludge (all sludge samples are assumed to be perfect). In disseminated deposits such as the Mission (and Banner) where the ore minerals are not relatively soft and friable, as compared to the gangue, loss of core is not apt to be accompanied by selective grinding of ore minerals; consequently, the core samples may be within an acceptable range of accuracy even though the core recovery is quite low.

Obviously, our selection of 70% recovery as the dividing line between the use of core assays alone and the use of combined assays was somewhat arbitrary. We do not regard the revised results as being 100% accurate, but consider them to approach more closely the true value.

J. H. COURTRIGHT

Attach: Tables I and II

TABLE I

EX HOLES

Core Rec. Range	Number of Samples	Core Assay % Cu	Sludge Assay % Cu	Difference (Core-Sludge) / Core
100%	59	1.17	1.00	-14%
85% to 99%	52	.69	.63	-08%
70% to 84%	20	.82	.58	-29%
51% to 69%	11	.85	.71	-16%
0% to 50%	7	.88	.94	+06%

AX HOLES

100%	40	.89	.78	-12%
85% to 99%	192	.71	.59	-17%
70% to 84%	127	.86	.65	-24%
51% to 69%	126	.56	.52	-07%
0% to 50%	358	.47	.47	0

TABLE II

PLUS 1.0% CU. AX & EX HOLES COMBINED

100%	29	2.16	1.65	-24%
85% to 99%	45	1.59	.98	-38%
70% to 84%	38	1.94	1.17	-40%
51% to 69%	22	1.68	1.21	-28%
0% to 50%	32	1.43	.91	-36%

MINUS 1.0% CU. AX & EX HOLES COMBINED

100%	41	.56	.56	0
85% to 99%	143	.52	.48	-08%
70% to 84%	72	.43	.44	+02%
51% to 69%	122	.52	.48	-08%
0% to 50%	278	.47	.42	-11%

June 15, 1960

AIR MAIL - CONFIDENTIAL

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

MISSION UNIT
EXTENSION INTO AND THROUGH
BANNER PROPERTY

Dear Sir:

This will acknowledge receipt of your letter of June 8 with the attached report on ore reserves of the Banner property prepared by Mr. W. O. Schubel.

This is a very good summary report and we are glad to have it.

One thing that stands out, of course, is the high stripping ratio in connection with the Banner ore which has been drilled so far. I suspect that this same tendency will continue in the undrilled eastern portion of their Eisenhower group of claims. As I have mentioned by telephone, to really appraise this matter a little better, I think we need additional detailed information, including the following:

1. In Attachment "C", Mr. Schubel has included the calculating methods of Banner, but it was not entirely clear to me whether he himself had used these same methods, although further study of the report indicates that this is not the case, in view of Mr. Schubel's remarks on pages 1 and 2. However, I would like to be assured about this. In describing the methods used in the report, I would like also to be sure that sufficient dilution allowance has been made where the polygons of ore join polygons of waste. As we have discussed in the past, there are several ways of doing this, and for Mission we finally accepted a method of calculating a dilution based on geological interpretations, which I believe gave an accurate result.

2. I would like to be sure that Mr. Richard has checked the calculations sufficiently to endorse them as being correct.

3. It seems that the ore in the upper levels is of much lower grade than that of the lower levels where certain high-grade plums occur. In order to estimate how we will come out on any deal with Banner, which will no doubt involve cash advances, we need especially to know the tonnage and grade of ore on each level, and even the distribution in different parts of each level. Therefore, in addition to a summary of ore and waste by levels, we also need the level plans with grade of each polygon shown thereon. This will also bring out what allowance has been made for dilution.

In the present state of negotiations, Banner is to agree to mine only a limited tonnage of the high-grade underground ore from the Palo Verde shaft, so on the level plans we shall eventually wish to define carefully which area they will be allowed to get this tonnage from.

Another reason that we need the level plans is to determine how much of the mining claim area is included in the present ore reserve, and how much of it remains still to be drilled outside of the present ore reserve. You mentioned that we could get this from the composite pit plan map - Attachment "A", but I find that this pit plan does not include the Banner ore but includes only the ore of the Asarco claims with the pit slopes extended back into the Banner ground.

4. As I mentioned, we need to have Mr. Richard's opinion and recommendation on the ore possibilities of the eastern area as soon as possible. It is my understanding that it is expected that this will be sent during the present week so that I will have it the first of next week.

5. We have no way of telling whether or not the Banner Company really means business now. In the past they have delayed and changed their minds continuously. I got the impression at our last meeting that we are approaching the time when they really mean to get down to business. Particularly, I wish to steer them toward the west from their shaft away from the area of the known open pit ore. I believe they have drilled some fairly good grade ore to the west, in addition to what they had before starting their Palo Verde shaft. So I think that they are again more interested in leasing the underground ore which may occur in the State No. 1 and Jo-Jo No. 3 mining claims. In connection with leasing these two claims, I would like your opinion on whether or not we should limit the upper elevation at which they will be allowed to mine. If any other limitations on these two claims occur to you, please let me know about them also.

You are to advise me how long you think it would take to get the level maps and the rest of the above information in shape to send on to me so that I will be in a position to fix the time of the next meeting with Mr. Travis.

Very truly yours,

D. J. Pope

DJP:pf

cc: KERichard-A/M-Confid.

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

September 14, 1959

FILE MEMORANDUM

MELMEN PEAK GEOLOGY
Banner Co. Drilling, Deep Hole
East of Mission Area, Arizona

During the spring of 1959 Banner Mining Company drilled a deep hole in the NW corner of Section 33, T 16S, R 13 E; about 200 feet south of the San Xavier Reservation and about 200 feet east of the diagonal access road to the Pima Mine. Drilling was stopped in black siltstone at 2000 feet, on May 19, 1959. No granite was encountered.

Numerous small chips of core were left about the sample table. These indicate that most of the rock probably was black siltstone, with a lesser amount of arkose. The chips may be grouped into three rock units: (1) Black, strongly calcareous, soft aphanitic rock -- probably siltstone or mudstone. One piece contained veinlets of white calcite. (2) Grey white fine- to medium-grained arkose of the Red Hill type. (3) Grey to tan-grey sandy argillite. This rock borders on the grain-size limit of fine-grained arkose.

Stratification in 2 chips of argillite dips 25° -- a smaller dip than the rocks on the East margin of ASSR claims. No alteration or mineralization appears in the chips observed.

A sludge sample from the discharge pond was washed and examined, and showed that a trace amount of pyrite had been cored. No Cu minerals were observed.

JOHN E. KINNISON

JEK/de

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

September 14, 1959

J. H. C.
SEP 17 1959

Banner Hole 109

CONFIDENTIAL

MEMORANDUM FOR K. E. RICHARD

MISSION MINE GEOLOGY

While logging Banner Mining Company's core during August, 1959, I logged Diamond Drill Hole 109, which was not included in the information exchange. The core showed direct similarity to Pima Mine rock types. Casual conversation with F. D. MacKenzie revealed that DDH 109 is located between the Pima pit and the Daisy shaft.

The geology near the bottom of the hole may be significant in deciphering the relationships between the Pima ore zone and the Mission ore zone. A log of the hole is attached, showing correlations which I believe probable.

JOHN E. KINNISON

Attachment
JEK/de
cc: JHCourtright

BANNER MINING COMPANY
Diamond Drill Hole 109

Located between Pima pit and Daisy Shaft

- Pima Mine hanging wall clastics -

181.0 - 232.0	Arg, rock brown colored. Spotty weak Cu silic.
232.0 - 300±	Arg, black. Traces lim., w/py-cpy below 257'.
300± - 345.0	Recrystallized arg, chloritic. Trace of oxidation to 310'.

- Pima Mine ore zone rocks -

345.0 - 378.0	Tactite, gray-green. Waste.
378.0 - 403.0	Diop. Hf, greenish and dense. Spotty weak cpy.
403.0 - 488.0	Tactite, strong diop. Chlorite-magnetite replacements at 423', 424', 417.0-418.5'. Tactite waste; but strong cpy in chlorite-mag. zones.
488.0 - 514.0	Diop Hf. Mod. cpy to 495'.
514.0 - 548.0	Tactite. Strong cpy 514-517'; very strong cpy-spotty-w/ strong mag, from 526 to 548'.
548.0 - 568.0	Marble.
568.0 - 573.0	Tactite. Diss py, tr. of sph.
573.0 - 580.0	Qtz-chl-calcite rock. Spotty strong cpy.
580.0 - 593.0	Tactite, with blebs of calcite. Diss. py.
593.0 - 609.0	Marble, strong serp-chl, local diop. and gouge. Cpy from 606-609.
609.0 - 614.0	Tactite and marble. Diss py.
614.0 - 667.0	Tactite, light yellow w/strong clay-like diop. Chlorite mag rock, intervals less than one foot, at: 628', 629', 631.5', 640', 641', and 643'. From 644-647 chl-mag rock, last foot w/garnet and cpy. From 659-667' is chl-mag rock with garnet.
667.0 - 675.0	Marble, brecciated and serpentinized. Spotty cpy.
675.0 - 691.0	Tactite. Strong blebs and vns of cpy.

691.0 - 695.0	Massive magnetite - cpy.
695.0 - 721.0	Mag-chlorite rock. Finely diss. strong cpy.
721.0 - 735.0	Probably footwall breccia zone. Recovered only 0.6' core in fragments, rock similar to above.

- Pima Mine Footwall Clastics -

735.0 - 750.0	Feldspathic rock. Tr. of py. Weakly oxidized with limonite films.
750.0 - 755.0	Shear zone. Finely granulated breccia and many chlorite seams. Slightly calcareous. Frags. are of feldspar rock as above.

- Mission Ore Zone(?) -

755.0 - 779.0	Diop. Hf. Fractured and strongly altered to chl-mag. Contains diss cpy.
779.0 - 786.0	Meta-porphyry(?). Recrystallized qtz-feldspar massive, with wisps of chlorite after biotite(?). No phenocrysts visible. Weak diss py.

B o t t o m

cc: KR

BANNER MINING COMPANY
Tucson, Arizona

August 29, 1959

TO : General Manager

FROM : Mine Engineer

SUBJECT: Methods Used in Calculating Ore Reserves in the Eisenhower Group

---

GENERAL: Diamond and churn drill holes are being drilled on approximately 250 foot centers. By the polygon method described below, each hole is given an area of influence and the volume of ore is calculated from the thickness of ore cut by the hole. The various factors applied in these calculations and the methods by which they were obtained are as follows:

DILUTION: All mineralized sections were expanded to a minimum thickness of 25'. If the section would not exceed the 0.50% cutoff selected, it would be classified as millable capping or waste, millable capping being between 0.36% copper and 0.50% copper. Millable capping and ore are then combined by tonnages to give an average grade of about 0.82 to the orebody.

POLYGONS: The method of construction was to erect a perpendicular to each line drawn between a hole and the other adjacent holes, at the midpoint of the line. In connecting these perpendiculars, the polygon is formed. As the polygon is not a perfect hexagon, a planimeter was used to measure the area.

TONNAGE FACTORS: The tonnage factors for each of the rock types carrying ore were calculated from the core and sludges of 5 diamond drill holes and averaged. A beam balance and a 500 cc graduate were used to compute specific gravity by Archimede's Principle. Factors are: Graywacke, 12.15 Cu Ft/Ton; Tactite, 10.89 Cu Ft/Ton; and Porphyry, 12.48 Cu Ft/Ton of ore in place.

GRADE: Drill sludges and core were weighted by Longyear tables for a combined assay for each run. For core recoveries over 80% drill sludges were not considered.

The following formula was used in connection with the tables:

$$Aw = \frac{FcAc + FsAs}{100}$$, where Aw is the combined or weighted assay,

Ac and As are the assays of the core and sludge respectively, Fc and Fs are the factors for core and sludge obtained from the tables knowing the core recovery in % and the size of bit used.

Each ore zone was averaged separately by weighting the footages of the runs. Tonnages were computed for each ore zone and the final grade obtained by weighting with tonnages.

/s/ Norman Harvey
Mine Engr

NH:d

BANNER MINING COMPANY
Tucson, Arizona

August 29 1959

TO : General Manager

FROM : Mine Engineer

SUBJECT: Methods Used in Calculating Ore Reserves in the Eisenhower Group

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DILUTION: All mineralized sections were expanded to a minimum thickness of 25'. If the section would not exceed the 0.50% cutoff selected, it would be classified as millable capping or waste, millable capping being between 0.36% copper and 0.50% copper. Millable capping and ore are then combined by tonnages to give an average grade of about 0.8 to the orebody.

POLYGONS: The method of construction was to erect a perpendicular to each line drawn between a hole and the other adjacent holes, at the midpoint of the line. In connecting these perpendiculars, the polygon is formed. As the polygon is not a perfect hexagon, a planimeter was used to measure the area.

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Norman Harvey
Norman Harvey
Mine Engr

NH:d

Bureau of Mines
Information Circular 7786

MINING METHODS AND PRACTICES AT THE MINERAL HILL COPPER MINE BANNER MINING CO., PIMA COUNTY, ARIZ.

BY WALTER R. STORMS AND ALLAN B. BOWMAN

United States Department of the Interior — May 1957

MINING METHODS AND PRACTICES AT THE MINERAL HILL COPPER MINE BANNER MINING CO., PIMA COUNTY, ARIZ.

BY WALTER R. STORMS AND ALLAN B. BOWMAN

* * * * * * * * * * **Information Circular 7786**

UNITED STATES DEPARTMENT OF THE INTERIOR
Fred A. Seaton, Secretary
BUREAU OF MINES
Marling J. Ankeny, Director

Work on manuscript completed January 1956. The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is made: "Reprinted from Bureau of Mines Information Circular 7786."

The work upon which this report is based was done under a cooperative agreement between the Bureau of Mines, United States Department of the Interior, and the Banner Mining Co.

May 1957

MINING METHODS AND PRACTICES AT THE MINERAL HILL COPPER MINE, BANNER MINING CO., PIMA COUNTY, ARIZ.

by

Walter R. Storms[1/] and Allan B. Bowman[2/]

CONTENTS

1/ Supervising mining engineer, Bureau of Mines.
2/ Vice-president and general manager, Banner Mining Co.

Information Circular 7786

CONTENTS (Con.)

ILLUSTRATIONS

SUMMARY AND INTRODUCTION

This paper, which describes mining methods and practices at the Mineral Hill copper mine, is one of a series being prepared by the Division of Minerals of the Bureau of Mines on mining methods, practices, and costs in various mining districts of the United States.

The Mineral Hill mine is situated on the northeastern piedmont of the Sierrita Mountains at an altitude of 3,650 feet in sec. 35, T. 16 S., R. 12 E., and sec. 2, T. 17 S., R. 12 E., Pima mining district, Pima County, Ariz. (fig. 1). The claims (figs. 2 and 3) are in a gently rolling area with only scant desert vegetation. The average annual precipitation is about 11 inches. The nearest surface water is the Santa Cruz River, an intermittent stream 8 miles east of the mine. The property is owned by the Banner Mining Co., a Nevada corporation.

This report presents a brief history of the mine, describes the geology of the area and the ore deposits, outlines methods of prospecting and exploration, and gives methods of sampling and the estimation of ore reserves and values. Development and stoping methods are explained, and methods of underground transportation, ventilation, mine drainage, and safety measures are described. The concluding section of the paper is a section on milling.

The Mineral Hill mine is an old mine that was reopened in 1951 after having been closed for 30 years.

ACKNOWLEDGMENTS

Acknowledgment is made to the executives and staff of the Banner Mining Co. for permission to publish this paper and for their valuable assistance. Special acknowledgment is due Boyd W. Venable, mine superintendent, and Wallace Boyd, mine geologist. The assistance of mining engineers of the Bureau of Mines Southwest Experiment Station in preparing this paper is also greatly appreciated.

HISTORY[3] [4]

The lode-mining claims at the Mineral Hill property originally were located about 1882. The Emperor Copper Mining Co. developed the copper deposits from 1882 until 1884, when the decline in the copper market forced it to close. It is reported that the Mineral Hill Mining Co. was formed in 1889 and took over the property. In

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3/ Wilson, Eldred D., Arizona Zinc and Lead Deposits, Part I: Arizona Bureau of Mines Bull. 156, 1950, pp. 39-50.

4/ Weed, Walter Harvey, The Mines Handbook: The Mines Handbook Co., Tuckahoe, N. Y., vol. 13, 1918, p. 548; vol. 14, 1920, p. 292; vol. 16, 1925, pp. 107, 385.
Neale, W. G., The Mines Handbook: The Mines Handbook Co., Inc., New York, N. Y., vol. 17, 1926, p. 319.
Rand, L. H., and Sturgis, E. B., The Mines Handbook: Mines Information Bureau, Inc., Suffern, N. Y., vol. 18, 1931, p. 375.

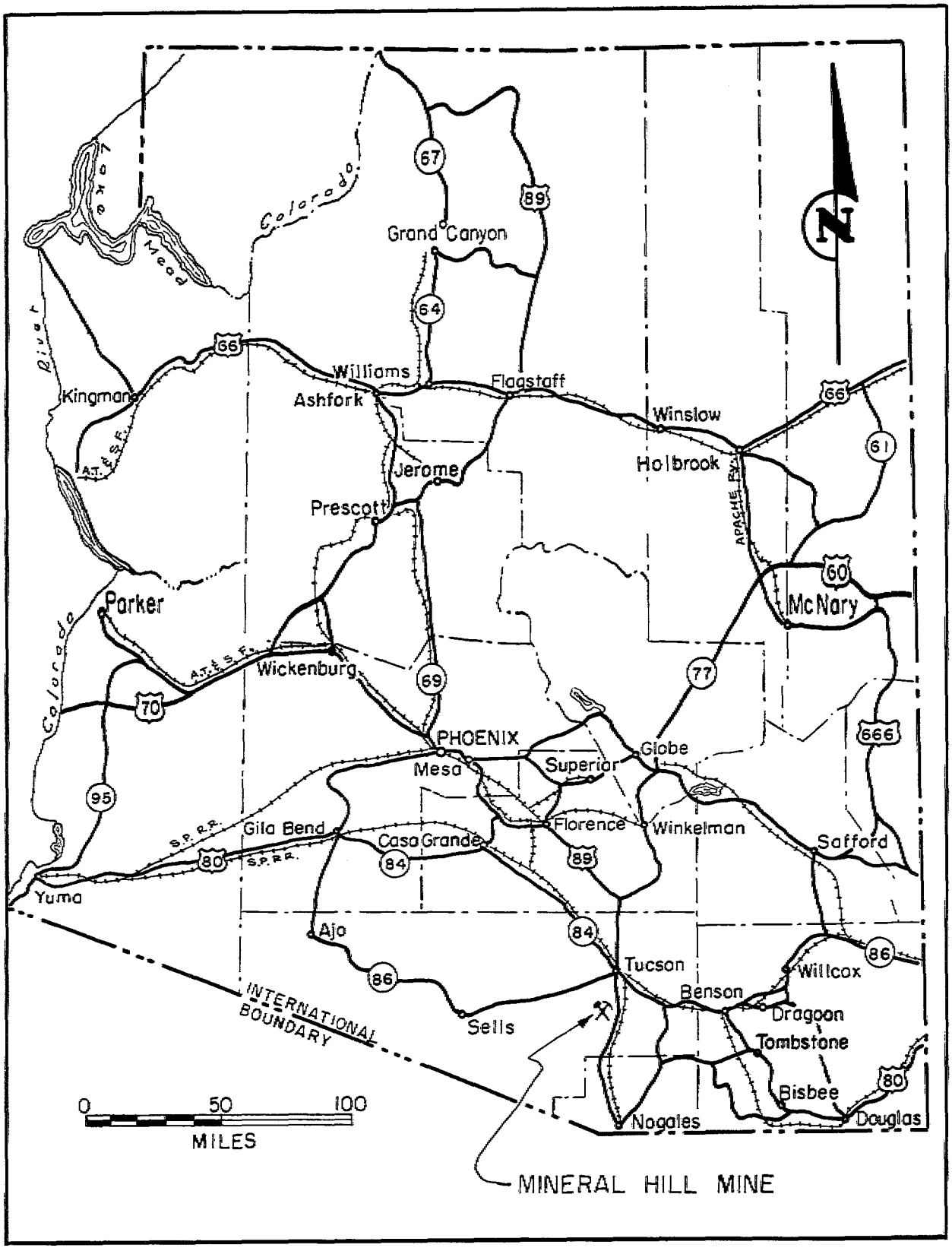
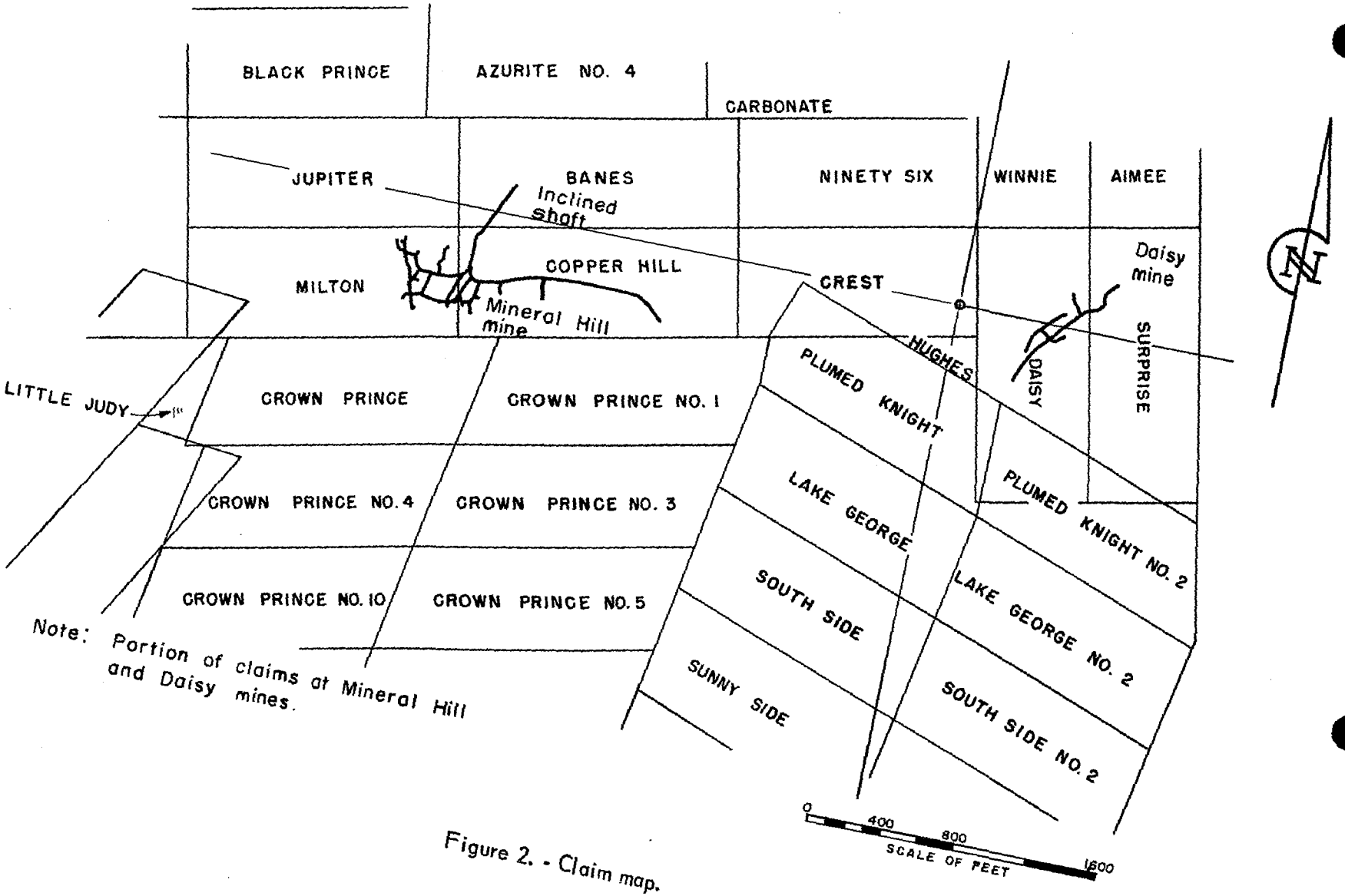


Figure 1. - Location map.



Note: Portion of claims at Mineral Hill and Daisy mines.

Figure 2. - Claim map.

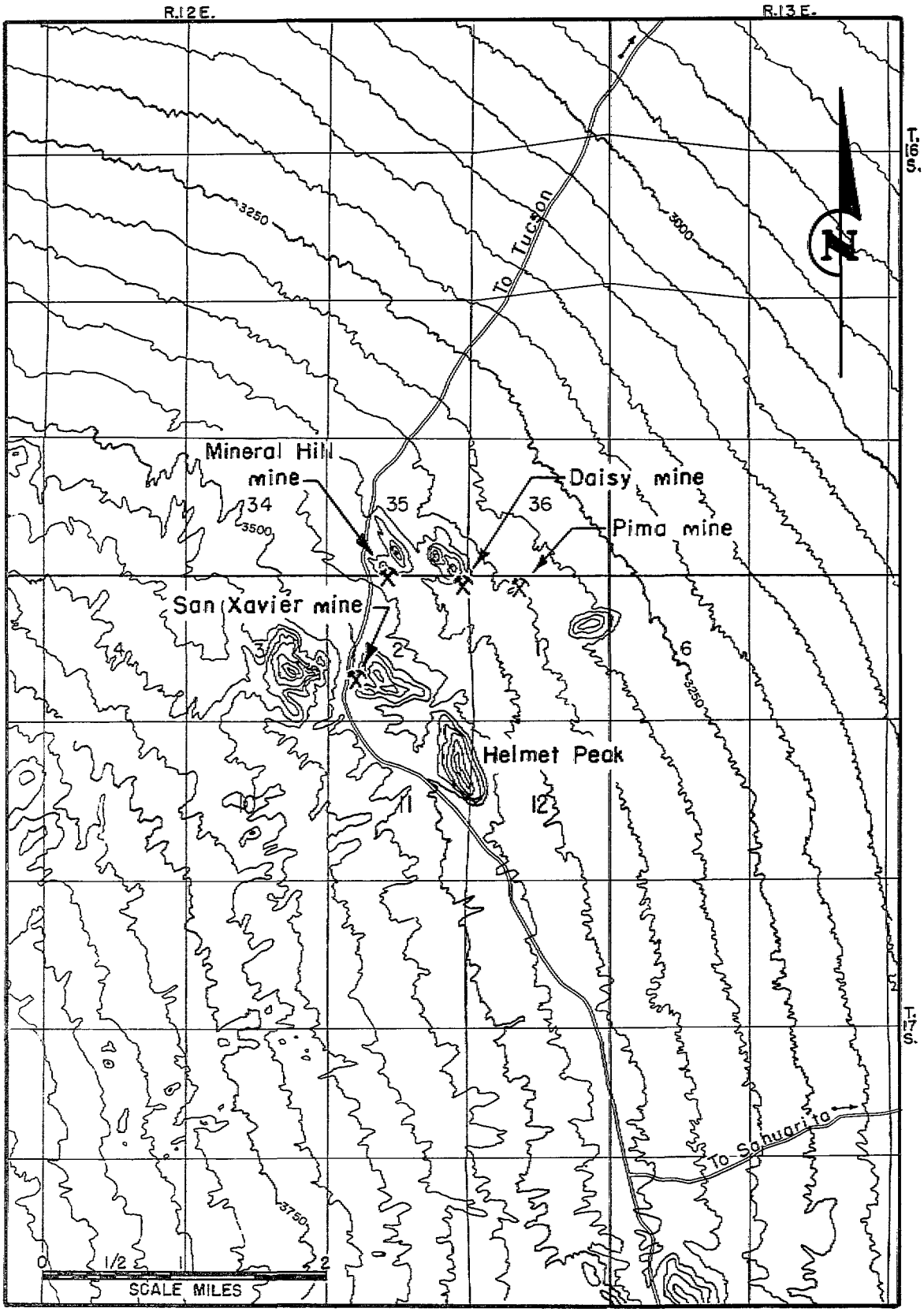


Figure 3. - Surface topography.

1894 this company consolidated with the Copper King Co., which operated the mine until 1897. In 1897 the consolidated company was reorganized as the Azurite Copper & Gold Mining Co.

In 1898 the Azurite Copper & Gold Mining Co. constructed a small furnace at the Mineral Hill mine and produced copper for about a year. The mine then remained idle until 1904, when the company was taken over by the Mineral Hill Consolidated Copper Co., which operated it until 1907. It then was closed because of the financial panic of that year. The mine was operated again in 1912 by this same company but was closed again in September 1913. In 1916 the old smelter was enlarged, and production was resumed for a few years until the mine finally was closed in 1921. It remained shut down until 1951.

About 1914 the Barnsdall Corp. of New York City acquired control of the Mineral Hill Consolidated Copper Co. The last production evidently was done under the direction of this company. In 1929 the charter of the Mineral Hill Co. expired, and the total assets were taken over by the Barnsdall Corp.

Early production records for the Mineral Hill property are scarce. Copper ore was produced from the mine by the Mineral Hill Consolidated Copper Co. Ore also was produced from the nearby Plumed Knight mine by the Pioneer Mining & Smelting Co. This mine was sold about 1917 to Barnsdall and later acquired by the Mineral Hill Consolidated Copper Co., which he evidently controlled at that time.

It is reported that 9,000 tons of high-grade copper ore was produced before 1889. From 1889 to 1894, 4,000 tons, averaging 12.5 percent copper, is said to have been shipped to El Paso; from 1895 to 1897, about 2,500 tons was shipped, reportedly ranging from 10.7 to 20.0 percent copper. From 1898 to 1899, 9,600 tons of ore is said to have been smelted in the small furnace of the Azurite Copper & Gold Mining Co. This ore is supposed to have produced 800,000 pounds of copper matte, ranging from 65 to 70 percent copper.

No production records are available from 1899 to 1915. It is said that from 1915 to 1917, about 46,000 tons of ore was mined, which averaged 3.8 percent copper and 0.77 ounce of silver a ton. From 1917 to 1921 the lower levels of the mine were developed, but evidently little or no ore was produced.

The Mineral Hill mine remained closed from 1921 until 1951, when the Banner Mining Co. obtained an option on the property and reopened it with Government exploration assistance under the Defense Production Act of 1950. From August 1951 to December 1952 this company pumped out the mine, rehabilitated most of the old underground workings, and thoroughly sampled them. With indication of enough ore, the company started to construct a 400-ton flotation plant in 1953 with the assistance of the Defense Materials Procurement Agency. It was completed and placed in operation in June 1954. The Mineral Hill mine began production early in 1953, the ore was stockpiled on the surface until the mill could be completed.

Meanwhile, the Banner Mining Co. had located another ore body by geophysical means some 3,000 feet east of the Mineral Hill incline and had explored it by surface diamond-drill holes. In 1953 a vertical shaft, the Daisy, was sunk in this ore body. A considerable amount of oxidized copper ore was shipped to International Smelting & Refining Co. Inspiration smelter. Sulfide ore from this shaft later was treated in the company flotation plant. The concentrates are shipped to the American Smelting & Refining Co. El Paso, Tex., smelter.

GEOLOGY

General Geology[5/]

The Pima mining district is on the eastern margin of the Sierrita Mountains 18 to 30 road miles south-southwest of Tucson. It includes the subdistricts of Mineral Hill and Twin Buttes. A plain, ranging in altitude from 4,500 feet on the west to about 3,000 feet on the east, slopes gently eastward toward the Santa Cruz River (fig. 3). However, this plain is surmounted by Mineral Hill, Helmet Peak, and Twin Buttes, which rise prominently above the piedmont. Drainage is eastward to the Santa Cruz River.

In general, the Sierrita Mountains are composed of a granitic core with metamorphosed sedimentary rocks on the west slope and much less altered sediments on the east (fig. 4). Coarse-grained intrusive igneous rocks, ranging from granite and quartz monzonite to granodiorite, underlie much of the eastern piedmont. Some intrusive dikes cut the sediments and probably are related to the granitic intrusion.

The regional structure has been complicated by folding, overturning, low-angle thrust faulting, and steeply dipping faulting; however, much of the complicated structure has not been worked out.

Ore Deposits

Sedimentary rocks, ranging from Cambrian to Cretaceous in age and consisting principally of limestones, shales, and quartzites, outcrop in the vicinity of the Mineral Hill mine (fig. 5). Farther eastward these rocks are covered by surface material, which is some 150 feet deep at the eastern property line. These sediments have been intruded by granite, which underlies much of the area, and cut by several porphyry dikes.

A large east-west preore thrust fault, the Mineral Hill fault, transverses the claims for almost 5,500 feet. At places this fault strikes almost northwest, but its general trend is east-west. It dips about 35° southward. Ore mineralization occurs along this large fault, usually at intersections with cross faults, or at or near intrusive contacts with limestone or quartzite.

Copper-ore deposits at the Mineral Hill mine are of the contact metamorphic type; the deposits usually occur sporadically along shear zones in the limestone and also disseminated through the contact silicates. Chalcopyrite is the principal ore mineral, although small amounts of chalcocite and bornite also occur. Some magnetite, pyrite, and small amounts of sphalerite, molybdenite, and scheelite are found. The gangue consists of limestone, quartz, pyrite, hematite, calcite, and contact silicates.

Two ore bodies are being mined at the Banner property, the Mineral Hill and the Daisy (some 3,000 feet east of the former).

At the Mineral Hill deposit some of the ore on and above the 300-foot level is very fractured and chloritic, and the ground is heavy. Below the 300- and above the 500-foot level the ground is better in some sections, but stope walls still require support. On the 600-foot level some of the ground is fairly strong, and some

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5/ Work cited in footnote 3.

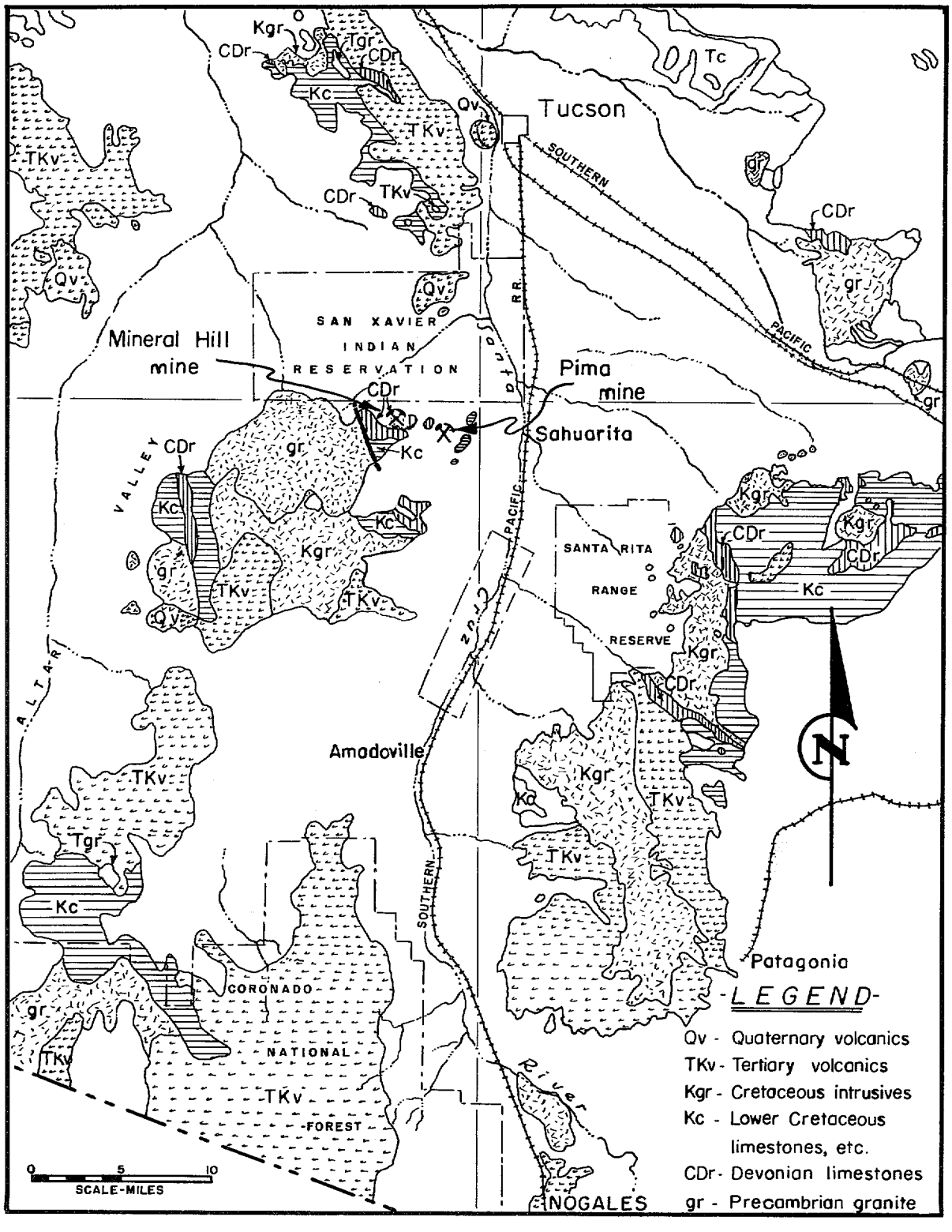


Figure 4. - Regional geology.

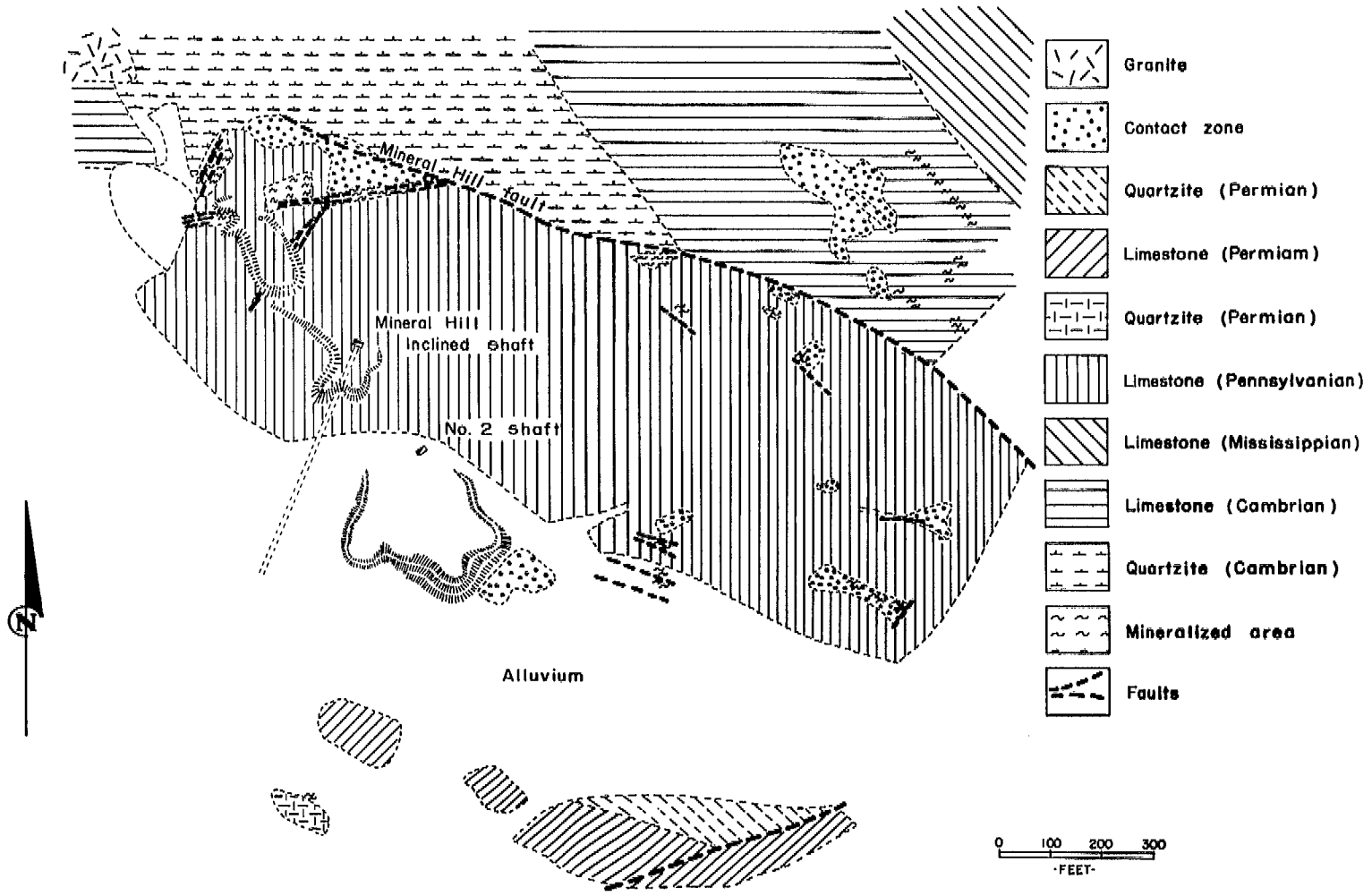


Figure 5. - Surface geology at Mineral Hill. *(Courtesy, Banner Mining Co.)*

stopes stand open with only chain pillars on 35-foot centers and roof bolts on a 5-foot pattern on the hanging wall to hold the back. The ground in chloritic areas on all levels is soft, weak, and heavy; in clay-garnet areas the ground is medium in strength but still requires sand fill to support the stope walls; in garnetite areas on part of the 600-foot level the ground is strong, and stopes may stand open after ore has been extracted.

Many ore shoots dip about 35° and are very erratic, both in dip and strike. Many shoots do not continue from one level to the next but pinch out, usually against a fault (see fig. 6 and 7).

The Daisy ore body was developed first by diamond-drill holes from the surface, then by a 450-foot vertical shaft. Bedrock was covered by 25 feet of overburden, mostly sand, gravel, and caliche. Ore came within 25 feet of the surface. It was localized along a northeast to east striking fault, which probably is a segment of the main Mineral Hill fault. Ore occurs in sedimentary rocks in a zone near the contact between Permian limestone and quartzite; the best ore is in the limestone.

PROSPECTING AND EXPLORATION

The Mineral Hill mine originally was located in the 1880's and by 1921 had been developed by several shafts and several hundred feet of underground workings. It would seem that all prospecting and exploratory work before 1951 was done by actual shaft sinking, drifting, and crosscutting.

The mine was reopened in 1951 and 1952 by the Banner Mining Co. after it had been idle since 1921. The water was pumped out, and all principal underground workings were rehabilitated. Since that date considerable exploratory work has been done by drifting, crosscutting, and diamond drilling, chiefly on the 600-foot level (fig. 8).

The area east of the Mineral Hill mine also was explored by diamond-drill holes before and after a geophysical survey had indicated possible ore in that area. Ore was discovered by this drilling under 25 feet of surface alluvium, about 3,000 feet east of the Mineral Hill mine. This ore body then was developed by the Daisy shaft.

SAMPLING AND ESTIMATION OF ORE

When the Mineral Hill mine was reopened and rehabilitated in 1951-52, all underground mineralized areas on the several mine levels were carefully cleaned and sampled. The assays of these samples then were plotted on large-scale level maps. From these sampled areas a number of ore bodies were outlined and plans made to mine them.

After production from the Mineral Hill mine began, only mine cars and development workings were sampled. Samples from mine cars, as ore is pulled from stope chutes, are taken for stope control. No actual samples are taken in the stopes, as all ore areas merely are checked "by eye." Channel or chip samples are seldom taken. Drift or crosscut faces may be channel-sampled, although much reliance is placed on car samples from those workings.

In estimating ore: (1) Plans and sections are drawn on each ore body on each level; (2) the area of ore on each level is measured; and (3) the cubic feet and tonnage in the block between levels are calculated, using 10.5 cubic feet per ton of ore. Many ore bodies pinch out between levels, but company engineers and

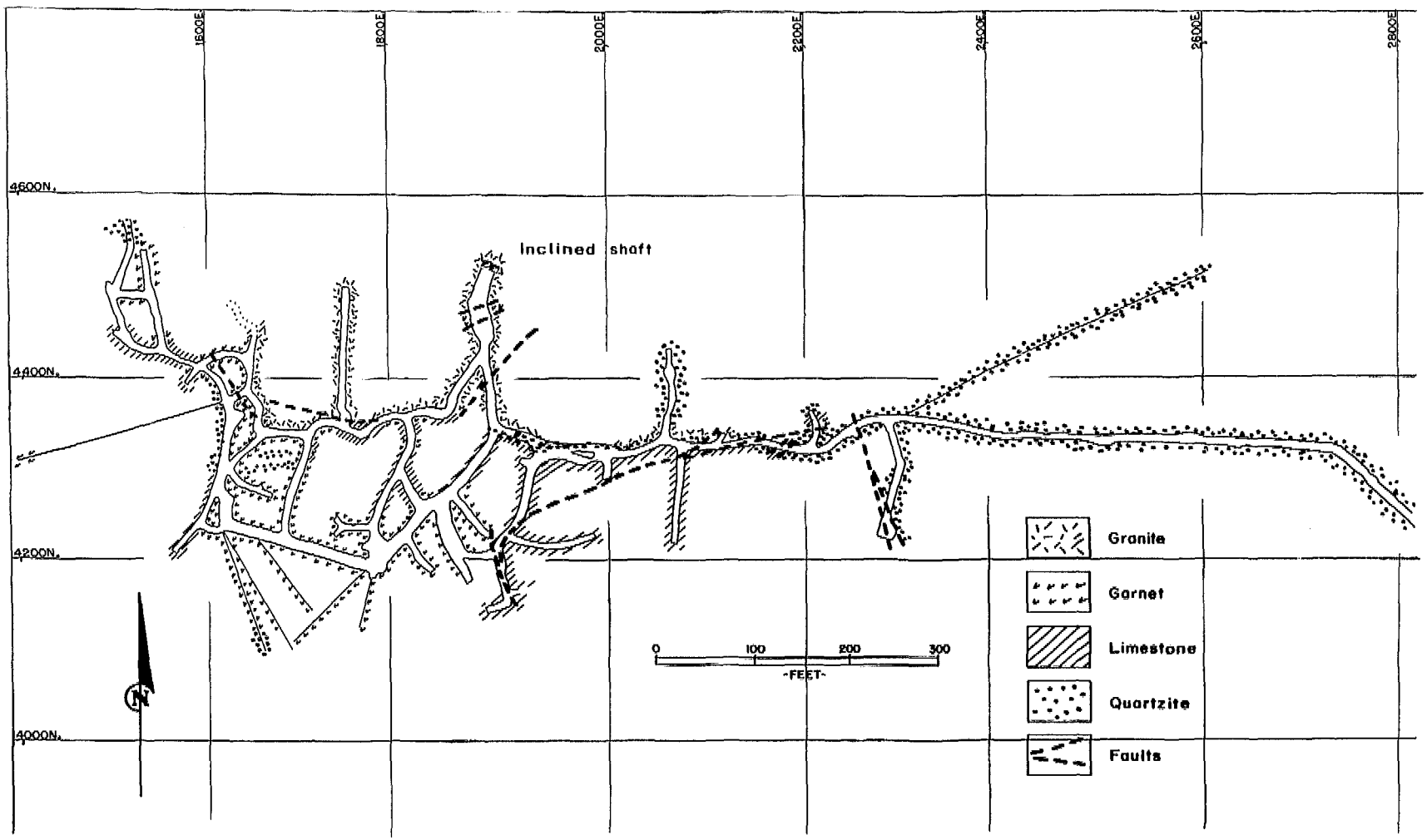


Figure 6. - 600-foot-level geology. *(Courtesy, Banner Mining Co.)*

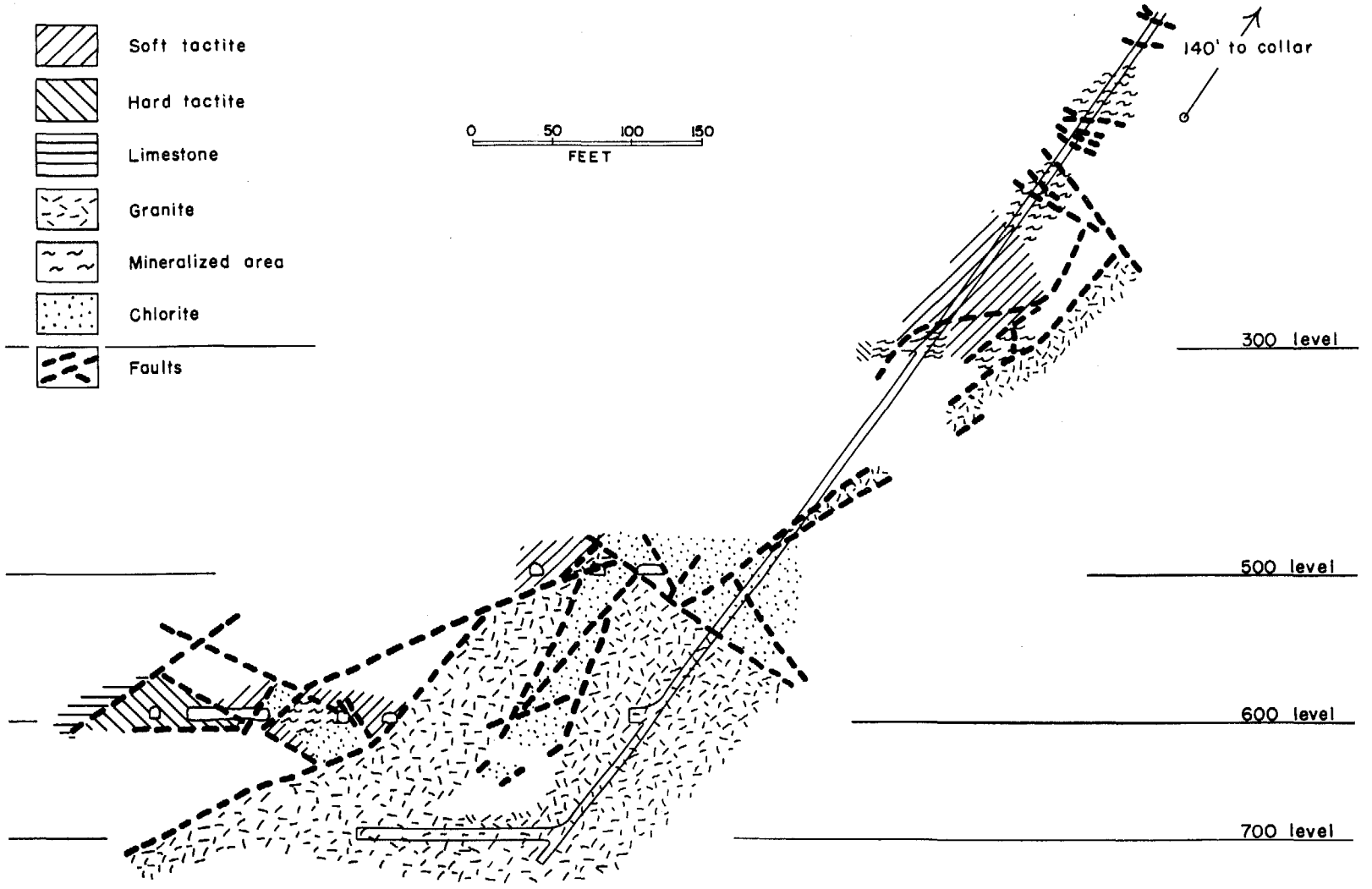


Figure 7. - Section through inclined shaft. *(Courtesy, Banner Mining Co.)*

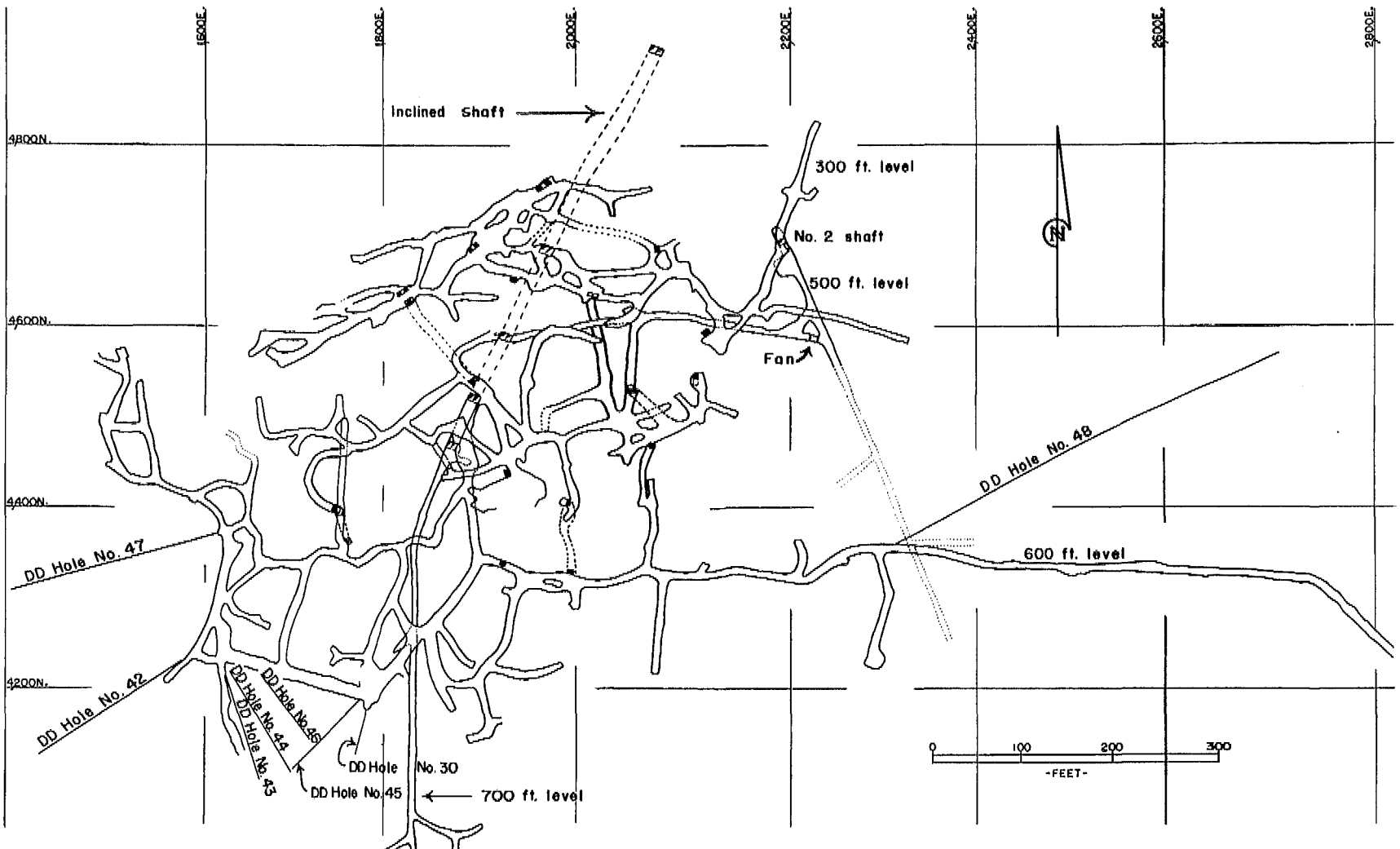


Figure 8. - Composite map of Mineral Hill mine.

geologists have found that enough new ore usually is discovered to make their calculations nearly correct.

DEVELOPMENT

Two separate ore bodies have been developed at the Banner Mining Co. property - the Mineral Hill and the Daisy deposits. The former was explored and developed before 1921 by at least 1 inclined and 4 vertical shafts, with many hundred feet of drifts and crosscuts; the latter was developed only recently by a 450-foot vertical shaft and some 2,500 feet of underground workings (see fig. 2).

Shafts

Shafts 1, 3, and 4 were sunk on 3 different mineralized outcrops at Mineral Hill for exploration purposes. Shaft 2 and the 54° inclined shaft were sunk to develop the main ore body. The former is a 2-compartment vertical shaft from the surface to the 500-foot level, a distance of 468 feet. The latter is a 2-compartment 54° inclined shaft from the surface to about the 800-foot level. Four levels have been developed from the inclined shaft - the 300, 500, 600, and 700. Only 2 of these levels, the 300 and 500, join No. 2 shaft. The 300-foot level is 348 feet vertically below the inclined shaft collar and 316 feet below the No. 2 shaft collar; the 500-foot level is 152 feet vertically below the 300; the 600-foot level is 100 feet vertically below the 500; and the 700 is about 90 feet vertically below the 600.

Both No. 2 and the inclined shaft have two compartments, the second compartment in each contains manway and pipes. The main compartment in the inclined shaft contains a 2-1/2-ton self-dumping skip running on 20-pound rails; the main compartment of No. 2 shaft contains a small cage used for men and supplies and sometimes for caging cars of muck to the surface. Both shafts were sunk before 1921 (the inclined shaft was sunk an additional 100 feet in 1955) and only recently were rehabilitated by the Banner Mining Co. Neither is completely timbered, the rock section in No. 2 being too small in places to hold anything except stulls for cage guides and for ladder and pipe supports. The inclined shaft is completely timbered only where the ground is heavy, otherwise track, ladder, and pipe are supported by stulls or sills across the incline bottom, or footwall.

The vertical Daisy shaft was sunk by the Banner Mining Co. after the ore deposit had been explored by surface diamond-drill holes.

Drifts and Crosscuts

All drifts and crosscuts are at least 5 by 7 feet in the clear. Haulageways usually are 7 by 8 feet. Timber is used only where necessary. Roof bolts are used where the ground is not too heavy but where some support is needed.

In developing the No. 1 ore body on the 600-foot level (fig. 6) a 12- by 12-foot haulageway was driven along the hanging wall of the ore shoot. Roof bolts, 1 inch in diameter and 6.5 feet long, were used to hold the back. They were spaced on the corners of a 5-foot square pattern, with 3- by 12- by 36-inch headboards and 8- by 8- by 3/8-inch washers. The bolts were of the slot-and-wedge type and were tightened by an impact wrench on the 1-inch nut. Roof bolts also are used in the smaller drifts and crosscuts where some support is necessary but where timber sets are not needed.

All drilling in drifts and crosscuts is done with medium-weight jackhammers on 3- and 4-foot feed legs. In both the Mineral Hill and Daisy mines, 7/8 inch, hexagonal, alloy-steel drill rods are standard and are used with 1 3/8-inch, detachable, tungsten carbide, 4-point star bits. Some drill steel has 1 9/16-inch tungsten carbide chisel bits formed directly on the end of the rod.

Drill rounds vary with the kind of ground encountered. Usually a burn cut is used, although a bottom or side wedge cut may be used in difficult rock. Forty-percent ammonia gelatin is used with 9-foot fuse and No. 6 blasting caps in dry headings. Where much water is encountered, regular-delay electric caps are used. Usually a 5-foot round is pulled in 7- by 8-foot drifts and crosscuts. All mucking is done by mechanical shoveling machines.

Raises

Raises at the Mineral Hill mine usually are driven at a very flat angle, so are stulled only. Manways and chutes through stope fill are cribbed, the inside of each being 4 by 4 feet in the clear on the inside.

MINING (STOPING)

At least four different methods of stoping are used by the Banner Mining Co. At the Mineral Hill mine both ore and country rock vary from soft and fractured to very hard and dense. On and above the 300-foot level much of the area is soft and badly brecciated and contains considerable soft gouge and chlorite. Between the 300- and 500-foot levels the ore and country rock are more firm outside of chlorite areas. On and above the 600-foot level much of the ore is hard garnetite-chalcopyrite.

In chlorite ore a system of slot mining is used; the clay-garnet ore is mined in long, narrow, cut-and-fill stopes; and on and above the 600-foot level in the No. 1 ore body a modified system of shrinkage stoping was used.

At the Daisy mine the ore is fairly hard, so it is mined chiefly by cut-and-fill stopes.

During December 1955, 12,800 tons of sulfide ore and 1,600 tons of oxide ore were mined. About two-thirds of this tonnage came from the Mineral Hill mine, the remainder from the Daisy. The average daily production is about 550 tons of sulfide-oxide ore.

Slot Mining Method

Much of the ore that remains above the 300-foot level is fractured and broken, with much chlorite and gouge. To mine this ore with least danger to miners, a slot system of mining was devised (see figs. 9 and 10).

First a 7- by 8-foot haulage drift was driven near the footwall side of the ore body. Next, square-set slots, 2 sets wide, were driven on 30-foot centers from the footwall for 35 feet, or to the hanging wall if the ore was not over 7 sets wide (it was seldom over 35 feet). The pillar between the two slots then was drilled and blasted out and the broken muck removed with a scraper attached to a double-drum slusher hoist. The slots were raised another set, a chute and manway were built into the first set off the haulage drift, then the haulageway was carefully lagged, and the two sill slots and the pillar were filled with sand prepared from mill tailings. No floor was used on this type of fill.

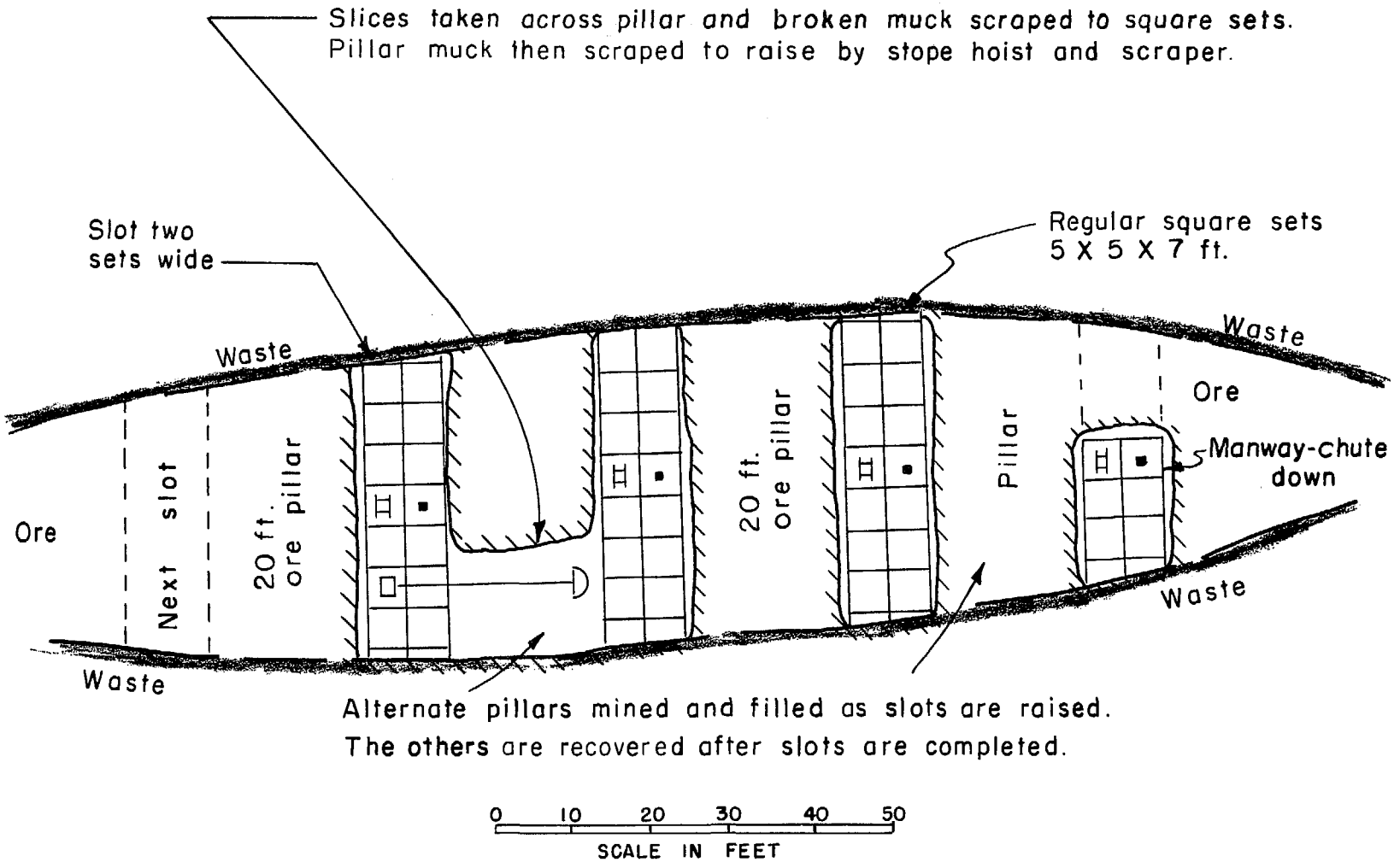


Figure 9. - Plan of slot-mining method.

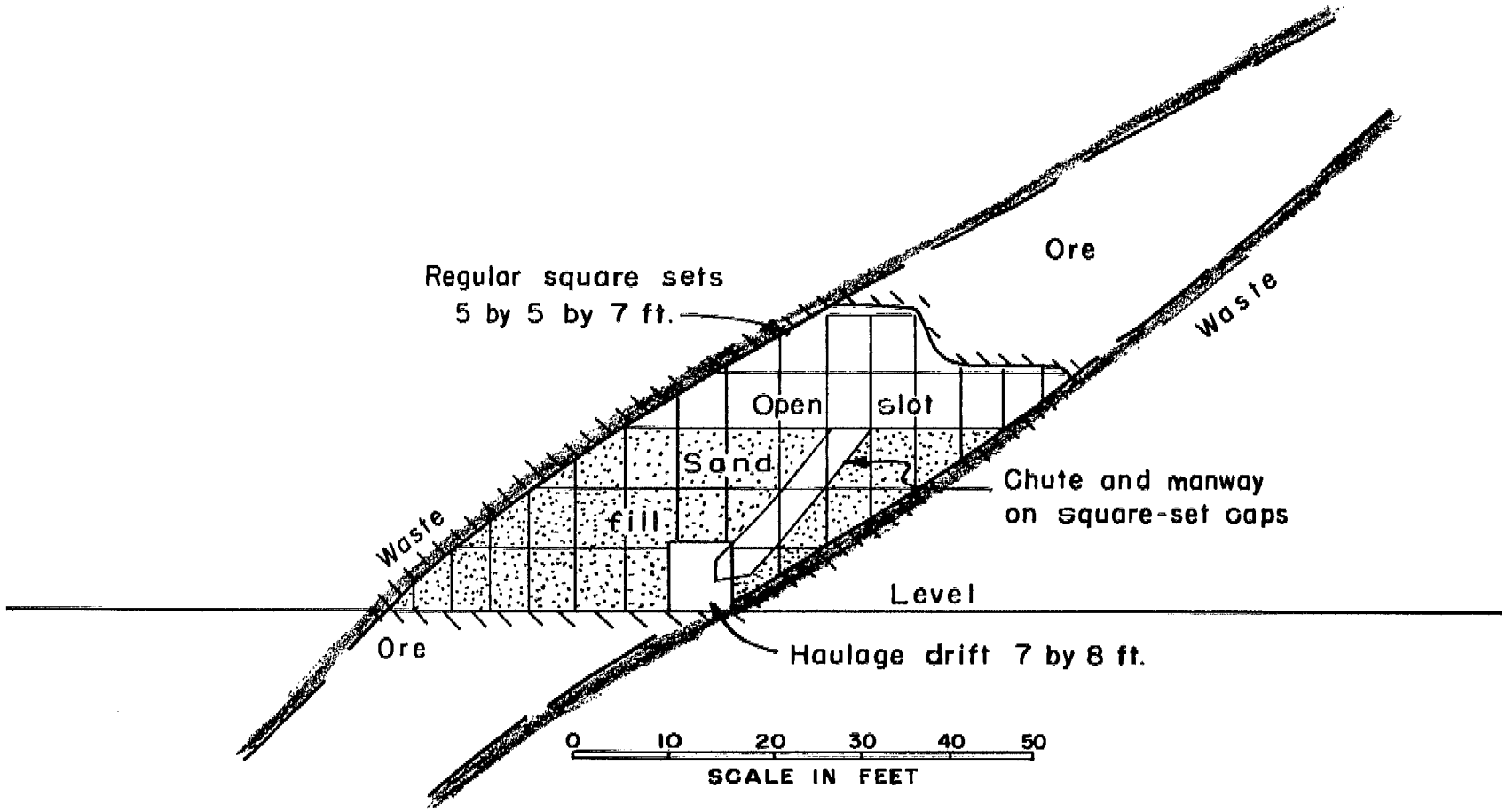


Figure 10. - Section through slot stope.

The slots now were advanced 1 set upward; then the pillar was drilled and blasted (see fig. 9) in successive vertical slices, the pillar face being kept about normal to the slots. The broken ore in the pillar was scraped to one of the slots, then moved to the chute by a second scraper, operating within the square sets. This cycle was repeated until the top of the ore body had been reached. Only alternate pillars were mined and filled as the slots were raised; the other pillars were recovered after the slots had been completed.

The chute and manway were carried up on an incline so the bottom usually rested on the square-set caps, as shown on figure 10. Figure 9 shows a plan of this type of stope, and figure 10 shows a cross section through one of the stopes.

Medium-size jackhammers with feedlegs were used for drilling, the same as in drifts and crosscuts. Hexagonal alloy-steel drill rods (7/8-inch) were used with detachable, 1-3/8-inch, tungsten carbide, 4-point star bits. Forty-percent ammonia gelatin was used with No. 6 caps and fuse for blasting. About 0.15 pound of powder was used per ton of ore broken. Production was 10 tons per man-shift, including mining, stope filling, and repairs.

All broken muck is scraped to the chute with scrapers pulled by double-drum hoists. When the distance for the muck to be moved is less than 40 feet, a 5-hp. double-drum air hoist with a 30-inch scraper is used. When this distance is over 40 feet, a 15-hp. double-drum electric hoist is used with a 36-inch scraper.

Cut-and-Fill Mining Method

Between the Mineral Hill 500- and 300-foot levels the ore and country rock stand better than in the area above the 300; but the wall rock still needs some support, as does the ore. In this area horizontal cut-and-fill stopes are used with roof bolts to temporarily hold up bad ground, and sands prepared from mill tailings to fill the stopes as the ore is being extracted.

On the 500-foot level a 7- by 8-foot, timbered haulage drift was driven lengthwise through the ore body; then raises were driven up on the approximate dip of the ore body to the 300-foot level. A 20-foot pillar was left above the haulage drift, then a stope was silled out from the raise, 20 feet wide, 8 feet high, and approximately 100 feet long across the ore body. A 15-hp., double-drum electric hoist with a 36-inch scraper was used to scrape the broken muck to the raise. Medium-weight jackhammers on feed legs were used to drill horizontal holes, first from the raise to start the stope and thereafter from the stope face. Drill steel and bits were similar to those used in drifting.

At first conventional detonators were used in the stope blast holes, but considerable trouble was encountered as the ore broke with many large boulders. These large pieces of ore caused trouble in slushing in the stope, in the chute pockets above the haulage level, and also at the grizzly over the shaft pocket. Millisecond electric blasting caps were tried and solved this problem. Much finer fragmentation resulted from the use of these millisecond caps, thus speeding loading at all points. Powder consumption in these stopes is about 0.65 pound per ton of ore broken. Ammonia gelatin, 40 percent strength, is used.

After the stope was silled out about 20 feet above the level, another 8- or 10-foot cut was taken, starting from the raise. The chute and manway then were raised to within 3 feet of the stope back (see figs. 11 and 12), and the stope was filled with sand from mill tails to this level. Chute and manway were cribbed, the chute

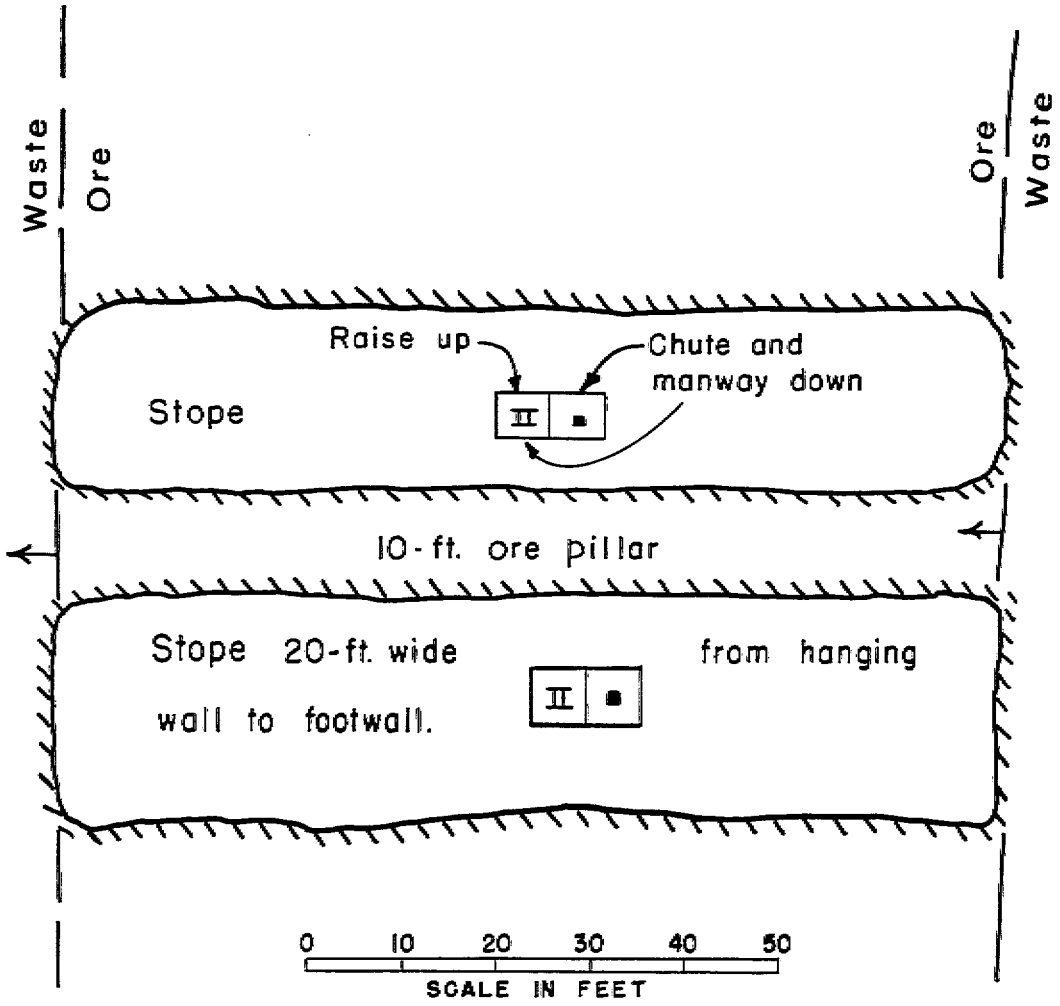


Figure 11. - Plan of cut-and-fill stopes.

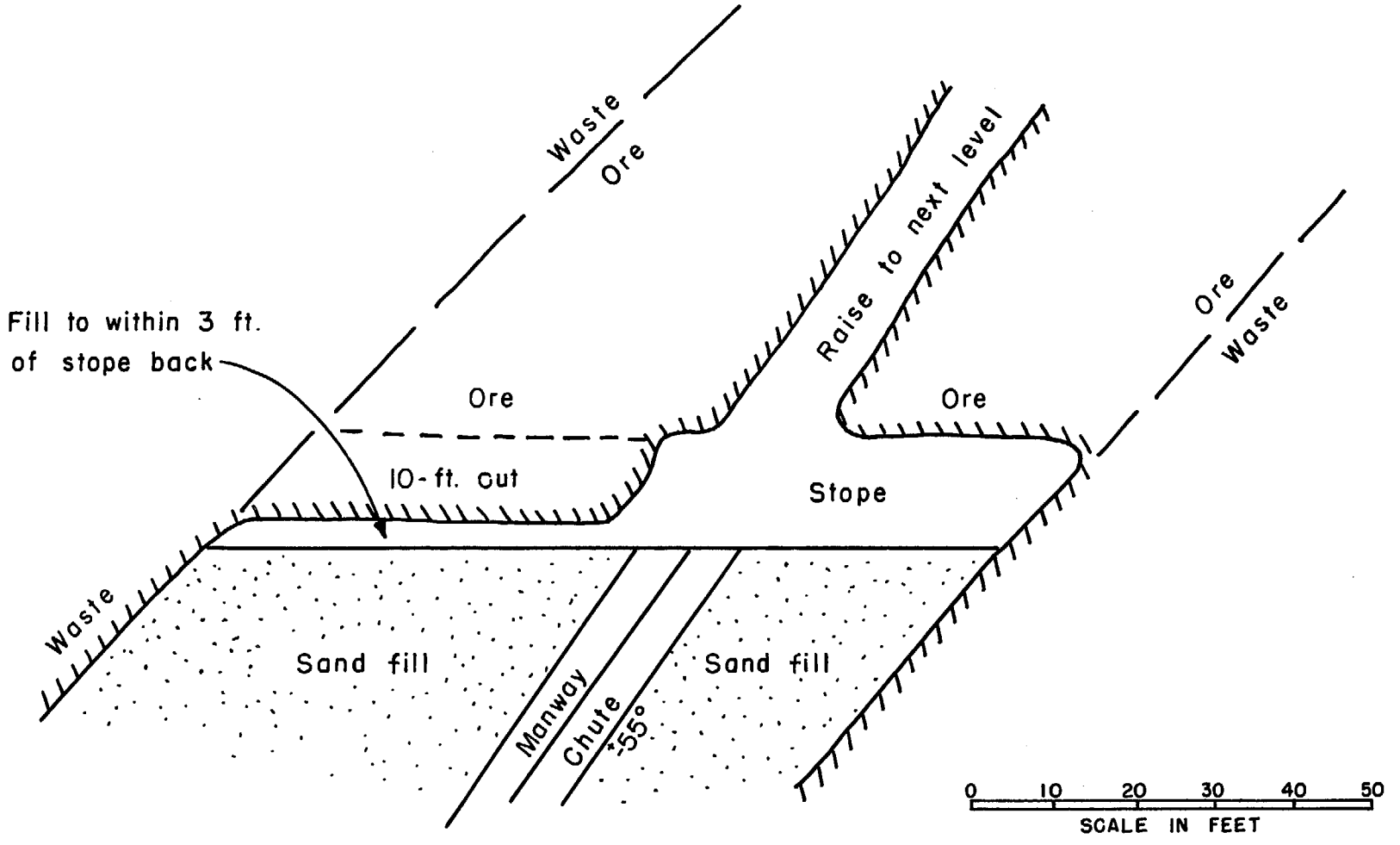


Figure 12. - Section on cut-and-fill stope.

being 4 by 4 feet on the inside, and lined with 2- by 12-inch boards. The chute-manway usually was inclined at about 55° with the manway above the chute. Production was 14 tons per man-shift, including mining, filling, and repairs.

Horizontal cut-and-fill stopes also are used at the Daisy shaft, although the hanging wall usually is very weak. Ordinary waste rock and alluvium are used for stope fill instead of sand from mill tails, as at the Mineral Hill mine. A floor of 2- by 12- or 3- by 12-inch boards, 5 feet in length, is laid on the waste fill. Production here was only 7 tons per man-shift.

Shrinkage Stopes

The No. 1 ore body on the 600-foot level of the Mineral Hill mine was mined by shrinkage-stoping methods, as the ore was a hard mixture of chalcopyrite and garnetite. The ore body was about 300 feet long and 80 feet wide and dipped at about 30°. It was developed by a 12- by 12-foot, double-track haulage drift along the hanging wall (see figs. 13 and 14), with raises near the ends of the ore body and sublevel drifts connecting these raises about halfway between the 600- and 500-foot levels. The main 12- by 12-foot haulage drift was rock-bolted and did not require timber.

At 30-foot intervals along the drift, as shown on figure 13, 8- by 8-foot stope openings were driven into the ore about 4 feet above the track level. These openings were widened to 25 feet and continued to the footwall of the ore. Broken muck was scraped from the stope with a 42-inch scraper pulled by a 3-drum, 25-hp. electric slusher hoist. This hoist was set up on the outer track in the 12- by 12-foot haulage drift and fastened temporarily to the drift wall by rock bolts. A portable, steel chute plate then was placed from the stope opening out over the inner track, so that muck could be scraped directly from the stope opening into 1-ton cars on this inner track.

After the stope had been silled out to a height of 8 feet, a second slice, about 6 feet thick, was taken from the stope back. Enough broken muck was left in the stope for miners to work upon. Jackhammers on feed legs were used for drilling; 8-foot horizontal holes were drilled after the cut had been started. As shown in figure 14, about 4 such 6-foot slices were taken from the stope back. Only enough broken ore was scraped out to allow working space above the muck pile. A 45° cut then was started a short distance from the stope opening and driven up to the hanging wall. This cut was enlarged the full width of the stope; then successive cuts were taken, as shown in figure 14, until the hanging wall had been reached. The hanging wall then was roof-bolted for safety. Only enough broken ore was pulled from the stope to allow space for miners to work. Access was either from an adjoining stope or from the inclined raise at the end of the ore body.

After this hanging-wall ore had been mined, slices again were taken from the back of the footwall section until the ore body had been mined out. The excess muck in this section was scraped down to the haulage-level opening, but difficulty was experienced with the hoist cable when broken ore was scraped from near the footwall. Because of this, some footwall ore was left in the stope and will be recovered later. Openings were broken through the pillars that separated the stopes for access and ventilation.

Forty-percent ammonia gelatin was used for blasting in these stopes with millisecond electric blasting caps. About 0.75 pound of powder was used per ton of ore broken.

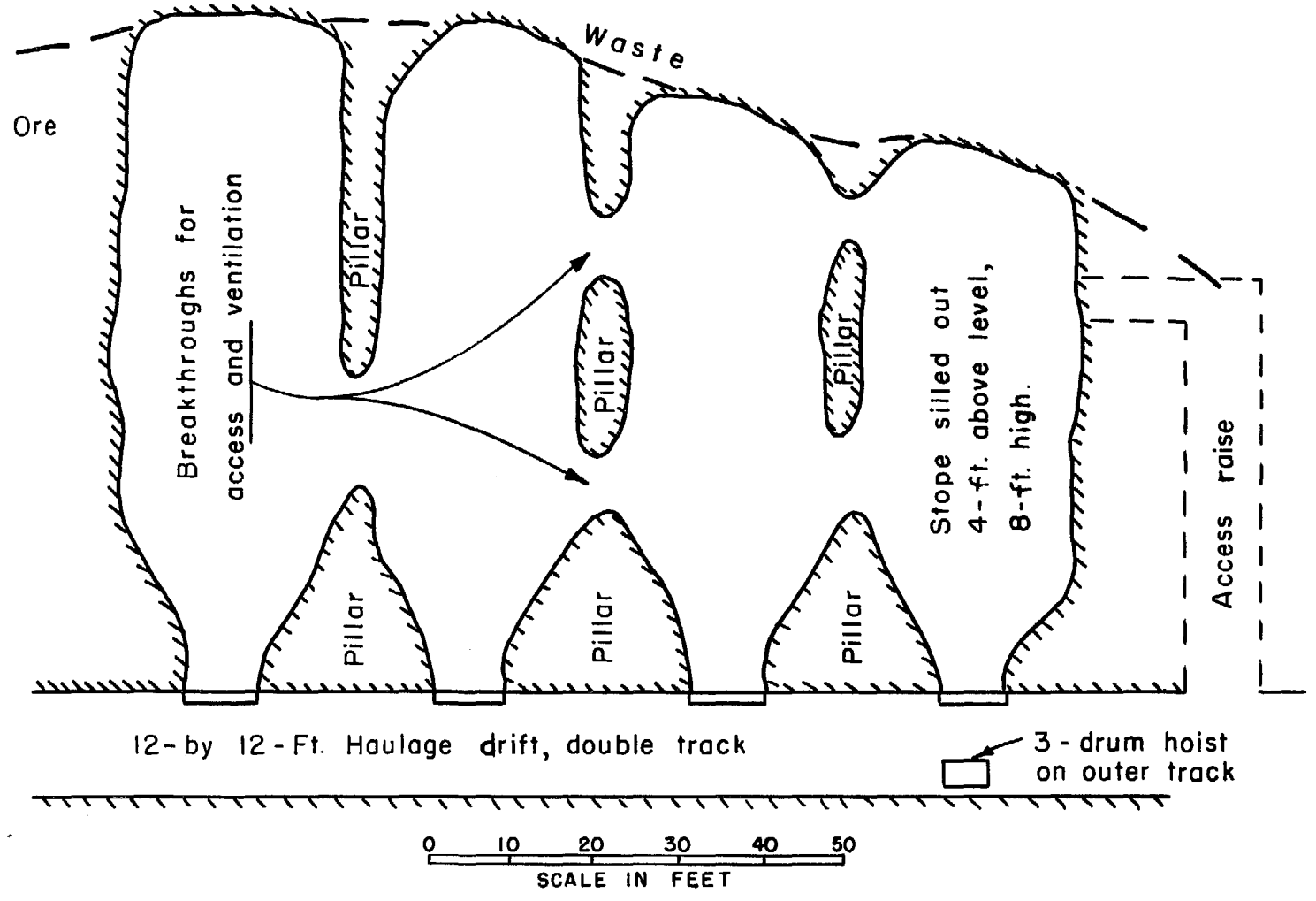


Figure 13. - Ideal plan of 600-level shrinkage stopes.

① Stope, 8 ft. high and 25-ft. wide driven to footwall.
②⑤ 6-ft. slices taken from stope back as shown.
⑥ Stope cut out to hanging wall.
⑦⑪ Slices taken up to hanging wall.
⑫ Slices now taken to footwall.

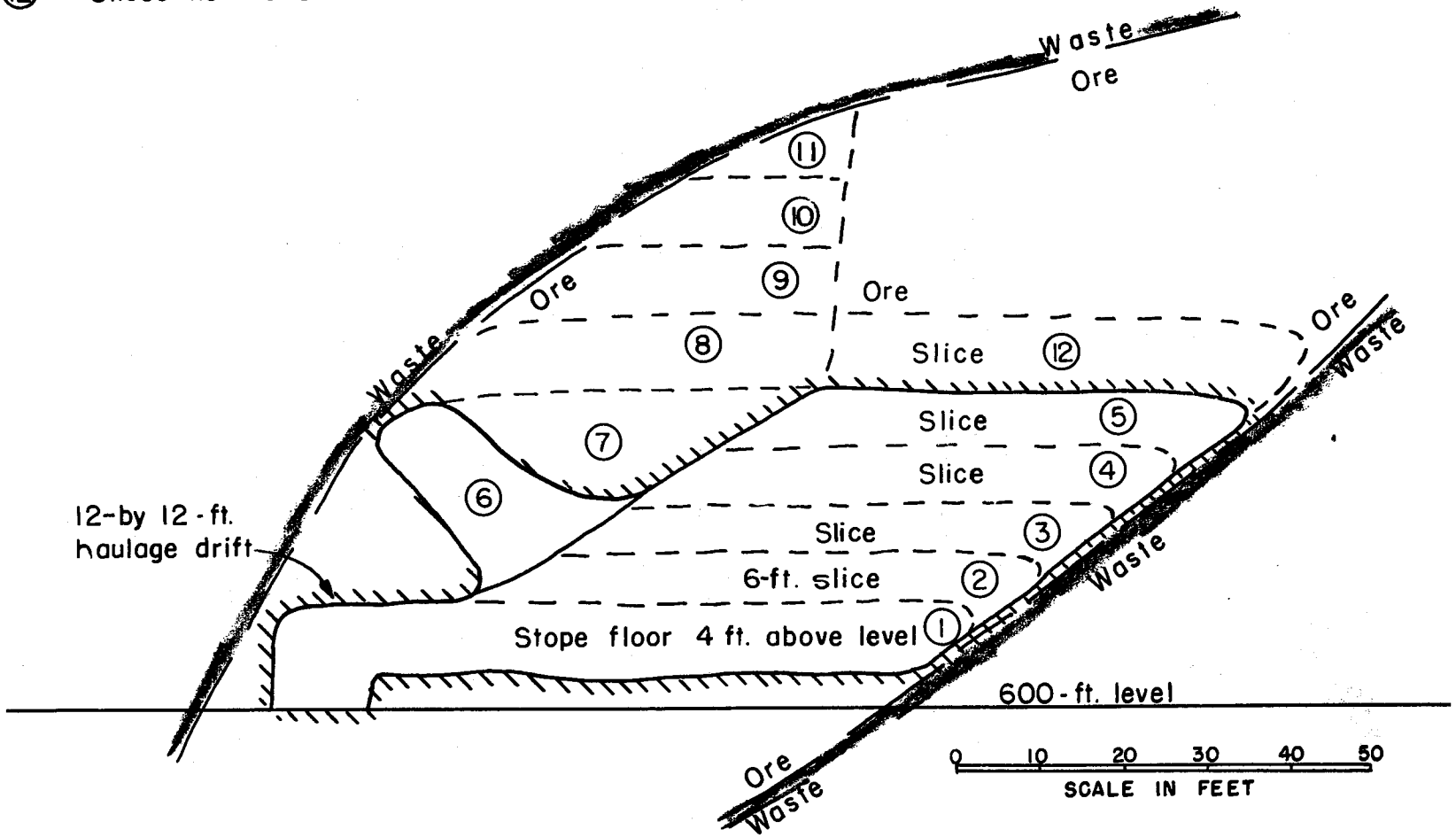


Figure 14. - Section through shrinkage stope.

Stope Fill

Horizontal cut-and-fill stopes at the Daisy mine are filled with waste from development openings and with alluvium. In the Mineral Hill mine stopes are filled with sand from mill tails.

On the surface at the Mineral Hill mine, mill tails to be used for stope fill are pumped to a 14- by 16-foot tank near the collar of the inclined shaft. The tails first go to a 10-inch, single-stage cyclone mounted on top of the tank and are pumped into this cyclone with a 3-inch sand pump at 30 pounds per square inch. The slime part of these mill tails, containing about 97 percent minus-325-mesh, is taken off in the cyclone and returned to the tailing thickener for transfer to the tailing pond. The sand part, or underflow of the cyclone, containing about 50 percent of the total tailing to the cyclone, falls into the 14- by 16-foot tank, which is equipped with a heavy-duty, propeller-type agitator. Sands are kept in agitation before a pour into the mine at about 78 percent solids.

A 2-inch, victaulic pipeline leads from the agitator tank down the inclined shaft to the several mine levels. Only one valve is in this line; this is a rubber pinch valve at the tank to control the sand flow. All pipe bends are of the sweep type to keep pipe friction at a minimum and lessen pipe wear. An independent telephone line leads from each level to the agitator tank. Underground portable, Army field-type telephones with long extension cords are used, so that they can be taken into stopes.

When a stope is ready to be filled (either one of the square-set slot stopes or a cut-and-fill stope), the 2-inch victaulic pipeline, which already has been run up a manway to the stope, is extended into the stope. The cribbed chute-and-manway, which has been raised to the proper level for the fill, is sealed thoroughly all around with burlap. Quick-setting cement is used for sealing difficult joints. The man in the stope then telephones the man at the agitator tank, and the fill is started. Water drains from the sand fill quite rapidly, so a man may walk out on the fill within an hour after it has been poured. Within 8 hours the miners can begin work again as the fill has solidified by that time.

Separate water and compressed-air connections have been installed in the sandline at the surface, so that more water may be added to the sand if needed and the line may be washed out; compressed air may be used to clear out obstructions in the line.

TRANSPORTATION

At the Mineral Hill mine ore is hoisted in a 2-1/2-ton skip in the inclined shaft. Men and supplies are hoisted and lowered in No. 2 vertical shaft, and occasionally some waste rock is caged to the surface there.

The inclined shaft is equipped with a 250-hp. single-drum hoist and a 2-1/2-ton self-dumping skip, which can hoist 50 tons per hour from the 500- and 600-foot levels. A 100-ton ore bin and a 75-ton waste bin are installed on the surface at the inclined shaft headframe. Material from these bins is loaded into 18-ton dump trucks and hauled either to the mill or to the waste dump.

No. 2 shaft is equipped with a 75-hp., gear-driven, double-drum hoist and a 1-car-capacity cage. A 45-foot wooden headframe has been constructed over this shaft.

Underground, all transportation on the levels is by trains running on 18-inch-gage tracks, with 20-pound rails. One-ton, 20-cubic foot, side-dump cars, pulled by 1-1/2-ton storage-battery locomotives haul the muck to the inclined-shaft loading pockets, which are below the 300-, 500- and 600-foot levels; one is now being constructed below the 700-foot level. Each such pocket contains a measuring pocket for loading the skip. Battery-charging stations are on each level near the No. 2 shaft.

A telephone on each level at No. 2 shaft connects directly with the hoistman. Electric signals also are used to signal the hoistman from each level.

VENTILATION

Forced ventilation is provided in the Mineral Hill mine by a 36-inch fan driven by a 30-hp. electric motor on the 500-foot level near the No. 2 shaft. This fan has a capacity of 25,000 cubic feet per minute. Air is drawn down No. 2 shaft and blown out through the 500-foot level and down to the 600-foot level through raises, then back to the surface up the inclined shaft. Dead-end workings and some stopes are ventilated by small blowers with vent tubing.

MINE DRAINAGE

All water in the Mineral Hill mine drains to a sump below the 600-foot level, then is pumped to the surface by either of 2 routes. One pump is installed so that water may be pumped directly to the surface. An alternate method is to pump from the sump below the 600-foot level to one at the 300-foot level, then from there to the surface. Average water pumped is about 140 gallons per minute although water pockets often are encountered by development workings, especially on the 600-foot level, which increase this amount to approximately 400 gallons per minute.

SAFETY MEASURES

At the Mineral Hill and Daisy mines a first-aid box is provided on each level and a stretcher at the collar of all shafts. The Banner Mining Co. owns an up-to-date ambulance, which is stationed at the company office a short distance from the Mineral Hill mine and about 1 mile from the Daisy shaft. This ambulance contains complete first-aid equipment, stretchers, etc.

All key personnel has taken first-aid training and is qualified to give aid to the injured.

MILLING

As has been previously mentioned, a 400-ton flotation plant was constructed during 1953-54 at the Mineral Hill mine with the assistance of the Defense Minerals Procurement Agency. Recently the daily capacity of this mill has been increased to 500 tons by the addition of a middling regrind unit.

Ore is trucked from the Mineral Hill and Daisy mines to a 50-ton truck scale on the hillside above the mill. The ore is weighed and dumped into three 180-ton coarse-ore bins through grizzlies spaced 11 inches apart. From these bins, the ore is fed by three 36-inch apron feeders to a 30-inch conveyor belt feeding a 2-inch vibrating grizzly. The plus-2-inch material goes to a 30- by 18-inch jaw crusher. The minus-2-inch joins the crushed ore on a belt passing under both the vibrating grizzly and the crusher and is carried to a 4- by 8-foot, double-deck

vibrating screen. The top deck carries a 3/4-inch scalping screen and the lower deck a 3/8-inch finishing screen. After passing an automatic sampler, the minus-3/8-inch material goes to the three 500-ton ore bins by means of a bucket elevator followed by a shuttle belt conveyor. The plus-3/8-inch material is returned to a 4-foot cone crusher discharging onto the belt passing under the vibrating grizzly and the jaw crusher.

Each fine-ore bin is equipped with a volumetric feeder, so that ore can be fed from any bin or combination of bins. The feeders discharge onto a collector belt, which in turn discharges onto the ball-mill feed belt. This belt passes over a weightometer and discharges into an 8 by 6 ball mill. A 5-foot classifier is used to close the mill circuit.

The classifier overflow is pumped to the flotation section, which consists of sixteen 44- by 44-inch flotation machines divided into the following subdivisions: Cleaners, 2 cells; first roughers, 4 cells; second roughers, 3 cells; and scavengers, 7 cells. The concentrate from the first roughers goes to the cleaners. The concentrate from the second roughers goes to the head of the first roughers. The concentrate from the last seven cells (the scavengers) goes to the regrind, as does the cleaner tailing.

The regrind unit is a 42-inch by 7-foot ball mill operating in closed circuit with a 6-inch Dorrclone. The reground middling is returned to the head of the first roughers.

Final concentrates go to a 30-foot thickener from which they are pumped to a 6-foot-diameter, 4-disk filter. The filter concentrate discharges into a storage bin.

The final tailing goes to a 60-foot thickener, then to the tailing pond.

Water from both thickeners is returned to the mill steady-head tank.

Automatic samples are taken of the classifier overflow, tailings, and final concentrate.

About 95 percent of the copper is recovered in a concentrate assaying 25.50 percent copper.

INT.-BU.OF MINES,PGH.,PA. 8306

Courtright

DIAMOND DRILL
NOTES ON ~~DIAMOND~~ HOLE CORES
BANNER MINING COMPANY

By J. H. Courtright and K. Richard
January 13, 1956

HOLE NO. 82
(Little Eva No. 1 Claim)

From	To	
190'	217.5'	Conglomerate (gravel). No leached zone.
217.5'	371'	Fine-grained argillic quartzite varying to silty sandstone (330' to 371' soft clay zone). Moderate to sparse pyrite, sparse chalcopyrite both disseminated and as veinlets.
371'	415'	Metamorphosed limey siltstone, mottled green to light gray, some tan. Lime silicates, probably garnet. Very sparse disseminated pyrite and chalcopyrite.
415'	516'	Metamorphosed limestone. Fine textured garnet and green epidote. Tan to gray-green. Trace disseminated sulphides (460' to 512' hematite veinlets).
516'	621'	Greenish gray and brown garnetized limestone slightly argillic. Occasional hematite stringers. Very sparse pyrite and chalcopyrite in patches.
621'	670'	Dark gray to black dense limey argillite. Hardness 4 to 5. Slight effervescense in acid; no alteration and no sulphides.

From 190 to 516 only sawed slices of representative portions of the core were available for observation.

From	To	Assay Sludge
210'	217.5'	.21
217.5	220.0	.18
220.0	222.	.26
222.	224.	.15
224	226	.15
226	228.5	.15
228.5	232.5	.17
232.5	234.5	.11
234.5	240.0	.15
240.0	243.5	.15
243.5	249.	.26
249	253.5	.05
253.5	256.5	.08
256.5	259.5	.10
259.5	262.5	.10
262.5	266.5	.10
266.5	268.5	.15
268.5	273.5	.15
273.5	277	.08
277	279.5	.13
279.5	283.5	.16
283.5	287.5	.13
287.5	291	.10
291	296	.15
296	303	.14
303	306.5	.10
306.5	310	.10
310	316.5	.08
316.5	319.5	.10
319.5	324	.15
324	329	.15
329	331.5	.10
331.5	334	.10
334	336	.13
336	339	.18
339	343	.16
343	348	.15
348	350.5	.15
350.5	354	.14
354	356	.15
356	361	.16
361	363	.14
363	366.5	.10
366.5	371.5	.10
371.5	375	.07
375	379.5	.05
379.5	383	.07

From	To	Assay Sludge
383'	388.5'	.08
388.5	394.	.08
394.	404.5	.10
404.5	415.	.13
415	419	.22
419	422.5	1.03
422.5	426.5	.62
426.5	428.5	.15
428.5	432.5	.15
432.5	441.5	.13
441.5	450	.13
450	452	.05
452	455	.05
457	459	.06
459	460	.12
462	463	.12
468	472	.10
472	474.5	.04
474.5	481	.05
486	490.5	.05
496	508.5	.05
504.5		.08
511	516	.21
516	526	.20
526	536	.31
536	546	.68
546	551.5	.28
551.5	561	.15
561	571.5	.05
571.5	581.5	.05
581.5	590.5	.08
590.5	596.5	.05
596.5	604	.05
604	611	.08
611	616.5	.08
616.5	621.5	.10
621.5	631.5	.06
631.5	634.5	.05
634.5	644.5	.05
644.5	658.5	.05
658.5	663.5	.05
663.5	670.5	.05
670.5	680.5	.05

DIAMOND
NOTES ON DRILLED HOLE CORES
BANNER MINING COMPANY

By J. H. Courtright and K. Richard
January 13, 1956

HOLE NO. 84

From	To	Est. % Core Recovery	
206'	216.5'	10	Leached arkose(?). Copper stain at 215'. Sparse dark brown limonite.
216.5'	226.5'	0	
226.5'	231'	40	Fault or sheer dipping approximately 45°. Probably pre-mineral, contains chalcopyrite and pyrite.
231'	261.5'	20	Fine angular or coarse arkose, dark gray, silicified. A few pyrite-chalcopyrite stringers, but mostly disseminated chalcopyrite. Few quartz veinlets. Occasional gypsum stringers. At 300' bedding(?) 45°.
261.5'	296.5'	65	
296.5'	334'	80	
334'	360.5'	90	
360.5'	384'	95	
384'	390'	95	
390'	408'	95	Quartz-feldspar-mica rock. Gradational contact (380-384) with arkose above. Light tan color moderate disseminated chalcopyrite and pyrite. Few quartz veins.
408'	417'	85	Coarse arkose or angular conglomerate. Moderate chalcopyrite, sparse pyrite. At 415' gouge dip 60°.
417'	421'	95	Silty arkose, occasional coarse pebbles, some chlorite. Pale tan color common. A few sulphides in quartz stringers, but chalcopyrite-pyrite mostly is disseminated. Sulphide stringers dip principally 45°. From 429' to 460' the assay value is estimated at 1.0% copper. (These samples were lost and no assays were available.)
421'	445'	95	
445'	460'	100	
460'	489.5'	95	Coarse silicified arkose with some angular fragments. Dark gray color. Moderate disseminated chalcopyrite and pyrite.
489.5'	517'	90	Fine grained dark to light gray silty quartzite. Abundant pyrite-chalcopyrite veinlets (less disseminated sulphides than above material).

HOLE NO. 84 (Continued)

From	To	Est.% Core Recovery	
			From 517' to 518' gouge and breccia.
517'	517.5'	--	Gray to white fine-grained quartzite. Sparse disseminated pyrite and chalcopyrite.

ASSAY DATA BANNER MINING COMPANY HOLE NO. 84

From	To	Assay Sludge
206.5'	211.5	.33
211.5	216.5	.35
216.5	221.5	.25
221.5	226.5	.48
226.5	231.5	.38
231.5	236.5	.53
236.5	241.5	.68
241.5	246.5	.58
246.5	251.5	.63
251.5	256.5	.63
256.5	261.5	.68
261.5	264.5	.82
264.5	269.5	.53
269.5	272	.47
272	276	.28
276	281	.28
281	286	.33
286	289.5	.23
289.5	294.5	.33
294.5	299.5	.47
299.5	307	.43
307	313	.44
313	318	.42
318	323	.40
323	331.5	.56
331.5	337.5	.76
337.5	346.5	.88
346.5	356.5	.76
356.5	360.5	1.18
360.5	367.5	1.06
367.5	371.5	1.49
371.5	376.5	1.13
376.5	384.5	1.09
384.5	390.5	.38
390.5	397.5	.53
397.5	403.5	.38
403.5	408.5	.40
408.5	417.5	.75
417.5	419.5	.40
419.5	429	.83
429	460	No Assays
460	464.5	.71
464.5	471	.76
471	477.5	.66
477.5	489.5	.59
489.5	493.5	.71
493.5	496	.88
496	505	.93
505	511	.77
511	516.5	1.08
516.5	524.5	.38
524.5	529.5	.20
529.5	534.5	.13
534.5	540.5	.18
540.5	545	.23
545	549.5	.31
549.5	558.5	.23
558.5	561.5	.20
561.5	565.5	.15
565.5	569.5	.18
569.5	572.5	.28
572.5	576.5	.38
576.5	580	.41
281	524.5	.70
206	580	.59

DIAMOND
NOTES ON DRILL HOLE CORES
BANNER MINING COMPANY

By J. H. Courtright and K. Richard
January 13, 1956

HOLE NO. 89

From	To	Est.% Core Recovery	
197'	224'	50	Leached quartz-feldspar-mica rock, good porphyry textures. Trace copper stain at 200'. Sparse dark limonite.
224'	261.5'	50	Quartz-feldspar-mica rock (probably arkose). Strong porphritic texture. Strong alteration. Sparse disseminated pyrite and chalcopyrite, no stringers.
261.5'	370'	--	Same as above. Quartz pebbles (detrital) and large pink secondary feldspar at 369'. Hole still drilling.

ASSAY DATA BANNER MINING COMPANY HOLE NO. 89

From	To	Assay Sludge	From	To	Assay Sludge
197	202.5	.23			
202.5	209	.13			
209	212	.15			
212	216	.13			
216	221	.13			
221	224	.18			
224	227	.18			
227	229.5	.18			
229.5	233	.23			
233	236	.23			
236	241.5	.23			
241.5	246.5	.25			
246.5	249.5	.25			
249.5	255.5	.20			
255.5	257.5	.28			
257.5	261.5	.25			
261.5	264.5	.24			
264.5	268	.19			
268	271.5	.20			
272.5	277.5	.23			
277.5	279.5	.18			
279.5	282.5	.31			
282.5	287.5	.24			
287.5	291	.43			

Aa.16.16.0

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

April 2, 1953

Mr. W.R.Landwehr, Chief Geologist
Western Mining Department
American Smelting and Refining Company
600 PAcific National Life Building
Salt Lake City, Utah

TWIN BUTTES DISTRICT
Copper Queen Mine

Dear Sir:

Attached is copy of Mr. J.H.Courtright's memorandum of April 1, 1953 on the Copper Queen mine, in the Twin Buttes area, held by the Banner Mining Company.

The recent discovery in the Queen mine by drilling has now been exposed by drifting, and Courtright estimates the ore will be about 25 feet wide when fully exposed, with an undetermined strike and vertical extent. Drift assays of 4.75% copper have been assigned to the ore exposed. This is a very interesting showing.

The Banner people are still planning to build their mill, and at present they are confident they will be able to finance the venture by obtaining a government loan of about $400,000. at 5%.

To date Mr. Bowman has not given us his permission for a detailed examination of their Arizona properties, however, we should have the approval by the time Mr. Kenyon Richard and Mr. Courtright are available for this work (10 days).

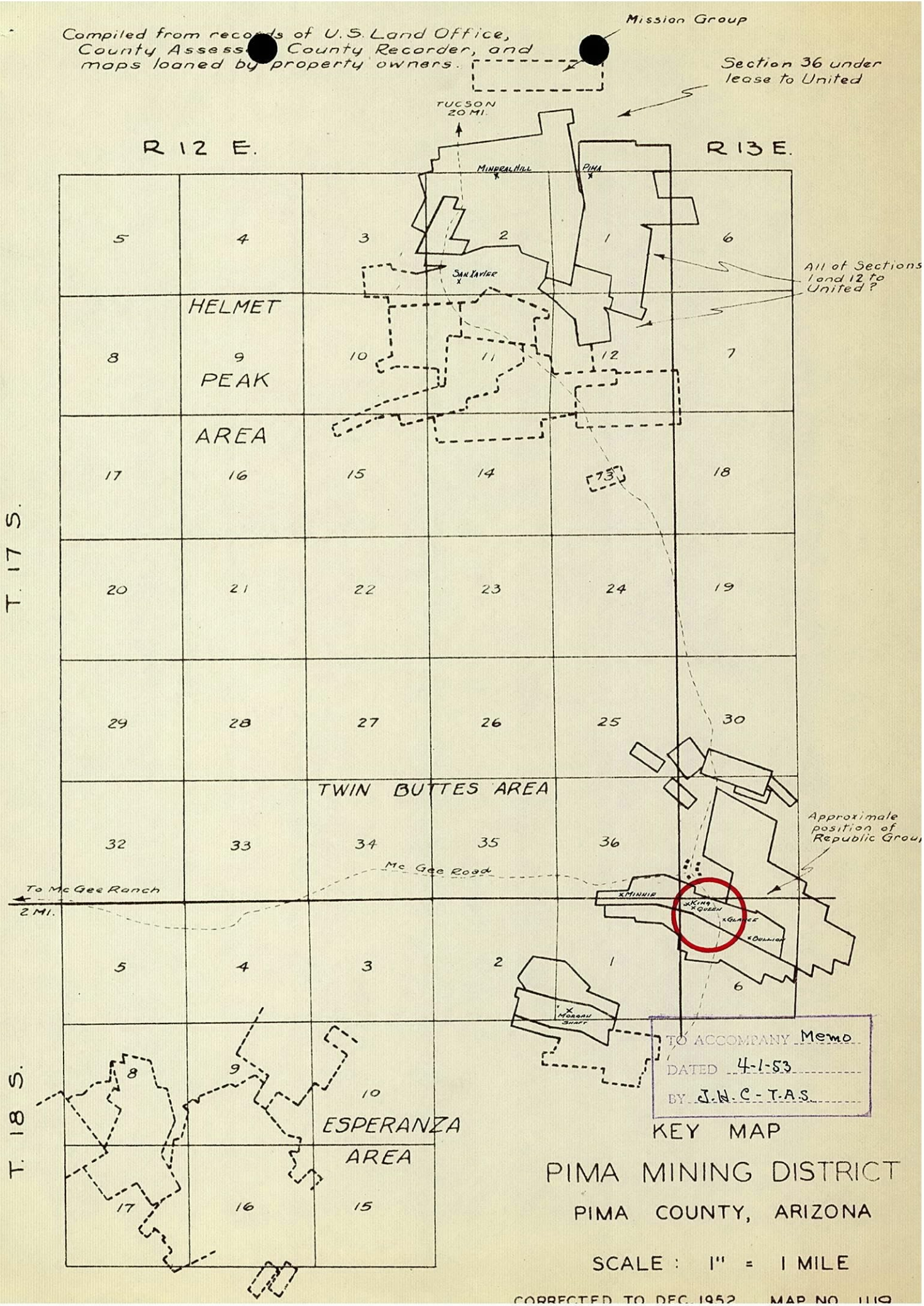
Very truly yours,

encls: memorandum

cc: D.J.Pope (2)
Kenyon Richard (1)
J.H.Courtright

T. A. SNEDDEN

TAS:blc



KEY MAP

PIMA MINING DISTRICT

PIMA COUNTY, ARIZONA

SCALE : 1" = 1 MILE

CORRECTED TO DEC. 1952 MAP NO. 119

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

April 1, 1953

MEMORANDUM TO:
Mr. T.A.Snedden

TWIN BUTTES DISTRICT
Copper Queen Mine

On March 29th Mr. Keith Papke and I made a trip to the Twin Buttes area to examine a new showing of copper ore recently opened up by the Banner Company in the Queen mine, previously reported by Reed Welch on February 27, 1953. Mr. Alan Bowman, Manager, spent the day with us on surface and underground.

The Queen is one of five limestone replacement deposits (the other four: Copper Glance, Minnie, Copper King and Copper Bullion) which occur along an east-westerly trending granite contact over a distance of 9000 feet. The mines have been plotted on the attached property map compiled by L.K.Wilson. Reported total production:

300,000 tons at 6.0% Cu.

Principal producers in the past:

	Tons	Cu %
Copper Glance.....	118,000	6.7
Copper Queen	75,000	7.0
Minnie	62,000	4.7

Maximum vertical depth of workings: 700 feet.

THe Banner Company recently opened up the Glance vertical shaft and the 500 level extending some 1800 feet to the Queen shaft, inclined 72 degrees south. They found that the open stope in the Queen terminated on the west against a steep, north-striking fault. Four holes were drilled southwesterly to prospect for a possible displaced segment of the ore; two holes cut 40-foot intercepts of 5.0% copper, according to Mr. Bowman. To date they have driven a distance of 22 feet westerly beyond the fault, apparently along the hanging wall of the ore, which is a more or less massive pyrite replacement of chloritic limestone. Copper occurs as intermingled chalcopyrite; drift assays average 4.75% copper. No maps were available, but judging from the positions and angles of the drill holes and the exposure in the prospect drift, the ore shoot is at least 25 feet thick, dips steeply south with undetermined westward and vertical extent. The fault shows post-mineral movement and there seems to be little doubt that the ore is a displaced segment of the main ore shoot mined out in the past.

Pre-Mineral fissures were also noted. These cut at various angles across the contact zone and may have exerted some control on ore deposition. Steep-dipping fissures striking nearly parallel to the contact, appear to be the principal ore controls.

Currently, a diamond drill is being used to explore the granite-limestone contact east of the main shoot. No ore has been encountered here so far.

The old stopes in the Glance and Queen mines are for the most part still open. In the Queen the stopes are as much as 50 feet wide, extending horizontally some 400 feet and vertically about 200 feet (dipping south 50 to 70 degrees). Those in the Glance are somewhat narrower.

The mineralization (pyrite-chalcopyrite replacement of metamorphosed limestone), is similar to that at Mineral Hill and Pima; however, the ground is more firm in the Twin Buttes mines.

On the surface around the Queen and Glance mines there is little or no evidence of gossan derived from sulphides. Apparently these "blind" deposits 300 to 400 feet below the surface were discovered by sinking on small copper carbonate seams in garnetized limestone near the granite contact. At the Copper King a carbonate vein two or three feet wide has been stoped to the surface. This reportedly bottomed at 300 feet depth.

In general, oxidation extends to around 400 feet depth, the present water table. According to Mr. Bowman, the Glance shaft is making less than 50 gallons per minute.

The Morgan mine, another contact type copper deposit lying one mile southwest of the Queen, and the Minnie, were operated by the A.S.&.R.Co. around 1917.

The Banner Company is continuing magnetic and self-potential surveys by S.H.Kelly. At Twin Buttes proper (one mile northeast of the copper Queen) they have found a strong magnetic anomaly over alluvial cover, running west-northwesterly across the southwest corner of Section 30. The width of the anomaly is 150 feet; length, plus 1000 feet; magnitude, 400 to 500 gammas.

In the Mineral Hill area a series of magnetic anomalies have been obtained, extending over alluvium 3000 feet northwesterly from their first drill hole located just west of Pima's property and west of the Alpha shaft. As reported by Reed Welch, the first hole cut 40 feet of 5.0% copper ore. A third hole is now drilling in this area which is covered by 140 to 150 feet of gravel. Information on the second hole, other than that "it cut low grade copper mineralization" was not obtained.

Eagle Picher has reportedly engaged United Geophysical to survey their ground around Helmet Peak.

Concluding, it seems a rather safe prediction, assuming continued heavy demand for copper, that additional new discoveries will be made in the Pima and Twin Buttes Districts. While no one of these is likely to be particularly large (judging from the ore habits characteristic of the area) the aggregate may reach a size of considerable importance.

Mr. Bowman stated that he would inform us after consulting with members of his company regarding our request for permission to make a detailed examination of their holdings.

attaching property map /s/ J.H.Courtright

cc: DJPope (2)
KRichard(1)
JHCourtright (1)
File

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

January 12, 1953

MEMORANDUM TO:
Mr. T.A.Snedden

MINERAL HILL MINE
(Banner Mining Company)
Pima Mining District
Pima County, Arizona

The following information was obtained during our visit to the subject property on December 29, 1952.

The Bowmans secured the property about two years ago and just recently have completed unwatering and sampling of old workings on the 300, 500 and 600 levels. New Development has been started on the 700 level. Access to the four levels is through a shaft inclined 54°.

The mine was opened up around 1920. Production amounted to something less than 100,000 tons, most of which was oxide ore from above the 300 level.

Copper values occur principally as chalcopyrite in an irregular zone of garnetized limestone dipping around 50° south. In plan the zone is about 100 by 300 feet, with the long axis parallel to, but well in the hanging wall of the east-west Mineral Hill fault.

In detail the ore (2% to 5% Cu) often presents a banded appearance, produced by parallel chalcopyrite and magnetite seams which occupy local zones of sheeting. Some of the copper is disseminated through the garnet. In general, chloritized limestone (weaker alteration) occurs in the transitional zones between ore and barren limestone. The distribution of copper is quite irregular and spotty.

Intrusive granite borders the footwall of the ore body in part, but no particularly close spatial relationship to the ore zone is evident. Principal control of ore deposition appears to be effected by a series of east-west faults cut by numerous cross-breaking fractures.

Oxidation extends to the 275 level, corresponding approximately to the water table. Most of the copper was converted in place to oxides but some was carried downward as evidenced by occasional chalcocite films on chalcopyrite in the sulphide zone. This chalcocite may account for the slightly higher than average grade on the 300 level.

Minor amounts of molybdenite and scheelite occur with the copper. The Scheelite is more abundant in areas of quartz veining.

Samples were cut after post-mine oxidation products had been cleaned off the rock surface. Non-sulphide copper determinations were not available, however oxidation other than post-mine appears to

be negligible below the 300 level.

Sample results and reserves, according to Allan Bowman, superintendent, were as follows:

	Square feet	% Cu
300 level	15,000	3.23
500 "	9,000	2.97
600 "	19,000	2.40
700 "	?	2.35

	Tons (10.5 cu ft/ton)	
Measured ore	78,000	300 to 600 level
Indicated	295,000	300 to 600 level
Inferred	125,000	600 to 700 level

The three categories above include ore from a few feet above the 300 to the 700 level; the total reserve was estimated as follows:

	Tons	Ag	Cu	MoS_2	WO_3
Total	500,000	.78	2.63	.05	.05

Mill tests reportedly produced a 25% to 30% copper concentrate with a recovery of over 95%. Over 60% of the tungstate was recovered in a table test.

The operators have recently shipped 650 tons of 6.0% copper (sulphide) from the 300 level of the No. 3 shaft situated a few hundred feet easterly from the incline. This ore shoot was described as a lense striking northerly, somewhat in the hanging wall of an easterly projection of the main body developed in the incline. This ore carries unusual amounts of molybdenum -- 1% to 2%. Some diamond drilling has been done, but no opinion was offered as to the tonnage of reserve existing here.

North of the No. 3 shaft there are sizable dumps of limestone and garnet, but very little evidence of copper mineralization.

The zone of garnetized limestone continues eastward for several hundred feet, as evidenced by prospect shafts and an occasional outcrop in the shallow gravel cover. The gravel becomes deeper within 700 or 800 feet of the Pima property line. This area may contain a

westward extension of the Pima Mining Company's deposit.

With the exception of this exploration possibility, prospects for a profitable operation on the Banner ground are much the same now as appraisals have indicated in the past -- rather slim. The ground is not sufficiently firm to permit use of the low-cost mining methods necessary to the profitable extraction of 2.5% copper. However, the Bowmans have secured a $260,000 D.M.E.A. loan and are negotiating a contract for copper prices up to 32¢ through 1956.

With this assistance it is quite possible that the mine will produce some 3.0% to 3.5% copper ore if milling facilities become available on the adjoining Pima property. The two deposits are similar mineralogically and should be amenable to the same process, including extraction of molybdenum and tungsten values.

J. H. Courtright
J. H. COURTRIGHT

Ariz. Dec 29, 52

Mineral Hill — Banner Mining Co.
Mgr. Bowman

540' incl shaft — Reopened + channel sampled at 300 - 500 - 600
New develop on 700 —
Tactite is ls locally lends in all directions, but general trend is E-W
Ore varies from tiny irreg veinlets and grains in chl or gar rock to mineralized sheared zones —
cpy with minor cc on 300
py and magnetite prominent gangue
Granite shows in footwall occ. but relationship obscure —
Appears to be an irreg pipe-like ore shoot dipping 50° S.

Reserves "indicated" (10.5 Cu ft/ton

tons	Ag	Cu	MoS_2	WO_3
500 000	.78	2.68	.05	.05

Oxidized to 200 — (water level)
Making 150 gpm on 300 —
Ground is firm except for occasional soft spots in chloritic rock —
300 level — 150000 sq ft — ave 3.25 Cu
Some cc coatings — may account for higher than average grades

Dec 30-52 Rima Mng Co — Drex Spaulding
Bob Thurman

Development: Vert. 2 comp. shaft
300 + 400 — 300' E + 400 W of shaft.
Sinking to 600 — Making 400 GPM.
Indicated ore:
from 220' (base of gravel) to 350 level
500 long x 70 thick — 10 cu/ton —
455,000 tons @ 3% Cu
from 350 to 450 —
500 long x 25 thick —
125000 tons at 5% Cu
A few DD holes to 600 show continuity —
Prospective — 500 x 25 x 150 —
187000 — tons @ 5%
possible 750,000 tons at 4.00

cpy occurs massive + as disseminations 5-10% magnetite — minor py in garnetized ls. some in chl.
Strongest faults E-W dipping ±50°S
Fresh ls or mble noted in foot + hang — nearly and alt ls assays over 1.0 Cu
Minor WO_3 + MoS_2
High grade associated with cross breaking slips + fractures — dist of hi gr. very irregular —
much white clay alt — for most part no timber in drifts — due to fractured nature of ground — large unsupported mine openings impractical.